NEW COMPANIES.

CHEMICAL MANURE COMPANY, LIMITED.—Incorporated on the 7th inst., with a capital of £50,000 in £10 shares, to manufacture and deal in chemical manures and articles incidental thereto.

CUMBERLAND LEAD MINES, LIMITED.—On the 7th inst., this company was registered, with a capital of £55,000 in £1 shares, to acquire and work silver, lead, copper, and other mines in the United Kingdom and Ireland, or elsewhere.

"GARTH" STEAMSHIP COMPANY, LIMITED.—Registered on the 6th inst., with a capital of £23,000 in £20 shares, to purchase the steamship *Garth*, of Cardiff.

HASTINGS PATENT HYDRAULIC FREESTONE COMPANY, LIMITED.—This company was registered on the 4th inst., with a capital of £20,000, in £5 shares, to take over the business known as the Victoria Hydraulic Patent Stone Works, at Hastings.

LANCASHIRE AND YORKSHIRE ELECTRIC LIGHTING COMPANY, LIMITED.—The company proposes to produce and supply electricity for the purposes of light, heat, motive power or force, or for telegraphic and telephonic purposes. It was registered on the 4th inst., with a capital of £100,000 in £5 shares.

NEW VAN CONSOLS AND GLYN MINING COMPANY, LIMITED.—This is a reconstruction of United Van Consols and Glyn Lead and Barytes Mining Company, Limited, now in course of voluntary liquidation. It was registered on the 4th inst., with a capital of £80,000 in £1 shares.

"NEW YORK CITY" STEAMSHIP COMPANY, LIMITED.—Registered on the 4th inst., with a capital of £27,000, in £100 shares, to acquire and work the s.s. *City of New York*.

"N. MOOSHER" SHIP COMPANY, LIMITED.—This company was registered on the 7th inst., with a capital of £3520, in £55 shares, to purchase and work the above-named ship.

PATENT TRIANGULAR NAIL COMPANY, LIMITED.—Upon terms of an agreement of the 23rd September, this company proposes to purchase and work the letters patent, No. 2831, A.D. 1877, for improvements in nails and other like articles. It was registered on the 1st inst., with a capital of £10,250, in £5 shares.

"CAW FELL" STEAMSHIP COMPANY, LIMITED.—Registered on the 3rd inst., with a capital of £36,500, in £100 shares, to purchase, own, and work the s.s. *Scaw Fell*.

SILVER CHORD MINING AND SMELTING COMPANY, LIMITED.—On the 3rd inst., this company was registered with a capital of £100,000 in £1 shares, to purchase, work, and develop the Silver Chord Mines and Smelting Works, Colorado, U.S.A.

STEAMSHIP "EURIPIDES" COMPANY, LIMITED.—Registered on the 2nd inst., with a capital of £28,800, in £100 shares, to purchase, own, and work the s.s. *Euripides*, of Live pool.

T. BELL AND COMPANY, LIMITED.—This is the conversion to a company of the business of chemical manufacturer carried on by T. L. Gregson Bell at the Vitriol Works, Abbey Mills, West Ham. It was registered on the 1st inst., with a capital of £14,000 in £1 shares.

THOMAS CALLOW AND COMPANY, LIMITED.—This company was registered on the 3rd inst., with a capital of £2000 in £1 shares, to carry on the business of refiners, smelters, and founders of metals of every description.

UNITED CANAL, COAL, LIME, AND BUILDING MATERIALS' COMPANY, LIMITED.—Incorporated on the 3rd inst., with a capital of £10,000 in £5 shares, to take over the business assets, and liabilities of the United Canal Coal Company, Limited, Canal Basin, Gravesend.

WOLVERTON AND STONY STRATFORD TRAMWAY COMPANY, LIMITED.—This company was registered on the 4th inst., with a capital of £20,000 in £1 shares, to construct and work tramways in the county of Buckingham.

LONDON PRICE LIST OF METALS, ORES, OILS, CHEMICALS, &c.

[FOR THE PRESENT AND PAST WEEK.]

Metal Market, City, Thursday Afternoon, 4 P.M.

(*November* 16, 1882.)

METALS AND ORES

	Nov. 9.		Nov. 16.	
	£ s.	£ s.	£ s.	£ s.
COPPER (per ton)—				
Chili, for 96 per cent.	68 5/	70 5/	68 0/	70 5/
Wallaroo	75 0/	76 10/	75 0/	76 10/
Burra Burra	75 0/	—	75 0/	—
English Tough	73 0/	75 0	73 0/	75 0/
English Ingot, best	74 10/	76 0/	74 10/	76 0/
Sheets sheathing and rod	82 0/	—	82 0/	—
Bottoms	86 0/	—	86 0/	—
Ore per unit	—	—	—	—
PHOSPHOR BRONZE				
Special Bearing Metal (p tn)	119 0/	—	119 0/	—
Other alloys (per ton	27 0/	142 0/	127 0/	142 0/
TIN (per ton)—				
Straits (Cash)	98 0/	99 0/	98 15/	99 0/
Do. for arr.	—	—	—	—
Billiton	—	—	—	—
Banca	—	—	—	—
English Ingots	—	—	—	—
Do. Bars	101 0/	102 0/	104 0/	102 0/
Do. Refined	102 0/	103 0/	105 0/	103 0/
Australian	104 0/	105 0/	106 0/	105 0/
TIN PLATES, per box, I.C. coke f.o.b. London	98 0/	99 0/	98 15/	99 0/
	0 16 9	0 17 6	0 16 6	0 17/6
IX. do.	0 21 0	0 22/6	0 21/6	0 22 6
I.C. charcoal	0 19 6	0 22/	0 19 6	0 22/
I.X. "	0 25/	0 27/	0 25/	0 27/
Red lead	15 6/	16 0/	15 6/	16 0/
White	21 10/	—	21 10/	—
Patent shot	17 0/	17 6	17 0/	17 6/
ZINC (per ton)—from No. 5 Gauge.				
Sheets, rolled	19 10/	—	19 10/	—
Do., foreign	19 5/	—	19 5/	—
LEAD (per ton)—				
Soft English pig	14 5/	14 10	14 5/	14 10
Do. W.B.	—	—	—	—
Spanish soft	13 10/	—	13 10/	—
Do. with silver	—	—	—	—
SPELTER (per ton)—				
Silesian, com.	17 5/	—	17 5/	—
Rhenish	—	—	—	—
English	—	—	—	—
QUICKSILVER, bot.	5 17 6	—	5 17 6	—
ANTIMONY ore (per ton)—				
Australian	—	—	—	—
Spanish	—	—	—	—
French Star	—	—	—	—
Regulus—	5 0	55 0/	0/	55 0/
Crude (per cwt.)	1 14/	—	1 14/	—
NICKEL (per lb.)	0 3/3	—	0 3/3	—
BRASS (per lb.)—				
Sheets, 48×24	0 0/8	—	0 0/8	—
Tubes	0 0/11	0 1/	0 0/11	0 1/
Wire	0 0/8½	—	0 0/8½	—
Yellow metal	0 0/6½	0 0/7	0 0/6½	0 0/7
ASBESTOS (per lb.)	0 0/3	0 0/6	0 0/3	0 0/6
PLUMBAGO (per cwt.)—				
Ceylon lump	0 16 6	1 2	0 15 6	1 2/
Do. chip	0 10/	0 14/	0 10/	0 14/
Do. dust	0 10/	0 12/	0 10/	0 12/
COALS (per ton)—				
East Hartlepool	1 2/	—	1 2/	—
Lambton	1 4/	—	1 4/	—
Tees	1 4/	—	1 4/	—
Hartley	1 2/	—	1 2/	—
Hetton	1 4/	—	1 4/	—
Hawthorn	1 3/	—	1 3/	—
Tunstall	1 2/	—	1 2/	—

OILS, CHEMICALS, &c.

	Nov. 9.		Nov. 16.	
	£ s.	£ s.	£ s.	£ s.
OILS (per ton)—				
Olive, Galloli	—	—	—	—
Do. Gioja	—	—	—	—
Do. Levant	—	—	—	—
Do. Seville	36 0/	36 10/	36 0/	36 10/
Do. Cerfu	—	—	—	—
Seal, pale	—	—	—	—
Sperm head	35 0/	35 0/	35 10/	36 0/
Cod	70 0/	72 0/	70 0/	72 0/
	31 10/	39 0/	31 10/	35 0/
E.I. Fish	—	—	—	—
Rape, English, brown	31 10/	31 10/	31 10/	31 15/
Do. refined	—	—	—	—
Foreign Refined	—	—	—	—
Ground nut and Gingelly Madr.	—	—	—	—
Palm oil, fine	37 10/	39 0/	37 10/	39 0/
Palm nut oil	—	—	—	—
Linseed oil	22 17/6	22 15/	22 5/	24 7/6
Cot onseed (per ton).				
Crude	26 10/	25 0/	26 10/	24 10/
Refined	28 0/	29 0/	28 5/	29 5/
Hull	25 15/	—	25 15/	—
Lard, English	70 0/	71 0/	70 0/	68 0/
Cocoanut, Cochin	36 0/	37 0/	36 0/	37 0/
Do. Ceylon pipes	30 15/	31 0/	30 15/	31 0/
Sydney	—	—	—	—
OIL CAKE (per ton)—				
Linseed, Lndn.	7 15/	8 0/	7 15/	8 0/
American barrels	8 12 6	7 15/	8 12/6	7 15/
Do. bags	—	—	—	—
Marseilles	8 5/	—	8 5/	—
Rapeseed	5 10/	6 0/	5 10/	6 0/
Cottonseed	5 10/	5 12/6	5 10/	5 12/6
TALLOW—PYC. old (per cwt.)	51 0/	53 0/	51 0/	52 0/
S.Americn. Beef	—	—	—	—
N. American "	—	—	—	—
Australian Beef (fine) (per cwt)	0 43/	0 44/	0 42/	0 43/
Do. Sheep " (per ton)	0 44/	0 45	0 44/	0 45/
PETROLEUM OIL—(per gal.)	0 6½	0 0/6½	0 7½	0/7½
Refined coal oil	—	—	—	—
Naphtha	0 0/7	0 0/8	0 0/7	0 0/8
TURPENTINE—(per cwt.)				
French Spirits	—	—	—	—
American do.	—	—	—	—
WHALEFINS (per. ton)—				
Davis' Straits	900/	1000/	900/	1000/
Arctic	900/	1000/	900/	1000/
BRIMSTONE (per ton)—				
Rough 3rds	6 15/	—	6 15/	—
Roll	9 5	9 10/	9 5/	9 10/
Flour	10 15	12 10/	10 15/	12 10/
CID, (per lb.)				
Acetic	0 18/	0 26/	0 18	0 26/
Second quality (per gal.)	—	—	—	—
Citric (per lb.)	—	1 10	—	1/10½
Muriatic (sp. salts per cwt.)	0 4/6	0 7 6	0 4/6	7 6
Nordhausen 50 per cent.	0 45/	0 50/	0 45/	0 50/
Nitros	0 0/2½	0 0/4½	0 0 2½	0 0/4½
Oxalic (per lb.)	0 /6	—	0 /6	—
Sulphuric, white	—	—	—	—
Do. Brown	0 0/0½	0 0/1	0 0/0½	0 0/1
Tartaric Crystal	0 1/8½	0 1/7½	0 1/8½	0 1/7½
Do. Powdered	—	—	—	—
AMMONIA—				
Carbonate, per lb.	0 0/6½	0 0/6½	0 0 6½	0 0/6½
Sulphate, Best White (per ton)	20 0/	20 5/	20 0/	20 5/
ARSENIC—White Lump (per cwt.)	0 24/	0 25/	0 24/	0 25 6
Powdered do	0 10 5	0 10 0	0 10/6	0 10/0
Bleaching Powder 35 %	0 5/	0 5 6	0 5/	0 5 6
BORAX, Rfc., Eng.	0 60/	0 63	0 60/	0 63/
COPPERAS, green, tierces (ton)	0 45/	—	0 45/	—
PORTLAND CEMENT—				
1st quality in casks 400 lb. gross, including casks, f.o.b., Thames, per cask	0 9/	—	0 9/	—
Do. in sacks, 200 lb. net (per ton)	2 0/	—	2 0/	—
Sacks extra, 1/6 each.				
Charlton White Paint (per cwt.)	1 12/	—	1 12/	—
Colley's Torbay Paint, Brown	0 30/	—	0 30/	—
Do. Red	0 34/	—	0 31/	—
LEAD, Sugar, Eng., white	0 31/0	0 34 6	0 31/0	0 34/6
Brown	—	—	—	—
Red (per cwt.)	0 16 6	0 17/0	0 16 6	0 17/0
White, ground	0 21/	0 22/	0 21/	0 22/
LITHARGE (per cwt.)	0 17 6	0 21/6	0 17 6	0 21 6
LIME (per ton)—				
Acetate, Brown	11 0/	11/ 10	11 0/	11/ 10
Distilled	16 10/	17 0/	16 10/	17 0/
POTASH—				
Bichromate (lb.)	0 0/5½	0 6/	0 0 5½	0 6/
Chlorate (pr. lb.)	0 0/5½	—	0 0 5½	—
Pruss. Red (lb.)	1 10/	—	1 10	—
Do. Yel. lb.	0 10/	0 10/	0 10/	0 10/
Sulphate 80% (per ton)	8 1/ 9	10/	8 1/	9 10
SALTPETRE (per cwt.)—				
Engl. refnd. kgs.	0 25	0 26/	0 25/	0 26/6
Do. barrels	0 27/	0 29/	0 27/	0 29
Do. Bengal	0 10/6	1 1/6	0 10/6	1 1/6
SODA, Acetate (per cwt.)	0 24/	0 25/	0 24/	0 25/
Bicarbonate	0 0/6	—	0 0 3	—
Caustic 60 to 62 %	0/0	9 3/	0/0	9 3/
Crystals grw.hts.exship (prton)	3 5/	3 5/	3 5/	3 5/
Nitrate	12 9/	13 0/	12 0/	13 0/

METROPOLITAN BOARD OF WORKS.

RETURN *of the Testings made at the Gas Testing Station during the Week ending November* 14, 1882.

Company and District.	Illuminating Power.* (In standard sperm candles.) Max.	Min.	Mean.	Sulphur. (Grains in 100 cubic feet of gas.) Max.	Min.	Mean.	Ammonia. (Grains in 100 cubic feet of gas.) Max.	Min.	Mean.	Sulphuretted Hydrogen.	Pressure.†
Gas Light and Coke Company.											
Netting Hill	17·3	16·8	17·0	9·2	7·8	8·4	0·2	0·0	0·1		
Camden	16·7	16·4	16·6	11·4	9·6	10·1	0·3	0·1	0·2		
Dalston	17·5	16·6	17·2	14·1	12·0	12·8	0·1	0·0	0·0		
Bow	17·5	16·3	16·9	18·8	15·1	16·8	0·5	0·1	0·3		
Chelsea	16·9	16·0	16·6	17·0	13·0	14·6	0·0	0·0	0·0		
Kingsland Rd.	17	16·5	16·9	10·6	8·4	9·5	0·3	0·0	0·1		
Westminster (cannel gas)	22·2	20·3	21·3	19·7	15·7	16·9	0·2	0·0	0·0	None	
South Metropolitan Gas Company.											
Peckham	17·0	16·4	16·7	12·0	10·0	11·3	0·6	0·0	0·3	In excess.	
Clapham	17·6	16·1	16·6	16·3	10·8	13·4	1·0	0·6	0·8		
Tooley Street	16·7	16·0	16·3	14·3	9·7	12·6	1·0	0·3	0·6		
Commercial Gas Company.											
Old Ford	17·1	16·5	16·8	9·4	7·5	8·2	0·1	0·0	0·1		
St. George-in-the-East	16·8	16·2	16·4	14·0	8·6	11·3	0·2	0·0	0·0		

W. J. DIBDIN, F.I.C., F.C.S.

Consulting Engineer and Superintending Gas Examiner.

Note.—The maximum amount of Ammonia present in the Gas supplied by the Commercial Gas Company, and tested in the St. George's-in-the-East District, during the week ending October 31st, should have been 0·2; minimum, 0·08; mean, 0·7.

* The standard illuminating power for common gas in the metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in the 100 cubic feet of gas. Ammonia not to exceed 4 grains in the 100 cubic feet of gas.

† Pressure between sunset and midnight to be equal to a column of one inch of water. Pressure between midnight and sunset to be equal to a column of six-tenths of an inch of water.

RATES OF FREIGHT.

THE current rates for coal and iron are:—

	Newport. Newcastle or Sunderland, s. d.	Cardiff, or Swansea. s. d.
Alexandria	11 9	12 0
Alicante	12 0	12 0
Ancona	—	13 0
Aden	—	18 0
Athens	—	11 0
Batoum	—	16 0
Bombay	18 6	19 0
Bahia	18 6	18 6
Barbadoes	—	15 0
Barcelona	14 0	15 6
Brindisi	—	10 6
Buenos Ayres	—	24 6
Bermuda	—	12 6
Bussorah	—	—
Cadiz	—	10 0
Cagliari	—	12 6
Calcutta	—	14 0
Callao	25 0	—
Cape Good Hope	21 0	20 0
Cape de Verds	—	10 6
Carthagena	—	10 9
Cardenas	—	14 0
Cienfuegos	—	11 0
Coconada	—	—
Civita Vecchia	13 0	13 6
Colombo	—	18 6
Constantinople	10 0	10 6
Corfu	—	12 0
Demerara	—	19 0
Fayal	—	14 0
Fiume	—	—
Galle	—	18 6
Genoa	0 0	11 0
Gibraltar	1—	0
Galatz	—	12 0
Havana	—	12 6
Hong Kong	—	22 6
Hiogo	—	—
Iquique	21 0	21 0
Jamaica	—	11 0
Java	20 0	22 6
Kertch	—	—
Kurrachee	—	20 0
Lisbon	8 9	9 0
Leghorn	11 0	11 6
Madras	—	—
Madeira	—0	11 0
Malaga	12	12 0
Malta	—	9 6
Maranham	—	17 0
Martinique	—	—
Mauritius	—	22 6
Marseilles	12 3	14fcs.

	Newport. Newcastle or Sunderland, s. d.	Cardiff or Swansea. s. d.
Messina	11 0	11 6
Montevideo	—	21 0
Montreal	—	12 0
Muscat	—	—
New York	—	11 0
New Orleans	—	12 0
Naples	—	11 3
Odessa	10 0	10 6
Oporto	—	10 6
Penang	—	19 0
Pernambuco	—	17 0
Palermo	11 0	11 9
Panama	—	22 6
Para	18 0	18 0
Padang	22 0	22 0
Port-au-Prince	—	12 0
Porto Rico	11 0	11 0
Port Said	11 0	12 6
Reunion	—	—
Rio Grande do Sul	—	17 6
Rio Janeiro	—	22 0
Rosario	—	—
Seychelles	—	31 0
Singapore	18 6	19 6
Saigon	—	—
Shanghae	—	—
San Sebastian	—	—
San Francisco	18 0	18 0
St. Catherine's	—	26 0
St. Paul de Loando	—	27 0
St. Thomas	—	11 0
St. Jago de Cuba	—	—
St. Lucia	—	12 0
Santos	24 0	24 0
Savona	—	11 6
Seville	—	11 6
Smyrna	—	13 0
Spezzia	—	13 0
Syra	—	10 9
Sierra Leone	—	16 0
Sebastopol	—	—
Taganrog	—	—
Tarragona	—	14 0
Teneriffe	—	14 0
Tientsin	—	—
Trieste	13 0	11 6
Trincomalee	—	—
Trinidad	—	13 0
Valencia	12 0	12 0
Valparaiso	22 6	22 0
Venice	14 0	13 9
Yokohama	—	—
Zanzibar	—	—

PRICES CURRENT OF MANUFACTURED GOODS OF BIRMINGHAM AND DISTRICT.

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The quotations given are manufacturers' average prices, dependent, of course, on terms of payment as well as the quality and quantity of goods ordered, and fluctuations in cost of raw material.

The Prices and Discounts quoted are carefully revised every week, and great pains are taken to render this List thoroughly reliable.

Nov. 5.

Prices and discounts show very little variation since our last advices. The associated makers of galvanised and enamelled hollow-ware have arranged an advanced list, but it has not yet been generally issued. Galvanised buckets are, however, increased something like 15 per cent., 12-inch 36 lb., being quoted 7s. 3d. per dozen. This arrangement will, no doubt, check the underselling which has been prevalent for a long time past. Iron is firm, and the mills appear well occupied, the marked bar houses coming in for a full share of orders.

ABRIDGED LIST.

AMERICAN WIRE HOBS, 1 lb., 42/6; 1½ lb., 33/6; 2 lb. 3/6; 2½ lb., 31/6; 3 lb., 30/6 per cwt.

ANCHORS, common, 1 to 10 cwt. 14/ per cwt.

ANVILS (Common), 17/3 per cwt.; Best anvils, not warranted 20/6 per cwt.; Best warranted anvils (hicks tied in 1 to 5 cwt.), 22/ per cwt.

AUGERS (shell), ½ inch to 2 inch, 11/ to 44/ per doz., less 57½%; (screw), ½ inch to 2 inch, 16/ to 64/ per doz., less 57½.

AXES, ship carpenters', /4½ to /5½ per lb.; Kent and house carpenters' ditto, /4 to /5; ditto, steel polished, 5 to 6, felling axes, /4½ to /4½; bright and blued, solid steel, /7 to /8. American felling or wedge axes, steel, polished, /11 per lb.

AXLE PULLEYS, iron, 8/ to 26/6, 1½ inch; Brass face ditto 26/6 to 46/6, 2½ inch.

AXLES, 35 to 45%

BASINS.—Bright tinned, shallow, 8 inch, 2/6; 9 inch, 2/9; 10 inch, 3/4; 11 inch, 4/; 12 inch, 4/6; 13 inch, 5/; 14 inch, 6/; 16 inch, 8/6 per doz.; galvanised ditto, 8 inch, 2/3; 9 inch, 2/6; 10 inch, 3/; 11 inch, 3/9; 12 inch, 4/3; 13 inch, 4/9; 14 inch, 5/9; 16 inch, 7/9 per doz.

BASTARD BELLOWS, 52½ %; best extra nailed bastard bellows, 47½%; best improved long Bristol, 42½%; common smiths' bellows, 62½%; best warranted extra double nailed, 45 to 50%; ditto, with movable pipe for shipment, 52½%.

BELLS.—House brass, rough, /8 to /10 per lb.; turned edge, 8½ to /10 per lb.; turned and lacquered on edge, 1/5 to 1/10 per lb.; cattle and sheep bells, with brass loops, 1/1 to 1/3 per lb.; clock bells, 1/5 to 1/6 per lb.

BELL STAPLES (fine tinned) ½ inch, /1½; ¾, /1½; 1, /2½; 1½ 3½; 2, /5½; 2½, /6½ per gross.

BED SCREWS, London, black heads, 6 and 7-16, and ½ inch, 8/6 to 10/6 per gross; London heads, with bright turned collar, 6 and 7-16, and ½ inch nuts, 11 9 to 12 9; black welded heads, 8/3 to 9/3; common slit heads, 6, and ½, and ¾ inch, 8 9 to 9/9; bright turned notched heads, 6, and 7-10, and ½ inch, 12 3 to 13 3; black notched heads, 10/ to 11/ per gross. Bedsteads, cheap stump, 6 feet by 3 feet 6 inches, 7/6 to 9/6 each; cheap French, 6 feet by 3 feet inches, 8/6 to 10 6 each, rising /6 for every 6 inches.

BOLTS.—Solid end tower, 72½ to 75%; ditto, solid end barrel 67½ to 70%; best solid tower bolts, 75%; japanned Scotch tower bolts 55%. Bolts and nuts, black, ½, and 5-16 to 2 inch and under, 3/6 and 4/1, ¾ 5/6, 7-16 6/7 per gross, ½ and 9-16 23/, ¾ and 11-16 21/, ¾ to 1½ inch 20/ per cwt.; 2½ to 3 inch, ½ 4/, 5-16 4/7, ¾ 6/6, 7-16 7/10 per gross, ½ and 9-16 21/, ¾ and 11-16 19/, ¾ to 1½ 18/ per cwt. Square heads, round necks, square nuts, bright engineers hexagon heads

inch 18/ per gross. Bright engineers hexagon nuts, ⅜ 10/, ½ 12/ ⅝ 14/, ¾, ⅞ 25/, 1 inch 36/ per gross. Black nuts, square, blank, ½ inch 10/6, ⅝ 11/6, ¾ inch 14/6, ⅞ inch 26/6 per cwt. delivered.

BRASS HEAD NAILS, 57½ to 65%; star head, 50%; brass plated countersunk head, 30 to 35%; blacksmith's tacks, 25/ per cwt.; real fine wrought bôt irons, 20 to 25%; fine cast, 60%; middle cast, 50, to 60; Victoria charcoal box irons, 45 to 50%; ordinary charcoal ditto, 60 to 65%; brushes, painters', 50 to 75%; best ditto, 15 to 50%; brass rolled, 2 to 12 inches wide to 30 W.G., /7½ per lb. Brass sheets, 24 and 28 inch, 8 lb. and upwards, or 27 W.G., /8½ per lb.; ship and turret bells, 1/4 per lb. Battery kettles, 125/ per cwt.; brass jelly pans, with bails, /04 to /05; without bails, /10½ to /10¾; Maslin kettles, cast, 4 to 16 inch, /9 to /09 per lb. Brass shoe bills, /9 per lb.; brass scale pans, 1/6; brass toddy kettles, 25 to 20%.

BRASS CORNICE POLE RINGS, light, middle and strong, 45%.

BRASS WIRE, /8 per lb. up to No. 20 W.G.; back bands, 3 lb. and larger, 16/9 per cwt.; ditto, smaller, 2/ per cwt. extra; double swivel ditto, 1/ per cwt. extra.

CART TRACES, 9 to 12 links to foot, 16/9 to 19/3 per cwt.

CHAIN, machine made, Wire, single link, "Iron," 55%; double link ditto, 55; machine-made Wire Chain, single link, "Brass," 55%; registered ditto, 55%; close link brass chain, 55%; oval link brass chain, 55%; brass clock chain, 55%; short link tested (rigging) chain, 3-16 inch, 19/9; ¼, 17/; 5-16, 15/3; ⅜, 15/; 7-16, 13/6; ½, 12/9; ⅝, 12/; ¾, 11/6; 1 inch, 11/ per cwt.; well chain, twisted or straight link, ½ inch, 25/3; 3-16, 18/; ¼, 26/; 5-16, 14/9 per cwt. delivered.

CHAIR NAILS (brass), lacquered or gold colour, No. 1 to 12, 2/ to 7/6 per 1000; machine polished, 1/9 to 7/3 per 1000; lacquered or gold coloured, 2/ to 12/ per lb.; discount per 1000, 57½%; per lb., 2%, delivered.

CHIPPING CHISELS, solid cast steel, /6 per lb.

COACH BOLTS AND NUTS, round or cheese heads, square necks and nuts, black, 3 inch by ¼, 4/1; ⅜, 4/5; ½, 5/1; ⅝, 5/7; 5 inch, 6/1 per gross. Bright, 3 inch by ¼, 4/9; ⅜, 5/3; ½, 5/9; ⅝, 6/3; 5 inch 6/9 per gross. Black, 3 inch by 5-16, 4/9; ⅜, 5/3; ½, 5/9; ⅝, 6/3; 5 inch, 6/9 per gross. Bright, 3 inch by 5-16, 5/6; ⅜, 6/; ½, 6/6; ⅝, 7/; 5 inch, 7/6 per gross delivered.

COACH SCREWS.—Patent bright pointed, 2 inch and under, ¼ inch, 3/1; 5-16, 3/8; ⅜, 4/6; 7-16, 5/4 per gross; ½ inch, 26/; ⅝ inch, 23/; ¾, 22 per cwt.; 4½ to 6 inches long, ½ inch, 26/6; 7-16, 25/; ½, 21/; ⅝, 19/; ¾, 18/ per cwt. ½ above 6 inch, ⅜ inch, 25/6; 7-16, 24/; ½, 20/; ⅝, 18/; ¾, 17/ per cwt.; 1/ per cwt. extra for hexagon heads, delivered.

COACH SPRINGS, 40%.

COCKS.—Brass range cocks, ½ inch, 30/; ⅝, 42/; ¾, 53/6; ⅞, 64/; inch 72/ per doz., less 20% discount; brass racking cocks, fast key, 1½ inch, 11/; 5-16, 13/; ⅜, 15/; 7-16, 18/; ½, 23/; 9-16, 34/; ⅝, 38/; ¾, 45/; ⅞, 59/; 1 inch, 66/ per doz.; loose key, 1/ to 18/ per doz. extra discount, 60%.

COFFIN FURNITURE, registered, 50%; ditto, common, 75%.

COPPER BOAT NAILS, ½ inch to 2 inches and above, 1/8 to /11½ per lb.; copper boat roves, ¼ to ½ inch and above, 1/6 to 1/ per lb.; cut copper nails and tacks, ½ inch to 1 inch and above, 1/ to /10 per lb.

COPPER WIRE, /10½ per lb. up to No. 20, W. G

COMPOSITION Sheathing and Slating Nails, ¾ inch, /8½ per 1o. Copper brads and bills, /10 per lb.; round copper kettles, bare rivets, 1/7 to 1/9 per lb.; light round covered rivets, 1/6 to 1/7 per lb.; loaded 1/5 to 1/6; oval copper kettles, bare rivets, 1/10 to 1/11 per lb.; oval bare rivets, raise down, 1/11 to 2/1 per lb. Copper slating nails (cut), 1 to 1½ inch and upwards, /10½ to /11½ per lb.; copper scale pans, 1/9 to 1/10 per lb. Copper nails and tacks (wrought), 1 to ½, 1/2 per lb. Chair webbing, No. 0, 4/5; 1, 4/8; 2, 4/11; 3, 5/2; 4, 5/6; 5, 6/ per gross of 60 yards. Carpet rings, 1/ to 1/4 per gross. Cornice poles, 2½ inch, brass, best burnished, 4/6 per foot, less 45%; ¾ covered brass poles, 1/2 per foot, less 45%; 2½ inch real birch cornice poles, polished, self or mahogany colour, with ends and rings complete, /8 per foot; 2½ inch real mahogany cornice poles, with ends and rings complete, 1/7 per foot; 2½ inch birch rings, polished, self or mahogany colour, 1/ per gross; 2½ inch real mahogany rings, 2/8 per gross net; japanned pillar chains, 1 yard, 16 by 6, 5/8 to 6/6 per doz. Japanned manger chains, 1¼ yard, 16 by 6, 7/3 to 8/6; japanned rack, 1 yard, 18 by 6, 5/ to 6/; japanned dog, 1½ yard, 12 by 5, 5/6 to 6/6; 2 yards, 14 by 6, 10/ to 11/. Cowties, 6/6 to 8/6; opening, 6/6 to 8/6; close ring, 5/6 to 6/6 per doz.; japanned watering chains, 14 by 6, 4/ to 5/; tinned ditto, 4/6 to 5/6; bullock chains, 3 inch hook at each end, 14/6 to 15/6; chest handles, improved japanned, 82½%; broad plate, strong and extra strong, 15 to 60%. Curtain rings (brass), 45 to 50%; square box coffee mills, 30 to 60%; common post coffee mills, 30 to 40%; best brass bushed mills 40 to 45%; London mills, 40 to 45%.

CUT NAILS.—Clasp, rose, and clout, 3 to 9 inch, 0/3; 2½ and 2¾ inch, 0/2; 3 and 2½ inch, 10/3; 1½ inch, 10/2; 1½ inch, 11/3; 1 inch, 12/3; ¾ inch, 16/6 per cwt.

DISH COVERS, blue japanned wire, 1/1 to 5/6 per set of 6.

DOOR SPRINGS, X, 25%; XX, 77½%; XXX, 72½%; XXXX, 65%; brass circular and iron circular, 55 to 65%; brass reliance, 10 to 20%; climax, 20%; universal, 55 to 60%; paragon, 20%; O'Connor's patent lever hinge springs, 10 to 20%. O'Connor's vertical spring hinge door spring, 15 to 25%; Gerish's spring hinges, iron, 20 to 25%; brass 10 to 20%.

FILES, 55% the list.

FLOOR BRADS.—2 inch, 0/9; 2½ inch, 0/6; 2¾ inch, 0/6; 3 inch, 0/6.

FRY PANS, 7½ inch to 17 inch, oval, bright, 12/ to 45/ per doz.; tinned, 14 to 53/ per doz.; fry pans, 5½ inch to 10 inch round bright, 10/ to 26/ per doz.; tinned, 11/6 to 29/ per doz.; fry pans, 10½ inch to 15 inch round, bright, 30/ to 60/ per doz.; tinned, 33/ to 64/ per doz., all fry pans 72½% and 5% delivered. Fire-irons, kitchen, in sets, /5 to /6 per lb.; tongs, /5½ to /6; pokers, /4½ and /5; fishhooks, best, 40 to 45%; common, 60 to 65%; light kitchen fenders, 5 inch, assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 28/ to 30/ per doz.; bright fronts, 31/6 to 34/. Manchester pattern kitchen fenders, 8 feet, 1 inch top, black front, 2 feet 9 inch to 3 feet 3 inch, 37/6 to 42/ per doz.; 3 feet 3 inch to 3 feet 9 inch, 42/6 to 47/6 per doz.

GALVANISED BUCKETS, 12 inch, 38 lb. to the doz., 6/3; 11 inch, 5/3; 10 inch, 4/6; 13 inch, 7/3; 14 inch, 8 9; 12 inch, 42 lb., 7/; 10 inch, 5/3; 11 inch, 6/; 13 inch, 8/; 14 inch, 9/6.

GALVANISED WASHING TUBS, oval, 22 inch, 27/; 24 inch, 30/; 26 inch, 34/.

GALVANISED WIRE NETTING, 2½ inch mesh and larger, 67½%; 1½ inch mesh and smaller, 72½%, delivered.

GIMP PINS.—Best black iron wire, ¾ by 18, ½ by 18, ¼ by 18, all /85 per lb.; 19 gauge, ½ per lb. extra; coloured, /1 extra; best bright iron panel pins in 1 lb. packets, ½, ¾, and 1 by 17 inch, /13; 1 and 1¼ by 16 inch, /14; 1½ by 15 inch, 3 per lb.; tinned, /11 per lb. Copper brass panel pins, /09 per lb., all sizes; copper ditto, 1/1 per lb. All sizes; brass escutcheon pins, ¾ by 16, ½ by 15, ¾ by 14, ¾ by 14, 1¼ by 13 inch, /09 per lb.; brass gimp pins, 19 gauge, ½ per lb.; ditto, 18 gauge, /11½ per lb.

GRID IRONS, London pattern, fluted, 70%; light ditto, 77½%; hanging round bar, 60%; doubled, 55%; round bar, /14 per bar, 67½%; best fluted bar, 67½%; flat bar, 67½%; common flat bar, 67½%; common gridirons, /1 /1½ and /2 per bar less, 65 to 75%; gimblets, 50%.

HAMMERS.—Cast steel stone breaking and quarry, per cwt.; solid cast steel engineers' hand, 2½ lb. each and above, /8 per lb.; solid cast steel boiler makers' hand hammers, 2½ lb. each and above, /8½ per lb.; iron and steel boiler makers' sledge hammers, 6 lb. and above, 17/ per cwt.; iron and steel sledge hammers, 6 lb. and above, 18/6 per cwt.; solid cast steel sledge, 28/ per cwt.; platelayers' keying, 28/ per cwt.; holdfasts, japanned, 18/ to 20/ per cwt.; common Kent hand hammers, 50%; patent hasps and staples, 20 to 25%.

HINGES.—Patent, edge butts, 60 to 70%; patent Scotch butts, 55 to 60%; broad and narrow same discounts; patent table, bed, and back-flap hinges, 57½%; patent chest hinges, 55%; patent strap hinges, 55%; H hinges, 55%; HL hinges, 55%; japanned and Garnett hinges, double washered, light and strong, 40%; best best, London or Lancashire patent tees, 67½%; patent light japanned Scoth tees, 67½%; light patent hook hinges on plate and to drive, 30 to 35%; weighty Gothic, 20/ to 24/; scolloped edges, not japanned, 22/ to 24/; Scotch japanned tees, double washered, 20/ to 23/; Gothic Scotch japanned tees, 19/ to 22/; Gothic Scotch tees, self colour, 17/ to 21/; light "patent" broad Butts, polished joint, No. 200, 50%; ditto, No. 564, 35%; box hinges, 50%; light Parliament hinges, best strong 45%; best best ditto, 35% off list. Wrought hinges, common, 55%; best, 52½%; best best, 50% off list. Heavy wrought hinges, common black, 13/6 per cwt.; ditto, common bright, 18/ per cwt.; filed edges, 17/6; japanned Gothic fancy, 15/6 to 18/; common bright, broad eye, 17/ to 18/; japanned, broad eye, fancy, 18/6; best bright, 21/ to 23/; best broad eye, 21/ to 23/ per cwt.; cast hinges, polished joint, light patent tariff butts, 200, 50%; 333, 49½%; 564, 35%; pressed hinges, common, 65 to 70%; best, 57½ to 62½%; common brass butt hinges, 1½ inch, 14/ per gross pairs net; very light, 8/6.

HOLLOWWARE.—Best, 45%; common, 55 and 50%; enamelled ditto, best, 30%; common, 35%.

HORSESHOES.—Fullered fore, 16/ to 18; fullered hind, 17/ to 19/; stamped fore, 16/6 to 18/6; hind, 17/6 to 19/6.

IRONFOUNDRY, GENERAL.—Ash grates 7/9 to 9/ per cwt., air bricks, 2/9 to 3/6; half-single, 3/3 to 3/6; double, 5/6 to 6/; bars and bearers, 7/3 to 8/3; barrow wheels, 8/; bake pans, 8/6 to 9/6; camp ovens, 9/; cooking stoves, 9/ to 10/6; cellar grating, 8/6; clock weights, 7/6; Dutch stoves, 8/6 to 10/; dumb bells, common, 7/ to 9/; best best japanned, 15 to 17/6; furnaces up to 50 gallons, ⅛ to ¼ galvanised ditto, /7 to /9 per gallon; furnace doors, 9/6 to 12/; furnace grates, 8/6; heaters for box irons, 6/6 to 7/6; heaters for urns, 8/6 to 9/6; oven doors and frames, 8/6 to 10/6; three legged pots, Danish and plumbers' 9/; plumb bobs, 12/6; pudding pans, 10/6 to 11/6; pump spous, 10.6 to 13/; sash weights, 4/6; ditto, with pulleys, 7/ to 8/6; shoe anvils, 8/6; Italian irons, 50%.

KNITTING PINS, iron, /2½ to /3 per lb.; steel ditto, 15 to 18 W.G., 1/8 to /9 per gross, brass ditto, 1/1 per lb.; keys and shanks, 50 to 65%; extra strong plate, 30 to 37½%; extra strong Banbury pinned keys, 35 to 40%; brass shutter knobs, 55%; brass cupboard turns, 55%; brass draw knobs, 55%; brass astragal knobs, 55%; brass range knobs, 40 to 45%; lock furniture, brass, 67½%; chain lock furniture, 37½ to 45%; ebony lock furniture, 2½ inch, Wilkes' spindles, 18/ per doz. sets; sham ditto, 8/ to 9/ per doz. sets; Norfolk latches, common, 82½%; Suffolk latches, 75%; best ditto, 55%.

and larger, 9/1 per cwt.; brass head nails, 62½%.

MELTING LADLES, 2 inch to 8 inch, 2/ to 16/ per doz., less 15%; Pitch Ladles, 3 inch to 6 inch, 1/6 to 12/ per doz., less 10%.

NAILS.—Patent forged nails, "Iron or Steel." Strong rose flat points), 1 inch, 4 lb., 45/6; 1¼ inch, 6 lb., 38/; 1½ inch, 7 lb., 36/, 1¾ inch, 8 lb., 34/6; 2 inch, 10 lb., 32/6; 2½ inch, 12 lb., 31/; 2¾ inch, 17 lb., 28/6; 3½ inch, 20 lb., 28/; 3 inch, 23 lb., 27/9 per cwt. Fine Rose (flat points), 1 inch, 2½ lb., 72 6; 1¼ inch, 3½ lb., 58/6; 1½ inch 4 lb., 54/6; 1¾ inch, 5 lb., 48 6; 2 inch, 7 lb., 43/6; 2¼ inch, 8 lb 41/6; 2½ inch, 10 lb., 37/9; 2¾ inch, 14 lb., 34/; 3 inch, 17 lb., 32/ per cwt. Coopers' rose (sharp points), 1¼ inch, 7 lb. per m., 2/4; 1½ inch, 8 lb., 2/7; 2 inch, 10 lb., 3/; 2¼ inch, 12 lb., 3/5; 2½ inch, 17 lb., 4/5½; 2¾ inch, 20 lb., 5/1; 3 inch, 23 lb., 5/11 per m. Fine Clasp (sharp points), 1½ inch, 4 lb. per m., 2/1; 1¾ inch, 5 lb., 2/4; 2 inch 7 lb., 2/10; 2¼ inch, 8 lb., 3/03; 2½ inch, 10 lb., 3/5½; 3 inch, 14 lb., 4/4½ per m. Best Canada (sharp pointed), 1½ inch, 4 lb. per m., 2/ 2 inch, 7 lb., 2/9; 2¼ inch, 8 lb., 3/0½; 2½ inch, 12½ lb., 4/0½; 3 inch 14 lb., 4/4½ per m. Pound Nails, 6dy, 2 inch, 28/6; 8dy, 2½ inch, 27/; 10dy, 3¼ inch, 25/6; 20dy, 4 inch, 21/ per cwt., discounts 50½% off iron, 45½% off steel. Nails, cast lath, 9/ per cwt.; wall nails, cast, 8/6 per cwt.; cast headed bills, ¾ by 8 oz., 12/ to 14/; fine round cast bills, ¾ inch, 21/ to 15/; strong round ditto, ¾ inch, 12/6 to 14/; cast slate pegs, 10/ to 12/; black coffin nails, 55 to 60%; white ditto 45 to 55%; black coffin bullens, 50 to 55%; white ditto, 40 to 45%.

PICKS, iron and steel excavators, /3 to /5 per lb.

PLANES, 45% off the list.

PLOUGH TRACES, 9 to 12 links to foot, 17/9 23/3 per cwt.

RATCHET BRACES, improved, 8 inch, 20/; 10 inch, 22/; 21 inch, 24/; 14 inch, 28/; 18 inch, 32/; 18 inch, 36/; 20 inch, 40; 22 inch, 44/; 24 inch, 48/ each, less 65% off list; ditto, with eccentric levers, 8 inch, 21/; 10 inch, 24/; 12 inch, 26/; 14 inch, 28/; 16 inch 30/; 18 inch, 33/; 20 inch, 36/; 22 inch, 39/; 24 inch, 42/ each, drill for above, 15/ per doz., less 40% eccentric lever brace.

RAILWAY BEATER PICKS, /3 to /5 per lb. delivered in London or Liverpool. Rakes, light garden, 50 to 60%; light solid end rakes, 47½ to 52½%; bordered teeth garden rakes, 50%; solid end, bolstered teeth garden rakes, 40 to 45%.

RIDDLES, common, ½ inch by 18, 21/ per doz.; do foundry or gravel, ½ by 18, 27/ per doz., less 55%.

RIVETS.—Copper hose, ¾ by 8 and above, at /11 per lb.

RIVETS, Machine-made Wire, No. 6, 18/3 per wt.; iron boot rivets, 24/ to 25/ per cwt.; brass ditto, /9½ per lb. Ship, tank and girder Rivets, ¼ inch, 17/; ⅜, 13/6; 7-16, 13/; ½ inch, 12/6 per cwt.; Best Boiler Rivets, 1/ per cwt. extra. Ship scrapers, black steel blades, 50 to 55%; bright, 47½ to 52½%; cast steel black, 47½ to 52½%; bright, 42½ to 47½%; best cast steel black, 40 to 45%; bright, 30 to 40 p.c.; sash chain, copper, 55 p.c.; zinc, 55 p.c.; iron prepared ditto, 50 p.c.

SAD IRONS, common, 7/6 to 8/ per cwt., delivered; best japanned, 12/6 to 13/6 per cwt.; best best opanned, 15/6 to 18/6 per cwt

SCALES, copper, 72½ to 77½%.

SCREWS, iron wood screws, 70% brass ditto, 60%; copper wood screws, 35%; stove ditto, 65%; do wel ditto, 70%; brass headlock screws, 40%.

SCREW STOCKS and DIES, 57½% off list.

SHOE BILLS, in 1 and 5 lb. parcels, extra strong, and strong, 9 to 13 W.G., 11/3; middle, 14 W.G., 11/3; fine, 15 W.G., 11/3; extra fine, 16 W.G., 12/3 per cwt Shoe heel, York, No. 1, 2/6 to 2/9 No. 3/ to 3/3; No. 3, 6/9 to 7/6 per gross net; Dundee hot turned, 4/6 to 5/3 bright edge imperial or solid Scotch, 8/3 to 8/9; bright York, 6/ 8, 6/9 to 7/3; bright solid, 6/3 to 6/9 toe plates, 8/3 to 8/9 per gross

SHOVELS, common iron, round back, dust, 4 inch to 8 inch, 1/9 to 6/ per doz., less 25%; socket handles, 1/ per doz. extra; Bell mouth Shovels, 7 inch to 10 inch, 2/ to 4/ per doz., net; ditto, japanned, with wood handles, 3/4 to 5/6 per doz. net. Shovels, all steel, crutch handles, No. 2, 17 No. 3, 18/3; No. 4, 19/9 per doz.; No. 5, 20/9 per doz.; eye-handles; 1/ per doz. extra; riveted ditto, 2/ per doz. extra; Spades and bovels, common, 62½%; second, 52½%; Best, 42½% discount off the list

SIEVES, brass and iron, 55% off list; Wove wire, brass and iron, 55% off list.

SOFA SPRINGS, "Bright," 8 by 5 inch, 10/8; 8 by 6 inch, 10/9 8 by 7 inch, 12/6; 8 by 8 inch, 13/6; 8 by 9 inch, 15/3; 8 by 10 inch 19/ per gross, less 15 per cent. "Coppered," 1/ per gross extra to 8 by 8; all above 1/6 per gross; coiled, /6 per gross extra.

SPLIT COTTERS, 60% off list. American Wire Tacks, 70% off list.—W. Gorse and Son, Icknield Square, Birmingham.

SPOKES.—Steel bicycle and perambulator, tinned, cut to lengths, and headed, No. 6, 29/9; 7, 30/3; 8, 30/6; 9, 31/; 10, 31/6; 11, 32/ 12, 33/9 per cwt. Bright, 6/ per cwt. less.

STAIR RODS, turned ends, 85%; ditto, solid fancy ends, 85%.

STAPLES, Wire fencing, 1½ to 2 inch, No. 6, W.G., 12/3; No.

STEEL TOYS, 10 to 30% off the list.

STEELYARDS, 65%.

TACKS, fine cut, in 1 and 7 lb. parcels, ½ inch, 20/6; ⅝ inch 28/6; ¾ inch, 19/9; ⅞ inch, 28/3; 1 inch, 17/6; 1¼ inch, 15/9; 1 inch 10/9 per cwt., tinned, 8/ per cwt. extra; in ½ cwt. bags, 1/ per cwt. less.

TIP NAILS, in 1 and 5 lb. parcels, ½ inch, 17/9; ⅝ inch, 16/3; 1 inch, 15/3; 1¼ inch, 14/3; 1½ inch, 13/3; best iron, 2/; charcoal, 8 per cwt. extra. Tinplates, best charcoal, I.C., 22/ per box; 2nd quality ditto, 21/ per box; best coke 19/; coke, 18/ per box.

TRAPS, bow spring, sham Dorset and real Dorset rabbit traps, 45 to 65% list prices; common traps, 4 inch, 5/6 to 8/ per doz. net run traps, 2½ inch, 4/ to 6/6 per doz.; bird traps, 3/9 to 4/ per doz. wolf and other double flat spring, common bridge, 1/; axle bridge 1/4 per lb., 40 to 45%; hawk or pole traps, 50 to 60%; wrought mole traps japanned, 2/6 to 3/9; galvanised, 3/ to 4/9.

TUBES, iron gas, 70%; fittings, 75%; galvanised iron gas tubes, 55% fittings 60%; lap welded boiler tubes, 50%, delivered; bell tube, zinc 33 to 35/ per cwt.; patent cased tube, 57½ to 62½%, cut to lengths if required; polished and lacquered twisted brass tube, 40%; patent cased taper iron tube, 40 to 45%; patent taper iron tube, 40 to 45%; parallel iron brased tube, 40 to 45%; twisted iron parallel tube, 40%; patent cased parallel tube, 40%; Brass Tubes, plain, rough, ⅛ inch and above, /9½; other shapes /10½ to /11½ per lb. Bell cop per tube, ⅛ inch and upwards, 1/0 to 1/1 per lb.; brass ditto, 1/2 to 1/4; locomotive and marine boiler tubes, seamless, 1½ to 3½ outside diameter, to 14 W.G., 1/0 per lb.

VICES, best warranted, "Black" staple, solid box, 26/6 per cwt. Best warranted, "Bright" staple, solid box vices, 28/6 to 30/6 per cwt.; vice boxes and pins, 67/ per cwt.

WASHERS.—Light iron, 77½%; heavy washers, 13 to 16 W.G 12/ per cwt.

WIRE, iron, bright, 9 to 6, 10/3; 7, 10/9; 8, 11/ 9, 11/3; 10/, 12/; 11, 12/6; 12, 13/3; 13, 13/9; 14, 14/3; 15, 15/; 16, 15/9 17, 16/9; 18, 17/3; 19, 18/3 per cwt.; galvanised, 9 to 6, 3/6 per cwt. extra; best annealed drawn fence wire, oiled, 0 to 6, £9 10/; 7, £10; 8, £10 5 9, £10 15/ per ton; galvanised, 0 to 6, £12 15/; 7, £13 5/; 8, £13 15/ 9, £14 5/ per ton. Steel fence wire, rounder oval, £2 per ton extra Black rolled fence wire, 4 or 5, £7 5/ per ton. Tinned bottling wire, No. 22, 31/6; 23, 33/6; 24, 35/6 per cwt., cut in lengths and made up in 7 lb. parcels. Fine galvanised iron wire, No. 23, 4/3 per stone of 14 lb.; cast steel wire, /5 per lb.; charcoal iron wire, 4/ per cwt. extra; tinned ditto, 9/ per cwt. extra, delivered in London; 5/ per ton less in Liverpool.

WROUGHT, best, countersunk clout and cone head Nails 1 inch, 29/9; 1½ inch, 25/3; 2 inch, 22/6; 2½ inch, 20/3 per cwt.; Best fine Swedish iron countersunk horse nails, stamped, 6 lb. per m. 53/ per cwt.; 8 lb. per m. 49/; 10 lb. per m. 45/9 per cwt.; 12 lb. per m, 43/6 per cwt., or subject to 45% Derby list. Wrought rose and deck head spikes, 4 inch, 12/9; 5 inch, 11/6; 6 inch, 10/9; 7 inch, 10/3 per cwt.; galvanised, 4 9 per cwt. extra; Wrought rose nails at or sharp points, 2 inch, 22/3; 2¼, 21/3; 2½, 19/6; 3, 18/ per cwt. Wrought nails, Map 1826 list, 40 to 45% wrought Bromsgrove nails March 1878 list, 30 to 35 p.c.

THE GORSEINON TINPLATE WORKS.—We understand that the tinplate works at Gorseinon, near Swansea, have been re-started by the proprietors, as the Gorseinon Tinplate Company, and that Messrs. Sim and Coventry, of 7, Laurence Pountney Hill, London, have undertaken the exclusive agency for the sale of tin and terneplates.

INDIAN DOCKYARDS.—A powerful steam fire-engine, of the Merryweather London Fire Brigade pattern, has just been supplied to the Indian Government for one of the dockyards. The engine is capable of pumping 350 gallons per minute, and was tested last week in the presence of the officials at the India Store Department, Belvedere Road. Steam was raised within three minutes to 25 lb. pressure on the square inch, and within ten minutes 100 lb. was reached. Two 1-inch jets were thrown to a height of 130 feet, and a single 1½-inch jet reached 170 feet. The tests were considered thoroughly satisfactory. This engine is especially built for hot climates, and is mounted on wrought-iron wheels of an improved design.

THE CLAY CROSS EXPLOSION AND THE RELIEF OF THE SUFFERERS.—It may not be generally known that the Midland Counties Miners' Permanent Relief Fund, which will be called upon to play such a prominent part in connection with the explosion at Clay Cross, was only called into existence under rather singular circumstances a few years ago. Between four and five years ago, when the West Riding of Yorkshire Fund was being inaugurated, meetings were held in Derbyshire, and branches were about to be formed. The movement, however, suddenly took a different turn, and it was decided to establish a society of their own. This was done, and there are now about 1000 members. An official return, giving the names, ages, together with the amount of legacies and weekly payments due to each family, has just been issued. This shows that out of the 300 men and boys employed at the pit 223 were members and half-members of the fund. The ages of the 34 who were killed range from 15 to 58 years, and the number of children from one to six. Of those lost 25 were married, and entitled to legacies, &c., to the amount of £125. Six single men were entitled to £90, two half-members to £15, and one widower to £5. There were 25 widows and 67 children left destitute. The whole of the legacies were paid on the day following the explosion, and amounted to £225. The weekly payments to families bereaved amounts to £13 os. 6d. weekly. Mr. Colley, the local president of the colliery, who is a married man with a wife and six children, narrowly escaped with his life.

PRICE LIST OF IRON AND STEEL.

PREPARED BY

MESSRS. BOLLING & LOWE,

2, LAURENCE POUNTNEY HILL, LONDON, E.C.

STAFFORDSHIRE.

Last Brands at Works. Per Ton.

BARS—
½ in. to 3 in. rounds and squares £8 0 0
1 in. to 6 in. flats..... 8 0 0

Rounds and Squares.
3½ in., 10s. per ton extra.
4 in., 20s. ,,
4½ in., 40s. ,,
5 in., 50s. ,,

Rounds only.
5½ in., 70s. ,,
6 in., 90s. ,,
6½ in., 110s. ,,
7 in., 130s. ,,

Round and Squares.
7-16 in., 10s. ,,
½ in., 20s. ,,
5-16 in., 30s. ,,
⅝ in., 40s. ,,
7-16 in., 70s.

HOOPS—
1 in. to 6 in. wide by usual guage £8 10 0
¼ in. wide up to 20 w. g., 20s. per ton extra.
⅛ in. wide up to 20 w. g., 40s. per ton extra.
⅛ in. wide up to 20 w. g., 80s. per ton extra, e
⅛ in. wide up to 20 w. g., 120s., per ton extra.

PLATES—
5 to 15 feet long by 4 feet wide, not exceeding 4 cwt. £9 10 0
4 to 5 cwt., 20s. per ton extra.
5 to 6 cwt., 85s. ,,
6 to 7 cwt., 50s. ,,
7 to 8 cwt., 75s. ,,
8 to 9 cwt., 110s. ,,
9 to 10 cwt., 120s. ,,
10 to 11 cwt., 140s. ,,
15 to 20 ft. long, 20s. ,,
20 to 25 ft. long, 40s. per ton.
4 to 4½ ft. wide, 20s. ,,
4½ to 5 ft. wide, 40s. ,,

SHEETS—
Singles 11 to 20 gauge, £9 10 0
Doubles, 30s. per ton extra.
Lattens, 60s. ,,

ANGLES—
1 in. by 1 in. to 8 united inches £8 15 0

TEES—
1 in. by 1 in. to 8 united inches £9 0 0
For each inch above 8 united inches 10s. per ton extra.
Best, 20s. per ton extra.
Best best, 40s.
Treble best, 60s.

STAFFORDSHIRE, MIDLAND, &c.

Ordinary Brands (at Works).

	£ s. d.	£ s. d.
Bars	6 10 0 to 7 10 0	
Hoops	7 0 0 to 7 10 0	
Plates	8 0 0 to 8 10 0	
Sheets	8 0 0 to 8 10 0	
Angles	7 0 0 to 7 10 0	
Tees	7 0 0 to 7 10 0	

Best, 10s. to 20s. per ton extra.
Best, best, 20s. to 30s. ,,
Treble best, 40s. to 60s. ,,

CLEVELAND AND NORTH OF ENGLAND BRANDS (at Works).

	£ s. d.	£ s. d.
Bars	0 0 0 to 6 5 0	
Ship Plates to 8 cwt.	6 15 0 to 7 0 0	
Angles	6 0 0 to 6 5 0	

Best, 10s. per ton extra.
Best, best, 30s. ,,
Treble best, 50s. ,,

SCOTCH (at Glasgow).

	£ s. d.
Bars, N B crown	6 10 0
Hoops	7 10 0
Ship Plates	7 15 0
Boiler ,,	8 0 0
Angles	7 10 0

Best, 10s. per ton extra.
Best, best, 30s. ,,
Treble best 50s. ,,

WELSH (Newport and Cardiff).

	£ s. d.	£ s. d.
Bars	6 5 0 to 6 0 0	
Plates	7 0 0 to 7 10 0	

Best, 10s. per ton extra.

BELGIAN, (f.o.b. Antwerp).

	£ s. d.	£ s. d.
Bars	5 12 6 to 6 10 0	
Hoops	6 10 0 to 7 0 0	
Plates	7 10 0 to 8 10 0	
Sheets	8 0 0 to 8 10 0	
Angles	6 0 0 to 7 10 0	
Rail rods	6 10 0 to 7 0 0	

IRON ROLLED GIRDERS—
Narrow flanges 6 0 0 to 7 10 0
Wide flanges 6 10 0 to 8 0 0

STEEL ROLLED GIRDERS, ANGLES and CHANNELS at proportionate differences.

BEST YORKSHIRE (at Works).

BARS—

	£ s. d.
To 2½ cwt.	19 0 0
2½ to 5 cwt.	20 0 0
5 cwt. and upwards	22 0 0

BOILER PLATES—

	£ s. d.
To 2½ cwt.	22 0 0
2½ to 3 cwt.	23 0 0
3 to 3½ cwt.	25 0 0
3½ to 4 cwt.	27 0 0
4 to 5 cwt.	30 0 0
5 to 6 cwt.	33 0 0
6 to 7 cwt.	36 0 0
7 cwt. and over	39 0 0

Plates over 6 feet to 8 feet wide, 40s. per ton extra.

Sheets	24	0 0
Angles and Tees	21	0 0

	£ s. d.	£ s. d.
Tyres to 4 cwt.	19 10 0	
4 cwt. to 5½ cwt.	23 0 0	
5½ cwt. and over	26 10 0	
Axles to 5 cwt	19 10 0	
5 cwt. to 6 cwt.	22 10 0	
6 cwt. and over	25 10 0	

RAILS (at Port nearest Works).

	£ s. d.	£ s. d.
Heavy iron	5 0 0 to 5 5 0	
,, Steel	5 5 0 to 5 10 0	
Light iron	5 10 0 to 5 15 0	
,, Steel	5 15 0 to 6 0 0	

Steel Mining Rails, 10 to 15 lb. per yard, £7 0/ to £6 10/.
Fish Plates, heavy, 20s. per ton above rails.
Fish Plates, light, 60s. to 80s. per cwt. do.

BOLTS AND NUTS, for fishes—
Heavy ... 16 0 0 to 20 0 0
Light ..... 26 0 0 to 28 0 0

STRIKES—
Heavy ... 14 0 0 to 16 0 0
Light ..... 16 0 0 to 18 0 0

PIG-IRON.

Scotch Warrants (Glasgow) 50s. 4d.
Cleveland Warrants No. 3 (Middlesborough) ... 43s. 9d.
Cleveland No. 1 (Tyne or Tees), G.M.B. ... 48s 0d.

CASTINGS

(f.o.b. Shipping Port).

SOCKET PIPES (for gas or water)—

	£ s. d.	£ s. d.
1½ to 2 in.	5 10 0 to 6 0 0	
2 to 3 in.	5 5 0 to 5 15 0	
3 to 8 in.	5 2 6 to 5 12 6	
8 to 20 in.	5 0 0 to 5 10 0	
20 to 48 in.	4 17 6 to 5 7 6	
Chairs	4 15 0 to 5 0 0	
Girders	5 15 0 to 8 0 0	

SCRAP—
Old rails, D.H. } 3 10 0 to 3 15 0
Do. flange }
Engineers heavy scrap 2 18 0 to 3 0 0
Light do. ..... 2 0 0 to 2 5 0

WIRE.

Rolled Fencing Wire (at Works)

	£ s. d.	£ s. d.
Nos. 0 to 4	7 10 0 to 8 10 0	
5	8 0 0 to 9 0 0	
6	8 10 0 to 9 10 0	

Galvanized.

	£ s. d.	£ s. d.
Nos. 0 to 4	11 10 0 to 11 15 0	
5	12 0 0 to 12 5 0	
6	12 10 0 to 12 15 0	

Drawn Fencing Wire.

	£ s. d.	£ s. d.
Nos. 0 to 6	9 0 0 to 9 10	
7	9 10 0 to 10 0 0	
8	10 0 0 to 10 5 0	
9	10 10 0 to 11 0 0	
10	11 10 0 to 11 0 0	

Galvanised.

	£ s. d.	£ s. d.
Nos. 0 to 6	12 10 0 to 13 0 0	
7	13 10 0 to 14 0 0	
8	14 5 0 to 14 15 0	
9	14 10 0 to 15 0 0	
10	15 10 0 to 16 0 0	

Drawn Bright Wire.

	£ s. d.	£ s. d.
Nos. 1 to 6	10 0 0 to 10 10 0	
7	10 10 0 to 11 0 0	
8	10 15 0 to 11 5 0	
9	11 5 0 to 11 15 0	
10	12 0 0 to 12 10 0	

Drawn Bright Steel Wire.

	£ s. d.	£ s. d.
Nos. 1 to 6	11 5 0 to 11 15 0	
7	11 15 0 to 12 5 0	
8	12 0 0 to 12 10 0	
9	12 10 0 to 13 0 0	
10	13 10 0 to 14 0 0	

Galvanised Fencing Strand (B.H)
7 wires.

	£ s. d.	£ s. d.
No. 0	17 0 0 to 17 10 0	
1	17 10 0 to 18 0 0	
2	18 0 0 to 18 10 0	
3	18 10 0 to 19 0 0	
4	19 0 0 to 19 10 0	
5	19 10 0 to 20 0 0	
6	21 0 0 to 20 10 0	
7	21 5 0 to 21 15 0	
8	21 0 0 to 23 10 0	
9	23 5 0 to 23 15 0	

3 wires.

	£ s. d.	£ s. d.
No. 0	15 10 0 to 17 0 0	
1	16 15 0 to 17 5 0	
2	17 10 0 to 18 0 0	
3	18 0 0 to 18 10 0	
4	17 15 0 to 18 5 0	
5	18 0 0 to 18 10 0	
6	18 15 0 to 19 5 0	
7	19 10 0 to 20 0 0	
8	20 0 0 to 20 10 0	
9	21 10 0 to 22 0 0	

STEEL (at Works).

Siemens-Martin or Bessemer.

	£ s. d.	£ s. d.
Plates	10 10 0 to 11 10 0	
Sheets	11 0 0 to 14 0 0	
Bars	9 0 0 to 10 0 0	
Angles	9 10 0 to 11 0 0	
Tees	10 0 0 to 11 10 0	
Spring Steel	12 10 0 to 14 0 0	
Cast Steel for Tools	40 0 0 to 60 0	

GALVANISED IRON ROOFING SHEETS (at Liverpool).

CORRUGATED SHEETS 5, 6, 7, 8 feet long.
Gauges 16, 18, and 20, £14 0s. to £14 10s.
22 and 24 gauge, £14 10 to £15 10s.
26 gauge, £17 10 to £18 10.
28 gauge, £19 0s. to £20 0s.
Sheets 8 to 9 feet long, 20. per ton extra.
Sheets 9 to 10 feet lon 40s per ton extra.
Sheets 10 to 11 feet ong, 60s. per ton extra.
Sheets 11 to 12 feet long 80s per ton extra.

IRON.

No. 515.

LONDON, FRIDAY, NOVEMBER 24, 1882.

THE DEPRESSION IN THE AMERICAN IRON TRADE.

IT is certainly a startling discovery that, so soon after the great strike of ironworkers in the United States—by which it should have been thought stocks were considerably reduced, and when briskness ought, as a matter of course, to have followed upon the idleness temporarily enforced—we should be brought face to face with a general depression of the iron trade in that country, showing itself in a scarcity of orders, a steady decline in prices, the gradual closing of works, and a threatened general reduction of wages. That the depression is, however, a hard fact, there is ample testimony to attest. The demand has declined to such an extent that some of the works have commenced to restrict their production, and latest advices bring us the information that the cessation of work is becoming alarmingly general. It does not appear very probable that the owners of mills and forges would close them, or shorten the hours of labour, unless there were a real necessity for such a step, or unless there were some object to be gained by it, as has in this case been hinted.

It will be remembered that, at the opening of the present year matters looked very prosperous for the iron trade of the United States. The expectations of a good year were partly based upon the large mileage of new railways proposed, expectations which, however, were destined, from various causes, not to be fulfilled. We find that in December of last year steel rails were sold at 60 dols. per ton; since then the price has steadily gone down, until they can now be bought at 42 dols. and even 41 dols. At Pittsburgh, in December last, Bessemer pig brought 27·50 dols. to 29 dols. per ton; and now the price is 25 dols. in the same market. No. 1 foundry pig then fetched 26 dols. per ton, and now the price is 24 dols. Bar iron was then firm at 2½ cents per lb., and all the mills were busy; that figure can now no longer be maintained, while several mills have changed from double to single turn, because of the scarcity of orders, notwithstanding the fact that all of them were entirely silent during four months of this year in consequence of the strike. Imported iron has not shared to the same degree the reduction which has taken place in the price of American iron. Gartsherrie was sold in December last at New York at 27 dols.; our latest quotations of that iron are 26 dols. and 26½ dols., a sign that Scotch iron at least has not as yet suffered much from the depression. There is, however, a general impression that lower prices will soon rule, the market for Scotch iron being very quiet. The closing of works in the States has made steady progress recently, and several are preparing to take the same course shortly. Already we hear of strikes, which are certainly ill-timed, against a reduction of wages; but in a good many cases the workmen have accepted a reduction, which, it is believed in some quarters, will become general unless the demand for iron improves. This latter eventuality is by no means entirely out of the question. Although the depression is pretty general, American ironmasters do not, as a body, take a very desponding view of the situation. They say that, although business is unusually dull for the season, with prices very low and still declining, there is no cause for apprehension, differing in this respect from the secretary of the American Iron and Steel Association, who is reported to have stated that there will speedily be an industrial panic, and that that calamity will force on a general reduction of wages.

While we are unwilling to adopt such a desponding view of the present condition of the American iron trade, it will be of advantage to enquire into the probable causes of its depression. Various reasons may be assigned for the decrease in the demand for American iron and steel products, and for the consequent decline in the prices obtained for them. First of all, the poor harvest of last year enforced economy upon American farmers in the purchase of many articles, including waggons and agricultural implements, which are largely composed of iron and steel. The next cause may be sought in the adoption of a cautious policy in the building of new railways, and of the wiser course of improving the efficiency and increasing the equipment of the old ones. Finally, the turning of the balance of trade has been against the Americans through heavy imports of foreign products. According to the Americans, they "are buying too much abroad"; they "have bought, and are still buying, too much iron and steel." It is not very probable that the latter view will gain very many adherents in this country, although the two first causes assigned for the depression are, no doubt, the correct and principal ones. At any rate, we are unable to share the apprehension of a general industrial collapse in the United States. Nor are we inclined to adopt a view which has been circulated there as to the probable cause of the prevailing depression. It has been openly stated that the depression of the American iron trade has been "got up"—that, in fact, it resembles a strike of the ironmasters, and has been set in scene to prevent any revision of the tariff in favour of the consumer. There are at present no proofs to hand to confirm such an explanation of the situation; but it will not be denied that the dulness which has so suddenly set in has made its appearance very opportunely for the manufacturers, and that it will supply them with very powerful arguments in support of a protectionist policy.

IRON TRADE SUMMARY.

THE English iron market has been quiet during the week, but it cannot be said that this inanimation has, as yet, affected its steadiness. The business done in pig-iron has not been quite so large as during former weeks. Exports have also fallen off, and this fact and the unfavourable reports from America have had a depressing influence upon the pig-iron markets. The Glasgow warrant market has been heavy, and a large business has been done at steadily declining prices. Closing quotations on Wednesday were, for buyers, 49s. 3d. cash, and 49s. 5½d. a month; sellers, ½d. per ton more. This represents a fall of 9d. per ton since the previous Wednesday. Makers have made no change in their prices, although they are proportionately much higher than those for warrants. But the fact is that makers have no stocks; and there are no stocks of Scotch iron either in Canada or in the United States, and manufacturers are consequently able to resist any pressure that may be put upon them. There was a large attendance on Tuesday at Middlesbrough; scarcely any business, however, was transacted. The tone of the market was weaker, merchants quoting as low as 43s. 9d. and even 43s. 6d.; makers, on the contrary, declining to part with No. 3 iron under 44s. 6d. to 45s. It is a satisfactory feature that stocks at Connal's stores, both at Middlesbrough and Glasgow, are declining. The local iron market at Newcastle has been very quiet during the week, and prices, as at Middlesbrough, are fully 3d. lower, Cleveland No. 3 selling in moderate quantities at 46s. 3d. delivered in the Tyne. Lancashire makers of pig-iron, being sold far ahead, are firm in their quotations. A steady trade in pig-iron is being done in the Midlands, and also in South Wales. The hematite iron market remains quiet, and values are lower, No. 1 being quoted at 57s., No. 2 at 56s., and No. 3 at 55s. net per ton, f.o.b. west coast ports, or on trucks at works. Quotations for pig metal are also less firm in the Forest of Dean than they were a short time ago. The finished iron market, although shipments are fairly satisfactory, has become quieter, partly under the influence of the dulness prevailing in the pig-iron market. Mills and forges are still going on steadily at present, to a large extent on home account, but new orders are not coming in quite so readily as might be desired. Fresh contracts might therefore with advantage be placed now, as manufacturers would not be averse to close under quoted prices. Thus, in Lancashire, buyers with good specifications to give out would now be able in many cases to secure a substantial concession in price, and although makers, as a rule, still hold to £6 12s. 6d. and £6 15s. as their quotations, there are good brands of bar iron to be bought at £6 10s. per ton, delivered into the Manchester district. In Cleveland and Durham, the manufactured iron trade remains steady, but the mills are not so hard pressed for specifications as of late, and the consequence is that prices are a little easier, and are as follows:—Ship-plates, £6 12s. 6d.; boiler-plates, £7 12s. 6d. and £7 15s.; shipbuilding angles, £6; engineering angles, £6 5s.; sheets, £8; common bars, £6 5s. On the Tyne, manufactured iron is quiet but steady; ship-plates changing hands at £6 15s. to £6 17s. 6d.; angle iron, at £6 2s. 6d.; bars, at £6 7s. 6d. On the Clyde, the finished iron trade is, if anything, a shade quieter, although a steady business continues to be done. Shipments continue on a satisfactory scale. In the Midlands, the general tone of the trade is of a more hopeful character, and both sellers and buyers seem to be of opinion that a turn for the better will shortly take place. Quotations are steady. The tinplate market is again depressed, and prices have further receded. Coke plates are offering at 15s. 6d. per box. In the hardware trade, manufacturers keep active, and in some branches even busy. Home orders are plentiful, but the foreign and colonial demand is hardly maintained. Prices and discounts show little variation. The state of business has improved at Sheffield, and the market considerably stiffened since last week. All descriptions of steel are still in good request, and rail mills keep very busy. There is no change to note in prices. The shipbuilding trade continues to be briskly employed, and the booking of new orders has become more frequent. Engineering works do not seem at all affected by the quietness of the iron market, being exceptionally busy. Locomotive builders are well-off for employment, whilst ironfounders and boiler-makers have no cause to complain of slackness. Bridge-builders have also a large amount of work on hand. The English coal trade is, on the whole, in a healthy condition, and prices are fully maintained. Steam, gas, and manufacturing coals are fairly brisk. The household coal trade is steady rather than active. Coke is unchanged, both in tendency and price.

The iron markets of the Continent preserve their previous tendency. The iron and steel works of Austria being full of work for months ahead, the various iron markets of that country are very firm, both for pig and finished iron, for the latter of which advances may be shortly expected. The Belgian iron market remains steady on the whole, but there are various complaints as to a scarcity of work. Whilst pig-iron is very firm at 75 fr. for foundry descriptions, bar iron is selling readily at 135 fr., here and there also at 140 fr. The French iron market is becoming quieter; as, however, almost without exception, the various establishments have succeeded recently in concluding long and satisfactory contracts both for crude and manufactured iron, quotations show no signs whatever of giving way. A quiet but steady tone prevails in the German iron market. The reduction noted in our last issue of 2 marks per ton of puddling pig by Westphalian makers has been conducive of some fresh business. The consumption of Bessemer and foundry pig is large, but English competition exercises a depressing influence upon prices. Finished iron is steady at 145 marks. The German steel trade is very active. The coal markets of the Continent continue animated. In Austria, the enquiry both for industrial and domestic fuel is increasing, and prices are consequently firm. In the Belgian coal market, a rising tendency prevails. The French market continues active. In Germany the demand is so heavy, especially for industrial gas and coking coal, that the collieries are scarcely able to meet it. Coke is also animated, and its quotations, as well as those for coal, very stiff. The American iron trade has entered another period of depression, which is considered all the more remarkable as it occurs so soon after the recent idleness enforced by the four months' strike. The demand is stated to be falling off all round, and several large iron and steel establishments are working reduced hours, or are actually on the point of closing their works for a time. Minor strikes against proposed reductions are occurring, but a general lowering of wages is spoken of. Quotations of Scotch pig-iron are keeping pretty steady at present.

MINERAL STATISTICS OF THE UNITED KINGDOM FOR 1881.

THE COAL TRADE.

MORE than usual interest attaches, at the present time, to the production of coal within the United Kingdom last year, on account of the lately threatened general strike of miners, as well as in connection with the restrictive policy adopted by a considerable proportion of the men. It may very well be that the men believe that although the consumption of coal is great, yet the production is so enormous that prices are kept unduly low, and, as a consequence, their wages do not receive the fair benefit of the increasing demand; but, on the other hand, it may be very pertinently asked whether cheap and abundant fuel is not as necessary now to the prosperity of almost every one of our manufacturing industries as cheap food is to the welfare of the workmen engaged in them? It is, perhaps, however, too much to expect that the miner will look further ahead than his own immediate gain, and consider whether the policy he pursues may not in the long run react upon himself, by injuring the industries upon which his own is dependent. However this may be, the output last year shows a considerable increase on the already very heavy production of 1880, the total quantity of coal raised in 1881 having been 154,184,300 tons, against 146,818,622 tons the year before, or an increase of 7,365,678 tons. At the same time, the average prices realised show, in the majority of cases, a reduction upon a figure already comparatively low. In Derbyshire, for instance, the fall exhibited is equal to almost 20 per cent., and in North Wales to over 14 per cent. The increase in the production is pretty evenly distributed over the different coalfields of the United Kingdom, but various districts show a diminution in their output, the most notable instance being that of Lancashire, where the quantity raised decreased by 580,190 tons. The following table furnished gives a very good idea of the distribution

MULTIPLYING AND REGISTERING ANEMOMETER.

BY M. E. BOURDON, PARIS.

(*For description, see page 436.*)

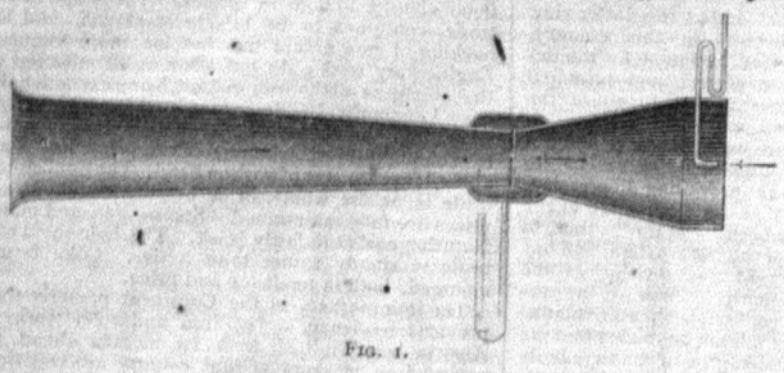


FIG. 1.

FIG. 2.

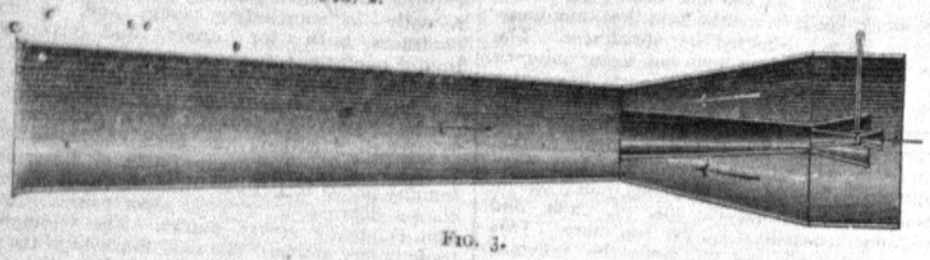


FIG. 3.

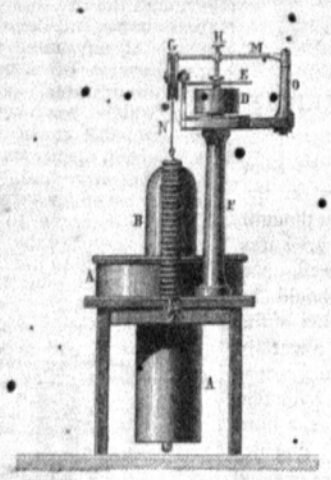


FIG. 4.

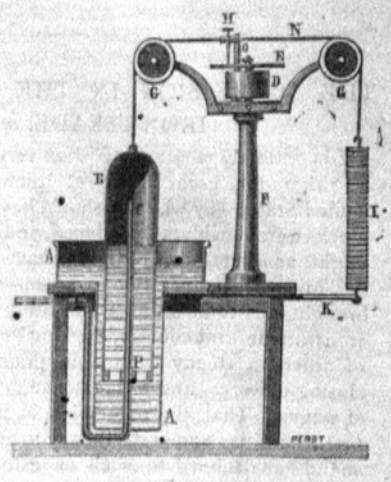


FIG. 5.

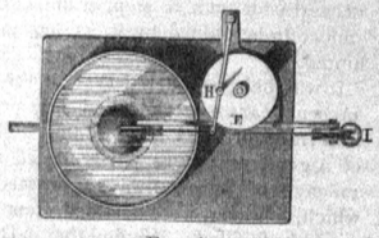


FIG. 6.

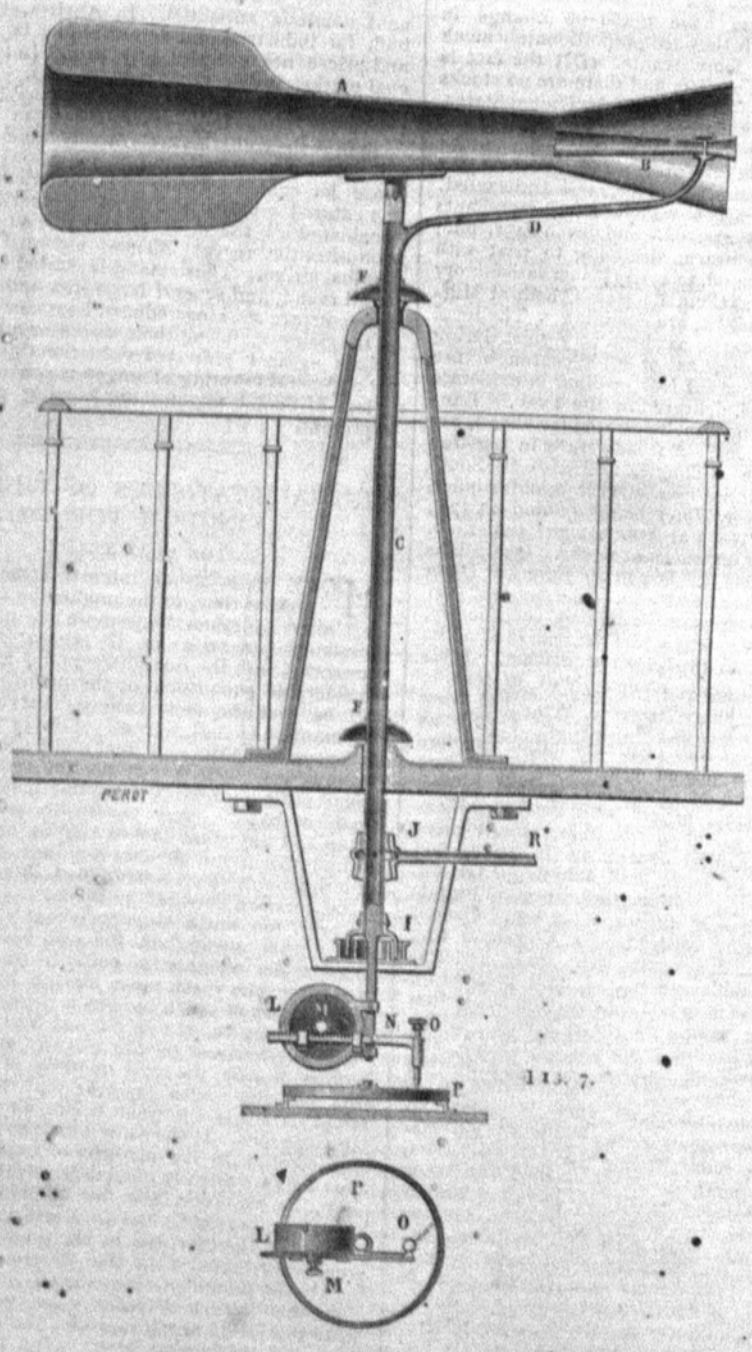


FIG. 7.

FIG. 8.

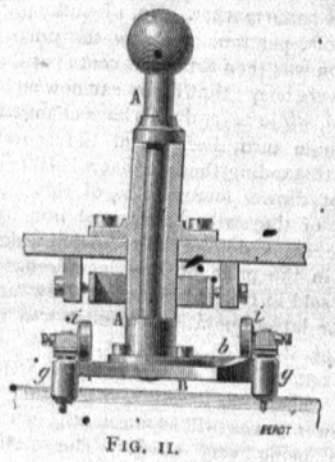


FIG. 11.

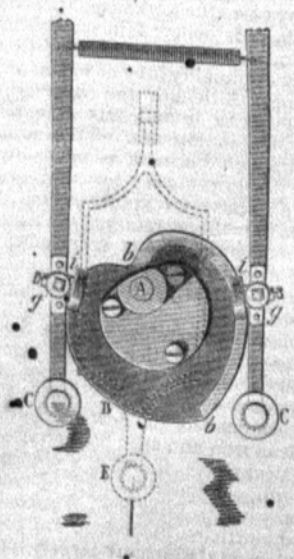


FIG. 12.

MULTIPLYING AND REGISTERING ANEMOMETER.

BY M. E. BOURDON, PARIS.

(*For description, see page 436.*)

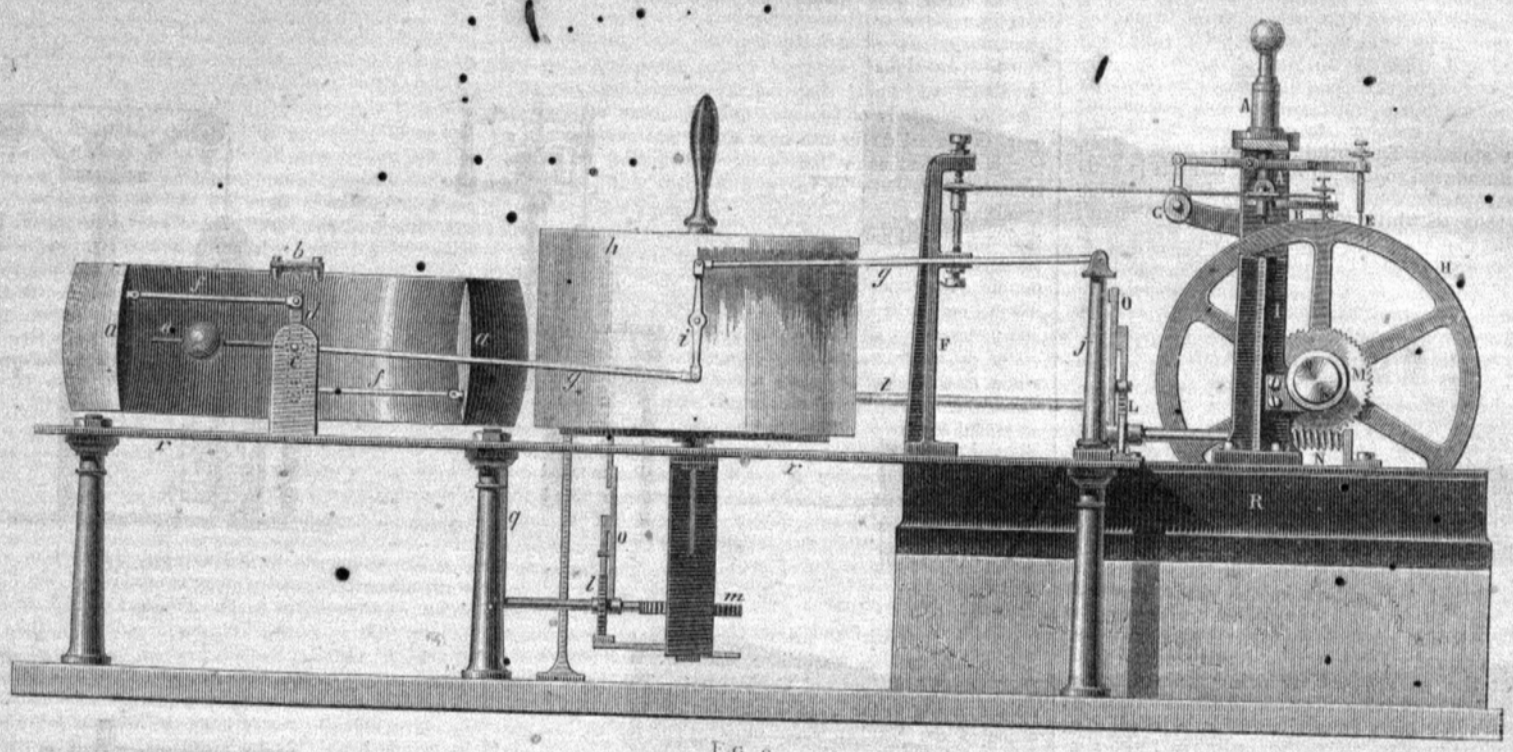


FIG. 9

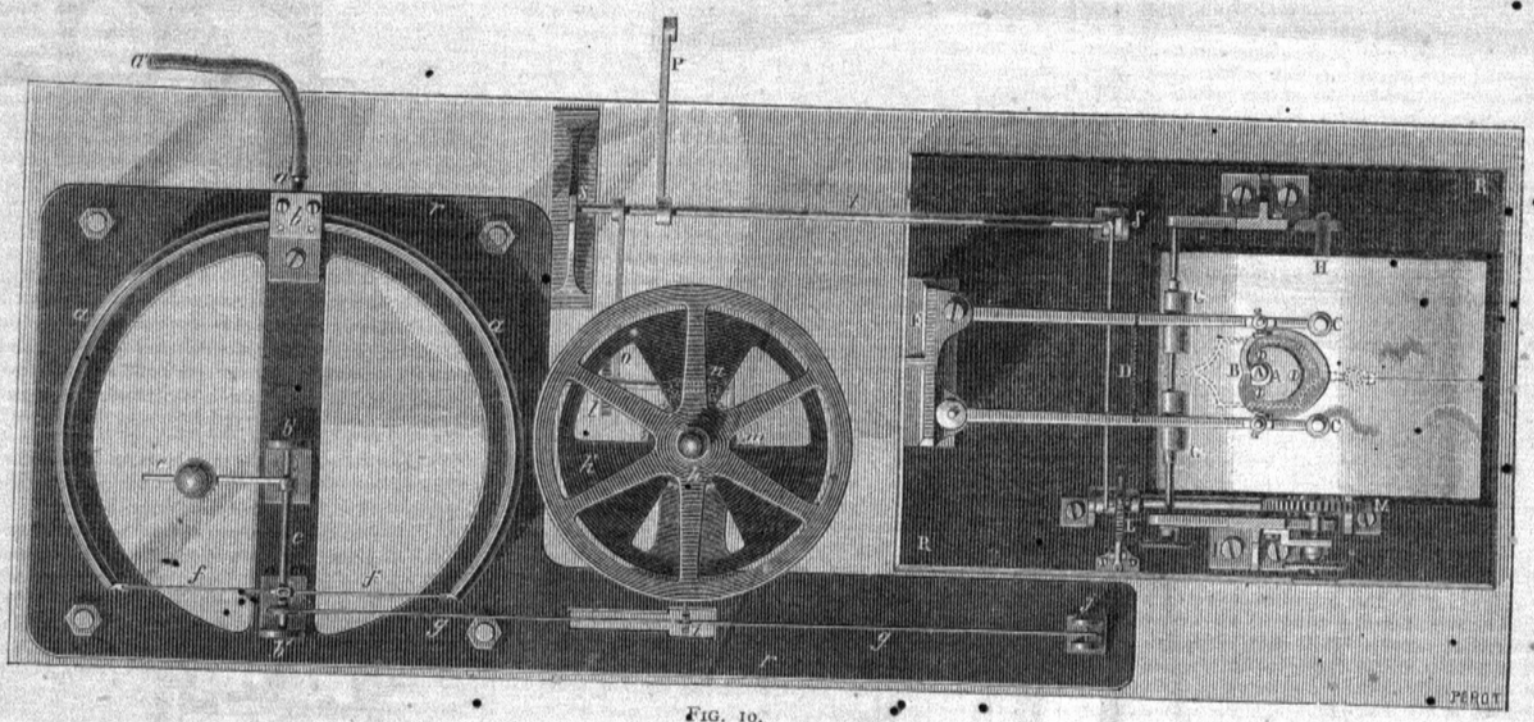


FIG. 10.

of coal throughout the country, and of the comparative fertility of each locality.

Summary of the Coal Produce of the United Kingdom.

District.	Quantity raised. Tons.
Northumberland and North Durham	14,061,567
South Durham	21,530,913
Cumberland	1,769 213
Westmoreland	1,860
Cheshire	782,000
Lancashire, North and East	9,326,722
,, West	9.173,088
Yorkshire, East and West Riding	18,287,141
,, North Riding	7,036
Derbyshire	8,508,923
Nottinghamshire	4,758,660
Warwickshire	1,133,419
Leicestershire	1,145,265
Staffordshire, South	8,481,000
,, North	4,799,400
Worcestershire	1,577,670
Shropshire	892 500
Gloucestershire	1 361,396
Somersetshire	731,754
Devonshire	20
Monmouthshire	5.412,840
North Wales	2,670,597
South Wales	16,821,336
Scotland, Eastern district	14,148,880
,, Western district	6,674,175
Ireland	127,585

The number of mines in operation was 3813, being 67 fewer than during 1880; while the most prolific coalfield of the country was that of South Durham, where 186 collieries produced 21,530,913 tons. The increase in the consumption of coal would appear, so far as we are able to judge, to be due principally to the greater quantity required for manufacturing purposes outside of the iron trade, for, whilst the consumption of fuel in connection with that industry showed an expansion between 1879 and 1880 of 5,565,218 tons, the further increase last year only amounted to 552,361 tons. The exports of coal in 1881 were 867,092 tons more than in the preceding year, and the quantity of fuel used by foreign steamers 301,512 tons more. The weight carried by the railways and canals, however, shows an increase of 5,054,689 tons. The fact that the shipments of coal, the consumption by foreign steamers, and the requirements of the iron trade exhibit only comparatively trifling improvements, while the quantity conveyed over our railways and canals increased so largely, points strongly to the conclusion that the general manufacturing industries of the country were in a healthy and active condition.

The quantity of coal brought into London by railway and canal was 6,754,492 tons, and that by sea 3,809,456 tons, the total showing an increase of 648,460 tons. The aggregate of our exports was 19,587,063 tons, of a value of £8,785,950, and there is apparently scarcely a country in the world to which the shipments did not extend. France was, as before, the most important customer, although her imports display a small reduction; Germany ranked second, and Italy third. The movement of coal coastwise shows an increase of about 430,000 tons, but there is nothing in connection therewith calling for particular notice. The table annexed will enable our readers to compare for themselves the variations in the prices per ton of coal in the different districts, and, at the same time, to obtain an idea of the relative values of the mineral in 1880 and 1881:—

	1880.			1881.		
	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Durham and Northumberland	8 0	10 4	6 0	7 10	12 6	5 3
Cumberland	9 0	20 0*	7 6	8 0	11 8	5 1
Derbyshire	7 6	10 0	6 1	6 1	7 0	5 6
Lancashire	8 9	18 9	6 8	8 10	25 0*	5 0
Cheshire	11 6	19 0	6 3	10 0	20 0*	5 7
North Staffordshire	8 4	12 6	6 6	7 4	10 0	5 6
South Staffordshire	9 0	12 6	6 6	8 5	12 0	6 6
Nottinghamshire	6 6	7 2	6 0	5 8	6 0	5 3
Warwickshire	6 6	7 6	6 0	7 0	9 0	5 6
Shropshire	9 2	13 4	6 8	9 9	13 4	6 0
Somersetshire	10 0	13 0	7 0	10 [illegible]	14 2	6 8
Gloucestershire	10 0	14 0	6 8	10 6	14 0	6 8
Yorkshire	8 0	12 0	6 0	8 0	11 8	5 2
Monmouthshire	6 0	6 6	5 1	6 10	8 6	6 0
North Wales	10 6	33 6*	6 0	9 0	33 0*	5 3
South Wales	7 6	13 0	6 0	6 7	13 4	5 0
Scotland	7 3	9 0	5 9	6 6	8 0	5 6
Ireland	12 0	23 4*	6 8	10 0	25 0*	5 0

* Cannel coal.

Before concluding these analyses of the mineral statistics of Great Britain and Ireland, it only remains for us very briefly to notice the account of the quantities of clay, salt, &c., which were produced last year. From a money point of view, both clay and salt rank only after iron ore in importance, the value of the clay worked last year having been £1,200,210, and that of the salt £1,149,110. The largest proportion of the clay obtained was fire-clay from the coal measures, but Cornwall and Devonshire produced 311,204 tons of the celebrated china clay and china stone. The production of rock salt in Cheshire amounted to 165,740 tons, while it is estimated that there were manufactured from brine 1,800,000 tons of white salt. The rest of the salt obtained in the United Kingdom came from Staffordshire and Worcestershire and Ireland.

THE LUMLEY RUDDER.

IT is well known to some of our readers that a ship's rudder possessing many advantages in practice was invented some years since by Mr. Henry Lumley, of 31, St. James' Street, Piccadilly, and is in satisfactory use in the Royal Navy. In this rudder a recessed, instead of a plane, surface is presented to the water. Mr. Lumley has recently improved upon this rudder, his object being to arrange the controlling or guiding mechanism in such manner that it is brought on the deck of the vessel instead of being beneath the counter or in the water, as hitherto. He is thus enabled to place the mechanism under supervision, and to obviate the necessity of descent for the purpose of repairing, adjusting, or arranging it, as occasion may require. He also has a stronger rudder than formerly, and one less liable to fracture in the part where the ordinary rudder is weakest. The invention is illustrated on page 438 of our present issue, and according to one arrangement, as shown partly in vertical section at fig. 1, and in the end view at fig. 4, the rudder-posts are carried up through the counter of the vessel, and the second or Lumley rudder-post is carried up behind the main or ordinary rudder-post to the deck. The post of this second, or tail rudder, thus carried up, is provided with a lever A, which acts as a supplementary tiller, and is arranged to work in and out of a guide held in a bearing B, which is fixed to the deck of the vessel. Thus, as the body portion is moved in the usual way, by the tiller or wheel, the lever A, acting as a supplementary tiller, and working in and out of the guide, controls the motion of the tail, and thus produces the angulation or recessing movement of the rudder. The water or wash of the sea is prevented entering the vessel, or trunkway, through the enlarged rudderport by means of sliding plates, which also act as a stop for the rudder. These plates take the place of the usual stuffing-box, and also form a support for the rudder, and are shown in figs. 2 and 3, where C is the upper plate and D the lower one, which latter is bolted to the main deck. These plates are somewhat of heart-shape, as shown in the engravings, and the lower one forms a framing in which the upper plate is free to slide, or partially rotate, according to the angulatory motions of the rudder. These plates are channelled, or grooved, for the introduction of a lubricating material. The recessed portions of the lower heart-shaped plate serve as stops to limit the movements of the rudder. Another part of Mr. Lumley's invention consists in the construction of the strong rudder and rudder heads, as shown in the engravings, where the body of the rudder is carried up to the deck with almost the same area of surface throughout, thereby admitting of a strong framing and a stronger rudder generally; and where in the common rudder the effects of torsion, or straining, or a blow from the sea, would have a bad effect, the extra strength in this arrangement would prevent any such ill results. The advantages of Mr. Lumley's improved rudder may be briefly summed up as follows:—Greatly increased steering-power, with less area of rudder; a strong rudder head, with a better distribution of the usual connections. The absence of weakness in the parts where most cases of fracture take place in the ordinary rudder, and sliding plates instead of the usual stuffing-box, which prevent any wash of the sea, and form a support to the rudder itself, and also a stop. The arrangement giving motion to the after-piece is simple, being a solid tiller, with a steel pin sliding within a strong standard supporting the steering gear.

OCCASIONAL NOTES.

MINE ACCIDENTS AND MINE INSPECTION.

A GREAT deal of agitation has been taking place at intervals in various parts of the country in South Wales and Monmouthshire notably with regard to what has been termed the "inefficient inspection" of mines by her Majesty's inspectors and their deputies. It has been plainly stated that, were the supervision supposed to be exercised by these gentlemen more thorough, there would be fewer accidents, fatal and non-fatal. The workmen's representatives and their constituents have gone even further. They have suggested to the Home Secretary what they deem an effectual remedy: the appointment of supplementary officials at the mines, to keep a constant outlook for possible evils and deficiencies. Intelligent workmen, it is submitted, would take a more real and practical interest in the welfare of their fellows than comparative strangers, whose knowledge is assumed to be mainly theoretical. To the observant the faultiness of this line of argument will be at once apparent. Where so much depends upon atmospheric conditions and mechanical contrivance, accurate conception of scientific details is of necessity indispensable; and, moreover, the moral stamina of men whose position is so completely independent as that of the government inspectors is much less likely to be tested, and much more likely to stand the test, than that of persons of purely local connection and limited scope of duty, if such a consideration is at all worth regarding. But, after all, figures are the most irrefutable of arguments, and statistics to which our attention has just been called may here be reproduced with some force and pertinence. In 1864, in the populous and vast district under the inspection of Mr. Wales, there were twenty men killed in collieries for every million tons of coal raised. Seventeen years later (1881) the coal production had increased from six millions to seventeen millions, but the accident fatalities were on an "inverse ratio"; though the increase in the quantity of coal raised had amounted to eleven millions of tons, there were only eight men killed for every million tons of coal brought to bank. What more convincing testimony could be adduced as to the conscientious and enlightened manner in which the mine inspectors fulfil their multifold, and too often thankless, duties?

THE LONDON WATER SUPPLY.

For the first time, we believe, since Mr. W. Crookes and Professors W. Odling and C. Meymott Tidy were called upon to report to the Local Government Board on the condition of the London water supply, their report has not been quite so favourable as usual, although they agree in saying that all the water companies are doing their duty in supplying "well-filtered, clear, and bright" water. It appears, however, that, especially during the latter part of October, the condition of some of the samples of water examined was unsatisfactory in respect to their colour, turbidity, and proportion of organic matter. Having regard, however, to the exceptionally flooded state of the river, and its occurrence at a period of exceptionally high tides, the condition of the water supply as a whole, though comparing disadvantageously with that prevailing during the summer and early autumn, is scarcely open to unfavourable comment. Thus, putting aside the New River Company's water as being largely contributed to by wells, and confining attention to the case of the East London Company, drawing its supply from the Thames and the Lea, and to the case of the Chelsea, West Middlesex, and Grand Junction Companies, drawing their supply from the Thames—in one sample only out of fifteen the proportion of organic matter was at all excessive; in seven samples only out of 104 there was any tinge of colour noticeable on careful inspection of the water in a tumbler or decanter; while in not one sample out of the 104 was there found any recognisable turbidity or freedom from brightness. Out of the total 182 samples of water examined, two only were recorded as "slightly turbid," and eleven as "very slightly turbid." In fourteen of the 182 samples a slight but distinct brownish colour was perceptible, which—being in excess of the faint tints either not appreciable or scarcely appreciable, on mere inspection, which alone come within the limits of measurement by the colour-metre—is in these instances left unrecorded numerically in the table issued with the report.

A ROYAL MINES COMMISSIONER AND HIS WORKMEN.

Already the name of Mr. William Thomas Lewis, mining engineer, of Mardy, Glamorganshire, has become a household word in Welsh colliery circles, and his last generous act of philanthropy is likely to lift him still higher in public esteem. Out of sympathy for the sufferings of the unfortunate colliers who, after a pit accident, are carried home on stretchers, or other nondescript and cumbrous conveniences, he has intimated his intention to provide an ambulance for the colliery with which he is directly connected in the Rhondda valley. His example will doubtless be followed by other colliery proprietors, and the needless pain at present caused to hapless workmen by exposure to weather inclemencies will thus be largely obviated. None the less, but, indeed all the more, will the colliers of the Rhondda be indebted to Mr. Lewis for the praiseworthy example which he has set. That they feel this, they have evinced by a resolution which they have just passed, intimating their great gratitude to him. Mr. Lewis is emphatically a "self-made" man, whom it would please Mr. Smiles to sketch. From a comparatively obscure position at Dowlais, where he had a warm friend in the late Mr. Menelaus, he has gradually worked his way up to a commercial eminence unsurpassed in the county of his birth. A foremost coal proprietor, the confidential agent of the Marquis of Bute, the chairman of the South Wales and Monmouthshire sliding-scale committee, and last, but not least, a prominent member of the royal commission appointed to enquire into accidents in mines, he has more than realised the appreciative anticipations of his acquaintances.

THE "MUZZLE" WITH A VENGEANCE.

We hold the *Morning Post* responsible for the following amusing application of the principle of the closure, or "gag," as some prefer to style the exercise of the right of majorities. We learn from our contemporary that "the Radical party at Frome have just put the *clôture* into practical operation at the Liberal Club, though in this case the minority have had their rights respected by a compromise which also puts 'the muzzle' on the majority." Last November the Frome Liberal Club was inaugurated with great effect; but it was soon found that a difference of opinion existed among the members of that powerful party on a most vital question in club life—that of refreshments. The teetotal party objected to alcoholic drinks being sold, and the matter was fought out last week, when the total abstainers succeeded in applying "the *clôture*" in one of its most objectionable forms on the other members of the club by a bare majority. The minority, however, had its revenge. As they, too, are shareholders, and so hold a certain power, they also carried that no teetotal drinks or other refreshments shall be sold in the club. As the Liberal party at Frome are thus brought face to face with a "split" which may be disastrous in its consequences, we think our Constitutional contemporary fully entitled to a good chuckle o'er the little episode. In passing, however, we may ask the *Morning Post* and such of our contemporaries having a *penchant* (we beg pardon, inclination) for "*clôture*," why they eschew the good English word "closure"? We guess the reason; but we withhold it.

TELEPHONE WIRES WITHOUT INSULATORS.

It has been generally believed that telephones will not work unless the wires are properly insulated. Yet that they will do so when that precaution is neglected, we learn through *Cotton, Wool and Iron*, which reports that Mr. Babcock, of Evansville, Indiana, who has been laying down an exchange 700 miles long, of No. 14 wire, found out by accident that they can be operated without insulators. In constructing one of the lines, 45 miles long, the lineman got drunk, and neglected to put on any insulators, merely fastening the wires to the poles. After the wire was up, no difference could be seen between its working and that of others that were insulated; and now some other lines have been built also without insulators, and work well. The telephone exchange in question now has 400 miles of lines which have been working for a year without insulators. Mr. Babcock, who is not an electrician, has been told by those who claim to be electricians that, although the lines might work in dry weather, he would be unable to do anything in wet weather; he has not, however, found that this prediction has come true. On an 81-mile line he has often whispered over it of an evening, and the whisper has been heard distinctly at the other end, although on twenty miles of it there are no insulators. The exchange has two 40-mile lines running parallel, the one insulated and the other not, and no one can tell by the working which one he is on. It now only remains for our electricians to explain so remarkable a phenomenon.

THE CITY AND ELECTRIC LIGHTING.

The question whether the ratepayers of the City or electric light companies are to bear the cost of experimenting with the light was practically settled at the meeting of the City Commissioners of Sewers held last Tuesday. The meeting was called for the purpose of considering the question of the electric light, and whether the authorities should themselves apply for a provisional order under the act of the present session. It was eventually decided, by a narrow majority, that, whilst the commission is in favour of electric lighting in the abstract, it is advisable to allow all further experiments to be conducted at the risk of the lighting companies, and not at the expense of the ratepayers. This is the proper view to be taken of the matter. The example thus set by the richest corporation in the land will no doubt find many imitators. At the same time, the commissioners show that they are not unmindful of the public interest. It was decided at the same meeting to instruct the City solicitor to appear on the application of the companies and secure clauses protecting public and private rights. We are saddled with monopolies sufficiently disagreeable already. Let not another be added to the burden.

MULTIPLYING AND REGISTERING ANEMOMETER.

IN his report to the French Firedamp Commission on "Appliances for Controlling the Ventilation of Mines," M. Aguillon, Ingénieur des Mines, draws attention to the multiplying anemometer, devised some time ago by M. Eugène Bourdon, the well-known maker of pressure guages, but only now brought prominently forward by its application to registering the speed of the air-current in mine workings. This appliance is based upon the Venturi tube, which consists of two hollow truncated cones united at their smaller bases, and which possesses the property of producing a diminution of pressure, or partial vacuum, at the plane of minimum sectional area. M. Bourdon has, by experiment, determined the relative dimensions and angles which give the best results, and has also conceived the idea of arranging one tube within another, and even a series of tubes, by way of intensifying the effect.

Fig. 1 of the engravings on page 434 and 435 shows the Venturi tube as adapted by M. Bourdon. The angle at the summit of the diverging cone is one of 5 deg., and at that of the converging cone, 21 deg.; while the respective lengths of the two cones are as 90 : 23. When it is required to measure the vacuum produced, the two cones are connected by a closed collar in such a

way that a small space is left between them, and is put in communication with a small barometrical tube, as shown; while a similar tube serves to measure the pressure of the entering air-current. Fig. 2 shows the application of two Venturi tubes combined in one apparatus, one end of the smaller coinciding with the smallest section of the larger. Taking 1 as the diameter of the cylindrical ajutage* of the large tube, its length would be represented by 0·5, the length of the converging cone by 1·15, that of the diverging cone by 4·5, and the smallest diameter by 0 56. The internal tube would be 0·29 at the largest, and 0 09 at the smallest diameter, while the length of the converging cone would be 0·4, and that of the diverging cone 1·7. The ratio of the smallest diameters of the two tubes is as 1 : 6·2, and the ratio between the two sectional areas, as 1 : 38·5, these being the proportions which M. Bourdon has found from numerous experiments to give the greatest amount of vacuum. The greater the speed of the air-current, the more marked is the multiplying effect of the second tube; but, taking a rough average, it may be said generally that, if the pressure of air at the mouth of the converging cone of the outer tube be represented by 1, the diminution of pressure at the mouth of the diverging cone of the inner tube will be as 6, even allowing for the obstruction caused by the latter. M. Murgue tried a double apparatus in the workings of the Bessèges Colliery, where the speed of the air current is perfectly well known; and, with a speed of 22 feet per second, obtained a diminution of pressure corresponding to over 1½ inch of water. M. Le Chatelier, who brought this appliance to the notice of the French Firedamp Commission, comes to the conclusion that it may be safely relied upon for gauging the general air-current of a mine, at any rate where the speed exceeds 13 feet a second. For cases in which, on account of the large sectional area of the return air-ways, no point can be found where this speed is attained, M. Bourdon has devised an apparatus with three tubes, shown at fig. 3, in which the effect is still more intensified. As the size of the outer tube, determined by the law based upon the results of experiment, would be so great as to render the instrument unwieldy in mine workings, some of the useful effect is sacrificed by reducing the dimensions to the following:—Total length, 7 feet 7 inches; length of diverging cone of outside tube, 5 feet; largest diameter of ditto, 1 foot 3 inches; smallest diameter of ditto, 7 inches; smallest diameter of intermediate tube, 1½ inch; and ditto of inner tube, 5-16ths inch. The two inner tubes are made of brass, and the outer one of sheet iron. M. Aguillon concludes that this 3-tube instrument may be employed with advantage underground, provided the workings be of sufficient sectional area, for measuring currents of a speed between 5 and 13 feet per second, the only fear being that the small tube may become stopped up with dust. We extract, from a long table furnished by M. Bourdon to the Paris Academy of Science, the following results obtained:—

Speed of air-current in feet.	Diminution of pressure in millimetres of water. Large tube.	Intermediate tube	Small tube.
5 ..	0·6 ..	1·8 ..	6
10 ..	2·1 ..	7·5 ..	28
13 ..	4· ..	16· ..	65
19 ..	8· ..	32· ..	135
26 ..	17· ..	70· ..	290
30 ..	21· ..	87 ..	370
40 ..	40 ..	168 ..	710

The great increase of useful effect, in proportion to the speed of the current, would appear to be attributable to the accelerating action exercised by the speed where gases or liquids are drawn along by the influence of lateral contact. The property which this appliance possesses of multiplying variations of speed permits of conducting experiments with great nicety; and it may be put in connection with electric bells, or other alarm signals, for calling attention to any variation in the *régime* of the ventilation.

For merely measuring, without registering, the indications of the anemometer, it is sufficient to place an open glass tube, in the form of a letter U, in communication, one end with the throttled portion of the bi-conical tube, and the other with its mouth. The surface of the liquid in one arm will show, against a fixed scale, the amount of vacuum produced. When it is required to register the variations of pressure in a mine, both arms of the glass tube must be closed, and the rod of the float which actuates the registering apparatus must pass through a stuffing-box. Here a practical difficulty arises: either the rod must be air-tight in the box, in which case the friction introduces a source of error into the readings; or, if it works easily, air is liable to enter and also cause error. To overcome this difficulty, M. Bourdon actuates the style of the registering apparatus by means of a connection of two levers, one of which is placed inside the closed chamber of the manometer; and there is only a turning instead of a sliding-rod to be kept tight in the stuffing-box. In this case, the float must be sufficiently large to set the whole mechanism in motion.

Another form of appliance for registering variations of pressure is shown in side view, front view, and plan by figs. 4, 5, and 6 respectively. A is a vessel in the form of a barometer reservoir, containing water, glycerine, or other liquid. It encloses the bell-glass B, weighted and guided at P along the pipe C, which affords communication with the throttled portion of the anemometer. The cord N, passing over the pulleys G G, connects the bell-glass with the balance spring I, made fast at K. The pulleys work on pins in the branches of the standard F, which also carries the pivot O of the hand M and style H, the card-plate E and the barrel D, containing a spring and wheel-work which causes the card plate to revolve. The variations of pressure in the bell-glass allow more or less liquid to enter it; and the consequent variations of its weight cause it to rise and fall, thus giving the style a lateral movement, and producing slightly curved but almost radial lines on the card. This latter revolves once in twenty-four hours, each of which has its corresponding division previously marked; and the speed of the air-current, or its pressure, or diminution of pressure, is shown graphically on the spaces answering to each hour. The speed, &c., is read off in figures by

* It so happens that no cylindrical ajutage is shown in fig. 2, as in figs. 1 and 3; but the proportion given holds good for the ajutage in cases where it is added.

placing over the card a glass plate with concentric circles corresponding to the different speeds, &c. traced upon it.

When the multiplying anemometer is applied to registering the force of the wind at observatories, where its direction has also to be recorded, an arrangement such as that shown at figs. 7 and 8 is adopted. A is the outer tube, B the inner, C the hollow spindle, and D the pipe affording communication between it and the inner tube; the joint J, and the pipe R, serving to continue the communication to the pressure registering apparatus. The caps. F F are merely for preventing rain from getting into the joints. To the bottom of the spindle is connected the arm N, carrying the style O, the arm being caused by the rack, pinion M, and clockwork in the barrel L to move the style from the centre to the circumference of the card-plate once in twenty-four hours. The fixed card is divided radially, according to the points of the compass; and the variations of the wind are recorded by the style upon the card in a diagram consisting chiefly of concentric arcs of greater or less extent.

Another apparatus for registering the speed and direction of the wind upon strips of paper attached to cylinders, instead of upon circular cards as in the arrangement just described, is shown in elevation at fig. 9, and in plan at fig. 10, figures 11 and 12 being enlarged vertical section and plan of the mechanism for actuating the styles. The cast-iron bed R carries an arched standard I, which affords a bearing for the vertical shaft A to be coupled to the shaft of an anemometer, such as that shown in fig. 7. On the shaft A is keyed the heart-shaped cam B, so as to follow the varying direction of the wind. This movement separates the styles C C, mounted on the arms pivoted on the standard F, and kept pressed against the sides of the cam by the spiral spring D. The styles trace a diagram on paper attached to the revolving drum H, as shown in the plan; but they do not both mark at once, as one of them is kept off the paper by the raised portion of the cam *b i b* (fig. 12), lifting the arm through the roller *i*. One style registers the direction of the wind on the east side, and the other on the west side of a neutral line, due north and south, traced by the style E. The eccentric rollers, GG, with their spindle and levers, serve to lift the styles off the drum while the paper is being placed or removed. The velocity or pressure of the wind is registered, by the style held by the lever *i* (fig. 9), on a slip of paper attached to the vertically revolving drum, *h*, the axis of which is carried by the brass plate *r r*. The style, held by the lever *i*, jointed to the parallel rods, *g g*, is actuated by the lever *c*, and rods *ff*, attached to the closed ends, *aa*, of a tube of sheet copper of elongated elliptical section, and bent to the form of a circle. It is placed in communication with the hollow shaft of the anemometer by the tube a^1; and the variations of pressure cause the ends of the annular tube to approach and recede from one another, thus actuating the parallelogram, which is counterbalanced by the adjustable weight *e* on the lever and rod carried by the plate *b* and bracket b^1. Rotary motion is given to the two barrels H and *h* by the worms N and *n*, the worm-wheels M and *m*, and the ratchet wheels L and *l*, worked by levers from the rod *t* supported at *s s*, and actuated by the lever P in connection with a clock. The diagrams, both of the speed and the direction of the wind, consist of zigzag lines, as shown on the drums in figs. 9 and 10.

Besides the application to mine ventilation, as referred to at the beginning of this notice, and its use in meteorology, this multiplying and registering anemometer is capable of rendering great services to the engineer in affording an exact indication of the velocity of the wind in exposed situations, and therefore of permitting the necessary resistance of lighthouses, chimney-shafts, and bridges to be accurately calculated. Had such an instrument been brought into requisition for registering the pressure and prevailing direction of the wind during the year previous to the erection of the Tay Bridge, it is probable that the precautions taken in consequence would have prevented the sad calamity which occurred.

MULTIPLE-SPINDLE SLOT DRILLING MACHINE.

IN the engraving on page 439 of our present issue, we illustrate an improved three spindle slot drilling machine, specially adapted for cutting the three keyways in a set of wringing machine roller spindles at one operation, thereby greatly economising time and labour. This machine has two heads, one carrying two drill spindles 1¼ inch diameter, the other only one, as one of the shafts of the wringing machine has only a keyway at one end. The traverse is driven by elliptical gearing, so as to equalise the motion, and is variable up to 4 inches, and the position of the two heads can be altered to any place between the frames, independently of each other. By throwing off the traverse belt the machine becomes an ordinary drill with three spindles. The down feed in slot drilling is self-acting by means of a ratchet and spiral wheels, with two speeds. The frame, being open at the ends, will take a long shaft in, and being open at sides also, can be used for cutting cross-keyways. These machines, which are manufactured by Messrs. Beverley and Atkins, of the Special Tool Works, Stanley Street, Sheffield, can be varied in design to meet the requirements of manufacturers.

THE IRON AND COAL INDUSTRIES OF INDIA.

IN an article on "Private Enterprise in India," the Bombay correspondent of the *Economist* refers to the investment of Mr. Hope, the late Financial Secretary to the Viceroy's Council, with the portfolio of Public Works, as a solid advance towards realising the assurance of the Government of India to foster private enterprise. Mr. Hope is a sort of *avatar* of enterprise and thoroughness. Having been placed in charge of the great spending department of the Indian Government, his appointment has been followed by a notification giving the department over which he presides the initiative in relation to the utilisation of mineral resources. Knowledge is therefore combined with power. Every information regarding the vast mineral resources of India is now centralised in an office which is the great purchaser of stores, and constructor of all the great public works of the empire. No time has been lost in utilising the power and information which his position assures him. No better opening is afforded to private enterprise in India than the iron trade. The Government of India have selected this opening as a first attempt. They have made public the fullest information regarding the supply and demand for iron, and have offered the patronage of the state to any company which will pioneer the new industry. The *Gazette of India* for August 5, 1882, to which all interested in the subject can turn, contains the first series of papers on the iron and coal resources of India. But a few supplementary details will be of interest. In 1880—81, the value of manufactured iron imported by the state exceeded one million sterling, whilst a value exceeding two millions sterling was imported by private importers. Altogether, the total imports of iron and steel were of the value of £3,300,000. The demand is sure to increase. Not only is the railway system developing, but iron is required for bridges and other works of construction. The demand is therefore certain and increasing. The supply, on the other hand, is unlimited, and, what is more to the point, distributed over this huge country in convenient localities, so that commanding centres of the industry can be established in the Punjab in the north, at Raniganj in the east, and near Chanda in the central provinces. The existing coal companies in Raniganj and Hazaribajh put out annually 840,000 tons, and the supply is only limited by the demand. Iron exists in many places. In the Punjab coal is known to exist, and iron is found in numerous localities. In the central provinces, the Warora collieries and Mohpani ironworks are established successes, and in the native state of Gwalior, and in Sambulpur, remarkably pure ores have been discovered, which occur not merely on the surface, but are free from phosphorus. In some parts of India the ores contain traces of sulphur and phosphorus, but since the discovery of the Thomas-Gilchrist process there would be no difficulty in eliminating such impurities, and converting the ores into pure steel. Two, therefore, out of the three essential factors in a profitable iron trade exist. Capital only is wanted to connect an unlimited supply of raw material with a considerable market for steel and wrought iron. To obtain this capital, and encourage private enterprise in this direction, is the task which Lord Ripon has entrusted to his colleague, Mr. Hope. The first step taken has been to publish full information on the subject of iron industry in general, and the history of the Bengal ironworks. A more substantial inducement to capitalists to come forward is the guarantee that the great purchasing Department of Public Works will order a certain fixed weight of iron and steel every year for ten years.

Such is a bare outline of the method which Lord Ripon is adopting to redeem a pledge he gave of encouraging private enterprise. With respect to iron, the correspondent believes that there will for many years be ample demand for a home industry, as well as foreign importations. One industry begets another, and the manufacturing history of the millions of India is only in its infancy, if, indeed, it can be said to have yet struggled into life. Visitations of famine suspended agricultural industry, and, by consequence commerce. The creation of industries that apply labour to a task, which drought and locust cannot arrest, will sustain commerce and demand even in times of recurring famine. If England wants a permanent market for English manufactures in India, she must help to establish manufacturing industry in this country. Complaints that the mother country will lose her market by teaching India to supply herself are groundless. Trade between the West and East will flow on in increased volume, though the channels may alter. English capitalists will serve themselves well if they will serve India. Fortunes may be made not in digging for gold, but in converting iron and coal, or fibres and paper, into gold. Mr. Hope's department evidently is prepared to answer every call upon it for information, and possibly some enterprising capitalist may recognise the advantage of a tour to India, in order that he may learn and see for himself.

THE MICROSCOPE IN ENGINEERING WORK.*

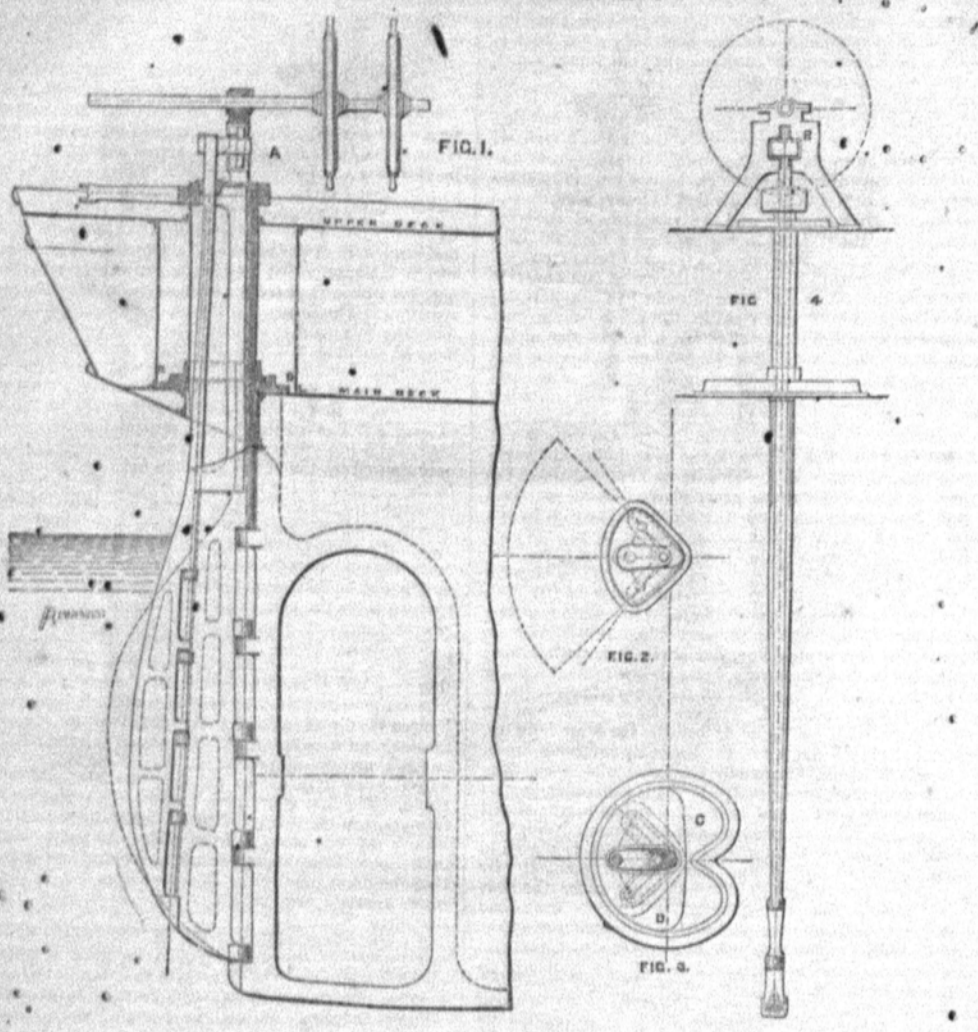
By Mr. R. Grimshaw.

THE specimens shown are intended to outline a method of using the microscope as an aid to the testing machine in estimating the value of structural materials. While it is not intended to suggest that the microscope will determine definitely the elastic limit, nor even the breaking strain of structural materials, it is designed to convey very distinctly the idea that the microscope may be used for preliminary investigations which will determine whether or not the material is good enough to warrant its being tried on the testing machine. If the microscope condemns the material, it is not worth while going to the expense of having it tested by more expensive methods. If the microscope fail to reveal any flaw, then the material may be sent to the testing machine to be further proved. The larger the specimens that would be required for testing in the machine, the more marked the advantages of the microscope in saving, in the case of specimens readily determined to be bad, the expense of further testing, and the risk of using it in construction. The samples shown this evening are of bridge timbers, and the lesson they are intended to convey is that had this method of examination been followed, the material which was proved to be faulty after being built into the bridge, would have been promptly thrown out. The samples shown were photographed by Mr. W. E. Partridge of New York, a professional engineer who is an enthusiastic amateur photographer, and to whom I am indebted for the particulars concerning them. "The timber from which the four specimens were taken came in the form of a chip broken off when a highway bridge was wrecked in 1879-80. The timber formed a portion of the sill of a draw-bridge, which consisted of two 12-inch sticks lying one on the other. The turn-table casting having been somewhat too small,

* Read at the Stated Meeting of the Franklin Institute, June 21, 1882.

THE LUMLEY RUDDER.

(*For description, see page 436.*)



this 24-inch timber had to support one of the A frames of the bridge at a distance of 12 inches outside of the bed-plate. After a few days of service, while an empty truck was passing over, the strain became so great that the A frame sheared the 24-inch sill, wrecking the whole bridge. The timber was so exceedingly poor that upon mounting it on the microscope the porous and weak nature of its structure was at once discovered. Its annular rings are sofbething like three times the distance apart which would be found in a piece of thoroughly good wood of a similar character. The medullary rays are few in number and short in length, while in good wood they are of considerable length, and so numerous that the tangential sections appear like a series of tubes seen endwise or a number of parallel chains. Afteronce seeing and comparing two samples of wood it is very easy to recognise their characteristic features by the use of a pocket magnifying glass." The trunks and limbs of exogenous trees are built up of concentric rings or layers of woody fibre, which are held together by radial plates acting like the trenails of a wooden vessel, or the "bonds" in a brick or stone wall. The rings or layers, representing successive years' growths, are composed of tubes, the interstices between which are also filled with cellulose. The slower the growth of a tree, the thinner these yearly layers, and the denser and harder the wood—other things being equal. This is true as between one kind of tree and another, and also as between different individuals of the same kind. Not only is the closeness of the growth an indication of the hardness and strength of the timber, but the size, frequency and regularity of distribution of the radial plates which bind the layers together may be taken as a very close illustration or sign of the character of the wood and its ability to resist strain, especially that from crushing stress. The micro photographs of the sections of good and bad timber show that in the strong specimens the concentric rings are close in texture and of slight width; and the radial plates frequent, wide, long, and thick; while in the poor material, the reverse characteristics are shown. The lesson to be learned from these micro-photographs is that having proper view of transverse and radial lengthwise sections, and of sections perpendicular to a radius, of a standard piece of timber resisting certain standard or minimum strains—all timber having fewer rings per inch of tree diameter, fewer fibres, and fewer and shorter radial plates per square inch of section, should be rejected as not up to the standard, and applied for other purposes or used with a greater factor of safety. This method has the advantage of enabling every stick of timber in a bridge to be inspected and judged, and is offered as an interesting and valuable aid to the breaking tests made by the machine. In this connection I may offer as the parallel in metal work two portions of pure Lake copper; one an ingot as ordinarily found, in which the grain is coarse and crystalline, the colour dark red, and the mass full of blow holes; this is an average sample of copper casting. The other is run from the same pig, at the same heat, and in a similar mould, but with proper precautions to prevent oxidisation; in consequence, there are no blowholes, the grain is close and fine like that of the best bronzes, and the colour is salmon, which is the true copper colour. The "deoxidised" casting weighs 25 per cent. more than the ordinary casting fromt he same pattern, calipering the same. For these I am indebted to the Philadelphia Smelting Works, Twelfth and Noble Streets. Tests made of the deoxidised copper rolled into sheets ·035 inch thick showed on strips 2 inches wide a tensile strength of 33,760 pounds per square inch, ordinary fine copper in sheets being quoted by Trautwine at 30,000 pounds. This would show 12·5 per cent. superiority in the metal having the fine fracture. No 20 "deoxidised" wire shows a calculated tensile strength of 45,000 pounds per square inch, and still later tests of wire of the same thickness showed a calculated tensile strength of 41,056 pounds per square inch for the ordinary, and 47,552 pounds for the deoxidised,* a striking confirmation of the indications of the microscope.

THE USE OF IRON IN TUBBING SHAFTS AND LINING DRIFTS.†

By the Engineers of the Societe John Cockerill.

In order to provide for the economical working of their Collard colliery, 758 acres in extent, the Cockerill Company decided to abandon three of the four existing shafts; to enlarge the Marie shaft to 14 feet 9 inches diameter, and to put down a new shaft of the same diameter, to be called the Cécile, on the site of one of those that were abandoned. As this last-named work was one of great difficulty, it was found necessary to first fill up the old pit with ashes and shale in small pieces. While the Marie shaft was lined with brickwork in the ordinary way, two bricks thick, a new system of iron tubbing was adopted for the Cécile shaft; and it is this system, with a similar application of iron to horizontal drivings, and their cost as compared with the ordinary methods, that constitute the object of this notice.

Iron Tubbing for Shafts.—The Cécile shaft is sunk to a depth of 571 yards, the first 28½ yards being lined with masonry, so as to support the foundations of the buildings and engines on the surface. As the strata did not afford a solid bed for this masonry, it was laid upon a strong oak framework, from which also was suspended the first iron ring. The rings consist of four channel irons, 8 inches by 2½ inches by nearly ¾ inch, connected by cast-iron fish plates fitting in the channel, and secured by four pins to each fish plate. The top ring is suspended from the oak framing, and the rings are connected together by eight vertical bars of channel iron, about 4 by 2 inches, turned up at each end and secured by bolts and nuts. The rings are 3 feet 3 inches apart for a depth of 139 yards, and 3 feet afterwards, and the space between the rings is closed by oak spiles 2 inches thick. The framework of the partition of the shaft consists of iron joists, in which a saving of one-third the cost of timber has been effected. The weight of each ring is 1·963 ton, and the total cost per metre (1·0936 yards) run, including labour, is 360 francs (£14 8s.). As compared with the brick-lined Marie shaft, the Cécile, sunk in one-third the time, shows a saving under four heads, viz.: (1) Expenses of sinking, timber, compressed air, coal, &c.; (2) Supervision and labour of engine drivers, stokers, &c.; (3) A smaller amount of excavation beyond the final diameter than that required by brickwork; and (4) The being able to dispense with the temporary timber lining required with brickwork.

Iron Supports for Driving.—A modification of the above system has also been employed with success for supporting the roof of mine workings. Rejected railway bars are bent into the form of the cross section of a tunnel. Formerly three rails were used to constitute each ring; but now only two are employed, with the fish-joints occurring at the sides, at a convenient height for screwing up the nuts. The rings are connected by tie-rods to keep them vertical and at an equal distance, about a metre (1·0936 yard) apart. The bottom rails also serve as sleepers for the tram rails. The space between the rings is closed by spiles in the usual manner. In October, 1870, a long and troublesome cross-cut was chosen for a trial of this system in its primitive form, as compared with the ordinary timbering. Seventeen rings were put up, a metre (1·0936 yard) apart, followed by 50 metres (54 yards) of timbering; and then came a second series of four iron rings, followed by another 50 metres of timbering. At the end of seven years the spiles in the iron portion had been renewed every year, and three fractures had occurred owing to the thrust of the strata, but they were repaired with fish plates on the spot; at the same time the tramway had been rectified once. The timber portion, on the other hand, had been entirely renewed every year, and the tramway had been rectified thrice yearly. Although the first cost of the iron support to the roof was 60 francs per lineal metre, as compared with 24 francs for the timber, the maintenance of the former cost only 8 francs (6s. 6d.) per lineal metre per annum, against 28 francs (£1 2s. 6d.). But a cross-cut is required to stand twenty years—ten for hauling, and another ten for ventilation; and, taking this period for comparison, the iron support shows a saving of 1820 francs (£72 16s.) per annum over the timbering, if maintenance as well as first cost be taken into consideration. Half the labour is saved, because two iron rings can be put up in a shift of ten hours against only one timber frame.—J. W. P.

* Actual breaking strength of the wires, 39½ and 39½ pounds for two samples of the "commercial," and 44½ and 47 pounds for the "deoxidised." It must be remembered that the larger the specimens tested the lower the tensile strength per square inch of section, and the finer the wire is drawn the greater its tensile strength per square inch and the less the superiority of the metal which was close-grained in the ingot.

† From Abstracts of Papers, *Min. Proc. Inst. Civ. Eng.*, vol. lxx.

NOTE ON THE MANUFACTURE OF STEEL FROM PHOSPHORIC PIG AT THE CREUSOT WORKS.*

By M. Delafond, Mining Engineer, Châlon-sur-Saone.

In July 1881 we were deputed by the Minister of Public Works to receive the rails manufactured at the Creusot works for the railways constructed for the state. One of the terms of the specification to be fulfilled by the manufacturer provides that "the employment of processes of manufacture not sanctioned by experience must be submitted to the approbation of the administration." The process invented by Messrs. Thomas and Gilchrist for obtaining steel from phosphoric pigs being of quite recent date, and thus coming under the condition cited in the preceding article, Messrs. Schneider were under the necessity of obtaining the authority of the administration to deliver rails made of dephosphorised steel. We have, in consequence, been led to make a detailed study of the dephosphorisation process as practised at Creusot, and to estimate the quality of the resulting products. The committee of permanent way for the state railways, thinking that the results obtained in these works in the treatment of phosphoric pigs presented the highest interest, invited us to draw up a memoir upon this important question, which should be published in the *Annales des Mines*, and in those of the *Ponts et Chaussées*. We should state, before commencing our subject, that Messrs. Schneider showed the greatest courtesy in furnishing us with all technical documents we required; and we seize this opportunity of thanking them for all their kindness to us.

HISTORY OF THE QUESTION.

The manufacture of steel in the Bessemer converter, and in the Martin furnace, demanded until quite recently the employment of pigs free from phosphorus. An eminent professor of metallurgy at the School of Mines at Paris, M. Gruner, pointed out some time back that it was the presence of a siliceous lining, both in the converter and reverberatory furnace, which prevented the elimination of the phosphorus, and he added that this metalloid would be expelled so soon as the apparatus employed was furnished with a basic lining. Two English metallurgists, Messrs. Thomas and Gilchrist, following the lead indicated by M. Gruner, were able to announce in 1878 that they had succeeded in eliminating phosphorus in the Bessemer converter by furnishing it with a lining of magnesian lime bricks. In November, 1879, Messrs. Schneider made a trial of the Thomas and Gilchrist process at Creusot. The first results obtained in the converter were scarcely satisfactory; but in the Siemens Martin furnace, on the contrary, success was immediate, but later success was equally obtained in the converter, and now the process is carried on in a regular manner, as well in the converter as in the furnace. At Creusot there are produced two varieties of steel, one which is termed acid steel, because it is obtained with an acid lining; the other, termed basic steel, because it is produced in presence of a lining of magnesian lime. We will study successively dephosphorisation in the Bessemer converter, and in the reverberatory furnace; but we shall only treat in an incidental manner questions which do not touch upon the manufacture of rails.

DEPHOSPHORISATION IN THE CONVERTER.

We will divide our remarks on dephosphorisation in the

* Translated from a paper in the *Annales des Mines*.

converter into two distinct sections, viz.:—I. Method of Manufacture; II. Quality of the Products obtained.

I.—Method of Manufacture.

The examination of the method of manufacture will be best considered under five distinct heads:—(1) Disposition of the Apparatus; (2) Method of Conducting the Operation; (3) Wear and Repair of the Apparatus; (4) Reactions which take place during the Refining; (5) Composition which the Pig treated ought to possess.

1. Disposition of the Apparatus.—The converters employed are the same as those used in the acid Bessemer process; the only difference consists in the method of lining. At Creusot they have abandoned the employment of dolomitic bricks, and employ a mixture of magnesian lime agglomerated together by means of anhydrous gas tar. This lime has the following mean average composition:—

Lime	53·00
Magnesia	35·80
Silica, alumina	7·70

It comes from the calcareous dolomite of the trias, and has to be subjected to a high temperature, in order that the silica and alumina may react upon the lime and magnesia. The lime thus made is ground, sheltered from the wet, and mixed with 10 to 11 per cent. of tar. There is obtained, thus, a brown powder, which is rammed against the walls of the converter by means of an iron rammer previously heated. The thickness of the lining may be about 0·65 m. at the bottom of the vessel; in the other parts it does not exceed 0·45 m. The twyers are made of silica; they are, in fact, the same as those used in the ordinary acid process. It has been found useless to protect the points of contact of the silica twyers with the magnesia lime lining by means of bauxite or graphite, in order to lessen the chemical combination. No means are employed to protect the throat of the converter from gobbing up, which is provided against by having the slags sufficiently fluid. But the utility of making the lower part of the converter easily removable, so as to facilitate the repair of the lining, is fully recognised. When a vessel has been newly lined, it is strongly heated with coke. There is thus obtained a double result; on the one hand, the volatile matter of the tar is removed, the carburetted vapours of which constitute a hindrance to the purification of the pig, and partly hide the colour of the flame escaping from the vessel; on the other hand, the tar leaves a residue of coke, which gives cohesion to the surrounding lining. The ladle and the ingot moulds are the same as those used in the acid Bessemer process; no change is made in the pressure of blast, nor in the volume of air per second.

2. Method of Conducting the Operation.—In a vessel capable by the acid process of treating ten tons of pig, about eight tons of phosphoric pig may be refined. There is first introduced into the converter 16 to 20 per cent. of strongly heated lime, obtained direct from a calcining furnace situated close to the vessel; there is also added 1·5 per cent. of fluor spar. The pig is taken direct from the blast-furnace; as soon as it is introduced into the converter the blast is turned on, and the operation commences. The operation may be divided into four distinct periods, which may be defined as follows: 1st, scorification; 2nd, decarbonisation; 3rd, after-blow; 4th, recarbonisation. The scorification corresponds principally with the departure of the silicon; as this body only exists in small quantity in the pig treated, this period only lasts about 1½ to 2 minutes. Then comes the decarbonisation, during which the carbon of the pig is burnt off; a long flame, due to the combustion of the carbonic oxide, escapes from the mouth of the vessel. This operation lasts from nine to ten minutes. The blast is then stopped, the converter turned down, and the liquid slag run out. There is then added from 5 to 6 per cent. of lime, similar to that used in the first addition; the vessel is then turned up and the blast again turned on. The after-blow then commences, during which the departure of the phosphorus takes place; this period lasts from four to five minutes, the temperature being extremely high. The blast is again stopped, and the slag, which has become very fluid, is run off as completely as possible. The quantity of slag now run off is twice as great as that obtained at the end of the decarbonisation period. While the converter is turned down, a sample of the metal is taken, which is at once hammered out, dipped in water, and broken. The fracture indicates whether the metal is sufficiently dephosphorised; a fracture showing brilliant flat crystals indicates a too high proportion of phosphorus. If this be the case, the after-blow is continued for a short time, and, if necessary, a fresh sample is taken. When the dephosphorisation is deemed sufficient, the metal is recarbonised by means of spiegeleisen. The spiegel contains 18 per cent. of manganese; on an average there is employed 10 per cent. on the original charge. The addition is made in two parts; the first part (about ⅓) is added in the vessel, the rest is added in the ladle, into which the metal from the converter is then poured, and the ingots cast. The loss is important, about 18 per cent.* In an acid blow it is only 8 or 9 per cent.†

3. Wear and Repair of the Apparatus.—It would be natural to suppose that the mean level occupied by the slag in the converter would, by reason of the action of the silicates on the lime, correspond with the greatest wear of the lining. But it is not so. It is the bottom of the converter which is most rapidly acted upon, and what is somewhat surprising, the twyers, although of silica and cooled by the blast, are corroded more than the basic part. It has been supposed that it is during the after blow, that is to say, at the moment when the temperature of the bath reaches its maximum, that the lining is most strongly attacked. What is the cause of this wear of the twyers? It is due to a simple mechanical action resulting either from the blast or from the oscillating movement of the metal in the converter? Or is it due to the formation, by the action of the air upon the very hot metal, of oxide of iron and manganese, which react in their turn upon the silica of the twyers? This latter explanation seems to us the most probable. After 15 to 20 blows the lining at the bottom of the vessel requires repair; the bottom, which is moveable, as before-mentioned, is taken off, the twyers changed, and the basic ramming surrounding them renewed; the rest of the lining does not in general require anything but a slight layer of basic put on it. It is only after 80 to 100 blows that the body of the converter requires repair, which consists simply in the addition of some fresh rammed material.

4. Reactions which take place during the Refining.—We will now examine what reactions take place in the converter during an operation. The pig treated is white, slightly mottled; the following is its average composition:

Carbon	3·90	per cent.
Silicon	1·30	,,
Manganese	1·50 to 2·00	,,
Phosphorus	2.50 to 3·00	,,
Sulphur	0·20 (a maximum.)	

Silicon is the first to disappear; it goes very completely, and in a very short time (1½ to 2 minutes). Does it combine directly with the lime added to the charge, or does it first form silicate of iron and manganese, which are afterwards transformed into silicate of lime? The latter hypothesis appears the most probable. At the commencement of the operation the temperature of the lime is lower than that of the bath; this would appear to be an obstacle to the direct formation of silicate of lime. It should be also observed that if the silica acted directly upon the lime there should be, at this point of the blow, a considerable corrosion of the basic lining; but it has been found that the the wear is then very slight. In either case—and this is the important point—the silicon is completely transformed into silica, owing to the presence of an excess of bases with which it forms silicates. In an acid blow, where these conditions do not exist, the slags and lining being essentially siliceous, the elimination of silicon is incomplete. When the silicon is expelled, the carbon commences to burn, the temperature of the bath progressively increases by reason of this combustion, and part of the slag becomes fluid. The fluor, which was added sensibly, increases its liquidity; at the end of the decarbonisation, the slags have the following average composition:—

	Per cent.
Silica	22·00
Lime and magnesia	47·00
Phosphoric acid	12·00
Oxides of iron and manganese ..	11·00
Alumina, chromic oxide, vanadic acid, sulphuric acid	5·00

As this slag contains silica and phosphoric acid in considerable quantity, the presence of which is hurtful, it is run off as well as possible; but its expulsion is only partial, because it has not yet reached a temperature sufficiently high to cause the whole of it to be liquid. Phosphorus commences to be expelled from the commencement of the blow, but its departure is at first insignificant.* So long as carbonic oxide is abundantly found, the phosphoric acid cannot exist; it would be immediately reduced. It is only towards the end of the decarbonisation that its removal becomes at all considerable; the analyses of the slag first expelled from the converter show a high percentage of phosphoric acid. It may be admitted that at least a fifth part of the phosphorus contained in the pig is eliminated at the end of the decarbonisation period, when the original percentage was from 2 to 3 per cent.; but it is chiefly during the after-blow that this metalloid is oxidised and passes into the slag. So that in order to prevent the phosphoric acid from attacking the sides of the converter, and to render the slag essentially basic, a fresh addition of lime, as before stated, is added. The combustion of the phosphorus develops great heat, and the temperarure in the converter becomes very high, causing the slag to become quite liquid, when it may be run off. The slag has about the following composition:—

	Per cent.
Silica	12·00
Lime and magnesia	54·00
Oxides of iron and manganese ..	11·00
Phosphoric acid	16·60**
Alumina, chromic oxide, vanadic acid, sulphuric acid	5·00

This slag is rich in phosphoric acid, and relatively poor in silica. When the tests have shown that phosphorus is sufficiently removed, the after-blow is stopped. If the blast were to be continued longer, the oxidation of the iron would become energetic, and the waste would be very great. The manganese departs in a very regular manner during the whole duration of the blow; when the pig contains from 1·5 to 2·0 per cent. of this metal, there remains at the end of the after-blow only a very small amount (from 0·01 to 0·02 per cent.). Sulphur is also partly eliminated; thus with a pig containing 0·2 per cent., the resulting steel contains on an average 0·03 per cent.; that is to say, that four-fifths of this body are removed. It is probable that it is during the after-blow and the recarbonisation that the removal of the sulphur is effected. There remains, then, after the after-blow a liquid product containing only traces of silicon, carbon, phosphorus, and very small quantities of manganese and of sulphur, but containing some oxide of iron, which would render it brittle. It is therefore necessary, in order to obtain steel, to reduce this oxide of iron, and add to the metal a little carbon; this is effected by the addition of spiegeleisen. The carbon and the manganese of the spiegel reduce the oxide of iron, and part of these two bodies remain in the metal. By varying the quantity of spiegel added, the percentage of carbon in the finished product may be augmented or diminished at will. There is formed by the reaction of the spiegel carbonic oxide, which would act upon the phosphoric acid of the slag, and would cause the phosphorus to re-enter the metal, if the precaution had not been taken of first separating the slag; but as it is impossible to completely remove the slag, a certain amount of phosphorus always re-enters the metal. This inconvenience may be diminished by adding the spiegel in the ladle before running in the metal from the converter; but we have then to guard against a too great ebullition (caused by the chemical reactions which take place), and the projections which would be the consequence of it. It is, therefore, the custom at Creusot to add about a third of the spiegel in the con-

* The basic loss here given appears to be considerably higher than that of most of the other works using the process. On the other hand, the acid loss given is lower than the average English hematite waste, which is probably about 12 per cent.—Translator.

† The loss is estimated on the charge of pig and spiegel. For every 1000 kilos. of ingots there is produced 400 to 500 kilos. of slag.

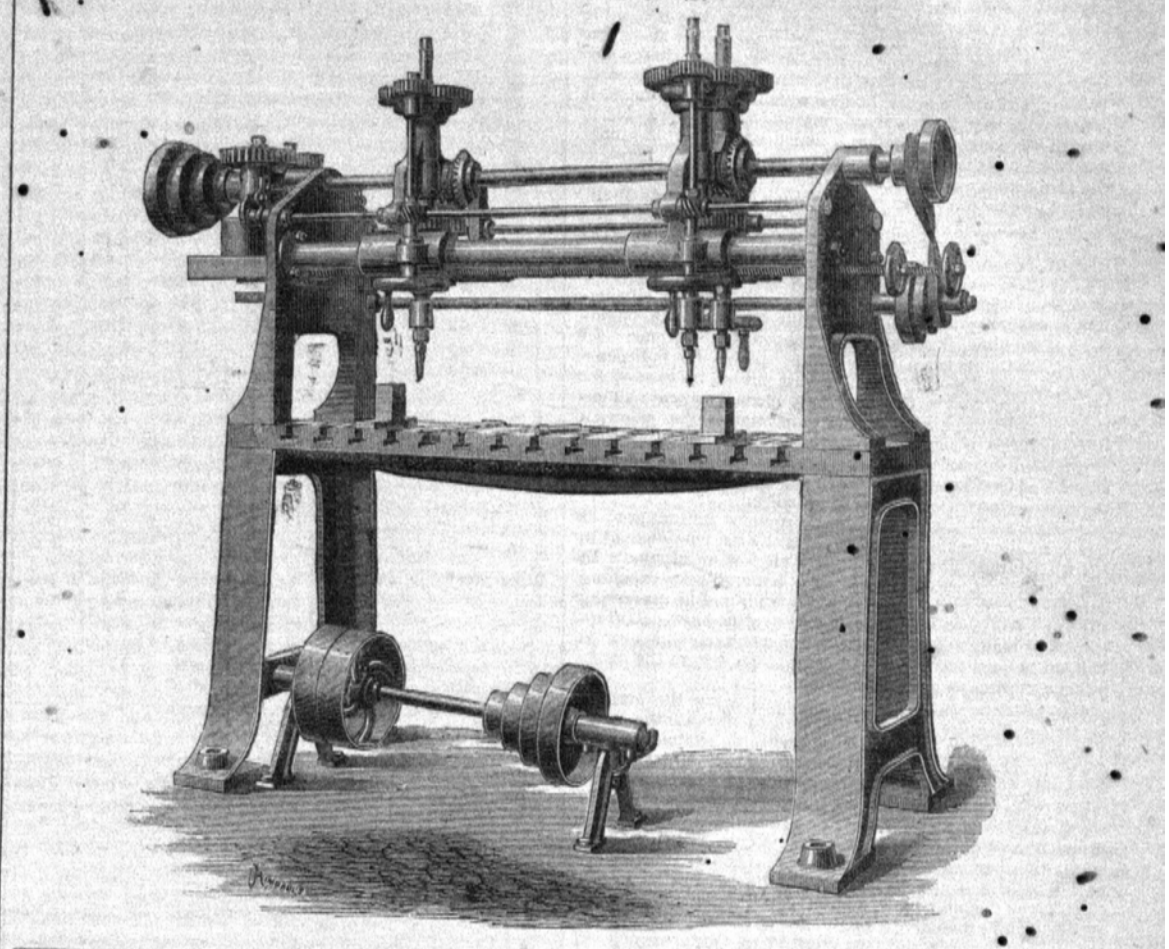
* Some metallurgists have thought that the phosphorus was oxidised in part during the period of scorification, but that the phosphoric acid produced was again reduced by the carbonic oxide formed during the decarbonisation. It does not seem proved, however, that any notable part of the phosphorus is oxidised at the same time as the silicon, considering that the slag at first produced is very acid; the lime is probably at too low a temperature to absorb the silica easily in proportion as it is produced.

** As the question of the state of combination of the phosphorus in the slag is still probably not completely settled, nothing is here said about it.

MULTIPLE-SPINDLE SLOT DRILLING MACHINE.

BY MESSRS. BEVERLEY AND ATKINS, SHEFFIELD.

(*For description, see page* 437.)



verter, and the rest in the ladle. By these precautions the re-entry of phosphorus does not exceed 0·20 per cent.

5. Composition which the Pig treated ought to possess.—The refining in the converter causes as complete a departure as can be wished of silicon and phosphorus; but sulphur is only partially removed. As this body is hurtful to the quality of steel, which it renders brittle, it is important only to treat pigs containing but a very small proportion of it. This result may be attained by increasing the heat in the blast furnace, and making the slags very calcareous: the presence of manganese in the charge also assists powerfully in causing the sulphur to enter the slag. With regard to the other bodies which the pig contains, it is necessary that the total amount of heat they are able to furnish by their combustion is sufficient to give the final product a high temperature, and to melt the slag. Now, as the proportion of carbon only varies between narrow limits, and as its oxidation does not give much heat, it is principally upon the amount of heat which the silicon phosphorus and manganese can develope that we must rely for obtaining the wished-for result. Let us examine separately what proportion of these several bodies the pig should contain.

Silicon.—Silicon furnishes much heat, and its elimination in the converter is certain. As it burns at the beginning of the blow, it elevates the temperature at once; for this reason its presence in the pig appears to be indispensable; but, on the other hand, it must not be in excess, for then we should have the following inconveniences: an excessive addition of lime in order to neutralise the silica; a large quantity of slag, reducing the useful effect of the converter, and wear of the lining. For these reasons it is considered at Creusot unadvisable to use pigs containing more than from 1·00 to 1·50 per cent. of silicon.

Manganese.—Manganese only presents advantages; as has been already stated, it facilitates by its employment in the blast-furnace the obtaining of a pig low in sulphur. In the converter it also probably acts favourably in expelling sulphur, by rendering the slag more fluid, and in preserving the iron against oxidation during the after-blow. Unfortunately, manganiferous pigs are expensive, and one is obliged to limit the addition of manganese ores to the blast-furnace charges as much as possible.

Phosphorus.—It is, therefore, by increasing the amount of phosphorus that we generally look to increase the heat. The first trials made at Creusot with pig containing only 0·9 per cent. of phosphorus were fruitless. Good results were only obtained when the proportion of phosphorus was raised from 1·7 to 1·8 per cent.; and recently, from motives we shall learn further on, they have been led to increase the proportion of phosphorus to from 2·50 to 3·00 per cent. Yet a high percentage of phosphorus is not without inconveniences, which may be classed as follows: too long continuance of the after-blow, and, in consequence, the increase of waste and greater wear of the lining.

II.—Quality of the Products Obtained.

It is necessary, in order to appreciate the quality of dephosphorised steel, to study the following points:—(1) Chemical composition; (2) Mechanical Properties; and (3) Physical Structure.

1. Chemical Composition.—Messrs. Schneider have furnished us with the results of analysis made in August and September, 1881, of acid and basic steel destined for the manufacture of rails. Each blow of the basic steel was subjected to a chemical analysis, but of the acid steel one blow only was analysed per day.* The results obtained are indicated by diagrams, which show to what extent the carbon, silicon, manganese, sulphur, and phosphorus have varied during a period of two months. The silicon, whose elimination in the converter is assured, was not regularly estimated in the basic steel, but it has been proved by many trials that this body only exists in traces in this steel. In the acid steel, also, phosphorus was not always estimated, yet the estimations of it have been sufficiently numerous to show that it varies between 0·065 and 0·085 per cent., giving a mean of 0·075. The diagrams are easily understood, and the following conclusions may be drawn from them:—

Silicon.—The acid steel always contains notable proportions of silicon, sometimes even more than of carbon. The basic steel, on the contrary, only contains traces.

Phosphorus.—Basic steel contains rather less phosphorus than acid steel.

Sulphur.—Sulphur appears to be in less proportion in basic steel.

Carbon.—The percentage of carbon is sensibly higher in the basic steel than in the other.

Manganese.—The proportion of this body is very variable in steel, whatever be the mode of manufacture.

The average composition of the two varieties of steel resulting from these diagrams may be tabulated as follows:—

	Basic steel.	Acid steel.
Carbon	0·43	0·40
Silicon	Trace	0·30
Manganese	0·76	0·66
Phosphorus	0·060	0·075
Sulphur	0·025	0·040

The characteristic property of basic steel may be said to be that it contains only traces of silicon.† It is thus purer than acid steel, and presents a more uniform composition. Judging, therefore, from its chemical composition only, it may be assumed that basic metal ought to give more regular results under the mechanical tests than acid steel.

2. Mechanical Properties.—The mechanical properties were shown by two series of tests. (1) Tensile tests on round bars; (2) Rail tests by falling weight and amount of deflection, in conformity with the terms of the specifications to be fulfilled by the forge-masters.

Tensile Tests.‡—Messrs. Schneider have supplied us with the results obtained in August and September 1881, of the tensile tests made upon round bars of 16 millimetres in diameter, and having a length of 30 centimetres between the two points of observation. These experiments were made, like the chemical tests, upon every blow of basic metal, and upon one blow per 24 hours of acid metal.

The diagrams published show side by side the results obtained by the two varieties of metal, both as regards the breaking strain and the extension. The average during the period under consideration was:

	Basic Steel. Kilos.	Acid Steel. Kilos.
Breaking strain (per sq. millim.)	72·00	73·20
Co-efficient of extension	16·10%	17·20%

The results are very nearly equal; they show, however, a slight advantage in favour of the acid steel. But against this, it should be observed, that the limits obtained for the basic steel were less than those for the acid; thus, for the first the breaking strain varied between 66 and 78 kilos, and the co-efficient of extension between 12 and 20 per cent., while for the second, the breaking strain varied between 63 and 80 kilos, and the co-efficient of extension between 12 and 23 per cent. There is, therefore, rather more regularity in the quality of the dephosphorised products.

*Tests on Rails.**—These trials consist of static tests or deflection, and dynamic tests or tests made by letting fall a weight. Many experiments have been made at Creusot on different types of rails manufactured both from acid and from basic steel. We cannot enumerate them all, but shall confine ourselves to giving the results of a very complete set of tests made in September, 1881, on rails of the type Est (Vignoles 30 kilos.). There were tested, during this month twelve rails of dephosphorised steel, and thirteen of ordinary steel. The results obtained are given in the above tables.

These tables show that there is a very great similarity between the two varieties of rails, and that they appear to be of equivalent quality.* An examination of the other tests made at Creusot would lead one to the same conclusion. The Minister of Public Works therefore decided, on the 9th December, 1881, to admit equally for the supply of the State rail contracts both varieties of steel.

3. Physical Structure.—The chemical and mechanical tests do not absolutely suffice to appreciate the quality of a metal; its physical structure also plays an important

* The analyses were made with great care at the works at Creusot; the documents which we have taken from the register of tests, therefore, merits every confidence.

† Silicon tends to harden the metal; basic steel, therefore, other things being equal, should, in order to have the same hardness as acid steel, contain rather more carbon. This is in accordance with the results indicated by the before-mentioned analyses.

‡ Forge-masters are not compelled to make these tests. Messrs. Schneider, however, carried them out regularly, in order to control their manufacture.

Statie Tests.—The rail being placed on two supports, at a distance of 1·10 m. apart, the following pressures were applied in the middle, and were maintained for five minutes: 10, 15, 17, 20, 25, and 30 tons. The amount of deflection was measured first, while the pressure was still applied; second, when the pressure was removed. The latter (the permanent deflection) is headed F.P in the tables, the former F.M.

Kind of Steel.	Deflection under a Charge of 10 Tons. F.M.	10 Tons. F.P.	15 Tons. F.M.	15 Tons. F.P.	17 Tons. F.M.	17 Tons. F.P.	20 Tons. F.M.	20 Tons. F.P.	25 Tons. F.M.	25 Tons. F.P.	30 Tons. F.M.	30 Tons. F.P.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Acid Steel	2·2	0·2	3·2	0·3	3·8	0·5	4·9	0·8	13·3	7·9	32·5	25·7
	2·2	0·2	3·2	0·3	3·7	0·6	4·8	0·8	13·0	7·8	32·3	25·5
	2·3	0·2	3·2	0·3	3·4	0·4	4·4	0·5	21·2	16·0	35·3	29·2
	3·4	0·3	3·6	0·6	4·2	0·8	5·1	1·1	11·6	6·8	28·2	21·8
	1·9	0·1	3·0	0·2	3·5	0·3	4·3	0·4	9·8	4·5	30·2	25·0
	2·2	0·1	3·4	0·3	4·0	0·6	4·9	1·2	16·0	11·8	37·7	31·0
	2·0	0·1	3·1	0·2	3·8	0·5	4·7	0·9	8·5	3·8	23·2	17·1
	2·2	0·3	3·2	0·4	3·6	0·5	4·5	0·7	13·2	8·3	31·2	24·8
	2·5	0·1	3·5	0·3	3·9	0·5	4·4	0·7	9·2	5·3	28·3	23·5
	2·1	0·0	2·9	0·1	3·4	0·2	4·2	0·5	10·8	5·9	26·3	21·2
	3·0	0·3	4·3	0·6	5·1	0·8	7·4	2·5	17·3	11·5	35·4	28·2
	2·3	0·1	3·4	0·2	3·9	0·4	5·0	1·0	17·3	11·9	37·1	30·1
	2·2	0·2	3·2	0·3	3·8	0·5	4·9	0·8	13·3	7·9	32·5	25·7
Average	23·6	0·17	3·3	0·3	3·8	0·51	4·89	0·92	13·4	8·4	31·5	25·3
Basic Steel	2·2	0·0	2·8	0·0	3·6	0·0	4·9	0·7	14·6	8·6	30·2	23·3
	3·2	0·0	3·7	0·0	4·1	0·0	4·9	0·2	10·0	4·3	23·3	16·7
	2·9	0·2	3·7	0·2	4·3	0·3	5·0	0·5	10·2	4·4	21·7	14·7
	2·6	0·0	3·5	0·1	3·9	0·1	5·1	1·6	13·9	8·2	30·7	23·8
	3·6	0·0	3·8	0·1	4·4	0·4	5·6	1·0	12·1	6·7	28·1	20·7
	2·2	0·1	3·1	0·2	3·4	0·3	4·4	0·7	12.1	7·4	29·4	22·0
	1·8	0·1	2·8	0·2	3·2	0·3	3·8	0·4	11·1	6·4	30·0	23·5
	1·9	0·1	2·9	0·2	4·0	0·3	4·6	0·4	12·2	7·5	29·1	23·8
	2·1	0·1	3·3	0·3	3·7	0·4	4·8	0·7	10·5	5·2	24·2	17·6
	2·4	0·0	3·2	0·1	3·7	0·3	4·4	0·5	8·1	3·4	25·6	19·4
	2·2	0·0	3·1	0·0	3·6	0·1	4·5	0·4	10·9	5·6	27·4	20·6
	2·1	0·2	3·0	0·2	3·5	0·3	4·1	0·4	10·8	6·5	34·1	27·6
Average	2·43	0·07	3·24	0·13	3·8	0·23	4·62	0·46	11·4	6·2	27·8	21·2

Dynamic Tests.—The rail being placed on two supports at a distance of 1·10 m. apart, a monkey weighing 300 kilos was allowed to fall on the middle from different heights, the deflection of the rail being measured every time. (The two halves of the rail which were broken under the static tests were used in these trials.)

Kind of Steel.	Deflection under a Fall from a Height of 1 Metre. 1st half	1 Metre. 2nd half	1·50 Metre. 1st half	1·50 Metre. 2nd half	2 Metres. 1st half	2 Metres. 2nd half	2·25 Metres. 1st half	2·25 Metres. 2nd half	2·50 Metres. 1st half	2·50 Metres. 2nd half	3 Metres. 1st half	3 Metres. 2nd half	3·50 Metres. 1st half	3·50 Metres. 2nd half	4 Metres. 1st half	4 Metres. 2nd half	4·50 Metres 1st half	4·50 Metres 2nd half
	mm.	mm.	mm.	mm.	mm.	mm.	mm	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Acid Steel	3	3	10	10	16	15	22	22	29	30	38	38	48	48	58	59	69	70
	3	3	9	8	15	15	22	22	30	29	39	38	47	48	58	58	68	70
	3	3	9	9	17	17	25	26	34	35	46	47	57	57	70	70	B*	B*
	3	3	8	9	16	17	22	24	31	32	40	42	52	53	66	66	75	79
	3	3	7	7	14	14	21	22	28	29	37	38	48	49	60	61	70	71
	3	3	9	8	14	15	22	23	34	32	40	40	48	49	59	62	67	70
	2	2	7	7	12	13	18	20	25	27	33	37	42	43	52	53	62	64
	3	3	8	8	14	15	22	29	30	40	38	38	48	50	60	60	72	73
	3	3	9	9	16	16	23	24	31	32	41	42	52	53	64	64	76	77
	3	3	7	8	14	14	21	22	27	27	32	33	44	45	56	57	67	68
	3	2	8	7	14	13	21	21	28	28	35	36	44	46	57	56	68	68
	2	2	7	7	14	14	21	22	29	28	38	37	49	48	59	56	71	67
	3	2	8	8	16	15	22	22	29	30	39	38	48	48	58	59	69	70
Average	2·8	2·7	8·1	8·1	15·5	14·8	21·7	23·0	29·4	30·7	38·2	38·7	48·5	49·0	60·9	60·0	69·5	0·6
Basic Steel	2	2	7	6	14	14	21	20	28	28	36	35	43	44	53	53	52	60
	2	2	6	6	12	13	18	19	25	26	32	34	41	43	50	51	B*	59
	2	2	6	6	12	12	18	20	24	26	32	32	39	40	47	48	59	58
	3	2	8	7	15	15	21	22	29	30	37	37	47	48	60	60	68	69
	2	2	6	7	11	13	18	19	25	24	32	32	41	42	51	52	63	63
	2	2	8	8	12	13	18	19	25	27	34	35	47	47	56	57	67	68
	2	3	7	8	14	14	22	22	28	30	37	40	46	48	55	58	67	68
	2	2	7	7	13	13	21	22	29	30	37	38	45	47	55	57	64	66
	2	2	7	7	12	12	19	19	25	25	33	33	43	42	53	53	65	64
	2	3	7	8	13	14	21	22	28	30	36	38	47	50	58	62	71	74
	2	2	7	7	13	14	19	20	26	28	34	36	43	43	52	53	63	65
	3	3	8	8	13	14	22	22	31	31	39	37	50	48	61	59	75	73
Average	2·2	2·3	7	7·1	13·0	13·4	19·8	20·5	26·8	27·9	34·9	35·6	44·3	45·1	54·2	55·0	65·6	65·6

* B means broken.

* These tests are made in the presence of the furbisher by the agents appointed by the State or by the railway companies.

* It may be incidentally remarked that the basic rails were slightly harder than the ordinary rails during the period under consideration.

part. Here a serious inconvenience revealed itself at first in manufacturing basic steel; the surface of the ingots was covered with blisters of from two to three centimetres in depth. During the rolling these cavities quite disappeared, but their sides did not weld together. The top part of the rail presented thus a great number of imperceptible cracks, which were detrimental to its resistance. Fortunately, this defect was remediable. It was discovered that those ingots coming from a cold blow were covered with blisters, whilst those from hot ones had only a very thin layer (two to three millimetres at most), which disappeared by oxidation, during reheating. The remedy for this fault in the basic ingots was thus indicated. It was only necessary so to conduct the operation that the metal at the moment of pouring was at a high temperature. This was accomplished by the following means—hot charges in the blast furnace; constructing calcining kilns near the converters, in order that the additions of lime might be at a high temperature; and by increasing the percentage of phosphorus in the pig treated. By the adoption of these measures the basic ingots have now no more superficial blisters than the acid ones. It may be remarked, before quitting this point, that these blisters are equally produced in acid operations, when the blow is cold. The following experiments, at which the author has assisted at the Creusot Works clearly proves this. In two Bessemer converters, with acid linings, two simultaneous operations were carried on, the pig used being the same in both cases; the one blow was hot, whilst the other had been rendered cold by the addition of pig and scrap.* The ingots resulting from the cold blow had their surface covered with blisters for a height of about 25 millimetres; whilst this fault did not exist in the ingots from the hot blow. These experiments show, although it is difficult to explain it theoretically, that the temperature of the steel at the time of pouring plays a considerable part in the formation of blisters.†

DEPHOSPHORISATION IN THE REVERBERATORY FURNACE.

We will confine ourselves to the subject of dephosphorisation in the reverbatory furnace to a few brief considerations, as we were not called upon to estimate the quality of the products produced. The furnace employed is the same as that used in the manufacture of Siemens-Martin steel; the only difference being that the bed is made of a mixture of magnesian lime of the same kind as that employed in the Bessemer converter. The roof is of silica bricks, a layer of bauxite is placed at the juncture of the magnesian lime and the bricks. The furnace is heated in the ordinary manner, by the combustion of gas from the Siemens generators. The charge of phosphoric pig is run in, and common iron dissolved gradually in the bath. The refining is produced under the influence of the current of gas, as in an ordinary operation. Lime is added, at three or four different times, in order to make the slag very basic; from time to time this slag is removed by means of a rake. Owing to this excess of base, silicon disappears completely, and phosphorus is almost totally eliminated. The different bodies disappear in the same order as in the Bessemer converter, so that the operation consists of the following successive periods: scorification, decarbonisation, and after-blow. The moment of stopping the refining and proceeding to re-carbonise by an addition of spiegel, is found by means of trial tests, as in the converter. One operation lasts about twelve hours, and about 15 tons are obtained. The advantages which the reverberatory furnace presents over the converter are the following:—

(1) The construction and repair of the basic hearth is much more easy.

(2) The temperature of the bath is obtained independently of the combustion of silicon, carbon, phosphorus, &c., so that there is no necessity for treating a pig containing a high proportion of these bodies.

(3) The slag is more easily removed, by means of a rake; it is easy to remove it at any time during the operation, while in the converter it can only be removed when it has become fluid; the elimination of phosphorus is also more assured, and the return of this body into the steel, on the addition of spiegel, less to be feared.

(4) The duration of the refining is longer, and the trial tests more easily taken; thus, one is better able to regulate the operation.

The manufacture of basic steel is thus easier in the reverberatory furnace than in the converter; for this reason Messrs. Schneider have, as before stated, been quite successful from the very commencement in making this metal in the Siemens-Martin furnace. The following is an analysis of a soft steel manufactured at Creusot, from phosphoric pig:—

	Per cent.
Carbon	0·16
Silicon	Trace
Sulphur	0·03
Phosphorus	0·03
Manganese	0·25

If one uses less impure raw materials, the resulting product will be proportionally better; a very high class steel may be obtained by treating a mixture of specially selected pig and iron, or steel, of good quality.

* The following table shows the course of the operations:—

	Hot Blow. Kilos.	Cold Blow. Kilos.
Metal taken direct from the blast furnace	6500	6500
Additions { Cold Pig...	600	1600
Additions { Steel Scrap	1000	900
Spiegeleisen	400	480
Total	7000	9480
Duration of blow	25 mins.	24 mins.
Aspect of steel after pouring	Tranquil.	Rose in moulds.

† Other circumstances, also, have an influence upon the formation of blisters. It is known that soft steel is more subject to them than hard, and the Terrenoire Company have shown that silicon also plays an important part in the matter. But we will not insist upon these considerations, our object being only to show that when steel for rails is poured very hot, it is free from surface blisters, and that by raising the temperature in the converter one is able to overcome the inconveniences which manifested themselves on commencing the dephosphorisation method.

SUMMARY AND GENERAL CONCLUSIONS.

Summing up, it may be said that the problem of manufacturing steel from phosphoric pig has been solved, both in the converter and reverberatory furnace, by the employment of a magnesian lime lining. The elimination of phosphorus is by this means as satisfactory as possible, that of silicon is nearly complete, and even sulphur is removed to a large extent. From comparative analyses made in August and September, 1881, it is shown that basic steel is purer than acid steel, and has a more uniform composition. The tensile mechanical tests show that the results furnished by the basic Bessemer steel are sensibly more regular than those given by the acid steel. Rails manufactured from these two varieties of steel give similar results under the static and dynamic tests. The inconvenience caused by the presence of blisters on the ingots, met with at starting the basic process, has been overcome by raising the temperature of the metal at the moment of pouring. The state has therefore been led to accept indifferently rails, made from either variety of steel. In the reverberatory furnace, the manufacture of basic steel is more easily carried out than in the converter, and the dephosphorisation is more complete. Metallurgists, therefore, are now in possession of two different methods of manufacturing steel, both in the converter and in the reverberatory furnace. The one consisting in treating pure products in an apparatus furnished with a siliceous lining; the other in treating impure products in presence of a basic lining. The following question, therefore, naturally seems to present itself. Since, other other things being equal, linings of magnesium lime offer a more complete purification than siliceous ones, why not treat all pig metal, even that resulting from pure ores, in a basic apparatus? By this means these latter should give a steel of very great purity. So far as concerns the reverberatory furnace, it appears probable that in the majority of cases the siliceous hearth will be replaced by one of magnesian lime; the carrying out of a basic operation presenting, as we have explained above, no difficulties. But with the converter the case is different; it would not be found advantageous to treat in a basic-lined converter metal such as that used in the acid process, since this metal is high in silicon; and, as we have shown above, this circumstance presents a grave obstacle. On the other hand, if the blast-furnace charges were so regulating that the resulting pig was but slightly siliceous, there would probably not be sufficient heat generated by the molecular combustion to assure the liquidity of the bath and slag. The treatment of pure metal, therefore, in the basic converted, is not without drawbacks. It might, it is true, be arrived at by the employment of the transfer method; that is, by removing silicon in an acid vessel, then running the metal into a basic lined vessel, and there finishing the blow. But this process offers the great drawbacks of being expensive and complicated. We will not, therefore, enlarge upon this question, the solution of which belongs to the future.

ON THE EFFECTS OF COMPRESSION ON THE HARDNESS OF STEEL.*

EXPERIMENTS were made at the ironworks of Saint Jacques at Montluçon confirmatory of the results already presented by Mr. Dumas in the name of Mr. Clémandot, that in compressed steel there was an increased hardness as compared with uncompressed. Further results have been obtained. Steels have been analysed, compressed and uncompressed, containing different proportions of carbon. The proportion of combined carbon, as regards the total carbon, has already been found to be greater in the compresssed as compared with the non-compressed steels. The experiments were made on elongated shot, the samples being taken from four different points in the depth, and the combined carbon was tested by the Eggertz process, and the total carbon by Boussingault's. The comparative results are so constant that one table of results will suffice:—

	Compressed.		Uncompressed.	
Carbon, total per cent. ..	0·70		0·70	
Combined carbon at A ..	0·60		0·49	
B ..	0·59	Mean 0·585	0·50	Mean 0·49
C ..	0·55		0·47	
D ..	0·60		0·50	
Free carbon by difference	0·115		0·21	

Thus the compressed steel has more combined and less uncombined carbon. The same results were obtained by sudden cooling in the ordinary manner of hardening. Hence compression produces the same physical effects as sudden cooling in steels.—E. F. B.

* *Comptes rendus de l'Académie des Sciences*, vol. xciv., 1882, p. 952; through *Min. Proc. Inst. Civ. Eng.* vol. lxix.

SCIENCE AND ART.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending November 18, 1882:—On Monday, Tuesday, and Saturday (free), from 10 a.m to 10 p.m., Museum, 7718; Mercantile Marine, Indian Section, and other Collections, 2637. On Wednesday, Thursday, and Friday, (admission 6d.), from 10 a.m. to 4 p.m., Museum, 1165; Mercantile Marine, Indian Section, and other Collections, 447; total, 11,967. Average of corresponding week in former years, 12,999. Total from the opening of the Museum, 21,476,543.

SOCIETY OF ARTS.—The following are the papers for the Wednesday evening meetings of the Society of Arts, before Christmas:—November 22, J. Hopkinson, D.Sc., F.R.S., "Ice-making and Refrigerating" (Dr. Siemens, F.R.S., Chairman of the Society's Council, presiding). November 29, Sir Frederick Bramwell, F.R.S., "Some Points in the Practice of the American Patent Office." December 6, William A. Gibbs, "The Artificial Drying of Crops." December 13, W. H. Preece, F.R.S., "Electrical Exhibitions." December 20, P. L. Simmonds, "The Utilisation of Waste. A Quarter of a Century's Progress."

AN IMPROVEMENT IN MERCURIAL THERMOMETERS.—Mr. S. G. Denton, F.M.S., 25A, Hatton Garden, has just exhibited, at the Meteorological Society, forty-six newly made mercurial thermometers constructed in a special manner, the zero of which has remained constant for over twelve months. The thermometers comprised twenty-three standards and twenty-three clinicals. To prove that they were newly made, the pieces of enamel stems were sent to the Kew Observatory, and hall-marked, previous to having their bulbs blown. They were then constructed into thermometers, graduated and returned to the observatory, and tested throughout. They were then placed under seal by the superintendent, and remained so for over twelve months, and then again re-tested. The mean amount of change being only about half a tenth of a degree Fahr. A standard thermometer, made by the same process as above, was also shown, it being verified in 1873 and in 1882, the zero being still constant.

PRIZES FOR PLANT LABELS.—The council of the Society of Arts offer a prize of five guineas, which has been placed at their disposal for the purpose by Mr. G. F. Wilson, F.R.S., for a wooden plant label, saturated with paraffin or some other preparation, which would preserve the label, and would be likely to keep the writing upon it legible, either with or without the aid of paint, for five years. The council also offer a similar prize of five guineas, which has been placed at their disposal by Mr. E. G. Loder, for a permanent border label, suitable for private gardens, the price of which shall not exceed £4 per thousand. The awards will be made on the recommendation of the committee appointed for the purpose by the council. The labels will be tested by the committee with the view of ascertaining, as far as can be done in a limited time, whether they would be likely to stand prolonged use. It is believed that satisfactory tests can be made in a month or two. It is desirable that competitors should state for which prize their specimens are submitted. Specimen labels, bearing a number or motto, and accompanied by a sealed envelope containing the name of the sender, must be sent in to the Secretary of the Society not later than June 1, 1883. The council reserve to themselves the right of withholding the prize offered if, in the opinion of the judges, none of the specimens sent in are deserving.

MEETINGS FOR THE WEEK.

MONDAY, NOV. 27.

ROYAL ACADEMY.—8 p.m.
ROYAL GEOGRAPHICAL SOCIETY.—8.30 p.m. M. Jessar's Survey from Sarakhs and Merv, with Remarks by Sir Henry Rawlinson.
MEDICAL SOCIETY.—8.30 p.m.
INSTITUTE OF ACTUARIES.—7 p.m.
SURGICAL AID SOCIETY.—3.30 p.m. Annual General Meeting.

TUESDAY, NOV. 28.

INSTITUTION OF CIVIL ENGINEERS.—8 p.m. A paper by the late Mr. R. Briggs, "American Practice in Heating Buildings by Steam," will be read with a view to discussion.
PHOTOGRAPHIC SOCIETY.—8 p.m.
ROYAL MEDICAL AND CHIRURGICAL SOCIETY.—8.30 p.m.
ZOOLOGICAL SOCIETY.—8.30 p.m.
ANTHROPOLOGICAL INSTITUTE.—8 p.m.

WEDNESDAY, NOV. 29.

SOCIETY OF ARTS.—8 p.m. Sir Frederick Bramwell, on Some Points in the Practice of the American Patent Office.
NATIONAL BENEVOLENT INSTITUTION.—Anniversary, &c., Freemason's Tavern.—10.30 a.m.
ROYAL SOCIETY OF LITERATURE.—8 p.m.
GEOLOGICAL SOCIETY.—Conversazione.

THURSDAY, NOV. 30.

ROYAL SOCIETY.—Anniversary. 4 p.m.
SCOTTISH CORPORATION.—Anniversary Festival.
SOCIETY OF ANTIQUARIES.—8.30 p.m.

FRIDAY, DEC. 1.

GEOLOGISTS' ASSOCIATION.—8.30 p.m.
PHILOLOGICAL SOCIETY.—7.30 p.m.
LIBRARY ASSOCIATION.—8 p.m. Mr. H. R. Tedder, on "A French Librarian on Librarianship."

SATURDAY, DEC. 2.

SOCIETY OF SCHOOLMASTERS.—2 p.m.

OBITUARY.

KOBELL.—The death is announced, on November 11, of Dr. Franz Ritter von Kobell, Professor of Mineralogy and keeper of the mineralogical State collections at Munich, well known through his numerous mineralogical publications. He died at the age of seventy-nine years.

MALLORY.—We much regret having to announce the death of Colonel William Henry Mallory, of Bridgeport, Connecticut, U.S.A., which occurred on the 8th instant. Colonel Mallory fought with the Federal Army in the American War, during which he received several wounds. He is, perhaps, better known in connection with the propeller bearing his name, and which he invented. By means of this apparatus a vessel is both propelled and steered, and is otherwise readily manœuvred. It has been applied in the United States to a number of vessels, notably to the *Alarm*, a torpedo ram, 173 feet in length, as described by us last week. In England the apparatus has been applied to a small vessel by the Admiralty. It is to be regretted that Colonel Mallory has passed away when the prospect of his receiving the substantial reward his genius and perseverence merited appeared to be opening. He had recently been in indifferent health, but a sudden attack of pneumonia was the immediate cause of his death, which occurred very unexpectedly.

CONTENTS.

NOTICES.

Communications on literary subjects and books for review are to be forwarded to the Editor. Anonymous correspondence will be wholly disregarded. The return of rejected MSS. cannot be guaranteed. Correspondents are requested to write on one side of the paper only, and to mark papers sent.

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THE WILKINSON TRAMWAY ENGINE.

To the Editor of Iron.

Sir,—In your issue of November 17, under the heading of "Railways and Tramways," we notice several misstatements in reference to our tramway locomotive, which we shall be much obliged if you will correct as follows:—

Nottingham Tramways.—"Town council have decided not to allow steam-engines," &c. This is untrue. The town council have in no wise interfered. The engine passed the Board of Trade inspection without a fault, but the inspector prohibited the use of steam till some worn-out points and crossings were replaced with new ones, which is now being done.

District Tramways.—In reference to what has appeared in the *Limited Liability Review* we are not responsible, and repudiate it *in toto*, not even having any knowledge of who the author is of such statements. The statement under above heading as to "fire and smoke," we say is untrue, as our engine does not, and cannot, emit smoke, for the simple reason that we burn coke; and as to fire, we may, when working up such gradients as at Nottingham, 1 in 13, 885 yards long, and at Huddersfield, 1 in 11½, 280 yards long (the steepest gradient of any tramway in Great Britain), with cars loaded to nearly double their carrying capacity, send out a spark or two (what engine exists that will not do this under similar conditions?) owing to the fire having been lighted with timber, which remains for some time in the fire-box in the form of light charcoal. The engine passed the Board of Trade inspection on Thursday last at Huddersfield with every success, after being put to the severest tests possible, as to starting on a gradient of 1 in 11½, and in brake power in descending same gradient with overloaded cars in both cases.

Trial on the Huddersfield Tramway.—Engine-wheels slipping.—On Thursday last the engine mounted the Chapel Hill, gradient of 1 in 11½, with a car and 46 men, in the presence of Major-General Hutchinson, without a single slip of the wheels. In fact, this almost absolute immunity from slipping (which is so common to the ordinary type of tramway locomotive) is one of the great features of our engine, and is somewhat of a paradox to many engineers.

Vertical Tramway Locomotives.—"This type of boiler has been abandoned for various reasons, but principally on account of its enormous consumption of fuel," &c. As such statements may be damaging to the already well-earned reputation of our improved form of Field boiler, we beg to say that we are working daily on a very heavy road with gradients of 1 in 16, 1 in 19, and 1 in 21, with 9½ lb. of common coke per car mile run, and evaporating 5¼ lb. of water per pound of coke burned, as per enclosed statement, which we shall have pleasure in verifying in daily practice for the information of any persons who may doubt the facts as here stated. We admit that this kind of boiler is not quite as economical in fuel burning as the locomotive type, but we assert that it has so many advantages—viz. ease to examine and clean, non-affection by expansion and contraction, no leakage of tube plates, absolute safety and durability, small difference in water level in ascending steep inclines, large volume of water carried in it, &c.—that any small extra consumption of fuel is more than counterbalanced by these and other advantages.

In conclusion, we would add that our engine has been examined by engineers from all parts of Great Britain and the Continent, who have expressed one unanimous opinion about it, and the result is that we are now building upwards of sixty-five engines, which fact in itself, we think, speaks volumes.

Your kind insertion of the above, in justice to ourselves, will greatly oblige yours, &c. Wm. Wilkinson.

For Wm. Wilkinson and Co. Limited.

Holme House Foundry, Wigan, Nov. 22, 1882.

[The statements in the paragraphs referred to in the above letter were inserted by us in perfect good faith, and upon what we consider to be good authority. In the case of the Huddersfield tramways, the statement referred to a preliminary trial, and is borne out by the report of a similar trial, which we reproduce in another column from a local journal, which also contains a report of the official trial, which we likewise print. Our statement, therefore, had no reference to the official trial, which, it will be seen, took place on Thursday week last, at the time when our report was being put into type. However, we gladly afford Messrs. Wilkinson and Co. the opportunity of correcting any errors that may have unintentionally appeared in our columns. We should add that, at the time of going to press this week, we received a telegram from Messrs. Wilkinson and Co., stating that they had received a letter from the corporation of Huddersfield purchasing the tram engine which was tried last week.—Ed.]

NOTICES OF BOOKS.

The Principles of Colliery Ventilation. By A. Bagos, Ass.M.I.C.E., &c. Second edition, greatly enlarged. London: Kegan Paul, Trench and Co., 1882.

In the author's opinion, insufficient precaution against blowers of gas and absolute want of any appliances ready at hand in case of explosion are points on which the management of collieries in this country is assailable. He has in his book, of which we welcome the second edition, given such additional particulars as may be of service to the officials of a colliery respecting the course to be pursued after accidents; but he also draws the attention of all those engaged in mining fiery pits to the risk attending the use of Davy and Clanny lamps. This caution is quite necessary. It is a remarkable fact that, although Sir Humphry Davy himself was well aware that under certain contingencies explosion may be communicated through the wire gauze of his lamp, the necessity for sheltering the lamp, while being carried in dangerous currents, was not universally known, even by mining engineers, until some considerable time after its invention. Attention has since then again and again been called to the defects in these two kinds of lamps, and the risks attending their use in dangerous currents, as against extinguishing lamps. No steps have, however, yet been taken to make the employment of the latter compulsory, but we believe that an act will ultimately have to be passed to make the use of non-extinguishing lamps illegal. The excellent and useful book before us, which contains besides many other valuable hints on the safeguarding of mines, will contribute towards such a desirable result, and its author will then have the satisfaction of knowing that his persistent labours in that direction have not been in vain.

Stationary Engine Driving. A Practical Manual for Engineers in Charge of Stationary Engines. By M. Reynolds. Second edition, revised and enlarged. With numerous illustrations. London: Lockwood and Co., 1882.

We are not at all surprised that a second edition of this capital handbook for engineers in charge of stationary engines should have been wanted so soon after its first issue; but the fact that it should have been called for so early is ample testimony to its worth, and the favour with which it has been received by those who are intended to use it. The author has taken the opportunity to thoroughly revise the whole, and to make many useful additions. Chapter II. (Materials of which Engines and Boilers are made) has been almost entirely re-written. Chapter XII. (Management of the Fire) has been largely extended, to embrace a comprehensive account of the varieties of British coals, with a notice of their behaviour in the furnace, and a discussion of the methods of treatment best suited to the several varieties. We would wish that the book were in the hands of every engineman in the country. Much mischief would thereby be prevented.

NEW BOOKS.

An Illustrated Dictionary of Words Used in Art and Archæology. By J. W. Mollett. Low and Co.

Decoration in Painting, Sculpture, &c. Vol. II. Low and Co.

Every-Day Art. By L. F. Day. Batsford.

Life of a Scotch Naturalist (Thomas Edward). By Samuel Smiles. New Edition. J. Murray.

Magnetism. By T. P. Treglohan. Longmans and Co.

Reports on the Scientific Results of the Voyage of H.M.S. *Challenger*: Zoology. Vol. V. H.M. Stationery Office.

Saxby's Weather Table and Almanac of the Heavens for 1883. C. Letts and Co.

Sun (The): Its Planets and their Satellites. By E. Ledger. Stanford.

Transactions of the Sanitary Institute of Great Britain. Vol. III. Stanford.

The Renaissance of Art in Italy. By Leader Scott. Illust. Low and Co.

BOOKS RECEIVED.

Electric Illumination (*Engineering* Series). Edited by James Dredge. London: Office of *Engineering*. 1882.

Manuals of Technology. By Robert H. Smith. London: Cassell, Petter, Galpin and Co.

Rules, Regulations, and Orders for the Passage of Letters Patent for Inventions; with List of Stamp Duties and Fees. 1882.

The City Diary, 1883. London: W. H. Collingridge.

The *Doterel* Explosion. By Thomas Rowan. London: E. and F. N. Spon.

Why Mine Owners Should Join the Liberty and Property Defence League. By W. Donisthorpe, Barrister-at-Law.

Correction.—In our last issue (of Nov. 17) the name of the publishers of Mr. M. Reynolds' *Stationary Engine Driving* is wrongly stated as J. S. Virtue and Co. It should be "Lockwood and Co."

METALLURGY AND MINING.

The Molecular Condition of Metals.—Some experiments, with interesting results, have been made by Herr Kalischer on the molecular condition of the different metals. Sheets of most of them may be rendered crystalline by heat, their capacity for conducting electricity also possibly increasing. Thus, a zinc sheet becomes crystalline at 307 deg. Fahr., while tin and cadmium crystallise at a temperature between 392 and 536 deg. Most of the metals obtained by electro-metallurgy yield similar results.

The Formation of Mineral Veins.—Dr. Fleitmann, of Iserlohn, well known as the inventor of a process for welding nickel, has published a striking result showing the rapid formation of mineral veins. Two years since the bottom of a stable pit was rammed hard with common clay containing iron. It served for storing dung for that period, water being thrown in occasionally to prevent overheating. It having become necessary to remove the pit, it was found that the clay had lost all colour, and was divided by numerous fissures about 1-6th inch in width, which were filled with iron pyrites. The iron oxide of the clay was changed, by the action of the organic matter and the water containing sulphate of ammonia, into ordinary mundic (sulphate of iron), which deposited itself in the fissures.

Machine for Bending Special Irons.—MM. Dandoy, Maillard, Luc et Cie., of Maubeuge, France, have made a machine intended for large iron roof works. It will bend the heaviest special irons employed in construction, angle and T irons, and double T's, as well as flat bars. The frame and rolls are of cast iron, the latter being chilled. The pressure is exerted from above by a combination of gearing actuated by a fly-wheel with crank handles. Two men at the handles, one on each side of the frame, are sufficient to work the machine, which may also be driven by power, with the addition of two pulleys to the crank-shaft. It is said that the changing of the special rolls, to suit the various sections of iron, is easily and rapidly effected, and that the machine answers its purpose admirably.

Patent Safety Lamps.—At the last meeting of the central board of the Miners' National Union, held at Durham, Mr. Thomas Burt, M.P., the chairman, called the attention of those present to a scheme put forward by Mr. Ellis Lever, of Manchester, to give a premium of £500 to any person who could invent the best portable electric lamp for use in mines. A letter was read from Mr. Lever, jun., stating that in his opinion a portable electric lamp to be used in mines was quite a probable thing. The meeting, looking upon the offer as an important thing, moved the following resolution:—"That this meeting desires to tender to Mr. Ellis Lever its best thanks for his kind and generous offer to pay a premium of £500 to the person who can invent the most useful portable electric lamp to be used in mines. That should Mr. Lever still kindly consent to give the premium of £500 for this purpose, the president and secretary be empowered to correspond with him, and, if necessary, see him on the subject." It was further agreed that the president (Mr. Burt), the vice-president (Mr. B. Peekard), and the secretary (Mr. W. Crawfurd) should form a sub-committee to assist the praiseworthy object which Mr. Lever wishes to bring about. The question of the amount of safety which miners have in safety lamps has long been a debated question, so that the offer will doubtless create great interest in mining circles.

Coal Deposits of the United States.—This subject is now attracting much attention in consequence of the discovery of rich seams of coal in the Southern States. Not long ago the great Pennsylvania fields enjoyed the monopoly of the coal deposits of the country, but they will soon be completely overshadowed by the coal deposits discovered in the four States of Kentucky, Tennessee, Georgia, and Alabama. These States contain together nearly 15,000 square miles of the finest bituminous coal territory, or nearly four times that of like deposits in Pennsylvania. Texas also is said to contain 6000 square miles of bituminous coal fields, and soft coal veins of excellent quality are already being worked in the Indian territory, in Kansas and Missouri. The mines of the Osage Coal and Mining Company, situate at Macallister, Indian territory, are among the best in the country, the coal being quite free from impurities,

and in quality greatly resembling the English cannel. The coal is already in strong demand over all the adjacent railways. The great Missouri basin in which the deposits are found is estimated to cover 84,000 square miles of territory. The Appalachian coalfields, extending south, are narrower in crossing Kentucky, but widen again in Tennessee, and expand across the north-west corner of Georgia and into Alabama, terminating in the vicinity of Tuscaloosa Tennessee and Alabama have largely developed their coal resources, and some investigators claim that Alabama has enough soft coal to supply the country for a century.

RAILWAYS & TRAMWAYS.

THE RAILWAYS OF THE WORLD.

AN interesting article by M. Paul Trasenster, of the Government School of Mines at Liége, tracing the growth of the railway system of the world, has appeared in the *Revue universelle des Mines*. Starting with the year 1840, when railway construction was in its infancy, M. Trasenster shows how the 5000 miles of line then in operation have grown into a total of nearly 250,000 miles, and how the system, which was then practically confined to a few European countries and the United States, has now spread to all quarters of the globe. In Table I. the progress of the development is shown in detail.

The rate of progression, it will be observed, has been rapid, and, on the whole, continuous. There has not, of course, been an equal development each year. In years of prosperous trade and active speculation the work of construction has been pushed on with great energy, while in times of depression it has languished. But if we take decennial periods, we find that the growth has throughout been tending to accelerate.

GROWTH IN DECENNIAL PERIODS.

	Increase. Miles.
1840 to 1850	19,200
1850 to 1860	43,200
1860 to 1870	63,200
1870 to 1880	102,000

Between 1870 and 1881, the year of least activity was 1878, the length of new line opened in that year being slightly under 8000 miles; while, on the other hand, the year 1881 was one of exceptional activity, no fewer than 15,100 miles of new line—that being the largest total ever recorded—having been added during it to the various systems.

Passing from the record of the past to the prospects of the future, M. Trasenster takes a survey of the position of the various countries in which the work of railway construction is being carried on. In Great Britain, he reminds us, the great increase in the number of railway Bills brought before Parliament last session points to a more rapid extension of our railway system than has been attempted in the recent years of dull trade. In France, the execution of he Freycinet scheme of public works provides for the application this year of £6,200,000 to the construction of railways, which is £2,000,000 in excess of the amount made available last year; while for 1883 the expenditure is likely to be on somewhat the same scale as at present. In Germany, more attention has been devoted to the improvement of the systems of water communication than to the extension of railways; but in Austro-Hungary, a large number of new railway projects are either in contemplation or in process of execution. The Italian Government, also, has in view a great extension of the railway system, a law promulgated in July last being intended to provide for the opening by the year 1892, at latest, of 2848 new miles of line. Similarly, the Roumanian Government is anxious to improve and extend its system of railway communication, and the Berlin Treaty provides for the improvement of the Turkish, Servian, and Bulgarian systems. Russia, also, is pushing on as fast as its means permit, if not, indeed, faster than is judicious, with the work of construction; and both Spain and Portugal would be glad to spend money in the same way, if they could obtain it. On the other side of the Atlantic, both the United States and Canada are adding with great rapidity to their present systems. Mexico is being exploited with almost feverish energy; Brazil has recently been extending its lines at the rate of about 300 miles a year; in the Argentine Republic a somewhat similar rate of progress is like'y to be maintained; and all the central American States are working at railways with more or less energy. Turning next to Asia, we find that private enterprise is taking a more active part in the construction of railways in India, and great schemes for the construction of railways in Asia Minor are being mooted. Our Australasian colonies, also, are busily adding to the length of their respective systems, which have recently been extending at the rate of about 600 miles per annum. And, lastly, in Africa, we find the French Government considering very ambitious railway projects in Algiers and Tunis, while in the extreme south the construction of new lines is being actively proceeded with.

On the whole, therefore, the probability seems to be, that in the immediate future the railway systems of the world will be developed with much greater rapidity than has yet been attained, and M. Trasenster estimates that the increase in 1883 is not unlikely to be as much as 17,000 miles. Whether such a rapid growth can long be sustained is another question. It may well be doubted, for instance, whether the United States, notwithstanding their great prosperity, can long continue to build new lines at the rate they have recently been d ing; and a collapse of the railway speculation in Mexico would astonish no one who has watched its recent development. At the same time, the fact that, casual fluctuations apart, the work of extension has, over a long course of years, been growing more active, must be especially encouraging to those engaged in our iron industries, telling as it does of the probability of a growing demand for their products. And to all of us the rapid development of the means of communication is important. It is enabling us to draw to a larger extent, and on far more favourable conditions as to cost, upon the resources of all nations for the supply of our wants, and by facilitating interchange, is promoting an enormous development of the trade of the world.—*Economist.*

TABLE I.—LENGTH OF LINES IN OPERATION ON DECEMBER 31.

	1881.	1880.	1879.	1875.	1870.	1860.	1850.	1840.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Europe	108,002	105,429	103,237	89,323	64,667	32,354	14,551	2,131
America	122,186	109,521	101,196	84,648	58,848	33,547	9,604	2,859
Asia	10,774	9,948	9,269	7,072	5,118	844	—	—
Australasia	5,481	4,889	4,363	2,312	1,042	350	—	—
Africa	3,147	2,904	2,705	1,552	956	298	—	—
	249,590	232,691	220,770	184,907	130,631	67,393	24,155	4,990

TABLE II.—LENGTH OF RAILWAYS IN OPERATION ON DECEMBER 31.

	1881.	1880.	1879.	1875.	1870.	1860.	1850.	1840.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Austria-Hungary	11,801	11 537	11,499	10,479	5,909	2,798	944	89
Belgium	2,614	2,569	2,507	2,187	1,810	1,080	559	187
Denmark	1,012	987	977	791	475	69	19	—
France	17,112	16,208	15 576	13,497	11,101	5,901	1,880	267
Germany	21,446	21,113	20,814	17,488	11,694	7,019	3,657	220
Great Britain	18,281	18 037	17,799	16,734	15,432	10,493	6,659	1,338
Greece	8	8	8	8	8	—	—	—
Holland	1,193	1,120	1 068	891	891	198	111	—
Italy	5,602	5,493	5,261	4,804	3,864	1,368	381	13
Luxembourg	234	200	193	171	107	31	—	—
Portugal	788	780	719	647	446	88	—	—
Roumania	921	865	865	771	153	—	—	—
Russia	14,799	14 796	14,619	12,238	7,142	994	312	17
Spain	4,837	4,659	4 457	3,702	3,250	1,198	17	—
Sweden and Norway	4,644	4,369	4 186	2,560	1,318	419	—	—
Switzerland	1,669	1,647	1,648	1,284	887	657	15	—
Turkey	1,041	1 041	1,041	960	180	16	—	—
Europe	108,002	105,429	103,237	89,323	64,667	32,354	14,551	2,131
United States	105 423	94,216	86,930	74,528	53,222	30,812	9,073	2,834
Canada	7,270	6,931	6,524	4,469	2,694	1,891	408	—
Argentine Republic	1,619	1,546	1,448	1,179	616	25	—	—
Brazil	2,517	2,188	1,912	1,038	508	134	—	—
Mexico	1 250	617	552	372	217	—	—	—
Peru	1,156	1,156	1,156	968	249	—	—	—
Other South American States ..	2,951	2,867	2,674	2,094	1,342	638	123	25
America	122,186	109,521	101,196	84,648	58,848	33,547	9,604	2,859
British India	9,936	9,205	8,598	6,559	4,804	844	—	—
Ceylon	139	138	119	91	74	—	—	—
Java	318	283	238	163	94	—	—	—
Asia Minor	284	246	246	221	146	—	—	—
Japan	99	76	68	38	—	—	—	—
Asia	10,774	9,948	9 269	7 072	5,118	844	—	—
Egypt	949	934	934	955	650	298	—	—
Algeria and Tunis	984	878	856	377	166	—	—	—
Cape	967	911	756	149	69	—	—	—
Natal	106	106	93	5	5	—	—	—
Reunion	141	75	66	66	66	—	—	—
Africa	3,147	2,904	2,705	1,552	956	298	—	—
New South Wales	1,047	855	741	439	337	125	—	—
New Zealand	1,344	1,266	1,178	545	44	—	—	—
Queensland	761	637	506	266	207	—	—	—
South Australia	844	681	562	252	134	47	—	—
Tasmania	172	172	172	151	43	—	—	—
Victoria	1,221	1,206	1,132	621	277	178	—	—
West Australia	92	72	72	38	—	—	—	—
Australasia	5,481	4,889	4,363	2,312	1,042	359	—	—
Total	249 590	232,691	220,770	184 907	130,631	67,393	24,155	4,990

THE HUDDERSFIELD TRAMWAYS.

THE following reports of the trials (preliminary and official) of the Wilkinson Tramway Engine are reproduced from the *Huddersfield Examiner* of Saturday, November 18 h, 1882:—

FURTHER TRIAL OF THE ENGINE.

The Huddersfield Town Council were summoned for the first time on Monday morning, in their capacity as the General Purposes Committee, to meet at the top of Chapel Hill, for the purpose of witnessing a further trial of the engine and car, particularly with a full load, up Chapel Hill. The following gentlemen attended:—The Mayor (Mr. J. F. Brigg), Alderman Wright Mellor, J. Woodhead, J. Crosland, J. Byram, H. Hirst, R. Hirst, and J. Jordan; Councillors Godfrey, Sykes, D. F. E. Sykes, William Hirst, Enoch Hephenstall, T. Chrispin, Benjamin Wade, B. Hanson, B. Schofield (West Ward), B. Dickinson, H. Horsfall, Hiram Burley, John Cowgill, John Broughton, E. B. Woodhead, John Wilson, Edmund Henry Walker, Joseph Hirst, George Brook, George Walker, William Murphy, J. Clark, G. H. Hanson, John Haigh, Richard Porritt, and Anthony Huddlestone; together with Mr. Dugdale, C.E., the borough surveyor and engineer for the lines; Mr. Potts, borough accountant; and Mr. Owen, deputy town clerk. About ten minutes past eleven o'clock the engine steamed with the car from the "stable" in Lord Street to the top of Chapel Hill, where most of the above gentlemen and others took seats inside or at the top of the car, making up forty passengers, and they were taken down Chapel Hill and on as far as the bottom of Rashcliffe. The car was turned there, and the engine put on again in front, and then the important test journey uphill was commenced, amid many speculations resulting in sundry bets for drinks upon whether it would be accomplished to the top of the hill without unloading or stopping. The number of passengers was more than the number the car will be licensed to carry, and those who know the gentlemen named above will recognise the fact that most of them are tolerably weighty individuals. With such a load, as might be expected, the engine "puffed and blowed," but kept on its laborious journey steadily, without stopping, at a pace difficult for the best of walkers to keep up with it, and reached the top of the hill with its important load, amid the clapping of hands of the passengers and of the bystanders who witnessed this capital feat of the iron horse. The engine and car then ran on Buxton Road, New Street, and John William Street. At the curve at the top of Northumberland Street the car ran off the line, but was got on again directly, and from that point the journey was successfully accomplished to Fartown Bar in nine minutes. On the return journey the engine and car both got off the lines at the passing points near the Thornhill Arms. The engine took its proper side of the loop, as it always has done, but the car ran on to the other side. The engine backed up to get the car over the points and on to the straight line again, but in doing so the engine was lifted by the force of the connecting bar acting diagonally off the line. Both engine and car were got on to the line in about twenty minutes. The journey to St. George's Square was run smoothly, but at the passing place opposite the Peel statue the car struck the points. At 12.30 the journey to Lindley was fairly commenced opposite to the Crown Hotel, Westgate, and the top of West Hill was reached in a little under five minutes. Continuing the uphill pull, the Bay Horse at Lindley was reached in seven minutes more, and in another four minutes and a half the engine and car arrived at the terminus just beyond the Fleece Inn, Lindley, thus completing the journey from Westgate in 16½ minutes—a very good time for such a heavy pull. On turning round, the car again took the wrong line at the points, but was got on again in a minute or so. Water had to be taken in here, as it had at Far-

town, and one minute to one o'clock the home run was commenced, and in sixteen minutes the engine and car brought the passengers down Westgate. The passengers alighted there and in St. George's Square, and the engine and car were then taken down Northumberland Street and "stabled" in Lord Street. The trial proved the engine to be sufficiently powerful to draw more than a legal load up the steepest gradients in the borough, and to run well and smoothly, excepting over the passing points and sharp curves. As regards the ordinary vehicular traffic, very few horses became restive while the engine was passing them, and when the tramways are in regular operation the horses will soon become accustomed to the engines and cars.

OFFICIAL INSPECTION.

On Thursday morning, Major-General Hutchinson, R.E., one of the inspectors of the Railway Division of the Board of Trade, arrived in Huddersfield by the train due from Leeds at 11.40 for the purpose of inspecting the Huddersfield tram lines. He was met at the station by the Mayor (Alderman J. F. Brigg), the Borough Surveyor (Mr. Dugdale, C.E.), Mr. S. W. Pilling (of the firm of S. W. Pilling and Co., Bolton, the contractors for the laying of the lines), and the maker of the tram engine (Mr. Wilkinson, of Wigan). They drove in a cab to the Town Hall, where they were joined by Councillor Armitage Haigh, the chairman, and Councillor G. H. Hanson, the vice-chairman of the Tramways Sub-Committee of the General Purposes Committee. The engine and car had been ordered to the top of Ramsden Street, and from this point the inspector, with the gentlemen above named, commenced the inspection shortly after twelve o'clock. The first journey was down Chapel Hill, the inspector riding on the step of the car with the borough surveyor, and having the plans of the section before him. Twice on Chapel Hill the engine and car were stopped to test the brake-power, and then a run was made to Lockwood, and continued on the Meltham Road, another stop being made for the purpose of testing the brakes opposite the Mechanics' Institute. The journey was then continued to the terminus, where the engine was reversed and the car turned round. The inspector walked with the borough surveyor back, behind the car, to the Lockwood Bar, examining the line as he went. At Lockwood Bar the car was backed up to the terminus at Salford, and then taken forward to the bar at Lockwood, and the journey resumed towards Huddersfield slowly, the inspector walking behind some distance. He drew attention to the loop line opposite the Bath Hotel, which is rather short, and expressed the hope that there were not many more loops of that length. The borough surveyor assured him that that was the only one. Shortly afterwards he got on the car, and the journey was resumed to the bottom of Chapel Hill. The steepest gradient in the kingdom on tramways worked by steam. Here a full load was taken up from amongst the passers-by, of whom there were plenty at that time, as it was just after one o'clock. The steam at the bottom of the hill indicated 132 lb. pressure. On the worst part of the hill, opposite Buxton Road Chapel, the inspector had the engine and car stopped. An attempt was then made to start again, but the engine would not start with a full load. About half the passengers had to alight, and then the engine accomplished its task with the lightened load. At the top of the hill the gauge showed 140 lb. pressure. The Mayor pointed out to the inspector that the Corporation would prohibit the stoppage of the engine to take up passengers on such a gradient as Chapel Hill. The inspector gave his assent to this, but said that the test he had made was a necessary one. It was also said that the present omnibuses do not stop to take up passengers on Chapel Hill. A discovery, however, was made on the car being reversed in Buxton Road for the purpose of going on to Paddock, which left it an open question in favour of the engine as to whether it would not be able to stop on the hill with a full load and start again without running back. The discovery was this. On the car being reversed at Lockwood, a pin was put into the lever holding the brake to prevent the car running back while the engine was being put on the other end. After this had been done the pin was not removed, so that the whole of the distance from Lockwood, and up Chapel Hill, the car was running with the brake on the four wheels. This oversight, of course, made the pull on Chapel Hill without stopping very much heavier. It was decided to have another test of the kind, and both Mr. Wilkinson and the chairman of the Tramways Sub-Committee were very sanguine that the engine was capable of coming out of the test successfully. The journey to Paddock was very successful. The inspector walked a great portion of the distance and examined the lines as he went. At the terminus at Paddock the engine was reversed, and the journey down hill commenced. A stoppage was made on the road downhill successfully testing the brake-power again. In Buxton Road the car struck the points, and the inspector had them run over a few times, but the same difficulty did not arise again. After this the journey was commenced to Moldgreen, and twice on the way down King Street the brakes were tested, and again twice on the curve uphill near the Green Cross Inn, each time with satisfactory results. Similar tests were applied about the same places on the return journey, with equally satisfactory results. A highly successful journey was then made to Fartown and back, after which a trip was taken to Edgerton, back, and then to Lindley, without the slightest hitch. Returning from Lindley a good speed was attained, and the brake-power of the engine was thoroughly tested. The only difficulty at the points throughout the whole of the journeys was at those in Buxton Road referred to above. The difficulty at passing points and curves at the trial on Monday was subsequently found to result from the wheels of the car being out of the parallel, and the remedying of this led to the great improvement in the running at the official inspection. Major Hutchinson, in the course of the day, stated that he was surprised to find the track in such good condition, considering the sets are not granite but Lancashire stone, and that they have been laid some time, and the ordinary traffic runs so much on the tram lines. Major Hutchinson likewise stated that on all the tramways he had inspected he had not seen the stoppages so well made as by this engine. He expressed himself very well satisfied with the lines generally. The inspection closed in St. George's Square at a quarter-past four o'clock, and the Mayor afterwards entertained Major-General Hutchinson and the gentlemen above named, together with the Town Clerk (Mr. Joseph Batley), at dinner at the Huddersfield Club. Mr. Wilkinson was determined not to shirk the severest test that his engine could be put to, of stopping and starting again with a full load on Chapel Hill, and shortly before five o'clock he had the engine and car run down to the bottom of Chapel Hill. There passengers were taken up till there were forty-four passengers on the top and inside the car. With this load, five more than the number (including the conductor) that the car will be allowed to carry, the engine steamed uphill, and on the most steep part of the gradient it stopped and started twice without any difficulty whatever, and reached the top of the hill in capital style. Yesterday morning again the engine and car were taken to Chapel Hill, to "make assurance double sure" on this point. Forty passengers were taken up on the car, and three on the engine, and the car and engine went down the hill and up again, and stopped and started again twice on each journey in a perfectly satisfactory manner. The points in Buxton Road, too, were run over backwards and forwards several times without any difficulty. Therefore, the questions of the fitness of the tramways for steam traffic and of Mr. Wilkinson's engine for the lines and the traffic are settled decidedly in the affirmative, and passengers will need to have no anxiety on the subject, while they will be glad to be rid of the pain of hearing the continuous urging and whipping of the horses in the carrying on of the omnibus traffic. The public will be wanting to know when the tramways will commence running. Well, we are informed that the tramways Sub-Committee will meet as early as possible, so as to make arrangements for the running of the lines from Fartown to Lockwood, which the inspector stated might be run at any time, and in less than a fortnight, it is expected, these sections will be open for traffic. With regard to the opening of the other lines, it will be only a question of how long a time will be required to obtain the necessary rolling-stock, which the committee will at once consider the desirability of ordering.

THE DEVELOPMENT OF SOUTHERN RAILWAYS.—New Orleans is rapidly increasing her railway connections with the interior, and extending the field of operations for her jobbing trade. The completion of the railway from Rome to Atlanta, Ga., opens a new route from New Orleans in connection with the Chicago, St. Louis, and New Orleans Railroad, by way of Rome and Atlanta to Macon and Augusta, Ga., Charlotte, N.C., Charleston, S.C., Savannah, and Brunswick, Ga., and all immediate points east.

EPPING FOREST TRAMWAYS.—On Saturday last a meeting of the shareholders of this company took place, the chief business being a proposed extension of the line now under construction, and the adoption of steam traction instead of horses. Mr. Mark Shepherd, the chairman, and Mr. C. B. King, C.E., the engineer to the company, referred to the great success of the steam tramway engines running on the Dewsbury, Batley, and Birstal line. The proposals were carried. As the Epping Forest line will essentially be a pleasure one, the engines (which, with the cars, will be supplied by Messrs. Merryweather and Sons) will draw three or more special cars when occasion requires, for carrying some 300 to 400 passengers on one trip of engine, thus doing the work of eight pair-horse cars.

SIX MONTHS' RAILWAY ACCIDENTS.—A blue-book has been published containing returns of all accidents and casualties reported to the Board of Trade by railway companies during the six months ending June 30, 1882, together with special reports on certain accidents which were inquired into. From this we learn that 522 fatal accidents occurred in that time, against 497 in the corresponding period of last year. Of the killed, 56 were passengers who lost their lives from various accidents, such as collisions between passenger trains, failure of couplings, falling between the carriage and the platform while the train was in motion, &c.; 252 were companies' servants, and the rest were chiefly trespassers, 117, including 31 suicides; 37 were killed while passing over railways at level crossings. The number of injuries not fatal was 2072, as against 2009 in the same period of last year. In the case of companies' servants, the most fruitful causes of accidents were—coupling and uncoupling, to which 194 injuries are put down, 18 being fatal; shunting, which caused 28 deaths and 417 injuries; working on the permanent way, during which 66 were killed and 53 injured; and walking, crossing, or standing on the line on duty, by which 54 met with death and 94 with injury.

GUERNSEY STEAM TRAMWAYS.—We have received a copy of the report of the directors of this company, to be presented to the shareholders at their fifth annual meeting to be held on Thursday next. From that document it appears that during last winter they were compelled to reduce the fare for the three miles to 2d., because the horse car proprietors had adopted a similar course, resulting in a considerable reduction in the traffic receipts. Would it not have been a wiser plan if the directors had displayed some faith in mechanical traction, and have retained their previous rates, presuming they were not excessive? The steam tramcars no doubt accomplish the journey in much less time than the horse cars, and if time is as valuable in Guernsey as elsewhere, passengers would, no doubt, be prepared to pay a slight extra charge as an equivalent for the time saved, especially as travelling on grooved rails is considerably more pleasant than in jolting street cars. We observe that no charge is made in the accounts for depreciation of permanent way and rolling-stock. It is true that the current expenditure in maintenance and repairs appears in the revenue account, but we think that a reserve account should be created to provide for the replacement of the rolling-stock, plant, rails, &c., when they are worn out. A car may be annually repaired for a number of years, but the time must eventually come when it is unusable. The same remark applies to the other items of plant.

THE RAILWAY TRAFFIC OF THE UNITED KINGDOM.—It will be seen from the table of traffic increases, given below, and taken from the *Statist*, that in almost all cases the recent rate of increase has not been equal to that of the earlier half of the year. The Scotch lines all show a slackened speed in their progress, their rate of increase having been over 3 per cent. in the first half of the year, but subsequently descending to little over 2 per cent. The Northern English lines, with the exceptions of the North-Eastern and the Sheffield, similarly fail to sustain in the second half of the year their previous rate of progress. In the South there is now hardly any progress at all, although the first half of the year brought very substantial increases. We must not start away with the notion that trade and traffic are checked throughout the country nevertheless. We may rather take heart from the distinct display of progress which remains, for the earlier months of this year were so favoured by mild weather, in contrast to the severe opening of 1881, that traffic on the whole increased immensely for the time. It is therefore not astonishing to find, as the year goes on, and the weather conditions no longer cause such wide variations of traffic, a descent to a more moderate rate of increase in the current half of this year. The present moderate rate of increase would have been thought satisfactory enough had we not been contemplating the peculiar contrast which resulted as much as anything from the facilities for traffic afforded by open weather early this year, and the corresponding impediments to traffic in the early months of 1881:—

Increase of Railway Traffic in the United Kingdom.

	1st Half 1882, Increase. £	Rate. Per cent.	Subsequently to Nov. 4. Rate. Per cent.	Increase of line now worked. Per cent.
Scotland—				
Caledonian ..	+ 40,000	= 3·0	2·2	+ 0·3
Glasgow & S.W.	+ 16,000	= 3·0	1·2	+ 0·7
N. British ..	+ 43,000	= 3·7	2·8	+ 0·1
England, North—				
North-Eastern .	+ 118,000	= 3·9	4·6	+ 1·2
Great Northern	+ 53,000	= 3·3	0·8	+ 6·0
L. & N. Western	+ 174,000	= 3·7	2·1	+ 1·7
Lanc. & York..	+ 78,000	= 4·5	2·3	+ 0·6
Midland ..	+ 124,000	= 3·8	3·1	Nil.
Sheffield ..	+ 52,000	= 6·4	6·0	Nil.
Great Eastern ..	+ 84,000	= 6·0	4·6	+ 11·9
Great Western	+ 129,000	= 3·7	2·8	+ 1·3
South—				
South-Eastern .	+ 32,000	= 3·5	1·0	+ 6·5
Chatham ..	+ 25,000	= 4·8	0·6	Nil.
Brighton ..	+ 41,000	= 4·5	2·5	+ 4·1
L. & S. Western	+ 69,000	= 5·5	4·1	Nil.
Ireland—				
G. N. of Ireland	—	—	6·8	Nil.
Great S. & W.	+ 25,000	= 8·0	8·4	Nil.
Mid. G. W. ..	+ 15,000	= 7·0	7·4	Nil.

ELECTRICITY AND TELEGRAPHY.

PORTRUSH ELECTRIC TRAMWAY.—A private trial trip o the Portrush Electric Tramway took place on Tuesday between Portrush and White Rock, about two and a half miles each way. The car was an open one constructed by the Metropolitan Carriage Company, Birmingham. Amongst those present were Mr. W. A. Traill, contractor for the line, and Mr. D. Hopkinson, representative of Dr. Siemens, the inventor of the electric system by which the cars are to be driven. The trial was considered a complete success, a speed of ten miles an hour having been attained going and returning, and no interruption to traffic caused.

THE RESULTS OF THE INTERNATIONAL TELEGRAPH CONFERENCE.—At this conference, held at Paris, and to which we have already referred, the representatives of thirty-two states were present. They met on October 16, in order, as stated in the official programme, to enter into an international convention for the preservation of submarine telegraphs. How far they have been able to accomplish their labours the following report will show. The countries represented were:—Europe, 18—Germany, Austria, Belgium, Denmark, Spain, France, Great Britain, Greece, Italy, Norway, the Netherlands, Portugal, Roumania, Russia, Servia, Sweden, Switzerland, and Turkey; Asia, 3—China, British India, Japan; America, 11—the Argentine Republic, Brazil, Costa Rica, St. Domingo, the United States, Columbia, Guatemala, Mexico, Nicaragua, San Salvador, and Uruguay. These 32 states were represented by 53 delegates, France sending 6 and Great Britain 5. The conference held its sittings almost continuously, and certainly no time was lost, for by November 3 the conference had completed its work. The members had the advantage of state recognition in France, for they were presided over by a member of the French cabinet, and were presented, in the course of their labours, to the president of the republic. At the conclusion of their work they were addressed by M. Cochery and by M. Kern, Swiss minister, who is the senior member of the diplomatic body, and also the Swiss representative in this conference. There were in all four questions with which the conference was concerned. The first question related to the protection of telegraphs; the second was to lay down rules for vessels laying or repairing telegraphs; the third question dealt with the rights of telegraph companies; and the fourth question, which seems the most difficult of all, and was discussed after the others, concerned the tribunals before which offences against the international code are to be brought and the punishments to be inflicted. The chief articles agreed to are the following:—The breakage of or damage done to a submarine cable, if caused intentionally or by culpable negligence, having the effect of stopping or clogging, altogether or partially, telegraphic communications, will be punishable, and costs and damages will be recoverable by civil action besides. Any owner of a cable who, in laying or repairing it, shall cause breakage or damage to another cable, must support the expenses rendered necessary by that breakage or damage. Vessels occupied in laying or repairing submarine cables must observe the rules or signals which are or shall be adopted by common consent of the high contracting powers. When a vessel occupied in the repairing of a cable has made the same signals, other vessels which see or are in a position to see the signals are to retire from the spot, or else to keep themselves at a

distance of a naval mile from the scene of operations for fear of hindering them; and fishermen's nets are to be kept at the same distance. The ship engaged in repairing the telegraph is to be as speedy as possible in its operations, and any vessel holding off in answer to signals is to be granted a delay of twenty-four hours at the outside. From a buoy indicating either the position, derangement, or repair of a submarine cable, all boats and fishermen's nets must keep away at least a quarter of a nautical mile. In case the owner of a boat can prove that an anchor or a fishing net has been lost by him in his endeavour to avoid injury to a cable, the owner of the cable is to indemnify him; but in order to claim this indemnity the captain of the boat must address a *procès verbal* supported by witnesses to the proper authorities within twenty-four hours after his arrival in port. The authorities will give immediate notice to the consul of the nation to which the owner of the cable belongs. The competent tribunals to recognise infractions of this convention are those of the country to which the offending vessel belongs; and prosecution or offences shall be conducted by the state or in its name. All evidence admissible in the ordinary tribunals of the country shall be admissible in these cases; and *procès verbaux* may be drawn up by officers commanding ships of war or ships specially commissioned for the purpose, whatever the nationality of the offending vessel; such *procès verbal* in each case being drawn up according to the usual forms, and in the language of the nation of the officer who draws it up. In any case of contravention of the regulations of the convention, judgment is to be given as summarily as the laws and regulations allow. These are the regulations adopted by the conference. In addition, the various members pledge themselves to do their best to induce the legislative bodies of their respective countries to adopt these regulations and make them both international and domestic laws; and the members are also to inform each other of all laws passed in their own countries with reference to the objects of the convention. Any state that has not yet joined the convention shall be admitted on demand, this demand to be addressed to the French republic, and by the French republic to the other signatories. The convention shall continue in force for a space of five years from a day agreed upon by the high contracting parties; and if, twelve months before the expiration of those five years, no one of the powers shall have given notice of its intention to retire from the convention, the convention shall continue for one year, and so on from year to year. If any power shall renounce the convention, the renunciation shall only affect that power. The conference hopes that the powers will agree at once on the signals to be used, both at the laying and at the repairing of a cable; and further that the various governments shall indicate, by means of buoys placed at the side, the direction of submarine cables, and buoys of uniform type should always be used for the service.

NAVAL ARCHITECTURE.

LAUNCHES.

ENGLISH.

Clive.—On November 15, this new Indian troopship was floated from the shipbuilding works of Messrs. Laird Brothers, Birkenhead. The dimensions of the vesssl are:—Length, 300 feet; breadth, 45 feet 8 incees; depth in hold to upper deck, 25 feet 6 inches; tonnage, builder's measurement, 3003 tons; gross measurement, 2730 tons; the mean load draught will be 16 feet 6 inches; and the speed on trial with all weights on board is to be 12 knots. The engines are a pair of direct acting inverted-cylinder compound engines, to indicate 2000 indicated horse-power on trial; the cylinders are 48 and 84 inches in diameter, and have a stroke of 4 feet. The boilers are cylindrical, four in number, to work at 75 lb. pressure, and proved to 150 lb.

SCOTCH.

Changchow.—On November 18, Messrs. Scott and Co. launched this iron screw-steamer, of 1800 tons, built to the order of Messrs. John Swire and Sons, London. This is the last of a fleet of six steamers that Messrs. Scott have built for the same owners. Dimensions:—Length, 270 feet; breadth, 35 feet; depth, 26½ feet. The steamer, which will have engines of 200 horse-power, will be engaged in the China trade.

Fulda.—On November 15, Messrs. John Elder and Co. launched from their shipbuilding yard at Fairfield this iron screw-steamer, of 5100 tons gross register, for the North German Lloyd, of Bremen. The vessel, which is intended for the Bremen and New York Line, is of the following dimensions:—Length, 450 feet; breadth, 46 feet; depth, 36 feet 6 inches. The vessel will be propelled by compound engines of the inverted cylinder type, supplied by the builders, having two low-pressure cylinders, 86 inches diameter, and the high-pressure cylinder of 62 inches diameter, 5 feet stroke, and working up to 95 lb. pressure. Steam will be supplied by four double-ended boilers, six furnaces in each, and it is fully expected that the engines will develope 6000 horse-power.

Giolconda.—On November 15, Messrs. A. and J. Inglis launched from their shipbuilding-yard this steamer, for the British India Steam Navigation Company. The dimensions of the *Giolconda*, which is built of steel, are:—Length, 285 feet; breadth, 36 feet; depth, 25 feet 9 inches; tonnage, 2100 tons. She will be fitted with engines of 1200 indicated horse-power, by the builders.

Gogo Burn.—On November 16, there was launched from the shipbuilding-yard of Messrs. Birrell, Stenhouse and Co., Dumbarton, this iron barque, of 1000 tons register. She has been built to the order of Mr. M. Carswell, Glasgow, for the Burn Line.

Polcevera.—On November 15, there was launched from the shipbuilding-yard of Messrs. Blackwood and Gordon, Port-Glasgow, this iron screw-steamer, of the following dimensions:—Length, 300 feet; breadth of beam, 37 feet 3 inches; depth of hold, 25 feet 6 inches; gross tonnage, 2250 tons; deadweight carrying capacity, 3200 tons. She is to be propelled by a pair of compound engines of 200 nominal horse-power; diameter of cylinders, 35 and 67 inches; length of stroke, 42 inches; with two large tubular boilers, capable of maintaining a constant working pressure of 80 lb. per square inch, which have been constructed by her builders. The steamer has been built to the order of the Societa Italiana di Trasporti Marittimi, of Genoa.

TRIAL TRIPS.

Balder.—This screw-steamer, launched from the yard of the Lindholmen Mekaniska Verkstad at Gothenburg in October, went on her trial trip recently. Her dimensions are:—Length over all, 169 feet; width, 23¾ feet; depth in the hold, 11¾ feet; while she draws, with a cargo of 570 tons, 16 feet of water. She is built of Bessemer steel made at Motala Verkstad, and fitted with engines of 70 horse-power, which at her trial brought her up to a speed of 9¼ knots per hour, the rate contracted for being 8½ knots. The vessel is intended for the general carrying trade, and built for Mr. J. C. Gjertsen, of Bergen.

Constance.—On November 21, the *Constance*, 14, unarmoured corvette, which has now left for the Pacific Station, made a measured mile trial of her engines, which are by John Penn and Sons, for the verification of the results obtained during the trial over the Maplin Sands. The draft of the ship was 16 feet 9 inches forward, and 18 feet 7 inches aft, the mean being slightly less than that at the former trial. Four runs were made under full power and two runs each at two-thirds and one-third power. The following were the results:—

	Full Power.	Two-thirds Power.	One-third Power.
Steam in boiler ..	64·3	64·12	64·25
Vacuum, forward ..	25·6	25·7	25·5
Do. aft ..	25·7	25·7	25·5
Revolutions	107	92	75
Mean pressures, high ..	34·11	26·17	16·32
Do. low ..	13·39	9·11	5·62
Total horse-power ..	2518·2	1559·5	797·75
Speed	13·71	12 07	9·94

Practically there was no difference between the two trials. The horse-power developed was about the same, while the difference in speed—that realised over the Maplin Sands being 13·787 knots—was a mere matter of decimals, and is more than accounted for by the condition of the hull. At both trials the power was greatly in excess of the contract.

Kristianstad.—This screw-steamer, launched from the yard of Ljungren's Mekaniska Verkstad at Kristianstad in October, went on her trial trip recently. Her dimensions are:—Length between perpendiculars, 80 feet; width, 16 feet; depth of hold, 5 feet; and she carries a cargo of 100 tons deadweight. Her engines, which are compound, and of 10 horse-power each, propelled her on her trial trip at the average speed of 8½ knots the hour, which was considered satisfactory. She has been built for the general carrying trade to the order of Kristianstad ångbåtsaktiebolog of Kristianstad.

THE GREAT MIDLAND RAILWAY DOCKS.—The Midland Railway Company have now completed their dock at Poplar, thus bringing the mines of the North and Midlands into direct railway communication with the River Thames. The work has been in hand for four years and a half, and its completion will probably lead to a great revolution in the mineral traffic of the company. The site of the docks is a great tract of what was marsh land to the east of Blackwall Reach, bounded on the south by the River Thames, on the north by the Poplar Station of the Blackwall Railway, and east and west by the two India Docks, Mr. Green's shipbuilding yard abutting on it to the east.

PROPOSED NEW DOCK AND RAILWAY.—At a meeting of freighters and shipowners held at Cardiff last week, the final arrangements were made for the prosecution of an application for parliamentary powers for the construction of a dock at Barry, near Cardiff, with a railway sixty-two miles long communicating with the coalfields of the Rhondda valley. The dock is to be capable of shipping 2,000,000 tons of coal per annum, and is to be provided with all modern appliances for quick despatch. As it is believed the scheme will injure Cardiff, it is expected that it will meet with strong opposition, more especially from the Marquis of Bute and the Taff Vale Railway Company.

DISASTERS AT SEA.—Seventy nine British and foreign actual shipwrecks were reported during the past week, making a total of 1365 for the present year, or a decrease of 308 as compared with the corresponding period of last year, while the increase for the week was 26. British-owned vessels numbered 34; eleven were steamers, with an aggregate tonnage of 11,855 tons, nine being British steamers, with a tonnage of 8536 tons. Total tonnage lost for the week, 21,771 tons. Total number of lives lost and missing, 55. Thirty vessels were wrecked off the coasts of the United Kingdom, 20 being British owned, two Swedish, two Norwegian, two German, two Danish, one Dutch, and one French. Two British vessels and one French sunk by collision, one (British) being lost off Great Britain and two off the French coast; two were abandoned at sea. The following are the quantities of produce and merchandise lost:—Corn, 3705 tons; coals, 2351 tons; timber, 1187 tons; coffee and general goods, 2152 tons.

NEW SHIPYARDS ON THE CLYDE.—Messrs. John Elder and Co. have recently inspected ground near the town of Ardrossan on the Ayrshire coast, with the view of establishing a branch of their extensive Fairfield business. The prospect is viewed with lively satisfaction by the inhabitants of Ardrossan, who have been experiencing a period of severe industrial depression, and who regard the present project as likely to be the inauguration of a happier state of things. Wood shipbuilding, once an industry pretty extensively practised in the town, has been in almost entire abeyance for several years, and is not likely now to be revived. The tendency of shipbuilding establishments is to gravitate towards the estuary, or to the lower reaches, where the depth of water is more suitable, and the launching facilities greater, for vessels of the size now in favour. The removal estuary-wise of another upper-reach firm has been for some time talked about. In Dumbarton a new yard is being established for the execution of iron and steel vessels of light draught, such as are employed in inland lakes and rivers. The name of the new firm is Murray Brothers. The ground is already enclosed, and the fitting of the premises with new plant and the necessary buildings, &c., is proceeding vigorously. This will make the sixth shipyard located and in active operation on the Leven, all of which are within a radius of a quarter of a mile.

THE "CAMPERDOWN."—Although no material has as yet been placed upon the blocks at Portsmouth, considerable progress has been made with the preliminary preparations for the laying down of the new double barbette armour-clad, the *Camperdown*. The keel plates and vertical keel pieces, garboard strakes, frames and angles, have been laid off and shaped, and at the end of the month it is expected that a beginning will be made upon the ship. The order for the supply of the steel plates and angles has been taken by the Steel Company of Scotland. The *Camperdown* is slightly larger than either the *Rodney* or *Howe*, which were originally designed to carry each four of the new 43-ton breech-loading-rifle guns, and the depth of which had subsequently to be increased to enable them to carry an armament of 63-ton guns. The *Camperdown*, which will have a draught of over 27 feet, has, on the other hand, been designed from the first to carry the heavier guns in the barbettes, with six of the new 6-inch broadside guns in a box battery between the barbettes. The barbettes are of novel construction, and differ in several important particulars from any yet in existence. They will be built upon the middle line of the ship, and will be pear-shaped, but without curves, so as to prevent any bending of the armour being required. The sides will also have a considerable slope for the purpose of causing shot to glance off from the hard steel face. The ship will take five years to build.

NEW TIDAL DOCK AT DUMBARTON.—During the past week the cofferdam at the mouth of the new tidal dock, which forms part of the extensions that Messrs. Denny and Brothers, of Dumbarton, are making to their shipyard, was partially demolished, and the water allowed to flow in. The situation of the dock is immediately at the base of the famous Castle Rock, and runs parallel with the Clyde, but opens into the river Leven. The area is about 4½ acres, the depth being 26 feet below the level of the surrounding wharfage, affording at high water a clear navigable depth of 20 feet, which may still be increased to 25 feet. The length is about 800 feet, the breadth throughout being 250 feet to the top of the sides, which are pitched rubble, and slope downwards about 10 feet, giving a clear navigable breadth of 230 feet. About 90,000 cubic yards of material have been excavated, but 30,000 more will have to be removed before the dock is brought to completion. The excavations have been made by several patent steam diggers, and the same machines, mounted on steam lighters, will overtake the deepening still to be done. Several months must elapse before the completion of the dock, and the whole works of extension, of which the dock is but a part, will not be finished before the end of next year. In connection with the tidal dock, a pair of sheer legs will be erected, capable of lifting 100 tons the makers of which are Messrs. Day, Summers, and Co., of Southampton. The dock is from the designs of Mr. W. R. Copeland, Engineer for the Burgh of Dumbarton, the contractor for the work being Mr. James Young, Dixon Street, Glasgow.

LEGAL INTELLIGENCE.

November 21.

HIGH COURT OF JUSTICE.

QUEEN'S BENCH DIVISION.

(*Sittings at Nisi Prius before* MR. JUSTICE GROVE *and a Special Jury.*)

GREEN *v.* CUTLER.

This was an action in which the plaintiff sought to recover compensation for personal injuries, under the provisions of the recent Employers' Liability Act.

Mr. Ashton Cross and Mr. E. C. Thomas appeared for the plaintiff; Mr. Bompas, Q.C., and Mr. W. S. Robson were for the defendant. The plaintiff was a skilled angle-iron smith, employed in the defendant's iron foundry at Milwall. According to his evidence it seemed that he was required on one occasion to do certain angle-iron work with a "flatter" which was so worn as to be unfit for use. He complained of its condition to the foreman, and received an order for a new one, but it appearing that just then there were none in stock, he was told by the foreman to make shift with what he had, and the consequence was that in so making shift, a splinter of steel flew off the flatter, occasioning the loss of an eye, and seriously interfering with his profits as a workman. On behalf of the defendant, the relations of obedience between the plaintiff and the foreman were contradicted, and with regard to the "flatter," skilled witnesses were called to show that though shorter than usual it was not dangerous or unfit for use, and that it was an inseparable incident of its use that particles of steel should occasionally fly off without any possibility of prevention.

The learned judge having intimated in the course of the case a strong opinion that there was no evidence of any defect constituting danger, such as was contemplated by the Act, permitted the case to go to the jury, and left it to them to say whether the accident occurred through the negligence of the foreman, or was unavoidable.

The jury adopted the latter alternative, and found their verdict for the defendant.

GENERAL NOTES.

RUSSIAN IMPORT DUTIES.—The petition of the mining congress at Charkoff, for the imposition of a tax of 15 copecks per pood on foreign pig-iron has been granted by the government in principle. The proposal made by the last congress for taxing foreign coal will probably also be accepted. The latter impost as at present contemplated would be at the rate of 2½ copecks per pood for Moscow, 3½ copecks for the Black Sea ports, and 1 copeck for the Baltic ports.

THE LANCASHIRE ENGINEERING TRADE.—Some of the engineering firms in the Manchester district are engaged on engines for electric lighting purposes, and Messrs. Mather and Platt are manufacturing an engine specially designed for driving the dynamos in connection with the Edison electric light. Messrs. W. H. Bailey and Co., of Salford, have in hand a water motor for Sir R. Vivien's silver mines in Norway, which will be placed on a mountain side, to work against a head of about 800 feet, developing about 30 horse-power. A new engineering works has been started in Manchester by Messrs. Ashby, Sumner and Co. specially for the manufacture of gas engines, and the firm have just completed a new experimental engine (Sumner's patent) termed the "Manchester Reversible Gas Engine."

THE LIGHTING OF PARIS.—The streets of Paris are lighted by 43,089 gas lamps, and 429 lamps which burn petroleum and colza oil. There are in addition 25,000 jets of gas in the buildings which belong to the municipality, and the total cost of lighting them is estimated for the current year at £260,000. An ordinary gas lamp burns about six gallons of gas an hour, and the cost for a year, supposing the gas to be burning for about ten hours every night, is almost exactly four guineas. The petroleum and oil lamps cost about 50 per cent. more. The gas company employ 76 men in looking after the lamps and the mains, many of them being told off to inspect the meters and the pipes in private houses, and see that there is no escape. The lighting power of the gas supplied by the company is tested every evening in eleven laboratories situated in different parts of the city.

HARBOURS, DOCKS, AND PIERS ASSOCIATION.—At a conference of the chairmen and principal officers of the harbours, docks, and piers authorities of the United Kingdom, held at the Westminster Palace Hotel on Wednesday, November 1, 1882, after long previous notice, Colonel Lyne in the chair, it was resolved that an association should thenceand there be formed, styled, "The Harbours, Docks, and Piers Association," the object of the association being to consider all matters affecting the interests of the harbours, docks, and piers of the United Kingdom, either separately or collectively, to watch all bills brought before Parliament in connection therewith, and to take such action relative to all the above matters as may be deemed advisable. A sub-committee was formed, consisting of Messrs. R. Capper, general superintendent Swansea Harbour; E. H. Garbett, secretary Hull Dock Company; F. B. Girdlestone, secretary Bristol Docks Committee; W. T. Lewis, agent and general manager to the Marquis of Bute, Bute Docks, Cardiff; and R. G. Underdown, general manager Manchester, Sheffield, and Lincolnshire Railway Company.

THE PIN INDUSTRY OF THE UNITED STATES.—The pins used in America are made by fourteen factories, chiefly located in New England. The annual production for several years past has been about 7,000,000 pins. This number has not varied much for some years, the demand remaining about the same. Two years ago the competition among the nine principal companies then existing for the manufacture of toilet pins led to such a cutting of prices that the business became unprofitable, and the market was flooded with goods. A year ago a combination was formed of three wire companies, and now all the pins made by them are shipped to New York, and handled by the head agency of that city. From their common warehouses they are sent to every part of the country. The importation of English pins is small, and the exportations of pins from the United States are confined to Cuba, South America, and parts of Canada. England supplies almost the whole world outside of the United States, although the American pins are not inferior in quality. The raw material—the brass and iron wire from which all American pins are made—is from the wire mills of the States, and much of the machinery is of American invention and patent.

THE LANDORE STEEL COMPANY AND THEIR WORKMEN.—As we stated last week, work has been resumed by the hammermen at the New Steel Works, Landore, after a stoppage of eleven weeks. A contemporary reporting the termination of this, the longest strike on record at these works, says:—"On Tuesday the strike of the hammermen at the New Steel Works, Landore, terminated. The men whose names were posted up at the entrance of the works about a month since have agreed to resume work on the masters' terms, and the men whose names were omitted from the list are not allowed to resume work. It is owing to these names having been left out of the list that the strike has been prolonged. Now, however, that a settlement has been arrived at, it is to be hoped that matters may go on smoothly in the future." Mr. Carulla, the manager, requests us to explain that, although generally accurate, the report requires modification in a small detail, as the men having submitted to the principle that the company is free to choose whom it will employ. A new selection has been made, some whose names were omitted from the list referred to having now been taken on. Ill-feeling on the part of the masters has been altogether absent throughout this dispute, which has only arisen through the necessity that the company has been under to assert its right to the establishment of order in a department where the persistent action of a section of the men stood in the way of conciliation.

THE MINERAL RESOURCES OF MEXICO.—While Mexico was a Spanish colony, from 1537 to 1821, the mines produced silver to the value of 2,086,269,703 dols., and gold 68,768,411 dols., in all 2,155,038,124 dols. Succeeding the Mexican independence in 1821, the mines produced, between that date and 1880 silver to the value of 900,658,309 dols., and gold 49,413,786 dols., or together 950,072,095 dols. This gives a grand total for the production of gold and silver in Mexico between 1537 and 1880 of 3,105,110,219 dols. Another computation, based on the report of the Mexican mint, gives a total output of the gold and silver mines mined at 3,723,137,070 dols. The gold and silver production of California, Nevada, Colorado, Utah, Dakota, Montana, Idaho, Oregon, Washington, New Mexico, and Arizona, from 1848 to January 1, 1882, is said to have amounted to only 2,296,596,186 dols., "most of it produced from territory formerly belonging to Mexico." The State of Chihuahua is considered one of the richest in minerals in the Republic. It is divided into 20 cantons, where 720 mining districts exist. In these districts 575 mines have been worked since the Spanish conquest. It is noteworthy that mines yielding only 16 ounces of silver to 300 pounds of ore have been abandoned because of their isolation and want of labourers. The character of this the richest Mexican mineral district may perhaps be more fully summarised by classifying the mineral districts as follows:—Gold, 14; silver, 541; copper, 4; lead, 4; mercury, 1; salt, 3; and coal, 2. There appears to be a general agreement in the opinion that capital, improved methods of mining and reduction processes, and transportation facilities are about all that is required to place Mexico again in the front rank as a producer of the precious metals, a position which she held until 1848.

PROPOSED GENERAL RESTRICTION OF THE OUTPUT OF COAL.—This movement, which was mooted at the recent conference held at Manchester, it is said, is now likely to become pretty general. The scheme was to first secure an advance of wages, and having done that, to restrict the output, so as to force up prices and curtail supplies. At the conference held at Rotherham, on Monday last, a resolution was carried to the effect that an effort should be made to endeavour to get a general system of restriction adopted, and the conference, which was fixed to be held on December 5, was adjourned to December 18, or some later day. The officials of the Yorkshire Miners' Association are taking a very active part in the movement. It may be stated that, from reports received by the supporters of the movement, the scheme is said to be likely to be tried. Although the Durham miners stood aloof from the demand for an advance, their miners' council have decided to take the opinion of the men on the question of restriction, and it is on their account that the Leeds conference is to be adjourned. It is expected that the opinion of the men will be laid before a meeting of their miners' council at Durham on December 16. North Wales is reported to have decided in favour of restriction. North Staffordshire will also support it. Lancashire and Cheshire have agreed by votes at their council meetings to support it. A number of the lodges in Northumberland are said to be in favour of it, whilst Yorkshire will give it very strong support. It is stated that the feeling in favour of restricting the output is, generally speaking, very strong, and that only some little discussion has taken place at the various Conferences with regard to the way in which it shall be carried out; and it is now decided to recommend the men to work five days per week, and no more than eight hours per day. The movement will, if put in force, be watched with great interest by both the public and those entrusted in the working of the mines.

THE HOME IRON AND COAL TRADE.

BARNSLEY AND SOUTH YORKSHIRE.—There seems to be a very fair business doing at most of the iron and steel works in manufactured material. The make of bar and sheet iron is about an average one, and the same remark will apply to the output of Bessemer steel rails, tires, &c. The foundries are scarcely fully employed with respect to the production of building castings, but there is a good deal of repairs on the books for collieries. The coal trade has been supported by the cold weather, which has prevailed of late, or the demand could not have been sustained. Reports from the metropolis are not over cheering, and it is questionable whether the present state of the coal trade can be sustained. The tonnage of both Silkstones and Barnsley house coal is not quite so good as it was a short time ago, and colliery agents report that they have great difficulty in enforcing increased prices. The business passing in house coal for country markets is rather quieter, and unless the colliers carry out their questionable policy of restricting the output, the state of trade will do it for them. The steam coal trade, considering that the close of the year is being approached, is fairly active. Many of the leading pits are doing a fair business with Hull and Grimsby by both rail and water. It is expected that a large tonnage of steam coal for shipment will be drawn from the Mitchell Main Colliery by Messrs. Josse Worms and Co., the senior partner in the firm, which does an extensive trade at Cardiff, having purchased the colliery. The Lancashire manufacturers are taking a very fair tonnage of engine fuel and slack, but there is not so much doing in this class of coal for some of the other markets. The coke trade is still good, and a large quantity of what is made is being sent to North Lincolnshire, where the smelting trade is active. Nearly all the men in the South Yorkshire district have returned to work, the last being those employed at the Wharncliffe Woodmoor Colliery, belonging to Mr. J. A. Allpart, son of the respected ex-manager of the Midland Railway Company. There are, however, a number of men out at the Bruntcliffe collieries, and a strike occurred on Wednesday at the pits belonging to Messrs. H. Briggs and Sons, Limited, owing to the firm wishing to advance the price of house coal to the miners. The Central Strike Committee appointed at the recent Manchester Conference met at Barnsley on Wednesday, and decided to make a further levy on Saturday. The returns showed that nearly 16,000 miners in Yorkshire paid the last levy. The Yorkshire Miners' Association has been benefited by the miners' agitation, the addition to its lodges having of late been very large. It may not be without interest to note that last month was the most fatal the West Riding Miners' Permanent Fund experienced since its formation, but it is to be feared that the present one will be even larger, an unusual number of single fatal accidents having of late occurred in South Yorkshire.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—The demand for iron of all descriptions is quiet, and the week's business has, if anything, been on a less extensive scale than in recent weeks. The enquiry is neither strong on home nor foreign account. The output of metal is well maintained on all hands, and although makers have not of late been delivering iron to as large an extent as during the months of September and October, stocks are not increasing to any important extent. Large consignments of metal have been disposed of for delivery during the remainder of this year and during the early months of next year, and even on foreign account the orders held are considerable; and are likely to keep the works in the district well employed during the winter. The prospects of the immediate future are very satisfactory, and it is generally thought that the present quiet aspect of the market is only a lull, which in a few weeks will give place to a fuller demand and an increased trade in every respect. The confidence shown in the future is demonstrated on the one hand by the fact that makers are keeping up prices, and on the other hand by the maintenance of a large output of metal. Nos. 1, 2, and 3 Bessemer are quoted at 56s. per ton at works nett, three months deliveries, and it is only in cases where second-hand parcels have changed hands that lower values have been accepted. The steel trade is busily employed, and there is no scarcity of orders. Shipbuilders are negociating for new contracts, and it seems probable orders of some importance will be booked during the ensuing month or two. Iron ore realises a steady value of about 13s. to 14s. a ton at mines. Coal and coke steady. Shipping quiet.

BIRMINGHAM.—Business is developing very gradually in the hardware manufactories, the briskness of demand in some branches having abated consequent on the unsettled and wintry weather. In the heavy branches, manufacturers keep well occupied, the pipe founders and general ironfounders in the Westbromwich, Wednesbury, and Dudley districts being well engaged on contracts for sanitary authorities and gas and water companies. The wrought iron tube branch is comparately quiet, except in the case of certain of the leading firms who have a number of contracts on hand for the Cape and South America. Engineering and constructive ironwork requisites continue in steady demand for the home and foreign railways and also for pier and gasometer work at home and abroad. Edge tools are in extensive demand, though the Wolverhampton houses are securing the bulk of the contracts, owing to the indisposition of the Birmingham firms to compete with them at the low prices at which they are now quoting for foreign orders. Chains, cables, naval brass-foundry, and other goods required in shipbuilding, are in active request, principally for the North of England and the Clyde. There is also a fair demand for steel and wire rope for ship, mining, and other purposes. Japanned and tinned goods are in steady requirement, though the briskness in this department has somewhat abated, except for coal vases and household culinary utensils. The lamp and chandelier branch is rather better employed, and the firms who are engaged in the production of electric lighting appliances are very busy. The lock trade is moderately occupied, though the manufacturers in Wolverhampton and Willenhall except some relief in the competition on the removal of Messrs. Chubb's establishment from Wolverhampton to London. A strike is expected in the wrought-nail trade at the end of the present week, unless the nail-masters concede an advance, the 10 per cent. demanded by the operatives.

CARDIFF.—The iron shipments from the port have amounted to 893 tons, while Bilbao ore has been received to the extent of 3490 tons, and 1515 from other places. Campanil Somorrostro stands at 15s. 6d. c.i.f.; good Rubio, 15s. 3d. c.i.f. Carthagena manganiferous are firm. The manufacturers of tinplates are again complaining of lowness of prices. Common cokes are quoted at 15s. 3d. to 15s. 6d. per box. The activity of the steam and house coal trades is only controlled by the boisterous weather. Nearly 50 per cent. more could be shipped if wind and weather permitted. The Royal Mail Company's contracts for 60,000 tons have been given to three Cardiff houses—the Powell Duffryn Company, Locket's Merthyr Steam Coal Company, and the South Wales Coal Company. The prices are reported to be slightly in excess of those of last year. The clearances last week amounted to 104,547 tons foreign and 17,044 coastwise. Patent fuel has been sent away to the extent of 3579 tons, and 548 tons of coke. Pitwood, which is rather scarce, with prices tending upwards, has been landed to the extent of 2861 tons. The freight market has somewhat improved.

CARMARTHENSHIRE.—Two cargoes of pig-iron, amounting to 420 tons, have arrived at Llanelly, one being from Workington and the other from Maryport. During the week 3387 boxes of tinplates have gone, per steamer, to Liverpool. The price of cokes rules about 15s. 6d., and slightly lower. On Saturday there was a large meeting of colliers at Llanelly, and the adoption of a sliding-scale and arbitration were strongly insisted upon by the speakers. The price of coal has advanced slightly. The anthracite trade is brisk. The weather is still very unfavourable for shipping and outdoor labour.

CLEVELAND.—There was a large attendance on 'Change at Middlesbrough on Tuesday, but scarcely any business was transacted, and the tone also was weaker than last week, while prices of iron in second hands are fully 3d. per ton below those ruling at the last market. The makers have still good supplies of orders, and will not reduce their quotations; but these are little better than nominal, for the few who are buying now are getting small lots from the merchants, and will not pay producers' figures. The chief cause of the unsatisfactory market is the decline in the shipments, though this is due largely to the bad weather; but the speculators have not failed to avail themselves of the opportunity this affords them to beat down the market prices. Up to Wednesday night only about 48,950 tons of pig-iron had been shipped from Middlesbrough, against 70,579 in the same period of October. A good deal of iron is due for shipment, but the merchants cannot take deliveries, as the steamers do not arrive to time. It is thought that stocks will show an increase this month, a thing they have not done for a long time. Makers still quote from 44s. 6d. to 45s. for No. 3 G.M.B., but merchants are taking 43s. 9d. for small lots of that quality, delivery next quarter. Forge pig is relatively stronger than No. 3, because it is not so plentiful, the furnaces having lately been put upon foundry iron, for which there was a better demand a little while ago. Only very small lots are being sold at 43s. 9d., but buyers are endeavouring to purchase at 43s. 7½d. Warrants can hardly be sold at all, and the utmost that can be got for them is 43s. for Connal's No. 3 f.o.b. warrants. It is apparent that those who have warrants will do best to keep

them until the spring shipping season has opened, for people will not buy unless heavy sacrifices are now made. The stock of Cleveland iron in Connal's stores on Tuesday evening was 101,566 tons, a decrease of 575 tons on the previous Tuesday. The shipments for the week ending November 18 amounted to 10,829 tons, against 15,211 tons during the previous week. Over 11,000 tons of pig-iron have been shipped this week already up to Wednesday night. The manufactured iron trade remains steady, but the mills are not so hard pressed with specifications as of late, and the consequence is that prices are a little easier, and are as follows:—Ship-plates, £6 12s. 6d. per ton; boiler-plates, £7 12s. 6d.; shipbuilding angle, £6; engineering angles, £6 5s.; sheets, £8; common bars, £6 5s.—all less the usual 2½ per cent; and puddled bars are £4 2s. 6d. per ton net. Few consumers are prepared to pay these prices. The foundry iron trade is dull, and pipe makers complain of a lack of orders. The output of steel is very fairly maintained just now, but the contracts are taken at a low figure. Shipbuilding in all its branches continues brisk, and fresh orders are reported to be coming in fairly well. Bessemer pig is dull; it can be bought at 56s. per ton f.o.b. net for Nos. 1, 2, and 3, West Coast ports. There is no change in the quotations of Cleveland and foreign iron ore. The coal trade is quieter for nearly all descriptions except households, as the consumers have now got fair stocks, and the quieter condition of the iron market is limiting buying.

DERBYSHIRE.—Taken as a whole, there has of late not been much change with respect to the state of the finished iron trade carried on in this locality. The furnaces are all fairly worked, and are producing a very good quality of pig-iron. Most of the foundries are only just able to keep going full time, even with the colliery repairs which are in hand. The house coal trade is steady rather than active; many of the leading pits in the Clay Cross, Staveley, and other districts are sending a large tonnage to London over the Midland line of railway. The Great Northern is doing a fair trade with the pits to which it has access. There is only a moderate demand for house coal at the land-sale pits, which work the thinner seams of coal. In gas coal there is a very fair business doing, and the same may be said with regard to locomotive coal for the use of the various railway companies. Slack and small coal is only in moderate request, and as very little coke is now produced in the district, prices of small coal are only low. South Yorkshire makers continue to send a very fair tonnage of coke into the district for the use of the furnaces there.

DURHAM.—The iron trade has been extremely quiet. This has been the case especially with pig metal, which has been in very slack request indeed. There has been no enquiry, and sales have been kept within the very smallest limits, and have been for present needs, there being no inclination to operate for the future. The middlemen have been doing what little business there has been in pig-iron, and their quotations are down fully threepence on the week, the dullness and low prices of the Scotch market to a large extent operating. The demand for next year's account is almost *nil*. Buyers just now seem inclined to wait. The quotations for pig metal are with merchants 43s. 9d. No. 3. Makers quote generally 48s. 6d. No. 1; 44s. 6d. No. 3; 44s. No. 4 foundry, and 43s. 6d. No. 4 forge. There are certain of the makers, however, who accept 44s. No. 3. There is no chance at the present time of doing business at the higher rates. The small shipments during the present month are a great drawback. They have so far been limited, so that many think they are likely to cause an increase of stocks when they come to be made up at the end of the month. The question of restricting the output of plates by working one day less per week has been a good deal talked of. There has been another meeting of the platemakers this week, and they are still considering the matter. There seems, however, to be an objection on the part of the leading firm in this county to the arrangement, and at present it seems rather doubtful whether it can be carried out. It is argued that ship-plates, to make anything like a fair profit, should be at least 15s. per ton more than they are at the present time, but it will probably be a matter of considerable difficulty to raise the rates to that extent. The steel trade is very quiet, and the reports from America of the rates of steel rails shut out all chance of English rails being successfully imported. The prices of manufactured iron are about:—Common bars, £6 5s.; best bars, £6 15s.; best best, £7 15s.; angles, £6; ship plates, £6 12s. 6d. to £6 15s.; boiler-plates, £7 15s.; sheets, £8, less 2½ per cent. Puddled bars, £4 2s. 6d. net. The bridge builders are well employed, and one of the Darlington establishments is being enlarged to meet the requirements. The household coal trade has been fairly active. At the same time, there has not been much inquiry as to cause a very active state of trade. The collieries have been able to keep their orders well in hand. There has been a good shipment of gas coal, and this week there has been more inquiry for steam sorts, as more vessels have arrived in the ports. Manufacturing coals are very firm, and the best for mill purposes range from 6s. to 6s. 9d., and for puddling and unscreened coal 5s. to 5s. 6d. at the pits. The figure for coke is unchanged. The price is firm at 12s. 6d. to 13s. 3d., delivered at the Teeside furnaces.

EAST WORCESTERSHIRE.—The demand for pig-iron is kept up. The number of furnaces in blast in South Staffordshire and East Worcestershire has been reduced by one. All-mine, hot-air pig-iron is quoted at £3 10s. to £3 12s. 6d. per ton; part-mine, £2 12s. 6d.; common iron, £2. Stocks show little increase up to the present time. The demand for finished iron has slackened somewhat, but quotations are steady, a state of things which has been still further strengthened by the ironworkers' demand for an advance of 10 per cent., as to which the President of the Mill and Forge Wages Board is to promulgate an early decision. Marked bars range from £8 12s. 6d. to £8 and £7 10s. Unmarked bars are £6 10s. to £6 15s. The strike in the rivet trade has almost wholly terminated, the great majority of the employers having agreed to give the advance asked for of 10 per cent. The notices of the horse-nail forgers for an advance of 3d. per 1000, and of the nail-makers for a rise of 10 per cent, expired on Monday. The bridge, girder, roofing, and gasometer works are actively employed. The coal trade is a little better, but the improvement is scarcely noticeable. The long-expected Miners' Conference at Tipton has resulted in the putting forward of sundry demands, which may or may not contain the germs of future disputes with the men. It was expected that a general assault would be made on the sliding-scale, but this happily was waved, and, although one or two speakers attacked it, the main exertions of the Conference seemed to be concentrated towards getting the present wages of thick and thin coal men (3s. 8d and 3s. 10d. per day respectively) recorded as a minimum in the scale. The Conference also passed a resolution in favour of a further advance of wages on December 1st next. As the state of trade is at present, however, it would scarcely stand another rise, which would simply mean greater underselling, and more extensive importation of "foreign" coal to these parts. A meeting of members of the coal trade will probably be called shortly to consider these questions. The fire-brick trade keeps very good, but competition is keen.

FOREST OF DEAN.—The iron trade of the Forest is not very brisk, and where quarter day orders have been executed this is more apparent. New business can be only regarded from the hand-to-mouth standpoint, and but for the "bookings" at last quarter-day, the district iron trade generally would afford very little of an encouraging character. Pig metal continues exceptionally light; in fact, it may be said there are no stocks in the Forest of Dean, and the output is despatched daily to meet orders. Quotations are less firm than they were a short time ago, and prospects have slightly given way. Manufactured iron shows no growth since last week. Tinplates are somewhat depressed in the market, and prices have receded. The district manufacturers are, withal, generally, making nearly full time. Iron ore is rather heavy in stock at the Dowlais mines. This firm decline to sell at present low prices, the West Dean proprietors being enabled to undersell them. Quotations range from 8s. to 12s. per ton, locally delivered. The coal trade has been of late surrounded by difficulties, arising from the wage question. This branch, however, is busier than was the case last week, the usual daily service of trains being strengthened by special ones. An enlarged rail tonnage has been done of late, and there are prospects of continuing. Quotations are from 10s. to 11s. per ton at banks. In the latter case the fuel (best quality) is chiefly disposed of to local customers. An important conference of masters and men took place on Monday to consider a series of questions relating to wages and other matters. After discussing, in detail the grievances of the colliers, the masters adjourned their decision, both in regard to an application for a further advance, as well as the several other matters which were advanced by the miners' representatives.

GLASGOW.—The warrant market has again been very depressed, and an enormous business has been done at declining prices. Holders seem to have got disgusted, and to have pressed their iron upon the market. New investors are still keeping aloof, and the chief buyers have been the "bears." The tone of the market is not at all satisfactory. A good trade is still being done in this district, and many works are well supplied with orders for a long time ahead, but reports from many of the English centres are getting unfavourable, and more especially the very bad reports from America are creating a fear that the demand for iron will fall off to such an extent, that stocks will again begin to increase. In the meantime, there is the utmost uncertainty as to what may be done: some say that the largest pig-iron makers are going to advance their miners' wages, so that the G.M.B. makers will also require to advance wages or lose the services of their best men. Makers have made almost no change in their prices, and are now asking relatively very much higher prices than can be got for warrant iron, and nearly all report favourably of the business they are doing. On Thursday warrants were steady at 49s. 10½d. to 49s. 11½d. cash, and 50s. 1d. to 50s. 2½d. a month; next day the market was stagnant at 49s. 11d. and 49s. 10d. cash. On Monday there was excited selling, from 49s. 9d. to 49s. 3d. cash, and 49s. 11d. to 49s. 7d. one month, and next day an immense business was done from 49s. 7d. to 48s. 10½d. cash, and 49s. 9d. to 49s. 1½d. a month. On Wednesday there was a slight rally, from 48s. 11d. to 49s. 3d. cash, and 49s. 1½d. to 49s. 5½d. a month. Closing buyers, 49s. 3d. cash, and 49s. 6d. a month. Sellers, ½d. per ton more. There are now 114 furnaces in blast, against 105 at this time last year. The shipments of pig-iron from Scotland last week were: Foreign, 7392 tons; coastwise, 3924 tons; total, 11,316 tons, against 11,153 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 639 tons, against 6930 tons in the similar period of last year. The total imports till November 18, 1882, are 211,872 tons, against 273,447 tons till November 19, 1881, showing a decrease for this year of 61,575 tons. The stock of pig-iron in Connal and Co.'s stores is now 616,372 tons, showing a decrease for the week of 1318 tons. The manufactured iron trade is, if anything, a shade quieter, though a steady trade continues to be done. The shipments of manufactured iron and machinery continue on a satisfactory scale. The shipbuilders continue briskly employed, and a number of new orders have recently been booked. Engineers are also busy, especially the locomotive builders, the Glasgow firms having just secured some extensive orders from the Indian Railways, which will give them full employment for a long time to come. Some of the founders are quiet, but many are heavily booked forward. The imports of Spanish iron ore keep up on a large scale, and prices are without change. The demand for all sorts of coal is active, even though the stormy weather on the East coast has greatly interfered with shipments. There is still a loud complaint of the scarcity of railway waggons. It is said a great number of men are leaving the ironmasters' pits and going to the sale coalmasters' pits, where they can earn about 5s. a week extra pay.

LANCASHIRE.—The iron market of this district is has continued very quiet during the past week. The large buying of a month or so back has been followed by a complete lull in the demand, and although makers are kept busy with deliveries against contracts, they are booking new orders only in very limited quantity. Consumers who are well supplied do not want to buy iron for present requirements, and as the tendency of the market is certainly not in an upward direction they are not induced to enter into speculative transactions at current rates. During the week prices have shown an easier tone, but the giving-way has not been so much on the part of makers as merchants, who have been offering second-hand iron, and in some cases for quoting forward delivery at under current rates. Lancashire makers of pig-iron are pretty well sold up to the end of March next, and although they are securing very few new orders, small odd sales are, with the deliveries they have to make under contract, more than sufficient to take away their present output, and stocks at works are being reduced considerably. Enquiries are made for deliveries over the first half of next year, but local makers are not disposed to go so far ahead, and they are firm at 49s. to 50s., less 2½ for forge and foundry qualities, delivered equal to Manchester. In district brands of pig iron the business doing is very small, but quoted prices are without material change. Lincolnshire averaging 49s. to 50s., less 2½, with Derbyshire brands about 1s. per ton more. The finished iron trade has quietened down considerably. The forges are still kept well employed, but old orders are being rolled off much faster than new ones are coming in, and shipping enquiries have recently only been limited in extent. Buyers with good specifications to give out would now be able in many cases to secure a substantial concession in price, and although makers, as a rule, still hold to £6 12s. 6d. and £6 15s. as their quotations, there are good brands of bar iron to be bought at £6 10s. per ton, delivered into the Manchester district. Sheets for which makers have been holding very firmly are also easier to the extent of about 2s. 6d. per ton. Founders of pipe and heavy castings are generally fairly employed, but it is upon work taken at low prices. Engineers are still generally well employed, and some of the large local firms have work on hand for some time forward, but unless new orders come in more freely than they have been doing recently, the prospects of prolonged activity are not very encouraging. The coal trade is quiet, but considering the exceptional pressure of a month or so back, a moderately good business is being done, and, except in the better classes of house coal, there is no material accumulation of stocks. Common round coals for iron-making and steam purposes are in fair demand, engine fuel also moves off tolerably well, and, notwithstanding the large supplies of slack, colliery proprietors are not disposed to contract forward except at an advance of 3d. to 6d. upon present rates. In the Manchester district the leading colliery proprietors are maintaining their recent advance in prices without difficulty, but at many of the West Lancashire collieries there is a giving-way of about 6d. per ton upon house fire classes of fuel. The average prices at the pit mouth are about as under:—Best coal, 10s. to 10s. 6d; seconds, 8s. to 9s.; common coals, 6s. 6d. to 7s. 6d; burgy, 5s.; and slack, 3s. 6d. to 4s. per ton. Shipments have been only small, partly in consequence of the scarcity of vessels; and delivered at the high level, Liverpool, or at the Garston docks, steam coal can be bought at 8s. to 8s. 6d., and seconds at 9s. to 9s. 6d. per ton. Coke is in good demand at about 10s. per ton for ordinary qualities at the ovens.

LEEDS AND WEST YORKSHIRE.—In Leeds there is but a slow demand for either best Yorkshire or common iron. Consumers of the latter are bought for nearly up to the end of the year. Then it is extremely probable that all sheet, bar, and angle iron will be ordered freely to begin the new year with. It is not expected that prices will be much different then to what they are now, nor that in the meantime they will fall below what they are at present, seeing that stocks were pretty well drawn upon when the brief spurt took place at the beginning of the quarter. The outlook for makers of best Yorkshire is not very bright. The Low Moor and Bowling iron works, especially the former, keep at a moderately good level of production in the boiler plate and railway rolling stock branches. There is no instability in prices, and nothing at all indicative of a movement for reviving quotations at the end of the year. There is nothing fresh to report this week with regard to steel making by the new process (new in this district except at Farnley), which two or three of our large firms have taken up. Locomotive builders have been negociating for new work to be entered upon in January, but it is not possible yet to announce any positive result. There is, however, a continual stream of such work going out at present, though not any quantity of it to one particular destination. Much of it is in execution of French, South American, Spanish, and other foreign orders, and for next year's employment orders from much the same countries are principally being relied upon. A few leading firms of special tool makers are engaged in first-class testing, shearing and turning tools, but, generally speaking, this class of work has fallen off during the present quarter. A good deal of iron bridge work is being done for a railway company in Queensland. Messrs. Dawson and Nunneley, of the Leeds girder works, have taken a contract to supply 400 tons of English wrought-iron roofing material for a new boiler shed at Messrs. Maudsley, Son and Field's engine works at East Greenwich. Portable railway plant is still finding its way in large quantities to destinations beyond seas. Work proceeds with tolerable regularity at the West Yorkshire collieries. All matters of difference between employers and employed seem to be settled, except the question of the reduction of output, to be debated at the National Conference, which is to be held in Leeds on December 5. No change in prices of either domestic or engine coal.

LIVERPOOL.—A steady, but dull, market continues. Buyers are not coming to the front yet to any extent, neither do sellers seem disposed to press their goods, and the intermediate men are consequently having an easy time of it—easier than they like probably. Pig-iron does not show much activity, for local requirements are never very heavy, and foreign ones are absent from the market. Some offers to America, based on rather advantageous rates of freight, brought no result, and the position with regard to the United States is defining itself slowly as not going to be very satisfactory for some months to come. The tinplate market continues inanimate and depressed, owing to the gloomy tone of American trade. A few good lines of special brands have been placed, indeed, on United States account, but there is a plethora of ordinary cokes offering at 15s. 6d. per box for I C. primes, without finding buyers. Wasters are, however, comparatively scarce, and are worth 3d. per box, more than the usual proportionate difference. The wire trade is pretty actively employed in the execution of

contracts for wire rods for the United States, and fencing wire for the Brazils and River Plate, and there has been a rather considerable fresh enquiry during the last few days for the latter places, due, it is supposed, to the favourable nature of the harvests and the wool yield. Shipments of wire have already been rather extensive, however. Bar iron is in somewhat lessened demand, with a weaker tone. North Staffordshire and the better class of Lancashire bar makers still hold out for £6 15s. delivered here for crown bars, but cannot get the figure, being underbid by merchants. Sheets and hoops are also easier in value, and decidedly feeling the effect of the opening of so many new mills. Plates and angles are not much enquired for, the chief demand coming from boilermakers, however, and on light parcels of light scantlings for export. The heavy losses at sea during the constant stormy weather of the last few weeks is leading to a limited demand among local shipowners for vessels to replace, and it is hoped that a few keels will fall to the share of the Mersey shipyards. The locomotive builders of Manchester and district are evidently extremely well-off for work, to judge from the following case:—A chemical manufacturer not far from here, having reason to require a small tank loco. for immediate use in his works, applied to the leading local works for cost of same and time of delivery, but was unable to secure an offer for one delivery earlier than the summer of 1884!

LONDON.—We have to notice a depression throughout the metal market, prices being generally lower than at the time of our last issue. Iron.—The demand for America being slack, there is not so much activity in pigs. Scotch warrants close 49s. 3d. Copper, easy but steady, £67 5s. spot bars. Tin.—There is a better tone and stronger prices. Fine foreign closes firm at £99 10s. cash; English ingots, £104. Tinplates, quiet. Cokes, 15s. 6d. to 16s. 6d., Liverpool. Lead, dull; soft Spanish, £13 12s. 6d.

NEWCASTLE AND THE TYNE DISTRICT.—This has been a quiet week in our local pig-iron market, exports having fallen off still more, and the business in hand has been curtailed by the detention of steamers abroad by the stormy weather at sea. Prices are quite 3d. per ton lower; No. 3 Cleveland pig sold is in moderate quantity at 46s. 3d. per ton, and No. 4 forge quality at 45s. 3d. delivered in the Tyne. Manufactured iron is quiet but steady. Ship-plates are changing hands at £6 15s. to £6 17s. 6d. per ton, whilst angle iron makes £6 2s. 6d. and bars £6 7s. 6d. per ton, delivered to the Tyne shipyards and wharves, less the usual commission. A good trade is passing in Spanish ores, and for Bilbao red ore the price is 8s. per ton, and the freight to the Tyne fully 9s. 3d. Iron shipbuilding prospects continue satisfactory; freights generally are improving, and the recent heavy losses at sea have had a tendency to quicken the demand for new vessels. Engine manufacturers also are exceptionally busy, and a great deal of pressure is used to get orders executed to make way for fresh work. The operative engineers are apparently in a contented mood, and in spite of the constant trades union outcry against overtime work, its opponents in this locality at least seem to be very few, judging from their readiness to earn as much as possible in that way. The fusion of the two firms of Sir W. G. Armstrong and Co. and Messrs. C. Mitchell and Co. into one limited liability concern has been the all-engrossing subject of conversation amongst all who are connected with mechanical engineering and iron shipbuilding down here. As regards the minor iron industries of the district, there is really nothing new to say. Forges and foundries are alike busy, and the chain and anchor trade is fairly prosperous. The coal trade, is on the whole, in a healthy state. Northumberland steam coals of the first quality are still sold for present shipment at 9s. per ton, less 5 per cent., and secondary sorts are in fair demand at 7s. 6d. to 8s., whilst small are selling readily at 3s. 6d. per ton. The colliery owners are still asking 10s. per ton for delivery of best steam in the first half of next year; but, as merchants and consumers to a man consider this an excessive price, no business is done. Gas coals are steady at the high rates recently quoted, viz., 7s. to 7s. 6d. per ton, f.o.b., less 2½ per cent. There is also an active demand for manufacturing sorts at 6s. 9d. to 7s. 3d., and for smithy coals at 6s. 6d. to 7s. House coals are improving again, and should frosty weather set in, a sharp rise is looked for in prices. Coke is steady, the export price being 14s. per ton for the best descriptions. Chemicals are dull and lowering in value; soda crystals sell at £2 15s. 6d., whilst soda ash makes 1¼d., less 1½ per cent., and bleaching powder about £4 net. Rouen cliff is in moderate request here at 4s. 6d. per ton. Firebricks go away in fair quantity for November; Cowen's keep at 55s. and Ramsay's at 45s., and lower qualities range from 31s. to 38s. per thousand. Cement has a good sale.

NEWPORT.—A steady business has been done during the week, and in some instances prices have been somewhat firmer. The pig-iron market again shows a slight improvement, Nos. 1, 2, and 3 Bessemer pigs are quoted at 56s. to 58s., and a very fair business has been done. The tone of the iron ore market continues firm, notwithstanding the heavy imports of this article from Bilbao and other places. Few contracts have been made for next year's delivery. Rubio is quoted at 15s. 3d. c.i.f., and Campanil Somprostro at 15s. 6d. c.i.f. The prices quoted in our last for the different kinds of manufactured iron still hold good, and the demand is kept up. The foundries and engineering works continue exceptionally busy. Steel is in good request, although little is being done in Bessemer blooms, which are quoted at £4 12s. 6d. to £4 17s. 6d. per ton. There is still great activity in the steel rail department, but no improvement to record with respect to prices. The tinplate trade remains in a very unsatisfactory state, and prices again show a decline. In many cases buyers can have their own terms. There is an increased demand for steam-coal, and the market is very firm. House coal and small coal are in excellent demand, and prices fully maintained. A high price is being obtained for pitwood owing to the scarcity of this article. It is expected that a large shipbuilding establishment will shortly be started at Newport. The coal clearances for the week (foreign) amounted to 32,993 tons, and coastwise to 14,907 tons, as compared with our last returns of 26,768 tons foreign, and 16,378 tons coastwise. Of iron, &c., 2395 tons left the port. The imports comprised 14,999 tons of iron ore from Bilbao, and 4000 tons from other places. Of pitwood only 762 tons were received.

NORTH STAFFORDSHIRE.—The quietude which has for several weeks characterised the finished iron trade of this district still continues, but it is not so marked as it was a fortnight ago. The general tone of the trade is of a more hopeful character, and both sellers and buyers seem to be of opinion that a turn for the better will shortly take place. It is well known by all connected with the trade that this is invariably the quietest quarter of the year, and merchants are reluctant to order except for pressing and immediate wants, being desirous of keeping down their stocks as much as possible, in view of the annual stocktaking and Christmas accounts. All orders coming in just now are for urgent requirements, which shows that stocks are already low, and doubtless before the end of the year heavier lots will be specified for, and contracts for future delivery entered into. The home market is inactive, as may be gathered from the foregoing; but there is a steady demand on foreign account, especially for the colonies and South America. Sales to Canada are few. Russia has lately ordered more than she has been in the habit of doing for a considerable period, but the early closing of the Baltic ports will unfortunately bring this desirable business to a close. Some of the plate mills are much pressed, but others are not fully employed. Hoops and heavy sections are in steady demand. Prices are firmer, and makers evince no great eagerness to enter lots of forward delivery. Pig-iron, especially of the better brands, is in good request, and rates are firm, at from 50s. to 55s., delivered equal to 40 miles. Ironstone finds a ready sale, and prices are well maintained. Puddled mine is quoted at 12s. 6d. to 13s. 6d., and furnace mine at 8s. 6d. to 10s., but the latter are not so firm as the former. Coal sells better, but rates do not mend. Some pits are pushed to meet requirements, but this is not in consequence of an increased demand so much as due to difficulty in getting men to work full time since wages were raised.

SHEFFIELD.—The iron market is considerably stiffer than was the case last week; and there is evidence of an improvement in prices, which will be maintained to the end of the year. One reason of this is that special efforts are being made to clear out orders before Christmas, and in order to obtain supplies special lines are being issued in the market. The ironworkers have not as yet made any further aggressive movements, and as there is a probability of work dropping off after Christmas, difficulties in this direction may be avoided. The men will certainly not receive advanced wages this year, and there are no indications of any great pressure of business that will occur at the immediate opening of the new one. In manufactured irons generally business is fairly brisk, more especially on plates and sheets, and many of the larger mills have orders on hand which will last for several months to come. In the armour-plate department there is unusual briskness. The Spezzia trials are, however, exciting great interest, as they indicate the advances which are being made in this department by the French leading maker. The armour-plate trade has for a long time been almost a speciality for English houses where superiority of material has been the question; but the Continental houses appear to be bidding for competition, even in this line. The final results of the trials is awaited with interest here. It will be noticed that in almost every market, and in almost every class of trade, French makers are advancing. In the cutlery branches they are even more formidable opponents than the German, because of the finish put on their goods, and it is with difficulty that they are beaten in many important branches of trade which form the staple here. Nothing but adhering to first-class workmanship can help some of the very oldest industries pursued here from falling into the hands of foreign competitors. The conduct of the colliers in causing a rise in the value of coal in the market is already being adversely felt. The season is fairly mild, and the demand for household coal not up to the average of this season of the year. The call for coal for commercial purposes is not excessive, and, from present indications, the advanced rates for fuel cannot be supported for long. The Australian and West African markets are both dull again; the latter especially so, owing to non-arrivals of produce. Electro-plate manufacturers are not very busy. Reports from travellers in London show business to be really dull there.

SOUTH STAFFORDSHIRE.—The reports from travellers who are "on the road" indicate that where deliveries are wanted this side Christmas the ironmongers have, in some of the branches, placed pretty much all the orders they care to give out until the new year. A few travellers have already returned home, and will not resume the road until January. The export orders that have come to hand this week are not of large extent; but manufacturers keep active, and in some branches even busy. Japanned coal vases are in large outturn of a great variety of qualities as well as styles. In London and some of the South of England centres vases wholly of polished brass are getting into increased sale, and complete toilet sets, water-cans, hot water jugs, candlesticks, waiters, crumb trays, mirrors, &c., made in this metal are also being put upon the market by an augmented number of japanners and tinplate workers. These goods are naturally very expensive. Trunks are going away in limited quantities in preparation for the holiday travelling season, and makers are realising better prices. The galvanised iron braziers are increasing their output, and the demand for alike wrought and cast hollow-ware is good. Safes are in improved call, and anvils and vices are going to foreign markets with briskness. New orders in the iron trade are scarcely so numerous, and here and there prices are slightly easier. But there is as yet no cause for complaint. Galvanisers allege this week that they can get some sheets (doubles) for hardly more than £9 per ton, but makers generally ask £9 10s. Common bars, £6 10s., and hoops £7, easy.

SWANSEA.—Iron ore has come to hand more abundantly during the past week; from Bilbao alone the imports numbered 2500 tons. For next year's delivery, however, there is but an indifferent enquiry. Iron is steady; the local works are well employed, and the general tone of the trade is healthy. But in this case, again, not much fresh business appears to be secured. Steel rails remain unaltered. General satisfaction is felt at the intelligence which has reached here that the Rhymney Company have taken the order for 7000 tons of 41½ lb. steel rails for the Indian State Railways. Stormy weather has again told upon the shipping, and lessened the briskness of an otherwise busy trade in coal exports. As it is, the steam coal clearances are represented by over 26,000 tons, and the patent fuel shipments by 5120 tons. Prices are fully maintained for all descriptions of coal, except, of course, anthracite. The trade in the last commodity is dull, most of the yearly contracts having been fulfilled. Patent fuel is firm, with indication of further advance. Pitwood is very high in price, in consequence of the restricted deliveries, 22s. to 22s. 6d. "into truck" is readily obtainable. Quotations for tin fluctuate from £90 to £100. The steam-freight market is unsettled.

WEST CUMBERLAND.—There is no change to report in the state of the hematite pig-iron trade this week. Business is slower than it has been for two months. The deliveries are inconsiderable, but the output of the works is not much reduced. Stocks, therefore, are naturally increasing, but not to such an extent as to necessitate the blowing-out of a furnace. There is a great sale of Bessemer iron, and although deliveries of late have not been extensive, it is anticipated makers will be able to maintain the production of iron through the winter. Business has been done to a large extent for delivery in the early part of next year, and a brisk spring trade is confidently looked forward to. The quotation this week is 56s. 6d. for mixed samples of Bessemer, with three months delivery. In some instances second-hand parcels have been sold at a lower figure for immediate delivery. There is a good employment in all the departments of the steel trade. Shipbuilders have booked fresh orders, and are busily employed; and the minor industrial branches are fairly employed. There is a steady demand for iron ore at 13s. to 14s. per ton of average samples. The coal trade is steady, prices showing an improvement.

SCOTCH PIG-IRON SHIPMENTS.

The table below (copied from the *Public Ledger*) is a comparative statement of the weekly shipments of Scotch pig-iron from the beginning of this year and the corresponding weeks of the previous four years, up to Nov. 18. The shipments were:—

Week ending		1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons	1878. Tons.
Jan.	7 ..	3,389	6,182	6,689	6,069	6,085
	14 ..	5,767	6,677	12,288	6,291	4,532
	21 ..	7,742	4,608	7,566	6,331	6,170
	28 ..	8,041	8,906	13,383	4,969	6,550
Feb.	4 ..	12,236	7,226	14,190	6,130	5,637
	11 ..	10,786	10,072	10,612	7,272	5,722
	18 ..	10,528	7,405	15,152	8,996	5,124
	25 ..	10,739	11,266	12,603	8,318	7,836
March	4 ..	12,600	9,900	17,968	13,910	6,816
	11 ..	13,287	8,261	23,985	10,743	8,662
	18 ..	17,544	7,893	20,987	11,167	7,725
	25 ..	12,375	12,262	23,598	9,463	11,499
April	1 ..	10,107	10,421	15,822	15,653	7,448
	8 ..	12,662	10,647	18,309	12,913	9,441
	15 ..	11,694	13,736	15,784	13,228	9,513
	22 ..	14,170	11,492	16,279	11,795	8,382
	29 ..	18,056	13,147	17,749	12,923	8,853
May	6 ..	11,387	9,461	14,799	13,135	9,348
	13 ..	14,982	10,718	13,123	9,919	7,820
	20 ..	12,122	9,532	11,036	11,415	10,742
	27 ..	9,760	11,943	12,819	15,434	7,362
June	3 ..	9,867	14,509	13,198	8,402	7,008
	10 ..	14,270	12,331	11,860	6,156	10,310
	17 ..	15,308	13,537	9,502	7,278	6,326
	24 ..	10,147	10,977	11,3[illegible]	7,074	7,175
July	1 ..	15,324	13,095	12,527	8,252	7,416
	8 ..	10,474	13,850	10,158	5,619	7,151
	15 ..	13,136	11,118	10,478	9 383	8,104
	22 ..	13,763	12,805	10,815	3,923	5,610
	29 ..	13,116	9,285	10,015	10,670	5,973
Aug.	5 ..	13,579	12,669	12,260	7,504	5,993
	12 ..	13,258	11,700	14,252	8,652	6,162
	19 ..	13,983	10,965	15 870	7,260	8,700
	26 ..	13,151	11,239	13,530	18,312	8,493
Sept.	2 ..	10,076	13,795	15,522	11,795	9,918
	9 ..	10,629	14,812	12,546	11,443	9,792
	16 ..	10,903	14,079	10,789	15,650	7,956
	23 ..	12 933	12,841	8,070	17,935	6,455
	30 ..	13,023	10,434	11,725	16,638	10,160
Oct.	7 ..	12,495	11,102	10,955	20,544	10,362
	14 ..	14,199	8,708	11,196	23,323	9,994
	21 ..	13.058	13,451	9.905	22,915	8,923
	28 ..	12,116	11,981	7,566	17,000	8,702
Nov.	4 ..	10,792	11,333	12,430	10,128	8,547
	11 ..	12,199	12,800	10,550	13,149	7,512
	18 ..	11,316	11,153	7,951	8,779	6,693
Totals	..	561,189	511,044	599,925	512,858	363 703

CLEVELAND PIG-IRON SHIPMENTS.

The following table contains comparative statements of the weekly shipments of Cleveland pig-iron from the beginning of this year and the years 1881 and 1880, up to last week, as well as the monthly shipments from January to October of 1882 and the previous four years. The shipments were:—

WEEKLY SHIPMENTS.

Week ending		1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
Jan.	7 ..	14,992	12,331	14,347	—	—
	14 ..	18,128	13,454	21,712	—	—
	21 ..	16,125	10,246	19,384	—	—
	28 ..	18,648	6,890	15,315	—	—
Feb.	4 ..	14,990	9,761	11,988	—	—
	11 ..	15,591	15,035	18,082	—	—
	18 ..	14,929	14,681	15,725	—	—
	25 ..	16,941	16,116	21,055	—	—
Mar.	4 ..	25,669	19,135	28,546	—	—
	11 ..	21,245	13,474	14,322	—	—
	18 ..	19,400	17,494	18,295	—	—
	25 ..	15,433	19,370	24,241	—	—

Week ending	1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
April 1 ..	19,850	20,498	12,138	—	—
8 ..	17,530	13,154	22,145	—	—
15 ..	14,934	19,390	18,835	—	—
22 ..	16,406	19,221	17,111	—	—
29 ..	16,286	22,946	20,878	—	—
May 6 ..	14,000	15,537	20,509	—	—
13 ..	16,841	15,395	19,239	—	—
20 ..	17,609	16,480	16,471	—	—
27 ..	16,801	21,426	21,648	—	—
June 3 ..	8,943	17,568	22,400	—	—
10 ..	17,678	19,796	18,368	—	—
17 ..	15,596	21,834	17,078	—	—
24 ..	15,715	21,827	12,312	—	—
July 1 ..	20,803	22,802	24,117	—	—
8 ..	18,473	15,265	18,613	—	—
15 ..	12,349	21,159	19,190	—	—
22 ..	14,218	22,046	17,362	—	—
29 ..	18,477	21,529	17,135	—	—
Aug. 5 ..	22,361	20,983	15,734	—	—
12 ..	21,199	15,982	17,651	—	—
19 ..	20,002	17,980	18,387	—	—
26 ..	18,864	21,923	14,667	—	—
Sept. 2 ..	20,536	15,027	20,609	—	—
9 ..	26,000	22,364	15,375	—	—
16 ..	25,491	16,866	14,472	—	—
23 ..	17,555	17,218	19,165	—	—
30 ..	27,395	19,903	19,657	—	—
Oct. 7 ..	26,079	26,941	15,922	—	—
14 ..	20,143	21,775	20,834	—	—
21 ..	24,357	13,358	27,593	—	—
28 ..	24,823	12,106	17,055	—	—
Nov. 4 ..	16,308	24,052	15,610	—	—
11 ..	15,211	19,741	20,617	—	—
18 ..	10,829	21,383	17,649	—	—
Totals ..	841,816	823,433	848,560	—	—

MONTHLY SHIPMENTS.

Month ending	1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
Jan. 31 ..	71,458	47,890	78,941	39,751	47,932
Feb. 28 ..	66,893	58,370	71,573	57,458	51,697
Mar. 31 ..	80,837	81,609	84,375	73,105	61,386
April 30 ..	68,909	78,894	88,018	65,250	69,256
May 31 ..	71,405	75,729	81,829	71,456	74,043
June 30 ..	68,373	91,577	82,186	60,808	68,804
July 31 ..	74,311	87,580	82,306	61,825	78,628
Aug. 31 ..	95,861	84,901	72,665	61,499	73,275
Sept. 30 ..	100,838	78,897	78,928	101,154	66,936
Oct. 31 ..	98,956	84,472	86,050	94,563	62,218
Totals ..	806,841	769,919	806,871	686,869	654,193

PROGRESS OF SMOKE ABATEMENT.—At a meeting of the Smoke Abatement Committee held on Saturday last at the offices, 44, Berners Street, under the presidency of Mr. Ernest Hart, it was announced that the Board of Trade had finally approved of the formation of a Smoke Abatement Institute and of the articles of association, and that the Duke of Westminster, the Duke of Northumbeland, and the Duke of Sutherland had accepted the offices of vice-presidents, and Mr. Ernest Hart the office of president of council. Communications were read from the Foreign Office, enclosing official documents communicated to the Senate of the United States by the President of the United States, containing a detailed and important report which Dr. Hopkinson, F.R.S., had made on the Smoke Abatement Exhibition at South Kensington for the information of the American Government, as directed by the American Minister upon cablegram instructions from the American Government. Official communications were also read from New Zealand, the Dominion of Canada, and Chicago, conveying information as to the steps taken in those countries on the impulse given to the question by the action of the Smoke Abatement Committee, and requesting information as to appliances and legislative measures which was ordered to be furnished. It was announced that the volume containing the reports of the jurors, with detailed tabulations of tests, forming a work of important character and permanent value, with a considerable body of illustrations, was now in the press, and was being published by Messrs. Smith, Elder, and Co. Mr. T. W. Cutler, F.R.I.B.A., and Mr. J. Lowry Whittle were appointed a sub-committee to report on the question of the formation of a museum and permanent exhibition of smoke-abating kitcheners, grates, and industrial appliances for public use and information. Mr. Kegan Paul (hon. treasurer) presented the audited accounts, which were audited by Messrs. Turquand, Young, and Co., and were ordered to be printed and circulated. It was announced that upwards of £200 had been subscribed towards the funds of the new Smoke Abatement Institute. A resolution was laid on the table which had been adopted by the Corporation of the City of London, who had appointed a committee to study the question of smoke abatement in London, and to consider the defects of present legislation and the advisability of taking more urgent measures for the abatement of smoke. Arrangements were reported of meetings to be held at Higher Broughton and in the pottery district with the like object. Other business of an important nature was transacted, and the meeting was adjourned.

THE CONTINENTAL IRON AND COAL TRADE.

AUSTRIA:—With the exception of a slight decrease in the orders of merchants, the iron and steel works of Austria have still ample orders in hand, for several months ahead, partly for engineering establishments, partly for railways. Locomotive and carriage builders especially are large consumers of iron and steel. In consequence, pig-iron keeps very firm, and as advances are expected in merchant iron, the former is not likely to give way. Building iron, and more particularly material used for bridge construction, enjoys a good demand. Steel rail mills are very busy. It will take some time before the contracts for rails in hand are worked off. The following are the quotations at works:—

	Oct. 17. Florins.	Nov. 16. Florins.
Styrian and Carinthian charcoal pig, white	52 — 54	51 — 54
Ditto grey	54 — 56	53 — 56
Ditto Bessemer	56 — 59	56 — 59
Bohemian and Hungarian pig-iron	43 — 47	44 — 47
Moravian and Silesian pig-iron	45 — 47½	45 — 47½
Spiegeleisen	65 — 75	65 — 75
Styrian and Carinthian bar iron	123 —125	123 —126
Bohemian bar iron	110 —115	110 —115
Moravian and Silesian bar iron	112 —117½	112½—117½
Hungarian bar iron	115 —117½	115 —117½
Sheet iron	167½—195	167½—195
Rolled wire	140 —180	140 —180
Joists	127½—132½	127½—132½
Steel rails	115 —125	115 —125
Old rails (at Vienna)	87½—102½	87½—100

The coal trade continues to be very active in all the coal basins of the Austrian Empire. Household, as well as industrial, fuel is much enquired after, and prices are firm. The railway companies and ironworks have concluded large contracts within the last few weeks.

BELGIUM.—Although the Belgian iron market displays a firm tendency, it is difficult to describe its actual state. Raw materials, coke and pig-iron, being very firm, it would follow, as a matter of course, that manufactured iron ought to be firm also. This would be the case under ordinary circumstances, but, as a matter of fact, the finished iron trade is not so uniformly well employed as to warrant a firm feeling. While some of the forge-masters are full of work, and therefore confident, there are others, less fortunate, who are unable to refill their order books, and therefore display some anxiety as to the future. Pig-iron, as we remarked above, is firm. Native foundry pig is quoted at Charleroi at 75 fr., forge qualities at 60 fr. to 62 fr. 50 c. Finished iron is fairly steady. Bar iron is selling at 135 fr. and 140 fr. Joists are firm at 145 fr. to 150 fr., angle iron at 150 fr. to 155 fr. There is less enquiry for plates, the general quotation being 190 fr. Boiler plates are steady at 210 fr., and fine plates at 270 fr. to 290 fr.

Great activity prevails in the Belgian coal market, the demand being well sustained, especially for industrial fuel and coking coal. Domestic fuel is also meeting with a good enquiry. There are no stocks. Under these conditions, a rise appears inevitable, but at present prices are firmly maintained. "Gailleteux" are selling readily at 11 fr. 50 c. and 12 fr.; domestic fuel at 13 fr. to 15 fr. in the centre and at Liége, but at 16 fr. and 17 fr. in Hainault. The demand for "bouilles" and "gaillettes" is slightly slacker, and the former remain at 20 fr. to 22 fr., the latter at 22 fr. to 24 fr. Small coking coal are very firm at 11 fr. 50 c. and 12 fr. Unwashed coke is at 19 fr.

FRANCE.—A well-marked quietness prevails in the French iron market. This has been slowly but surely coming, and will surprise no one who has followed the movement of business in France lately. Most consumers, both of the raw and finished product, have been buying largely during the last two months, and have covered their requirements for several months in advance, some for the whole of next year. But this apparent quietude notwithstanding, prices are as firm as ever, and they are not likely to move in a downward direction for the next few months. In the pig-iron market of the Meurthe-et-Moselle, business is maintaining its steady course. Foundry continues in active enquiry. Prices are 90 fr. for No. 1, 88 fr. for No. 2, 82 fr. to 84 fr. for No. 3, and 80 fr. to 82 fr. for No. 4. Very little forge pig remains for disposal; but actual sales are effected at 70 fr. for white, 71 fr. for white-mottled, 72 fr. for grey-mottled, and 73 fr. for grey descriptions. In the Haute-Marne, prices have undergone no change. Coke iron is still selling at 210 fr.; mixed brands, at 230 fr.; charcoal iron, at 240 fr.; wire rod, at 225 fr.; hammered iron and crude axles, at 250 fr. per 1000 kilogrammes. There is quietness in the Nord; but the absence of new business will enable forgemasters to work off old orders, with which they are much in arrear. At Paris quotations are still weak; merchant iron selling at 195 fr., and plating sections at 200 fr. and 205 fr. For the last twenty-five years the manufacture of charcoal iron (both pig and finished) has decreased in France to an enormous extent. Amongst the departments which have preserved that manufacture, the Landes undoubtedly ranks first. In 1880 the output of charcoal iron in the whole of France was 45,422 tons, and of this quantity the Landes supplied 16,935 tons. Since that time the output has been still more active. Present quotations, per 1000 kilogrammes for iron in the Landes, are as follows:—Grey charcoal pig, 135 fr.; mottled charcoal pig, 132 fr.; white charcoal pig, 130 fr.; charcoal bars, 300 fr. to 310 fr. In the Gironde, English pig is unchanged. Present quotations, per 1000 kilogrammes, are —Glengarnock, No. 1, 105 fr.; Eglinton, No. 1, 100 fr. to 102 fr.; Cleveland, No. 3, 85 fr. to 90 fr.

GERMANY.—The German iron market continues quiet, but steady. In Westphalia, blast-furnaces are in full activity, working off orders received. The reduction, by 2 marks, of puddling pig has had the effect of leading to new business. The furnaces of the Siegen district are stated to have concluded a convention, in order to have prices more under their control. There is a large consumption of foundry and Bessemer pig, but German makers are hard pressed by English competition, English foundry pig having been reduced at Dortmund another mark, to 43 marks, and Bessemer pig 2 marks, to 56 marks. Manufactured iron works are satisfactorily employed, and the larger establishments have still ample work in hand, so that it has been found possible to maintain the convent onal quotation of 145 marks for bar iron. Smaller makers, however, are offering bar at 140 and even 135 marks. The steel trade is very active. Ironfounders and engineering establishments are well off for work.

At Dortmund, the quotations for iron and steel, per 1000 kilogrammes at works (English descriptions per ton at port of shipment), are:—

	Nov. 13. Marks.	Nov. 20. Marks.
White-grained puddling pig ..	62	62
Spiegeleisen	76—78	76—78
German foundry pig No. 1 ..	75	75
German foundry pig No. 2 ..	72	72
German foundry pig No. 3 ..	66	66
German Bessemer pig	70	70
English foundry pig No. 3 ..	44	43
English Bessemer hematite pig .	56—58	56
Luxemburg pig	47½	47½
Bar-iron	140—145	135—145
Fine-grained iron	165—170	165—170
Angle-iron	150	150
Joists	150	150
Boiler-plates	215—220	215—220
Boiler-plates No. 2	205—210	205—210
Fine Siegen plates	185	180—185
Fine-grained plates	250	250
Charcoal plates	275	275
Low Moor plates	305	305
Bessemer steel rails	152—160	152—160
Bessemer steel rails (defective)	135	135
Bessemer steel pit rails	145	145
Iron pit rails	140	140

In the German coal market prices are firm. Collieries are scarcely able to meet the demand for industrial, gas, and coking coal. Great activity prevails in coke, which is also very firm in price. At Dortmund, quotations per 100 cwt. at the pit's mouth or at coke ovens are as follows:—

	Nov. 13. Marks.	Nov. 20. Marks.
Best coal (Stückkohle)	45—50	50
Cobbles	40	40
Large washed nuts	35—42	35—42
Washed smith's coal	34—35	34—35
Washed coking coal	28—30	28—30
Inferior coal	20—24	20—24
Gas coal	36—40	36—40
Mixed coal	30—35	30—35
Prime coke	65—70	65—70
Patent coke	70—78	70—78
Small coke	45—50	45—50

SWEDEN.—The following figures show the exports of metals from the city of Stockholm during the ten months of this year, as compared with the same period of last year:—

	1882. Tons.	1881. Tons.
Bar iron	24,323	18,703
Pig iron	12,681	11,686
Manufactured iron	4,273	3,186
Blooms	2,134	1,186
Iron plates	1,226	671
Scrap iron	275	242
Nails	555	535
Steel	642	577
Wrought iron	180	260
Iron wire	1,020	994
Railway wheels and tires	78	426
Rails	3	½
Spades	11	33
Saw blades	2	7
Castings	50	130
Copper	11	298
Zinc	6	8
Brass	30	23
Lead	15	2
Tin	½	¾
Iron ores	280	1,190
Lead ore	4	—
Bronze	2	1½
Sulphur	77	9
Machinery and tools	£13,000	£9,000
Railway material	£25,000	£300

There is but little activity in the Swedish market.—We informed our readers last year that during this winter it would be possible for purchasers of Swedish iron to obtain their supplies without regard as to ice in the port of Gothenburg, the Corporation of that town having purchased a powerful ice-breaker. This vessel, which has been building at Motala Mekaniska Verkstad during the summer, will be ready for delivery next month. She is built entirely of Swedish Bessemer steel, and will cost £16,200. The government mines bill, which has been promised for several years, has so far progressed that it will probably be laid before the next Diet. In consequence of the measure abolishing the right of "inmutning" existing in Sweden, by which the discoverer of a metal lode or a mineral deposit may work the same for his own benefit irrespective of the ground owner, an influential meeting of mine-owners, convened at Orebro a few days ago, decided to oppose the same. The school for teaching charcoal-burning, which was established 11 years ago by the well-known Swedish Iron Board (Jernkontor), and which is under the direction of Prof. Holmerz, had just completed a course, attended by thirty students. To date the school has passed 375 students, who have received thorough instruction in nine methods of charcoal burning. The Atvidaberg Copper Company has commenced reducing copper at their works by the so-called "wet" method. The ores are first roasted cold, then crushed and sorted. The powder is afterwards placed in cisterns, containing saltpetre and sulphuric acids, which separate the metal, and cause it to deposit on iron plates in the bottom. The mass is collected, dried, and then smelted into ingots in furnaces.

The method is considered to be cheaper than the shaft-furnace smelting, while at the same time returning more silver.

SCOTCH PIG-IRON QUOTATIONS.

(From the *Glasgow Herald*.)

	New York, Wednesday.					
	Th.	Fri.	Sat.	Mon.	Tu.	Wed.
Gartsherrie (in yard)	26½	26½	26	26	26	26
Coltness (at quay) ..	27½	27½	27½	27½	27½	27½
Langloan	26½	26½	26½	26½	26½	26½
Glengagnock ...	25	25	25	25	25	24½
Carnbroe	25	25	25	25	25	24½
Summerlee	26½	26½	26½	26½	26½	26½
Eglinton (at quay) ..	23½	23½	23½	23½	23½	23½
Shotts	27	27	27	27	27	27
Calder	—‡	—‡	—‡	—‡	—‡	—‡
Carron	24½	24½	24½	24½	24½	24½
Dalmellington ..	24	24	24	24	24	24
Kinnell	24	24	24	24	24	24

‡ None here.

NEW PATENTS.

ALL the patents are placed alphabetically, with the official numbers attached. The new applications range from No. 5416 to No. 5519, being the entries from Nov. 14 to Nov. 20, 1882.

NEW APPLICATIONS.

Administering Injections or Douches.—*T. G. F. Darby, Dulwich, Surrey.* [5488

Apparatus for Deodorising and Disinfecting Purposes.—*F. J. Austin, Merton Cottage, Bath Road, Hounslow, Middlesex.* [5416

Appliances for Saving Life at Sea.—A communication.—*F. Wolff, Copenhagen, Denmark.* [5511

Anchors.—*J. H. Kidd, Wrexham, Denbigh.* [5448

Anti-Fouling and Preservative Compounds for Ships' Bottoms, &c.—*J. and T. Kirkaldy, 40, West India Dock Road, Middlesex.* [5484

Basting Meat whilst Cooking.—*J. Reynolds, Henwick Lodge, Worcester.* [5467

Barbed Wire.—A communication.—*O. W. Malet, Manson Place, Queen's Gate, South Kensington, Middlesex.* [5512

Bedsteads.—*S. B. and S. I. Whitfield, Birmingham, Warwickshire.* [5401

Bleaching, &c., Cotton.—A communication.—*J. C. Mewburn, 169, Fleet Street, Middlesex.* [5471

Boots.—A communication.—*J. Wetter, New Wandsworth, Surrey.* [5491

Bottles and Stoppers.—*S. M. Bixby, New York, U. S. A.* [5439

Bolking, &c., and Refilling Tea into Boxes.—*B. Tydeman, Manor House, Orpington, Kent.* [5493

Caps for Securing the Ends of the Ribs of Umbrellas, &c.—A communication.—*C. A. Allison, 41, Southampton Buildings, Middlesex.* [5420

Cast Tubes of Gold.—A communication.—*T. Morgan, 27, Cockspur Street, Charing Cross, Middlesex.* [5514

Chairs.—*W. Kean, 69, Scrutton Street, Shoreditch.* [5460

Chucks for Lathes and other Machines.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5462

Cigarettes.—*J. Clarkson, Apperley Bridge, York.* [5413

Compound for Rendering Animal Fibres Water Repellent, and Proof against Moths, &c.—*C. B. Warner, 1, South Place, Finsbury, Middlesex.* [5481

Conduction, &c., of Electric Currents.—*R. E. B. Crompton, Mansion House Buildings, Queen Victoria Street, Middlesex.* [5438

Construction of Railways.—*E. N. M. Hepworth, Manchester, Lancs.* [5453

Devices for Erasing Pencil Marks.—*L. Wolff, York Road, Battersea, Surrey.* [5515

Distributing Electricity by means of Underground Conductors.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5518

Dyeing Cotton Wool, &c.—A communication.—*W. E. Gedge, 11, Wellington Street, Strand, Middlesex.* [5513

Electric Arc Lamps.—*W. B. F. E. Baron Elphinstone, Carberry Tower, Musselburgh, N. B., C. W. Vincent, Holloway, Middlesex, and J. Cottrell, Brixton, Surrey.* [5495

Electric Light Switches.—*C. Maynard, 10, Ann Street, Islington.* [5499

Envelopes.—A communication.—*R. Edwards, 40, Southampton Buildings, Middlesex.* [5463

Envelopes.—*R. B. Hayward, Addle Street, Middlesex.* [5485

Extraction, &c., of Salt or other Crystals from Liquids.—*J. Maynes, 36, Anderton Street, Harpurhey, Manchester, Lancashire.* [5442

Fastening Buttons with Eyes to Boots.—A communication.—*W. M. Brown, 38, Southampton Buildings, Middlesex.* [5418

Filtering.—A communication.—*W. P. Thompson, 6, Lord Street, Liverpool, Lancs.* [5450

Fixing Bolts.—*R. Howarth, Wolverhampton, Staffs.* [5417

Floor Coverings.—*S. Rawkesworth, Scarborough, York.* [5472

Frames for Pictures, &c.—A communication.—*A. J. Boult, 323, High Holborn, Middlesex.* [5431

Gas Motor Engines.—*J. Maynes, Anderton Street, Harpurhey, Manchester, Lancs.* [5510

Hammocks.—*A. Pratt, New York, U. S. A.* [5436

Handles for the in Carving Meat.—A communication.—*H. Lake, Southampton Buildings, Middlesex.* [5516

Heating, &c.—*C. R. Stevens, Lewisham, Kent.* [5435

Hydraulic Pressure Valves.—*H. Berry, Howard Street, Gloucester.* [5457

Improved Automatic Door Fastener for Railway Carriages.—*T. Scourfield, 33, Mostyn Road, Bow, Middlesex.* [5468

Incandescent Electric Lamps.—*A. Swan, Gateshead, Durham.* [5504

Indicating Amounts of Monies Received.—*S. H. and J. C. Boswell, Norwich, Norfolk.* [5494

Integrating Apparatus.—A communication.—*J. Amsler, 28, Southampton Buildings, Middlesex.* [5519

Lace Edging or Border with Fringe.—*R. J. S. Joyce, 18, Aldermanbury, London.* [5434

Ladies' Dress Bodice Forms.—A communication.—*S. Scott, Manchester, Lancs.* [5500

Lithographic Presses.—*R. B. Hayward, Addle Street, Middlesex.* [5444

Looms for Weaving.—*G. R. Snowden, and O. Ball, Bradford, York.* [5475

Lubricator Attachments for Railway Engines.—A communication.—*P. M. Justice, Southampton Buildings, Middlesex.* [5416

Making Electrodes for Secondary Batteries.—*H. Woodward, Shepherd's Bush, Middlesex.* [5422

Manufacture of Cocoa and Chocolate.—A communication.—*B. P. Wilding, 23, Rood Lane, Fenchurch Street, Middlesex.* [5005

Marking or Scoring in Card Playing.—A communication.—*G. F. Redfern, 4, South Street, Finsbury, Middlesex* [5419

Mills for Grinding Grain.—*R. Young, Glasgow, Lanark.* [5482

Motor Engines.—*C. Cinzio, Carouesso, Ticino, Switzerland.* [5477

Moles for Spinning, &c., Wool.—*J. E. Heppenstall, Milnsbridge, Huddersfield, York.* [5478

Musical Instruments.—*W. Booth, Rochdale, Lancs.* [5432

Obtaining Motive Power.—*L. L. Hollier, and G. Asher, Birmingham, Warwick.* [5003

Ornamental Nails.—A communication.—*A. J. Boult, 323, High Holborn, Middlesex.* [5517

Ornamental Tiles or Blocks of Earthenware.—A communication.—*J. Wetter, New Wandsworth, Surrey.* [5445

Packing, &c., for Pipe Joints.—*C. Wheeler, Newbury, Berks.* [5490

Pencil Cases.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5461

Pianofortes.—*W. Fischer, Leipsic, Saxony, Germany.* [5483

Pianofortes.—*W. H. Squire, 93, Camden Street, Camden Town, St. Pancras, Middlesex.* [5469

Potash and Soda.—A communication.—*A. M. Clark, 53, Chancery Lane, Middlesex.* [5481

Preparing Asbestos for Spinning.—A communication.—*J. C. Mewburn, 169, Fleet Street, Middlesex.* [5507

Preservation of Milk.—*M. E. and O. E. Pohl, Liverpool, Lancs.* [5437

Preventing the Displacement of Keys or Wedges.—*J. Williams, and D. Edwards, Cardiff, Glamorgan.* [5452

Printing Machines.—*W. W. Taylor, Ripon, York.* [5474

Producing Architectural Ornamentation, &c., from Wood Pulp.—Partly a communication.—*L. A. Groth, 30, Finsbury Pavement, Middlesex.* [5508

Producing Magnesium.—A communication.—*L. A. Groth, 30, Finsbury Pavement, Middlesex.* [5509

Proportional Reducing Valves.—*A. W. Quinlan, Glasgow, Lanark, N. B.* [5002

Pulverising Sand, &c.—*J. Nicholas, Illogan, Cornwall.* [5454

Putty.—*G. A. Biddis, Newbury, Berks.* [5436

Railway Lamps.—*J. Thomas, 357, Caledonian Road, Holloway, Middlesex.* [5426

Railway Sleepers.—*W. R. Polley, Old Brompton, Kent.* [5499

Rolling Mills.—*F. Asthower, and T. Bicheroux, Annen, Westphalia, Germany.* [5449

Rotary Gas or Explosion Engine.—A communication.—*J. C. Mewburn, 169, Fleet Street, Middlesex.* [5006

Saggers for Baking Pottery ware.—A communication.—*J. H. Johnson, 47, Lincoln's Inn Fields, Middlesex.* [5497

Screw Bolts, &c.—*T. Hancock, Wolverhampton, Staffs.* [5489

Self-Acting Buckets, &c., for Raising, &c., Grain and other Cargoes.—*G. M. Key, and J. Lowrie, Limehouse, Middlesex.* [5501

Self-Emptying Centrifugal Machines with Continuous Movement.—A communication.—*E. A. Brydges, Berlin, Germany.* [5440

Self-Recording Lever Weighing Machines.—*T. Williams, jun., Myddelton Square, Middlesex.* [5473

Separating Fats, &c., and Obtaining Glycerine, &c. from them.—A communication.—*W. P. Thompson, 6, Lord Street, Liverpool, Lancs.* [5166

Sewing Machines.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5451

Ships' Hatches.—*E. T. Pawley, Cardiff, Glamorgan.* [5476

Slaying Warps.—*B. L. Hattersley, and W. Greenwood, both of Keighley, York.* [5487

Sliding Gasaliers, &c.—*G. and E. Atkins, Birmingham, Warwick.* [5447

Solution for Washing, &c., Wearing Apparel.—*S. Hulme, Brook Street, Manchester.* [5413

Sounding the Depth of the Sea.—*W. J. Mackenzie, Glasgow, Lanark, N. B.* [5450

Spindle Mountings of Spinning Machinery.—*R. N. Cotterill, Bolton-le-Moors, Lancs.* [5479

Spinning, &c.—*J. A. and T. H. Dewhurst, and R. Cornthwaite, all of Skipton, York.* [5464

Steam Packing.—*H. W. Johns, New York, U. S. A.* [5428

Steering Vessels.—*W. Pepper, Kingston-upon-Hull.* [5423

Stones for Lithographic Printing.—*P. Stuart, Edinburgh, Midlothian, N. B.* [5441

Storage, &c., of Grain for Bread Making.—*K. J. Dance, Chadwick Road, Kent.* [5429

Stoves.—*S. Slater, Oldham, Lancs.* [5496

Thermo-Electric Generators.—*H. Woodward, Shepherd's Bush, Middlesex.* [5421

Tipping Coal, &c., from Railway Trucks.—*P. G. B. Westmacott, Elswick Works, Newcastle-upon-Tyne.* [5480

Tobacco.—A communication.—*J. Howard, 3, Pier Road, Erith, Kent.* [5470

Transit Instruments.—*J. L. Clark, 6, Westminster Chambers, Victoria Street, Westminster.* [5485

Treatment of Coal, &c.—*J. Jamieson, Akenside Hill, Newcastle-upon-Tyne.* [5498

Tricycles.—*W. J. George, Birmingham, Warwick.* [5477

Utilisation of Residues.—*J. Longmore, Liverpool, Lancs* [5465

Valves for Controlling Steam.—A communication.—*J. Wetter, New Wandsworth, Surrey.* [5455

Wheels of Carriages.—*W. J. Fraser, 98, Commercial Road East, Middlesex.* [5468

Web-Printing and Folding Machines for Delivering, &c., Newspapers.—*T. Sowler, and W. Pattison, Manchester, Lancashire.* [5444

ABSTRACTS OF SPECIFICATIONS RELATING TO METALS

Published during the week ending Nov. 18, 1882.

(Prepared by PHILIP M. JUSTICE, 53, Chancery Lane, W.C.)

Metallic Pens.—1722 (1882).—*Morgan-Brown*, communicated by B. Lawrence. Provisional Protection only.—A blank is struck out for the pens with a point or nibat each end, middle portions of the blank being struck out at the same time, and afterwards slit to form two pens.

Sheet Lead.—1750 (1882).—*W. Barr.* Provisional Protection only.—The sheets are cast at the start of almost the ultimate thickness required, so as to require but little subsequent lamination or other treatment. The metal is cast from a travelling crucible on to a polished bed, and when cooled, is rolled to the required gauge.

Manufacture of Wire.—1762 (1882).—*J. Westgarth.*—The wire is of the double-headed rail section, and is twisted so as to form a double thread, the web of the wire forming the core. In the manufacture the wire is first cold-rolled into the double head section and afterwards twisted.

Manufacture of Iron and Steel.—1763 (1882).—*H. C. Bull.*—The blast furnace is of the usual form and size, and is supported by columns based on the foundation, and has a refractory lining which is first fired or burnt. A chamber forming an oven lined with firebrick directly over the charging opening of the furnace is provided for calcining and drying the ore before it is admitted into the furnace. A heating stove is also provided, in which the combustion chamber is formed at the top, which prevents the column of firebrick crushing in from the weakening at the base. A group of eight gas producers, suitably lined, are employed to deliver a stream of hot gas constantly into the blast furnace. The above arrangement of apparatus is employed to produce iron direct from the ore.

Increasing Diameters of Tubes.—1777 (1882).—*S. Fox.*—A lathe headstock is employed, fitted with a revolving mandril and chuck; said chuck is provided with a number of radial guide slots on its face, carrying bosses or rollers; these revolving rollers or bosses are furnished with anti-friction rollers between their respective studs. Said bosses are formed to expand by means of sliding blocks and rollers. When the end of a tube is required to be expanded, the end is heated red hot, and expanded by means of the bosses.

Horseshoes.—1781 (1882).—*Johnson*, communicated by J. Moore. Provisional Protection only.—The heel part of the shoe is provided with an indiarubber pad or cushion, to prevent jarring.

Nut and Bolt Blanks.—1795 (1882).—*Clark*, communicated by A. Marland and T. Neely.—The machine is composed of a forming die, and four principal tool-carrying parts; the blanks are cut of a proper length from a rod or bar compressed and punched from opposite ends by means of two punches, which meet each other.

Pickling Metal Plates.—1808 (1882).—*J. R. Turnock.*—The pots containing the pickle and water for swilling are movable, being suspended so that they are capable of receiving a reciprocating motion by means of a connection with a crank, this movement causing the liquid to flow to and fro against the plates. The racks in which the plates are held are provided with wheels travelling on an overhead way to the places for loading and unloading.

Siliceous Copper and Bronze.—1824 (1882).—*Mewburn*, communicated by L. Weiller.—Into a plumbago crucible containing copper is introduced a specified quantity of the following mixture: fluosilicate of potass, pounded glass, chlorids of sodium, carbonate of soda, carbonate of lime, and chloride of calcium in specified proportions, the silicium and sodium in this mixture absorbing all the oxides present in the mass.

Refining Metals.—1836 (1882).—*Barlow*, communicated by J. L. O. Seyboth.—The object is to purify and improve metals and metallic compounds, by adding to them certain salts mixed with charcoal cellulose or paper pulp, from which salts their respective metalloids, such as kalium, natrium, phosphor, &c., are formed in the melting heat of the metals to be purified, while the impurities are carried to the top of the crucible to be skinned off.

Reducing and Purifying Metal.—1831 (1882).—*R. S. Ripley.*—The ores to be reduced are pulverised, and a proper admixture made with the materials requisite for fluxing and purification. The powder falls through an orifice calculated to deliver a given quantity per second, and passes through an intense flame from a number of blow-pipes, which speedily reduces the metal.

METROPOLITAN BOARD OF WORKS.

Return *of the Testings made at the Gas Testing Station during the Week ending November 21, 1882.*

Company and District.	Illuminating Power.* (In standard sperm candles.)			Sulphur. (Grains in 100 cubic feet of gas.)			Ammonia. (Grains in 100 cubic feet of gas.)			Sulphuretted Hydrogen.	Pressure.†
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
Gas Light and Coke Company.											
Notting Hill ...	17·1	16·8	16·9	8·9	7·1	8·1	0·1	0·0	0·0	None	In excess.
Camden ..	17·3	16·5	16·9	11·7	9·7	10·7	0·2	0·1	0·1		
Dalston... ..	17·8	16·4	16·8	13·4	11·3	12·4	0·1	0·0	0·0		
Bow	17·5	16·5	17·1	17·6	15·3	16·4	0·4	0·1	0·3		
Chelsea... ..	17·3	16·4	16·9	12·0	10·2	11·0	0·1	0·0	0·0		
Kingsland Rd.	17·1	16·7	16·9	13·9	8·4	10·3	0·2	0·0	0·1		
Westminster (cannel gas)..	20·7	20·4	20·6	19·0	14·7	15·6	0·3	0·0	0·1		
South Metropolitan Gas Company.											
Peckham ...	16·7	16·4	16·5	13·5	8·5	11·2	0·4	0·0	0·2		
Clapham ..	17·2	16·4	16·6	14·0	8·4	12·3	0·0	0·0	0·3		
Tooley Street ..	17·1	16·3	16·6	12·6	10·4	11·6	0·5	0·2	0·3		
Commercial Gas Company.											
Old Ford ...	16·6	16·6	16·6	11·7	7·9	10·3	0·2	0·0	0·1		
St. George-in-the-East	17·2	16·3	16·7	17·0	8·9	13·3	0·1	0·0	0·0		

W. J. DIBDIN, F.I.C., F.C.S.
Consulting Engineer and Superintending Gas Examiner.

Note.—The maximum amount of Ammonia present in the Gas supplied by the Commercial Gas Company, and tested in the St. George's-in-the-East District, during the week ending October 21st, should have been 0·2; minimum, 0·08; mean, 0·1.

* The standard illuminating power for common gas in the metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in the 100 cubic feet of gas. Ammonia not to exceed 4 grains in the 100 cubic feet of gas.

† Pressure between sunset and midnight to be equal to a column of one inch of water. Pressure between midnight and sunset to be equal to a column of six-tenths of an inch of water.

COMMERCIAL.

NEW COMPANIES.

"Abermard" Steamship Company, Limited.—This company was registered on the 8th inst., with a capital of £20,000, in £100 shares, to purchase the steamship now in course of construction, to be called the *Abermawr*.

Australian and New Zealand Electric Company, Limited.—Upon terms of an agreement dated 9th inst., this company proposes to purchase the interest of Lewis Abraham Tallerman in eight agreements with the Maxim Weston Electric Company, Limited, for the supply of electric light and machinery and appliances in the colonies of Victoria, New South Wales, Queensland, New Zealand, Tasmania, South Australia, and Western Australia. It was registered on the 10th inst., with a capital of £50,000, in £50 shares.

Bristol General Omnibus Company Limited.—For carrying on the business of an omnibus company in Bristol and neighbourhood, this company was registered on the 9th inst., with a capital of £20,000 in £5 shares.

Compania de Navegacion por Vapor del Dique i Rio Magdalena, Limited.—This company proposes to carry on the business of a steamship company, and will carry out an agreement of the 8th April between F. de P. Manotas, secretary of the State of Bolivar, and N. T. Fleming, the latter representing the Atlas Steamship Company, of Liverpool. It was registered on the 8th inst., with a capital of £100,000 in £10 shares.

IRON EXPORTS.

COMPARATIVE EXPORTS of Pig, Merchant, and Railway Iron for the Last Twelve Months.
(*Specially prepared for* IRON.)

PORT.	1881. Nov.	1881. Dec.	1882. Jan.	1882. Feb.	1882. March.	1882. April.	1882. May.	1882. June.	1882. July.	1882. Aug.	1882. Sept.	1882. Oct.
(PIG IRON.)	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ardrossan	1,040	360	645	848	1,090	1,816	1,915	933	260	3,180	1,275	160
Barrow-in-Furness	3,900	8,945	7,231	3,000	3,110	6,068	6,170	17,613	18,198	27,887	11,790	10,764
Borrowstoness	—	—	—	—	200	500	1,410	1,050	380	1,616	2,785	1,375	929
Cardiff	—	—	—	—	—	500	2,715	1,199	350	—	1,183	—	60
Dundee	—	—	—	—	—	—	—	—	—	—	500	—	—
Glasgow	15,584	11,481	11,647	13,060	17,628	13,956	20,324	24,245	17,225	24,834	21,020	17,839
Goole	—	—	—	—	31	—	—	442	624	210	347	140
Grangemouth	2,265	2,351	800	800	4,762	6,160	1,900	4,218	4,886	3,318	4,776	4,601
Granton	75	—	—	—	31	50	885	—	10	300	—	50
Greenock	1,570	164	500	1,868	540	2,535	45	1,353	85	3,080	710	130
Grimsby	1,162	172	225	1,112	197	698	627	703	1,861	1,619	1,417	2,545
Hartlepools	3,105	2,000	1,265	1 308	4,740	3,032	4,468	1,945	6,588	9,530	2,370	10,904
Hull	2,177	1,645	780	3,111	1,744	1,859	1,248	2,331	716	1,025	1,123	1,387
Liverpool	11,391	10,341	11,559	13,463	2,481	23,803	23,896	15,654	15,058	13,530	17,863	2,985
Middlesbrough	37,483	19,216	24,388	31,778	53,262	38,570	42,010	41,607	30,385	58,450	58,483	56,535
Newcastle-on-Tyne	6,145	3,025	6,013	3,605	8,998	8,029	11,908	9,422	12,018	12,903	7,769	
Newport	400	3	1,955	—	1,399	1,400	679	—	—	—	—	—
North Shields	—	2,250	1,500	—	—	—	—	1,000	2,440	1,950	1,500	400
Port Glasgow	550	50	—	—	—	250	—	—	—	—	—	—
South Shields	60	530	2,250	50	420	30	20	55	—	800	—	100
Stockton	540	300	1,370	1,310	2,501	520	2,441	835	3,310	1,965	418	2,040
Sunderland	40	—	—	—	30	75	25	—	150	—	94	15
Swansea	25	—	50	—	—	—	—	—	—	39	10	—
Troon	150	200	930	1,120	—	1,720	—	680	1,922	1,860	835	—
Whitehaven	5,130	1,894	6,185	4,010	5,160	4,170	2,930	4,350	11,084	14,155	9,430	—
(MERCHANT IRON.)												
Ardrossan	—	—	—	—	—	—	—	—	—	—	—	—
Barrow-in-Furness	—	—	—	—	—	—	—	—	—	—	—	—
Blyth	—	—	—	—	5,144	—	—	—	—	1,150	—	—
Cardiff	—	—	—	—	—	—	—	—	—	201½	117	334
Glasgow	1,535	1,846	6,023	5,502	1,155	1,528	1,146	3,911	4	—	—	—
Goole	536	428	670	711	980	310	1,084	782	923	2,954	3,716	5,666
Granton	—	—	—	—	—	—	—	—	472	1,026	1,002	1,111
Greenock	—	—	—	—	—	—	—	—	—	—	—	—
Grimsby	—	—	—	—	—	5	61	38	—	—	1	—
Hartlepools	13	21	69	282	165	343	15	116	46	28	8	8
Hull	148	1,237	519	329	719	412	639	319	844	442	163	486
Liverpool	1,155	1,556	1,312	1,046	1,035	1,151	1,155	2,012	627	2,413	3,019	1,311
Middlesbrough	15,392	13,475	13,215	12,624	15,011	12,633	15,561	13,428	13,526	16,105	17,717	18,864
Newcastle-on-Tyne	985	170	212	152	36	320	364	622	794	2214	570	1,010
Newport	627	528	504	1,207	578	925	1,121	1,630	225	710	495	427
North Shields	260	—	—	118	1,123	48	1,813	—	500	4,634	302	—
South Shields	—	—	2	—	—	—	—	44	12	—	—	2,272
Stockton	113	66	—	28	26	51	30	201	75	182½	25	80
Sunderland	—	1,137	505	337	43	816	56	—	—	—	280	1,105
Swansea	—	39	—	—	283	44	—	—	91	10	45	166
Whitehaven	342	190	707	42	43	611	158	78	634	75	200	25
(RAILS—IRON AND STEEL.)	—	—	—	—	—	—	—	—	—	—	767	3,446
Ardrossan	—	—	—	—	—	—	—	—	—	—	—	—
Barrow-in-Furness	4,536	1,360	5,285	2,208	—	—	—	3,150	—	5	—	—
Borrowstoness	—	—	—	—	—	1,075	2,651	6,428	11,171	14,978	5,609	7,667
Cardiff	3,838	7,238	3,152	4,812	8,279	460	—	—	—	—	—	—
Glasgow	—	218	—	—	—	3,566	4,493	9,500	6,209	6,854	15,748	6,418
Grimsby	—	—	—	4,240	—	—	—	—	—	—	210	100
Hartlepools	450	1,256	1,000	1,200	4,461	1,330	—	1,803	—	—	—	—
Hull	10	1,406	—	—	—	1,300	6,255	21	2,100	—	650	1,150
Liverpool	11,469	10,089	14,818	9,471	11,933	1	200	36	—	27	5	4
Middlesbrough	10,288	3,718	15,512	10,949	9,757	20,687	17,285	25,934	16,750	19,868	13,754	20,198
Newcastle-on-Tyne	28	—	4	5	47	9,074	10,851	8,444	6,884	6,629	9,289	8,235
Newport	4,791	10,912	16,186	18,014	5,962	37	3	5	25	37	24	7
North Shields	—	—	9	—	—	12,421	11,905	8,420	12,326	10,248	8,345	19,129
Port Glasgow	—	—	—	—	—	—	—	—	399	—	—	—
South Shields	5	—	—	—	—	—	—	—	—	—	—	11
Stockton	—	—	—	—	—	—	—	—	—	—	—	—
Sunderland	—	250	—	—	—	299	—	5	68	—	—	—
Swansea	—	—	254	—	203	767	330	173	250	1,074	—	—
									2	105		

COMPRESSED LIME CARTRIDGE COMPANY, LIMITED.—On the 9th inst., this company was registered with a capital of £50,000, in £20 shares, to acquire and work the invention of Charles Sebastian Smith and Thomas Moore, of an improved method of and apparatus for breaking down or getting coal and other minerals in mining, quarrying, or tunnelling operations; and also an invention of C. S. Smith for improvements in machinery or apparatus for compressing lime and other pulverulent substances into solid or coherent form. The company further proposes to take over the business of manufacturing compressed lime cartridges, &c., carried on by Sebastian Smith and Co.

CYCLE COMPANY, LIMITED.—This company was registered on the 8th inst., with a capital of £3000, in £1 shares, for carrying on business as manufacturers and dealers in bicycles, tricycles, and perambulators, and fittings for the same.

FRENCH METROPOLITAN GENERAL ELECTRIC COMPANY, LIMITED.—On the 10th inst., this company was registered, with a capital of £1,200,000, in £20 shares, to acquire and apply for inventions, patents, &c., relating to electricity and electric motor force or other similar agency, and to work and develop the same, especially in the departments of Seine, Seine and Marne, and Seine and Oise.

G. H. SMITH AND COMPANY, LIMITED.—This is the conversion to a company of the business of bolt, nut, and rivet manufacturer carried on by George Bond Smith of Brookfields, Birmingham. It was registered on the 11th inst., with a capital of £15,000, in £10 shares.

KERNER BURGLAR PROTECTION COMPANY, LIMITED.—This company proposes to acquire and work an invention for improvements in relation to electric circuits and in apparatus for protection from burglars whereof letters' patent No. 1195 were granted to W. P. Thompson, on a communication from Marion Harrison Kerner. The company further proposes to supply alarms and signals of all kinds. It was registered on the 9th inst., with a capital of £100,000, in £1 shares.

LORD CLIVE STEAMSHIP COMPANY, LIMITED.—Registered on the 11th inst., with a capita of £64,000, in £100 shares, to purchase the above steamship.

NORTH-EASTERN ELECTRIC LIGHT AND POWER COMPANY, LIMITED.—This company was registered on the 9th inst., with a capital of £10,000, in £5 shares, to carry on the business of an electric light and power company in all branches.

OTTO CYCLE COMPANY, LIMITED.—This company proposes to purchase 30 patents granted to Edward Carlo Friedrich Otto relating to bicycles, tricycles, &c., and to take over the business carried on at 118, Newgate Street, with the assets thereof. It was registered on the 14th inst., with a capital of £50,000 in £2 shares.

SCARGILL LEAD MINING AND SMELTING COMPANY, LIMITED.—This company proposes to acquire and work mineral properties situate in the manors of Scargill, parish of Barningham, North Riding of Yorkshire. It was registered on the 14th inst., with a capital of £12,800, in £2 shares.

SHAW, SAVILL AND ALBION COMPANY, LIMITED.—This company proposes to purchase the shipping business of Messrs. Shaw, Savill and Company, of 34, Leadenhall Street, and of the Albion Shipping Company, Limited. It was registered on the 10th inst., with a capital of £700,000, in £10 shares.

SHIP "TREWBRIDGE" COMPANY, LIMITED.—This company proposes to take over the barque *Trewbridge* from E. B. Hatfield, subject to a mortgage for £7000. It was registered on the 10th inst., with a capital of £14,000, in £100 shares.

SIR W. G. ARMSTRONG, MITCHELL AND COMPANY, LIMITED.—This company was registered on the 14th inst., with a capital of £2,080,000, in £100 shares, to acquire the business and properties of the firms of Sir W. G. Armstrong and Company, and C. Mitchell and Company. It further proposes to carry on the business of engineers, ordnance makers, contractors, ship builders and repairers; colliery, mine, and quarry owners; iron, steel, and metal manufacturers and founders; merchants and traders for all purposes.

SOUTHEND-ON-SEA AND DISTRICT AUXILIARY RAILWAYS AND CARRIAGE COMPANY, LIMITED.—This company was registered on the 11th inst., with a capital of £21,000 in £3 shares, to construct, maintain and work auxiliary railways and tramways between Southend, Pitsea, Rochford and Shoeburyness in Essex, and such other places as may be thought fit.

VERDAL NICKEL MINING COMPANY, LIMITED.—Upon terms of an unregistered agreement of the 4th inst., with Charles Trelease, this company proposes to purchase the Verdal Nickel Mines situate at Skjakkerdal on the Throndhjem fjord, in Norway. It was incorporated on the 11th inst., with a capital of £10,000 in £1 shares.

SOUTH WALES COAL SHIPMENTS, OCTOBER, 1882.

The following is a summary of the foreign coal shipments from Cardiff, Newport, Swansea, and Llanelly, during the month of October 1882:—

	Tons.		Tons.
Aden	4,561	Madeira	1,400
Alicante	631	Malaga	1,020
Alexandria	8,029	Malta	32,266
Amsterdam	1,543	Maranham	2,500
Ancona	1,677	Marseilles	19,461
Antwerp	607	Martinique	3,063
Bahia	1,419	Mauritius	4,418
Barcelona	19,039	Messina	1,448
Bari	593	Monte Video	10,246
Bayonne	240	Nantes	3,497
Bilbao	3,677	Naples	11,899
Bombay	10,190	Odessa	8,483
Bordeaux	15,877	Oporto	920
Boulogne	1,500	Palermo	1,993
Brest	742	Palma & Port Maho	930
Brindisi	4,014	Para	3,167
Buenos Ayres	9,780	Pernambuco	2,135
Cadiz	5,239	Piræus and Athens	884
Caen	9,458	Port Said	28,877
Calcutta	4,720	Rangoon	14,127
Callao	1,200	Rio de Janeiro	8,508
Cape of Good Hope	21,936	Rio Grande	—
Cape de Verde	14,085	Rivers	330
Carloforte & Cagliara	691	Rochefort	4,856
Carthagena & Porman	—	Rouen	16,693
Ceylon	23,946	Santander	263
Charente	2,112	Santos	856
Constantinople	12,537	Savona	5,385
Copenhagen	864	Seville	2,484
Coquimbo	—	Singapore	18,530
Corfu	1,546	Smyrna	535
Cronstadt	1,200	Stockholm	2,180
Demerara	1,357	St. Lucia	2,975
Dieppe	21,007	St. Malo	5,129
Dunkirk	—	St. Nazaire	39,026
Fécamp	2,728	St. Thomas	4,403
Galatz and Danube	5,588	Swinemunde	—
Genoa	30,196	Sulina	4,329
Gibraltar	31,054	Syra	4,318
Hamburg	1,493	Tarragona	1,224
Havanna	13,376	Teneriffe	2,867
Havre	27,064	Trouville	3,443
Hong Kong	8,675	Valencia	—
Jamaica	982	Valparaiso	440
Java	2,535	Venice	2,106
La Rochelle	20,728	West Coast of Africa	—
Leghorn	805	Yokohama	—
Lisbon	10,248	Zanzibar	—
Other French ports	32,046		

PRICE LIST OF IRON AND STEEL.

PREPARED BY

MESSRS. BOLLING & LOWE,

2, LAURENCE POUNTNEY HILL, LONDON, E.C.

STAFFORDSHIRE.

List Brands at Works. Per Ton.

BARS—
- ¼ in. to 3 in. rounds and squares £8 0 0
- 1 in. to 6 in. flats 8 0 0

Rounds and Squares.
- 3½ in., 10s. per ton extra.
- 4 in., 20s. ,,
- 4½ in., 40s. ,,
- 5 in., 50s. ,,

Rounds only.
- 5½ in., 70s. ,,
- 6 in., 90s. ,,
- 6½ in., 110s. ,,
- 7 in., 130s. ,,

Round and Squares,
- 7-16 in., 10s. ,,
- ⅜ in., 20s. ,,
- 5-16 in., 30s. ,,
- ¼ in., 40s. ,,
- 3-16 in. 70s.

HOOPS—
- 1 in. to 6 in. wide by usual guage £8 10 0
- ⅛ in. wide up to 20 w. g., 20s. per ton extra.
- ¼ in. wide up to 20 w. g., 40s. per ton extra.
- ½ in. wide up to 20 w. g., 80s. per ton extra.
- ½ in. wide up to 20 w. g., 120s., per ton extra.

PLATES—
- To 15 feet long by 4 feet wide, not exceeding 4 cwt. £9 10 0
- 4 to 5 cwt., 20s. per ton extra.
- 5 to 6 cwt., 25s. ,,
- 6 to 7 cwt., 50s. ,,
- 7 to 8 cwt., 75s. ,,
- 8 to 9 cwt., 110s. ,,
- 9 to 10 cwt., 120s. ,,
- 10 to 11 cwt., 140s. ,,
- 15 to 20 ft. long, 20s. ,,
- 20 to 25 ft. long, 40s. per ton.
- 4 to 4½ ft. wide, 20s. ,,
- 4½ to 5 ft. wide, 40s. ,,

SHEETS—
- Singles 11 to 25 gauge. £9 10 0
- Doubles, 30s. per ton extra.
- Lattens, 60s. ,,

ANGLES—
- 1 in. by 1 in. to 8 united inches £8 15 0

TEES—
- 1 in. by 1 in to 8 united inches £9 0 0
- For each inch above 8 united inches 10s. per ton extra.
- Best, 20s. per ton extra.
- Best, best, 40s.
- Treble best, 60s.

STAFFORDSHIRE, MIDLAND, &c.

Ordinary Brands (at Works).

	£ s. d.	£ s. d.
Bars	6 10 0	to 7 10 0
Hoops	7 0 0	to 7 10 0
Plates	8 0 0	to 8 10 0
Sheets	8 0 0	to 8 10 0
Angles	7 0 0	to 7 10 0
Tees	7 0 0	to 7 10 0

- Best, 10s. to 20s. per ton extra.
- Best, best, 20s. to 30s. ,,
- Treble best, 40s. to 60s. ,,

CLEVELAND AND NORTH OF ENGLAND BRANDS (at Works).

	£ s. d.	£ s. d.
Bars	6 0 0	to 6 5 0
Ship Plates to 8 cwt.	6 15 0	to 7 0 0
Angles	6 0 0	to 6 5 0

- Best, 10s. per ton extra.
- Best, best, 30s. ,,
- Treble best, 50s. ,,

SCOTCH (at Glasgow).

	£ s. d.
Bars NB crown	6 10 0
Hoops	7 10 0
Ship Plates	7 15 0
Boiler ,,	8 0 0
Angles	7 10 0

- Best, 10s. per ton extra.
- Best, best, 30s. ,,
- Treble best 50s. ,,

WELSH (Newport and Cardiff).

	£ s. d.	£ s. d.
Bars	5 15 0	to 6 0 0
Plates	7 0 0	to 7 10 0

Best, 10s. per ton extra.

BELGIAN, (f.o.b. Antwerp).

	£ s. d.	£ s. d.
Bars	5 12 6	to 6 10 0
Hoops	6 10 0	to 7 0 0
Plates	7 0 0	to 8 10 0
Sheets	8 0 0	to 8 10 0
Angles	6 0 0	to 7 10 0
Nail rods	6 10 0	to 7 0 0

IRON ROLLED GIRDERS—
- Narrow flanges. 6 0 0 to 7 10 0
- Wide flanges .. 6 10 0 to 8 0 0

STEEL ROLLED GIRDERS, ANGLES and CHANNELS at proportionate differences.

BEST YORKSHIRE (at Works).

BARS—

	£ s. d.
To 3 cwt.	19 0 0
3 to 5 cwt.	20 0 0
5 cwt. and upwards	22 0 0

BOILER PLATES—

	£ s. d.
To 2½ cwt.	22 0 0
2½ to 3 cwt.	23 0 0
3 to 3½ cwt.	25 0 0
3½ to 4 cwt.	27 0 0
4 to 5 cwt.	30 0 0
5 to 6 cwt.	33 0 0
6 to 7 cwt.	36 0 0
7 cwt. and over	39 0 0

Plates over 6 feet to 8 feet wide, 40s. per ton extra.

Sheets	24	0 0
Angles and Tees	22	0 0

	£ s. d.
Tyres to 4 cwt.	19 10 0
4 cwt. to 5½ cwt.	23 0 0
5½ cwt. and over.	26 10 0
Axles to 5 cwt.	19 10 0
5 cwt. to 6 cwt.	22 10 0
6 cwt. and over.	25 10 0

RAILS (at Port nearest Works).

	£ s. d.	£ s. d.
Heavy iron	5 0 0	to 5 5 0
,, Steel	5 5 0	to 5 10 0
Light iron	5 10 0	to 5 15 0
,, Steel	5 15 0	to 6 0 0

Steel Mining Rails, 10 to 15 lb. per yard, £7 0/ to £6 10/.

Fish Plates, heavy, 20s. per ton above rails.

Fish Plates, light, 60s. to 80s. per cwt. do.

BOLTS AND NUTS, for fishes—

	£ s. d.	£ s. d.
Heavy	16 0 0	to 20 0 0
Light	26 0 0	to 28 0 0

SPIKES—

	£ s. d.	£ s. d.
Heavy	14 0 0	to 16 0 0
Light	16 0 0	to 18 0 0

PIG-IRON.

Scotch Warrants (Glasgow) 49s. 0d.
Cleveland Warrants No. 3 (Middlesbrough) ... 43s. 6d.
Cleveland No. 1 (Tyne or Tees), G.M.B. ... 47s 3d.

CASTINGS

(f.o.b. Shipping Port).

SOCKET PIPES (for gas or water)—

	£ s. d.	£ d.
1½ to 2 in.	5 10 0	to 6 0 0
2 to 3 in.	5 5 0	to 5 15 0
3 to 8 in.	5 2 6	to 5 12 6
8 to 20 in.	5 0 0	to 5 10 0
20 to 48 in.	4 17 6	to 5 7 6

Chairs ..... 4 15 0 to 5 0 0
Girders ..... 5 15 0 to 8 0 0

SCRAP—

	£ s. d.	£ s. d.
Old rails, D.H.	3 10 0	to 3 15 0
Do. flange	3 0 0	to 3 5 0
Engineers heavy scrap	2 18 0	to 3 0 0
Light do.	2 0 0	to 2 5 0

WIRE.

Rolled Fencing Wire (at Works)

	£ s. d.	£ s. d.
Nos. 0 to 4	7 10 0	to 8 10 0
5	8 0 0	to 9 0 0
6	8 10 0	to 9 10 0

Galvanized.

	£ s. d.	£ s. d.
Nos. 0 to 4	11 10 0	to 11 15 0
5	12 0 0	to 12 5 0
6	12 10 0	to 12 15 0

Drawn Fencing Wire.

	£ s. d.	£ s. d.
Nos. 0 to 6	9 0 0	to 0 10
7	9 10 0	to 10 0 0
8	10 0 0	to 10 5 0
9	10 10 0	to 11 0 0
10	11 10 0	to 11 0 0

Galvanised. £ s. d. £ s. d.

Nos. 0 to 6	12 10 0	to 13 0 0
7	13 10 0	to 14 0 0
8	14 5 0	to 14 15 0
9	14 10 0	to 15 0 0
10	15 10 0	to 16 0 0

Drawn Bright Wire.

Nos. 1 to 6	10 0 0	to 10 10 0
7	10 10 0	to 11 0 0
8	10 15 0	to 11 5 0
9	11 5 0	to 11 15 0
10	12 0 0	to 12 10 0

Drawn Bright Steel Wire.

Nos. 1 to 6	11 5 0	to 11 15 0
7	11 15 0	to 12 5 0
8	12 0 0	to 12 10 0
9	12 10 0	to 13 0 0
10	13 10 0	to 14 0 0

Galvanised Fencing Strand (B.B)
7 wires.

	£ s. d.	£ s. d.
No. 0	17 0 0	to 17 10 0
1	17 10 0	to 18 0 0
2	18 0 0	to 18 10 0
3	18 10 0	to 19 0 0
4	19 0 0	to 19 10 0
5	19 10 0	to 20 0 0
6	20 0 0	to 20 10 0
7	21 5 0	to 21 15 0
8	23 0 0	to 23 10 0
9	23 5 0	to 23 15 0

3 wires.

	£ s. d.	£ s. d.
No. 0	16 10 0	to 17 0 0
1	16 15 0	to 17 5 0
2	17 10 0	to 18 0 0
3	18 0 0	to 18 10 0
4	17 15 0	to 18 5 0
5	18 0 0	to 18 10 0
6	18 15 0	to 19 5 0
7	19 10 0	to 20 0 0
8	20 0 0	to 20 10 0
9	21 10 0	to 22 0 0

STEEL (at Works).

Siemens-Martin or Bessemer.

	£ s. d.	£ s. d.
Plates	10 10 0	to 11 10 0
Sheets	11 0 0	to 14 0 0
Bars	9 0 0	to 10 0 0
Angles	9 10 0	to 11 0 0
Tees	10 0 0	to 11 10 0
Spring Steel	12 10 0	to 14 0 0
Cast Steel for Tools	40 0 0	to 60 0

GALVANISED IRON ROOFING SHEETS (at Liverpool).

CORRUGATED SHEETS 5, 6, 7, 8 feet long.

- Gauges 16, 18, and 20, £14 0s. to £14 10s.
- 22 and 24 gauge, £14 10 to £15 10s
- 26 gauge, £17 10 to £18 10.
- 28 gauge, £19 0s. to £20 0s.
- Sheets 8 to 9 feet long, 20. per ton extra.
- Sheets 9 to 10 feet lon 40s. per ton extra.
- Sheets 10 to 11 feet ong, 60s. per ton extra.
- Sheets 11 to 12 feet long 80s. per ton extra.

RATES OF FREIGHT.

THE current rates for coal and iron are:—

	Newport. Newcastle Cardiff or Sunderland, Swansea.	
	s. d.	s. d.
Alexandria	11 0 ...	13 0
Alicante	12 0 ...	11 0
Ancona	— ...	13 0
Aden	— ...	20 0
Athens	— ...	11 0
Batoum	— ...	16 0
Bombay	18 6 ...	19 6
Bahia	18 6 ...	18 6
Barbadoes	— ...	15 0
Barcelona	— ...	10 3
Brindisi	— ...	11 0
Buenos Ayres	— ...	24 6
Bermuda	— ...	18 6
Bussorah	— ...	—
Cadiz	— ...	10 0
Cagliari	— ...	12 6
Calcutta	— ...	14 0
Callao	— ...	—
Cape Good Hope	21 0 ...	20 0
Cape de Verds	— ...	11 6
Carthagena	— ...	10 0
Cardenas	— ...	14 0
Cienfuegos	— ...	11 0
Coconada	— ...	—
Civita Vecchia	13 0 ...	14 0
Colombo	— ...	19 6
Constantinople	10 0 ...	11 0
Corfu	— ...	12 6
Demerara	— ...	19 0
Fayal	— ...	14 0
Fiume	— ...	—
Galle	— ...	19 0
Genoa	10 0 ...	11 0
Gibraltar	— ...	9 6
Galatz	— ...	12 0
Havana	— ...	12 0
Hong Kong	— ...	22 6
Hiogo	— ...	—
Iquique	21 0 ...	21 0
Jamaica	— ...	11 0
Java	20 0 ...	22 6
Kertch	— ...	—
Kurrachee	— ...	20 6
Lisbon	8 9 ...	9 0
Leghorn	11 0 ...	11 6
Madras	— ...	—
Madeira	— ...	11 0
Malaga	12 ...	12 0
Malta	— ...	10 0
Maranham	— ...	17 0
Martinique	— ...	—
Mauritius	— ...	22 6
Marseilles	12 3	14 cs.

	Newport Newcastle Cardiff or Sunderland, Swansea.	
	s. d.	s. d.
Messina	11 0 ...	11 6
Montevideo	— ...	11 0
Montreal	— ...	11 0
Muscat	— ...	—
New York	— ...	11 0
New Orleans	— ...	13 0
Naples	— ...	11 6
Odessa	10 0 ...	10 6
Oporto	— ...	10 6
Penang	— ...	19 6
Pernambuco	— ...	17 6
Palermo	11 0 ...	11 0
Panama	— ...	22 6
Para	18 0 ...	18 0
Padang	22 0 ...	22 0
Port-au-Prince	— ...	12 0
Porto Rico	11 0 ...	11 0
Port Said	11 0 ...	12 6
Reunion	— ...	—
Rio Grande do Sul	— ...	17 6
Rio Janeiro	— ...	22 6
Rosario	— ...	13 0
Seychelles	— ...	—
Singapore	18 6 ...	19 6
Saigon	— ...	—
Shanghae	— ...	—
San Sebastian	— ...	—
San Francisco	18 0 ...	18 0
St. Catherine's	— ...	20 0
St. Paul de Loando	— ...	27 0
St. Thomas	— ...	11 0
St. Jago de Cuba	— ...	—
St. Lucia	— ...	12 0
Santos	24 0 ...	24 0
Savona	— ...	11 6
Seville	— ...	11 6
Smyrna	— ...	13 0
Spezzia	— ...	13 0
Syra	— ...	10 9
Sierra Leone	— ...	16 0
Sebastopol	— ...	—
Tagsanrog	— ...	—
Tarragona	— ...	14 0
Teneriffe	— ...	14 0
Tientsin	— ...	—
Trieste	13 0 ...	11 6
Trincomalee	— ...	—
Trinidad	— ...	15 0
Valencia	12 0 ...	12 0
Valparaiso	22 6 ...	22 0
Venice	14 0 ...	14 6
Yokohama	— ...	—
Zanzibar	— ...	—

PRICES CURRENT OF MANUFACTURED GOODS OF BIRMINGHAM AND DISTRICT.

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The quotations given are manufacturers' average prices, dependent, of course, on terms of payment, as well as the quality and quantity of goods ordered, and fluctuations in cost of raw material.

The Prices and Discounts quoted are carefully revised every week, and great pains are taken to render this List thoroughly reliable.

November 22.

The prices and discounts of hardwares show little variation beyond the galvanised sheet iron goods referred to last week. Works generally are tolerably well employed, home orders being fairly plentiful; the foreign and colonial demand is scarcely maintained, however. Corrugated sheets are quieter, and the rates are scarcely so firm. Engineers and ironfounders are busy in most departments, although no great urgency seems to be required in the execution of orders. Marked iron is in good demand, but there is not as much enquiry for the colamoner qualities.

ABRIDGED LIST.

AMERICAN WIRE HOBS, 1 lb., 42/6; 1½ lb., 36/6; 2 lb., 32/6; 2½ lb., 31/6; 3 lb., 30/6 per cwt.

ANCHORS, common, 1 to 10 cwt. 14/ per cwt.

ANVILS (Common), 17/3 per cwt.; Best anvils, not warranted 20/6 per cwt.; Best warranted anvils (bicks tied in 1 to 3 cwt.), 22/ per cwt.

AUGERS (shell), ½ inch to 1 inch, 11/ to 44/ per doz., less 57½%; (screw), ½ inch to 1 inch, 16/ to 64/ per doz., less 57½.

AXES, ship carpenters', /4½ to /5½ per lb.; Kent and house carpenters' ditto, /4 to /5; ditto, steel polished, 5 to 6, felling axes, /4½ to /4½; bright and blued, solid steel, /7 to /8. American felling or wedge axes, steel, polished, /11 per lb.

AXLE PULLEYS, iron, 8/ to 26/6, 1½ inch; Brass face ditto 26/6 to 48/6, 1½ inch.

AXLES, 35 to 45%

BASINS.—Bright tinned, shallow, 8 inch, 2/6; 9 inch, 2/9; 10 inch, 3/4; 11 inch, 4/; 12 inch, 4/6; 13 inch, 5/; 14 inch, 6/; 15 inch, 8/6 per doz.; galvanised ditto, 8 inch, 2/3; 9 inch, 2/6; 10 inch, 3/; 11 inch, 3/9; 12 inch, 4/3; 13 inch, 4/9; 14 inch, 5/9; 16 inch, 7/9 per doz.

BASTARD BELLOWS, 52½ %; best extra nailed bastard bellows, 47½%; best improved long Bristol, 42½%; common smiths' bellows, 42½%; best warranted extra double nailed, 45 to 50%; ditto, with movable pipe for shipment, 52½%.

BELLS.—House brass, rough, /8 to /10 per lb.; turned edge, 8½ to /10½ per lb.; turned and lacquered on edge, 1/5 to 1/10 per lb.; cattle and sheep bells, with brass loops, 1/1 to 1/3 per lb.; clock bells, 1/3 to 1/6 per lb.

BELL STAPLES (fine tinned) ½ inch, /6; ¾, /13; 1, /21; 1½, 3/; 2, /3; 2½, /4½ per gross.

BED SCREWS, London, black heads, 6, and 7-16, 4/; ½ inch, 8/6 to 10/6 per gross; London heads, with bright turned collar, 6 and 7-16, and ½ inch nuts, 11/9 to 12/9; black welded heads, 8/3 to 9/3; common slit heads, 6, and ½, and ¼ inch, 8/9 to 9/9; bright turned notched heads, 6, and 7-16, and ½ inch, 12/3 to 13/3; black notched heads, 10/ to 11/ per gross. Rodsteads, cheap stump, 6 feet by 3 feet 6 inches, 7/6 to 9/6 each; cheap French, 6 feet by 3 feet 6 inches, 8/6 to 10/6 each, rising /6 for every 6 inches.

BOLTS.—Solid end tower, 72½ to 75%; ditto, solid end barrel, 67½ to 70%; best solid tower bolts, 75%; japanned Scotch tower bolts 55%. Bolts and nuts, black, ¼, and 5-16 to 2 inch and under, 3/6 and 4/; ½, ⅝, 7-16 6/7 per gross, ½ and 9-16 8/, ⅝ and 11-16 11/, ¾ to 1¼ inch 20/ per cwt.; 1½ to 3 inch, ½, 4/, 5-16 4/7, ⅜ 6/6, 7-16 7/10 per gross, ½ and 9-16 21/, ⅝ and 11-16 19/, ¾ to 1¼ 18/ per cwt. Square heads, round necks, square nuts, bright engineers' hexagon heads 2½ to 3 inch, ½ 22/, 5-16 24/, ⅜ 27/ 7-16 31/ ½ 45/ 9-16 51/ ⅝ 67/ ¾ 69/ ⅞ 126 inch 184/ per gross. Bright engineers hexagon nuts, ⅜ 10/, ½ 12/, ⅝ 14/, 20/, ¾ 25/, 1 inch 36/ per gross. Black nuts, square, blank, 2 inch 16/6, 1¼/6, 1½ inch 18/6 per cwt. delivered.

BRASS HEAD NAILS, 57½ to 65%; star head, 50%; brass plated countersunk head, 30 to 35%; blacksmith's tongs, 21/ per cwt.; real fine wrought box irons, 20 to 25%; fine cast, 60%; middle cast, 50 to 60%; Victoria charcoal box irons, 45 to 50%; ordinary charcoal ditto, 60 to 65%; brushes, painters', 50 to 75%; best ditto, 45 to 50%; brass rolled, 2 to 12 inches wide to 30 W.G., /75 per lb. Brass sheets 24 and 28 inch, 8 lb. and upwards, or 27 W.G., /85 per lb.; ship and turret bells, 1/4 per lb. Battery kettles, 125/ per cwt.; brass jelly pans, with bails, /95 to /97; without bails, /102 to /105; Maslin kettles, cast, 4 to 10 inch, /9 to /95 per lb. Brass shoe bills, /9 per lb.; brass scale pans, 1/6; brass toddy kettles, 15 to 20%.

BRASS CORNICE POLE RINGS, light, middle and strong, 45%.

BRASS WIRE, /8 per lb. up to No. 20 W.G.; back bands, 3 lb. and larger, 16/9 per cwt.; ditto, smaller, 2/ per cwt. extra; double swivel ditto, 2/ per cwt. extra.

CART TRACES, 9 to 12 links to foot, 16/9 to 19/3 per cwt.

CHAIN, machine made, Wire, single link, "Iron," 55%; double link ditto, 55%; machine-made Wire Chain, single link, "Brass," 55%; registered ditto, 55%; close link brass chain, 55%; oval link brass chain, 55%; brass clock chain, 55%; short link tested (rigging) chain, 3-16 inch, 19/9; ¼, 27/; 5-16, 15/3; ⅜, 13/; 7-16, 13/6; ½, 12/9; ⅝, 12/; ¾, 11/6; 1 inch, 11/ per cwt.; well chain, twisted or straight link, ½ inch, 25/3; 3-16, 18/; ¼, 16/; 5-16, 14/9 per cwt. delivered.

CHAIR NAILS (brass), lacquered or gold colour, No. 1 to 12, 2/ to 3/6 per 1000; machine polished, 1/9 to 3/3 per 1000; lacquered or gold coloured, 2/ to 2/9 per lb.; discount per 1000, 57½%; per lb., 2%, delivered.

CHIPPING CHISELS, solid cast steel, /6 per lb.

COACH BOLTS AND NUTS, round or cheese heads, square necks and nuts, black, 3 inch by ¼, 4/1; 5/16, 4/5; 4, 5/1; 4½, 5/7; 5 inch, 6/1 per gross. Bright, 3 inch by ¼, 4/9; 5/16, 5/3; 4, 5/9; 4½, 6/3; 5 inch 6/9 per gross. Black, 3 inch by 5-16, 4/9; 5/16, 5/3; 4, 5/9; 4½, 6/3; 5 inch, 6/9 per gross. Bright, 3 inch by 5-16, 5/6; 5/16, 6/; 4, 6/6; 4½, 7/; 5 inch, 7/6 per gross delivered.

COACH SCREWS.—Patent bright pointed, 2 inch and under, ¼ inch, 1/; 5-16, 3/8; ⅜, 4/6; 7-16, 5/4 per gross; ½ inch, 20/; ⅝ inch, 23/; ¾, 22/ per cwt.; 4½ to 6 inches long, ½ inch, 16/6; 7-16, 25/; ⅜, 21/; ½, 19/; ⅝, 18/ per cwt.; above 6 inch, ½ inch, 25/6; 7-16, 24/; ⅜, 20/; ½, 18/; ⅝, 17/ per cwt.; 2/ per cwt. extra for hexagon heads, delivered.

COACH SPRINGS, 40%.

COCKS.—Brass range cocks, ½ inch, 30/; ¾, 42/; ⅞, 53/6; 1, 64/; inch 75/ per doz., less 30% discount; brass racking cocks, fast key, 1¼ inch, 11/; 5-16, 13/; ⅜, 15/; 7-16, 18/; ½, 23/; 9-16, 34/; ⅝, 38/; ¾, 51/; ⅞, 59/; 1 inch, 66/ per doz.; loose key, 1/ to 18/ per doz, extra discount, 60%.

COFFIN FURNITURE, registered, 50%; ditto, common, 75%.

COPPER BOAT NAILS, ½ inch to 2 inches and above, 1/8 to /11½ per lb.; copper boat roves, ¼ to ⅜ inch and above, /6 to 1/ per lb.; cut copper nails and tacks, ½ inch to 1 inch and above, 1/ to /10 per lb.

COPPER WIRE, /10½ per lb. up to No. 20, W. G

COMPOSITION Sheathing and Slating Nails, ⅞ inch, /85 per lb. Copper brads and bills, /10 per lb.; round copper kettles, bare rivets, 1/7 to 1/9 per lb.; light round covered rivets, 1/6 to 1/7 per lb.; loaded 1/5 to 1/6; oval copper kettles, bare rivets, 1/10 to 1/11 per lb.; oval bare rivets, raise down, 1/11 to 2/1 per lb. Copper slating nails (cut), 1 to 1½ inch and upwards, /10½ to /11½ per lb.; copper scale pans, 1/9 to 1/10 per lb. Copper nails and tacks (wrought), 1 inch, 1/2 per lb. Chair webbing, No. 0, 4/5; 10, 4/8; 09, 4/10; 06, 4/6 per gross of 60 yards. Carpet rings, 1/ to 1/4 per gross. Cornice poles, 2½ inch, brass, best burnished, 4/6 per foot, less 45%; ⅝ covered brass poles, 1/2 per foot, less 45%; 2½ inch real birch cornice poles, polished, self or mahogany colour, with ends and rings complete, /8 per foot; 2½ inch real mahogany cornice poles, with ends and rings complete, 1/7 per foot; 2½ inch birch rings, polished, self or mahogany colour, 19/ per gross; 2½ inch real mahogany rings, 28/ per gross net; japanned pillar chains, 1 yard, 16 by 6, 5/8 to 6/6 per doz. Japanned manger chains, 1½ yard, 10 by 6, 7/3 to 8/6; japanned rack, 1 yard, 18 by 6, 5/ to 6/; japanned dog, 1½ yard, 12 by 7, 5/6 to 6/6; 2 yards, 14 by 6, 10/ to 11/. Cowties, 6/6 to 8/6; open ring, 6/6 to 8/6; close ring, 5/6 to 6/6 per doz.; japanned watering chains, 14 by 6, 4/ to 5/; tinned ditto, 4/5 to 5/6; bullock chains, ½ inch hook at each end, 14/6 to 15/6; chest handles, improved japanned, 82½%; broad plate, strong and extra strong, 15 to 65%. Curtain rings (brass), 45 to 50%; square box coffee mills, 30 to 60%; common post coffee mills, 30 to 40%; best brass bushed mills 40 to 45%; London mills, 40 to 45%.

CUT NAILS.—Clasp, rose, and clout, 3 to 9 inch, 9/3; 2½ and 2¾ inch, 9/9; 2 and 2½ inch, 10/3; 1½ inch, 10/9; 1½ inch, 11/3; 1¼ inch, 12/3; 1 inch, 14/3; ¾ inch, 16/6 per cwt.

DISH COVERS, blue japanned wire, 1/7 to 5/6 per set of 6.

DOOR SPRINGS, X, 85%; XX, 77½%; XXX, 72½%; XXXX, 65%; brass circular and iron circular, 55 to 65%; brass reliance, 10 to 20%; climax, 20%; universal, 55 to 60%; paragon, 20%; O'Connor's patent lever hinge springs, 10 to 20%. O'Connor's vertical spring hinge door spring, 15 to 25%; Gerish's spring hinges, iron, 20 to 25%; brass 10 to 20%.

FILES, 55% the list.

FLOOR BRADS.—2 inch, 9/9; 2½ inch, 9/6; 2½ inch, 9/6; **FRY PANS**, 7½ inch to 17 inch, oval, bright, 12/ to 55/ per doz.; tinned, 14 to 50/ per doz.; fry pans, 5½ inch to 10 inch round bright, 10/ to 26/ per doz.; tinned, 11/6 to 29/ per doz.; fry pans, 10½ inch to 15 inch round, bright, 30/ to 60/ per doz.; tinned, 33/ to 64/ per doz., all fry pans 72½% and 5% delivered. Fire-irons, kitchen, in sets, /5 to /6 per lb.; tongs, /5½ to /6; pokers, /4½ and /5; fishhooks, best, 40 to 45%; common, 60 to 65%; light kitchen fenders, 5 inch, assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 28/ to 30/ per doz.; bright fronts, 31/6 to 34/. Manchester pattern kitchen fenders, 5 feet, 1 inch top, black front, 2 feet 9 inch to 3 feet 3 inch, 37/6 to 40/ per doz.; 3 foot 3 inch to 3 feet 9 inch, 42/6 to 47/6 per doz.

GALVANISED BUCKETS, 10 inch, 38 lb. to the doz., 6/; 11 inch, 6/6; 12 inch, 7/6; 13 inch, 8/6; 14 inch, 10/; 10 inch, 42 lb., 6/9; 11 inch, 7/3; 12 inch, 8/3; 13 inch, 9/3; 14 inch, 10/9.

GALVANISED WASHING TUBS, oval, 12 to 22 inch, 26 to 70 lb. per doz., 4d. per lb; 24 to 30 inch, 84 to 156 lb. per doz., 3½d. per lb. delivered.

GALVANISED WIRE NETTING, 1½ inch mesh and larger 67½%; 1 inch mesh and smaller, 72½%, delivered.

GIMP PINS.—Best black iron wire, ⅜ by 18, ½ by 18, ⅝ by 18, all /55 per lb.; 19 gauge, /1 per lb. extra; coloured, /1 extra; best bright iron panel pins in 1 lb. packets, ⅜, ½, and ⅝ by 17 inch, /35; 1 and 1¼ by 16 inch, /31; 1½ by 15 inch, /3 per lb.; tinned, /1½ per lb. extra; brass panel pins, /95 per lb., all sizes; copper ditto, 1/1 per lb. all sizes; brass escutcheon pins, ⅜ by 16, ½ by 15, ⅝ by 15, ¾ by 14, ⅞ by 14, 1 by 13 inch, /95 per lb.; brass gimp pins, 19 gauge, 1/ per lb.; ditto, 18 gauge, /11½ per lb.

GRID IRONS, London pattern, fluted, 70%; light ditto, 77½%; hanging round bar, 60%; doublet, 41%; round bar, /6 per bar, 67½%; best fluted bar, 67½%; flat bar, 67½%; common flat bar, 67½%; common gridirons, /1 /1½ and /2 per bar less, 65 to 75%; gimblets, 50%.

HAMMERS.—Cast steel stone breaking and quarry, per cwt.; solid cast steel engineers' hand, 1½ lb. each and above, /8 per lb.; solid cast steel boiler makers' hand hammers, 1¼ lb. each and above, /85 per lb.; iron and steel boiler makers' sledge hammers, 6 lb. and above, 17/ per cwt.; iron and steel sledge hammers, 6 lb. and above, 18/6 per cwt.; solid cast steel sledge, 28/ per cwt.; platelayers' keying, 28/ per cwt.; holdfasts, japanned, 18/ to 20/ per cwt.; common Kent hand hammers, 55%; patent basos and staples, 20 to 25%.

HINGES.—Patent, edge butts, 60 to 70%; patent Scotch butts, 55 to 60%; broad and narrow same discounts; patent table, bed, and back-flap hinges, 57½%; patent chest hinges, 55%; patent strap hinges, 55%; H hinges, 55%; HL hinges, 55%; japanned and Garnett hinges, double washered, light and strong, 40%; best best, London or Lancashire patent tees, 67½%; patent light japanned Scotch tees, 67½%; light patent hook hinges on plate and to drive, 30 to 35%; weighty Gothic, 20/ to 24/; scolloped edges, not japanned, 22/ to 24/; Scotch japanned tees, double washered, 20/ to 23/; Gothic Scotch japanned tees, 18/ to 22/; Gothic Scotch tees, self colour, 17/ to 21/; light "patent" broad Butts, polished joint, No. 200, 50%; ditto, No. 564, 35%; box hinges, 50%; light Parliament hinges, best strong 45%; best best ditto, 35% off list. Wrought hinges, common, 55%; best, 50%; best best, 50% off list. Heavy wrought hinges, common black, 1/6 per cwt.; ditto, common bright, 18/ per cwt.; filed edges, 17/6; japanned Gothic fancy, 15/6 to 18/; common bright, broad eye, 17/ to 18/; japanned, broad eye, fancy, 18/6 to best bright, 20/ to 21/; best broad eye, 21/ to 23/ per cwt.; cast hinges, polished joint, light patent tariff butts, 200, 50%; 3½, 42½%; 564, 35%; pressed hinges, common, 65 to 70%; best, 57½ to 62½%; common brass butt hinges, 1½ inch, 14/ per gross pairs net; very light, 8/6.

HOLLOWARE.—Best, 45%; common, 55 and 56%; enamelled ditto, best, 30%; common, 35%.

HORSESHOES.—Fullered fore, 16/ to 18; fullered hind, 17/ to 19/; stamped fore, 16/6 to 18/6; hind, 17/6 to 19/6.

IRONFOUNDRY, GENERAL.—Ash grates 7/9 to 9/ per cwt., air bricks, 2/9 to 3/6; half-single, 3/3 to 3/6; double, 5/6 to 6/; bars and bearers, 7/3 to 8/3; barrow wheels, 8/; bake pans, 8/6 to 9/6; camp ovens, 9/; cooking stoves, 9/ to 10/6; cellar grating, 8/6; clock weights, 7/6; Dutch stoves, 8/6 to 10/; dumb bells, common, 7/ to 9/; best best japanned, 15 to 17/6; furnaces up to 50 gallons, /33 to /43; galvanised ditto, /7 to /9 per gallon; furnace doors, 9/6 to 12/; furnace grates, 8/6; heaters for box irons, 6/6 to 7/6; heaters for urns, 8/6 to 9/6; oven doors and frames, 8/6 to 10/6; three legged pots, Danish and plumbers' 9/; plumb bobs, 10/6; pudding pans, 10/6 to 11/6; pump spous, 12/6 to 13/; sash weights, 4/6; ditto, with pulleys, 7/ to 8/6; shoe anvils, 8/6; Italian irons, 50%.

KNITTING PINS, iron, /25 to /1 per lb.; steel ditto, 25 to 28 W.G., 28 to /9 per gross, brass ditto, 1/1 per lb.; keys and blanks, 50 to 65%; extra strong plate, 30 to 37½%; extra strong Hanbury pinned keys, 35 to 40%; brass shutter knobs, 55%; brass cupboard turns, 55%; brass draw knobs, 55%; brass ashpan knobs, 55%; brass hinge knobs, 40 to 45%; lock furniture, brass, 67½%; chain lock furniture, 37½ to 45%; ebony lock furniture, 2½ inch, Wilkes' spindles, 18/ per doz. sets; sham ditto, 8/ to 9/ per doz. sets; Norfolk latches, common, 82½%; Suffolk latches, 75%; best ditto, 55%.

and larger, 9/ per cwt.; brass head nails, 62½%.

MELTING LADLES, 2 inch to 6 inch, 2/ to 16/ per doz., less 15%; Pitch Ladles, 3 inch to 6 inch, 3/6 to 12/ per doz., less 10%.

NAILS.—Patent forged nails, "Iron or Steel." Strong rose or flat points), 1 inch, 4 lb., 45/6; 1¼ inch, 6 lb., 38/; 1½ inch, 7 lb., 36/; 1¾ inch, 8 lb., 34/6; 2 inch, 10 lb., 32/6; 2¼ inch, 12 lb., 31/; 2½ inch, 17 lb., 28/6; 2¾ inch, 20 lb., 28/; 3 inch, 23 lb., 27/9 per cwt. Fine Rose (flat points), 1 inch, 2½ lb., 72 6; 1¼ inch, 3½ lb., 58/6; 1½ inch 4 lb., 54/6; 1¾ inch, 5 lb., 48 6; 2 inch, 7 lb., 43/6; 2¼ inch, 8 lb 41/6; 2½ inch, 10 lb., 37/9; 2¾ inch, 14 lb., 34/; 3 inch, 17 lb., 32/ per cwt. Coopers' rose (sharp points), 1½ inch, 7 lb. per m., 2/4; 1¾ inch, 8 lb., 2/7; 2 inch, 10 lb., 3/1; 2¼ inch, 12 lb., 3/5; 2½ inch, 17 lb., 4/5½; 2¾ inch, 20 lb., 5/1; 3 inch, 23 lb., 5/11 per m. Fine Clasp (sharp points), 1½ inch, 4 lb. per m., 2/1; 1¾ inch, 5 lb., 2/4; 2 inch 7 lb., 2/10; 2¼ inch, 8 lb., 3/04; 2½ inch, 10 lb., 3/5½; 3 inch, 14 lb., 4/4½ per m. Best Canada (sharp pointed), 1½ inch, 4 lb. per m., 2/2 inch, 7 lb., 2/6; 2¼ inch, 8 lb., 3/03; 2½ inch, 12½ lb., 4/03; 3 inch 14 lb., 4/4½ per m. Pound Nails, 6dy, 2½ inch, 28/6; 8dy, 2¾ inch, 27/; 10dy, 3½ inch, 23/6; 20dy, 4 inch, 23/ per cwt, discounts 50½% off iron, 45½% off steel. Nails, cast lath, 9 per cwt.; wall nails, cast, 8/6 per cwt.; cast headed bills, ⅜ by 8 oz., 12/ to 14/; fine round cast bills, ⅜ inch, 11/ to 15/; strong round ditto, ⅜ inch, 12 6 to 14/; cast slate pegs, 10/ to 12/; black coffin nails, 55 to 60%; white ditto 45 to 55%; black coffin bullens, 50 to 55%; white ditto, 40 to 45%.

PICKS, iron and steel excavators, /3 to /5 per lb.

RAILWAY BEATER PICKS, /3 to /5 per lb. delivered in London or Liverpool. Rakes, light garden, 50 to 60%; light solid end rakes, 47½ to 52½%; bolstered teeth garden rakes, 50%; solid end, bolstered teeth garden rakes, 40 to 45%.

RIDDLES, common, ½ inch by 18, 21/ per doz.; do foundry or gravel, ½ by 18, 27/ per doz., less 55%.

RIVETS.—Copper hose, ⅜ by 8 and above, at/11 per lb.

RIVETS, Machine-made Wire, No. 6, 18/3 per wt.; iron boot rivets, 24/ to 25/ per cwt.; brass ditto, /91 per lb. Ship, tank and girder Rivets, ¼ inch, 12/; ⅜, 13/6; 7-16, 13; ½ inch, 12/6 per cwt.; Best Boiler Rivets, 1/ per cwt. extra. Ship scrapers, black steel blades, 50 to 55%; bright, 47½ to 52½%; cast steel black, 47½ to 52½%; bright, 42½ to 47½%; best cast steel black, 40 to 45%; bright, 30 to 40 p.c.; sash chain, copper, 55 p.c.; zinc, 55 p.c.; iron prepared ditto, 50 p.c.

SAD IRONS, common, 7/6 to 8/ per cwt., delivered; best japanned, 12/6 to 13/6 per cwt.; best best opanned, 15/6 to 18/6 per cwt

SCALES, copper, 72½ to 77½%.

SCREWS, iron wood screws, 70% brass ditto, 62%; copper wood screws, 35%; stove ditto, 65%; do wel ditto, 70%; brass headlock screws, 40%.

SCREW STOCKS and DIES, 57½% off list.

SHOE BILLS, in 1 and 5 lb. parcels, extra strong, and strong, 9 to 13 W.G., 11/3; middle, 14 W.G., 11/3; fine, 15 W.G., 11/3; extra fine, 16 W.G., 12/3 per cwt Shoe heel, York, No. 1, 2/6 to 2/9 No. 3, 3/ to 3/3; No. 3, 6/9 to 7/6 per gross net; Dundee hot turned, 4/9 to 5/3 bright edge imperial or solid Scotch, 8/3 to 8/9; bright York, 61 B, 6/9 to 7/3; bright solid, 6/3 to 6/9 toe plates, 83/ to 8/9 per gross

SHOVELS, common iron, round back, dust, 4 inch to 8 inch, 1/9 to 6/ per doz., less 25%; socket handles, 1/ per doz. extra; Bell mouth Shovels, 7 inch to 10 inch, 2/ to 4/ per doz., net; ditto, japanned, with wood handles, 3/4 to 5/6 per doz. net. Shovels, all steel, crutch handles, No. 2, 17 No. 3, 18/3; No. 4, 19/9 per doz.; No. 5, 20/6 per doz.; eye-handles; 1/ per doz. extra; riveted ditto, 2/ per doz. extra; Spades and hovels, common, 62½%; second, 52½%; Best, 42½% discount off the list

SIEVES, brass and iron, 55% off list; Wove wire, brass and iron, 55% off list.

SOFA SPRINGS, "Bright," 8 by 5 inch, 10/8; 8 by 6 inch, 10/9 8 by 7 inch, 12/6; 8 by 8 inch, 13/6; 8 by 9 inch, 15/3; 8 by 10 inch 19/ per gross, less 15 per cent. "Coppered," 1/ per gross extra to 8 by 8; all above 1/6 per gross; coiled, /6 per gross extra.

SPLIT COTTERS, 60% off list. American Wire Tacks, 70% off list.—**W. Gorse and Son**, Icknield Square, Birmingham.

SPOKES.—Steel bicycle and perambulator, tinned, cut to lengths, and headed, No. 6, 29/9; 7, 30/3; 8, 30/6; 9, 31/; 10, 31/6; 11, 32/ 12, 32/9 per cwt. Bright, 9/ per cwt. less.

STAIR RODS, turned ends, 85%; ditto, solid fancy ends, 85%.

STAPLES, Wire fencing, 1¼ to 2 inch, No. 6, W.G., 12/3; No.

STEEL TOYS, 10 to 30% off the list.

STEELYARDS, 65%.

TACKS, fine cut; in 1 and 7 lb. parcels, ½ inch, 29/6; ⅝ inch 28/6; ¾ inch, 20/9; ⅞ inch, 28/3; 1 inch, 27/6; 1¼ inch, 26/9; 1½ inch 26/9 per cwt., tinned, 8/ per cwt. extra; in ½ cwt. bags, 1/ per cwt. less.

TIP NAILS, in 1 and 5 lb. parcels, ½ inch, 17/9; ⅝ inch, 16/3; 1 inch, 15/3; 1¼ inch, 14/3; 1½ inch, 13/3; best iron, 2/; charcoal, per cwt. extra. Tinplates, best charcoal I.C., 22/ per box; 2nd quality ditto, 21/ per box; best coke 19/; coke, 18/ per box.

TRAPS, bow spring, sham Dorset and real Dorset rabbit traps, 45 to 65%, list prices; common traps, 4 inch, 5/6 to 8/ per doz. net run traps, 2½ inch, 4/ to 8/6 per doz.; bird traps, 3/9 to 4/ per doz. wolf and other double flat spring, common bridge, 1/; axle bridge 1/4 per lb., 40 to 45%; hawk or pole traps, 50 to 60%; wrought mole traps japanned, 2/6 to 3/9; galvanised, 3/6 to 4/9.

TUBES, iron gas, 70%; fittings, 75%; galvanised iron gas tubes, 55% fittings 60%; lap welded boiler tubes, 50%, delivered; bell tube, zinc 33 to 35/ per cwt.; patent cased tube, 57½ to 62½%, cut to lengths if required; polished and lacquered twisted brass tube, 40%; patent cased taper iron tube, 40 to 45%; patent taper iron tube, 40 to 45%; parallel iron brased tube, 40 to 45%; twisted iron parallel tube, 40%; patent cased parallel tube, 40%; Brass Tubes, plain, rough, ⅜ inch and above, /95; other shapes /10½ to /11½ per lb. Bell cop per tube, ⅜ inch and upwards, 1/6 to 1/1 per lb.; brass ditto, 1/2 to 1/4; locomotive and marine boiler tubes, seamless, 1½ to 3½ outside diameter, to 14 W.G., 1/6 per lb.

VICES, best warranted, "Black" staple, solid box, 26/6 per cwt. Best warranted, "Bright" staple, solid box vices, 28/6 to 30/6 per cwt.; vice boxes and pins, 67/ per cwt.

WASHERS.—Light iron, 77½%; heavy washers, 13 to 16 W.G 12/ per cwt.

WIRE.—Iron, bright, 0 to 6, 10/3; 7, 10/9; 8, 11/ 9, 11/3; 10, 12/; 11, 12/6; 12, 13/3; 13, 13/9; 14, 14/3; 15, 15/; 16, 15/9 17, 16/9; 18, 17/3; 20, 18/3 per cwt.; galvanised, 0 to 6, 3/6 per cwt. extra; best annealed drawn fence wire, oiled, 0 to 6, £9 10/; 7, £10; 8, £10 5 9, £10 15/ per ton; galvanised, 0 to 6, £12 15/; 7, £13 5/; 8, £13 15/ 9, £14 5/ per ton. Steel fence wire, round or oval, £2 per ton extra Black rolled fence wire, 4 or 5, £7 5/ per ton. Tinned bottling wire, No. 12, 31/6; 23, 33/6; 24, 35/6 per cwt., cut in lengths and made up in 1 lb. parcels. Fine galvanised iron wire, No. 23, 4/3 per stone of 14 lb.; cast steel wire, /5 per lb.; charcoal iron wire, 4/ per cwt. extra; tinned ditto, 9/ per cwt. extra, delivered in London; 5/ per ton less in Liverpool.

WROUGHT, best, countersunk clout and cone head Nails 1 inch, 29/9; 1½ inch, 25/3; 2 inch, 22/6; 2½ inch, 20/3 per cwt.; Best fine Swedish iron countersunk horse nails, stamped, 6 lb. per m. 53/ per cwt.; 8 lb. per m. 49/; 10 lb. per m. 45/9 per cwt.; 12 lb. per m. 41/6 per cwt., are subject to 45% Derby list. Wrought rose and dock head spikes, 4 inch, 22/9; 5 inch, 11/6; 6 inch, 10/9; 7 inch, 10/3 per cwt.; galvanised, 4/9 per cwt. extra; Wrought rose nails at or sharp points, 2 inch, 22/3; 2½, 21/3; 2¾, 20/6; 3, 18/ per cwt. Wrought nails, May 1876 list, 40 to 45% wrought Bromsgrove nails March 1878 list, 30 to 35 p.c.

LONDON PRICE LIST OF METALS, ORES, OILS, CHEMICALS, &c.

[FOR THE PRESENT AND PAST WEEK.]

Metal Market, City, Thursday Afternoon, 4 P.M.

(*November 23, 1882.*)

METALS AND ORES.

	Nov. 16.		Nov. 23.	
COPPER (per ton)—	£ s.	£ s.	£ s.	£ s.
Chili, for 96 per cent.	(8¼ c/	70 5/ 67 7 6	70 5/	
Wallaroo	75 0/	76 10/ 74 10/	75 0/	
Burra Burra	75 0/	— 74 10/	—	
English Tough	73 0/	75 0/ 72 10/	74 0/	
English Ingot, best	74 10/	76 0/ 74 10/	76 0/	
Sheets sheathing and rod	82 0/	— 82 0/	—	
Bottoms	86 0/	— 86 0/	—	
Ore per unit	—	— —	—	
PHOSPHOR BRONZE				
Special Bearing Metal (p tn)	119 0/	— 119 0/	—	
Other alloys (per ton	127 0/	142 0/ 127 0/	142 0/	
TIN (per ton)—				
Straits (Cash)	98 15/	99 0/ 99 10/	99 0/	
Do. for arr.	—	— —	—	
Billiton	—	— —	—	
Banca	—	— —	—	
English Ingots	104 0/	102 0/ 104 0/	102 0/	
Do. Bars	105 0/	103 0/ 105 0/	103 c/	
Do. Refined	106 0/	105 0/ 106 0/	105 c/	
Australian	98 15/	99 0/ 99 10/	99 0/	
TIN PLATES, per box, I.C. coke f.o.b. London	0 16 9	0 17 6 0 16/	0 17/	
IX. do.	0 21 0	0 22/6 0 21/	0 22/	
I.C. charcoal	0 19 6	0 22/ 0 19 6	0 22/	
I.X. "	0 25/	0 27/ 0 25/	0 27/	
Red lead	15 6/	16 0/ 15 0/	16 0/	
White	21 10/	— 21 10/	—	
Patent shot	17 0/	17 6 17 0/	17 6/	
ZINC (per ton)—from No. 5 Gauge.				
Sheets, rolled	19 10/	— 19 10/	—	
Do., foreign	19 5/	— 19 5/	—	
LEAD (per ton)—	c c			
Soft English pig	14 5/	14 10 14 5/	14 10	
Do. W.B.	—	— —	—	
Spanish soft	13 10/	— 13 10/	—	
Do. with silver	—	— —	—	
SPELTER (per ton)—				
Silesian, com	17 5/	— 17 5/	—	
Rhenish	—	— —	—	
English	—	— —	—	
QUICKSILVER, bot.	5 17 6	- 5 17 6	—	
ANTIMONY ore (per ton)—				
Australian	—	— —	—	
Spanish	—	— —	—	
French Star	5 c	55 0/ 0/	55 0/	
Regulus—				
Crude (per cwt.)	1 14/	— 1 14/	—	
NICKEL (per lb.)	0 3/3	— 0 3/3	—	
BRASS (per lb.)—				
Sheets, 48×24	0 0/8	— 0 0/8	—	
Tubes	0 0/11	0 1/ 0 0/11	0 1/	
Wire	0 0/8½	— 0 0/8½	—	
Yellow metal	0 0/6½	0 0/7 0 0/6½	0 0/7	
ASBESTOS (per lb.)	0 0/3	0 0/6 0 0/3	0 0/6	
PLUMBAGO (per cwt.)—				
Ceylon lump	0 16 6	1 2/ 0 16 6	1 2/	
Do. chip	0 10/	0 14/ 0 10/	0 14/	
Do. dust	0 10/	0 12/ 0 10/	0 12/	
COALS (per ton)—				
East Hartlepool	1 2/	— 1 2/	—	
Lambton	1 4/	— 1 4/	—	
Tees	1 4/	— 1 4/	—	
Hartley	1 2/	— 1 2/	—	
Hetton	1 4/	— 1 4/	—	
Hawthorn	1 3/	— 1 3/	—	
Tunstall	1 2/	— 1 2/	—	

OILS, CHEMICALS, &c.

	Nov. 16.		Nov. 23.	
OILS (per ton)—	£ s.	£ s.	£ s.	£ s.
Olive, Galioli	—	— —	—	
Do. Gioja	—	— —	—	
Do. Levant	36 0/	36 10/ 36 0/	36 10/	
Do. Seville	—	— —	—	
Do. Corfu	—	— —	—	
Seal, pale	35 10/	36 0 35 0/	36 0/	
Sperm head	70 0/	72 0/ 70 0/	72 0/	
Cod	37 10/	39 0/ 38 0/	39 0/	
E.I. Fish	—	— —	—	
Rape, English, brown	31 15/	31 15/ 31 10/	32 0/	
Do. refined	—	— —	—	
Foreign Refined	—	— —	—	
Ground nut and Gingelly	—	— —	—	
Madr.	—	— —	—	
Palm oil, fine	37 10/	39 0/ 37 10/	39 0/	
Palm nut oil	—	— —	—	
Linseed oil	22 5/	22 17/6 21 10/	22 0/	
Cottonseed (per ton).				
Crude	26 10/	24 10/ 26 10/	23 0/	
Refined	28 5/	29 5/ 28 0/	29 0/	
Hull	25 15/	— 25 15/	—	
Lard, English	70 0/	68 0/ 70 0/	67 0/	
Cocoanut, Cochin	36 0/	37 0/ 36 0/	37 0/	
Do. Ceylon pipes	30 15/	31 0/ 31 0/	31 5/	
Sydney	—	— —	—	
OIL CAKE (per ton)—				
Linseed, Lndn.	7 15/	8 0/ 7 15/	8 0/	
American barrels	8 12 6	7 15/ 8 12/6	7 15/	
Do. bags	—	— —	—	
Marseilles	8 5/	— 8 5/	—	
Rapeseed	5 10/	6 0/ 5 10/	6 0/	
Cottonseed	5 10/	5 12/6 5 10/	5 12/6	
TALLOW—P.Y.C. old (per cwt.)	51 0/	52 0/ 51 0/	52 0/	
S.American. Beef	—	— —	—	
N. American "	—	— —	—	
Australian Beef (fine) (per cwt)	0 42/	0 43/ 0 41/	0 42/	
Do. Sheep " (per ton)	0 44/	0 45 0 44/	0 45 6	
PETROLEUM OIL—(per gal.)	0 7½	0 0 7½	0 7½	0/7½
Refined coal oil	—	— —	—	
Naphtha	0 0/7	0 0 8 0 0/7	0 0/8	
TURPENTINE—(per cwt.)				
French Spirits	—	— —	—	
American do.	—	— —	—	
WHALEFINS (per. ton)—				
Davis' Straits	900/	1000/ 900/	1000/	
Arctic	900/	1000/ 900/	1000/	
BRIMSTONE (per ton)—				
Rough 3rds	6 15/	— 6 15/	—	
Roll	9 5/	9 10/ 9 5/	9 10/	
Flour	10 15	12 10/ 10 15/	12 10/	
ACID, (per lb.)				
Acetic	0 18/	0 26/ 0 18	0 26/	
Second quality (per gal.)	—	— —	—	
Citric (per lb.)	—	1/10 —	1/10	
Muriatic (sp. salts per cwt.)	0 4/6	0 7/6 0 4/6	7/6½	
Nordhausen 50 per cent.	0 45/	0 50/ 0 45/	0 50	
Nitros	0 0/2½	0 0/4½ 0 0/2½	0 0/4	
Oxalic (per lb.)	0 /6	— 0 /6	—	
Do. Brown	0 0/0½	0 0/1 0 0/0½	0 0/1	
Tartaric Crystal	0 1/8½	0 1/7½ 0 1/8½	0 1/7½	
Do. Powdered	—	— —	—	
AMMONIA—				
Carbonate, per lb.	0 0/6½	0 0/6½ 0 0/6½	0 0/6½	
Sulphate, Best White (per ton)	20 0/	20 5/ 20 0/	20 5/	
ARSENIC—White Lump (per cwt.)	0 24/	0 25 6 0 24/	0 25/	
Powdered do	0 10 5	0 10/0 0 10/6	0 10/0	
Bleaching Powder 35 %	0 5/	0 5/6 0 5/	0 5/6	
BORAX, Rfc., Eng.	0 60/	0 63/ 0 60/	0 63/	
COPPERAS, green, tierces (ton)	0 45/	— 0 45/	—	
PORTLAND CEMENT—				
1st quality in casks 400 lb. gross, including casks, f.o.b., Thames, per cask	0 9/	— 0 9/	—	
Do. in sacks, 200 lb. net (per ton)	2 0/	— 2 0/	—	
Sacks extra, 1/6 each.				
Charlton White Paint (per cwt.)	1 12/	— 1 12/	—	
Calley's Torbay Paint, Brown	0 30/	— 0 30/	—	
Do. Red	0 31/	— 0 34/	—	
LEAD, Sugar, Eng., white	0 31/0	0 34/6 0 31/0	0 34/6	
Brown	—	— —	—	
Red (per cwt.)	0 16 6	0 17/0 0 16 6	0 17/0	
White, ground	0 21/	0 22/ 0 21/	0 22/	
LITHARGE (per cwt.)	0 17 6	0 21/6 0 17 6	0 21/6	
LIME (per ton)—				
Acetate, Brown	11 0/	11/ 10 11 0/	11/ 10	
Distilled	16 10/	17 0/ 16 10/	17 0/	
POTASH—				
Bichromate (lb.)	0 0/5½	0 6/ 0 0/5½	0 6/	
Chlorate (pr. lb.)	0 0/5½	— 0 0/5½	—	
Pruss. Red (lb.)	1 10	— 1 10	—	
Do. Yel. lb.	0 10/	0 10/ 0 10/	0 10/	
Sulphate 80% (per ton)	8 1/	9 10/ 8 1/	9 10/	
SALTPETRE (per cwt.)—				
Engl. refnd. kgs.	0 25	0 26/ 0 25/	0 26/6	
Do. barrels	0 27/	0 20/ 0 27/	0 29	
Do. Bengal	0 10/6	1 1/6 0 10/6	1 1/6	
SODA, Acetate (per cwt.)	0 24/	0 25/ 0 24/	0 25/	
Bicarbonate	0 0/3	— 0 0/3	—	
Caustic 60 to 62 %	0/0	0/3/ 0/0	0/3/	
Crystals grw. hts. & ship (prton)	3 5/	3 5/ 3 5/	3 4/	
Nitrate	12 0/	13 0/ 12 0/	13 0/	

IRON.

No. 516.

LONDON, FRIDAY, DECEMBER 1, 1882.

ENGINEERING EDUCATION.

IT has long been felt, and the fact has more than once been publicly commented upon, that the members of the engineering profession are in an anomalous position, and are in some respects placed at a disadvantage with the members of the other liberal professions. The engineering profession has no defined status; it may—and, in fact, does—number amongst its members persons who are in no sense of the word engineers, nor are entitled either by their knowledge or abilities to add C.E. to their names. Such persons are self-constituted members: they have no examination to pass, they require no certificate of ability, they need not belong to any of the engineering societies, and they may strut about in their borrowed plumes as much as they like and no one can say them nay. Let it not for one moment be thought that we wish to imply that belonging to a professional society or institution will make an engineer. Nor, on the other hand, that there may not be sound practical engineers who are not members of any society. Old George Stephenson was the earliest and most noble example of men of this latter class, and we can never forget him. No; what we mean is, that the public have at present no guarantee whatever that a man who happens to be unknown to professional fame, or who has not yet executed some great work or other, may be entrusted with the carrying out of a project with the reasonable prospect of his being successful. It is true that the certificates of the three leading institutions, viz., the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Society of Engineers, which latter embraces all branches of the profession, are to a certain extent evidence of professional attainments on the part of the holders, for they can only be admitted as members upon reasonable proof that they are more or less qualified. These, however, are not such diplomas as are necessary in the medical or legal professions, nor are they absoute and irrefragable evidences of professional education and training. What is wanted is a system of education and examination undertaken by responsible institutions, and which shall place the members of the profession, and thereby the profession itself, in a condition of defined proficiency, and rescue it from its present comparatively anomalous position.

During the present year this subject has received much careful attention at the hands of the council of the Society of Engineers, and the president, Mr. Jabez Church, has been most assiduous in his endeavours to carry out some scheme having for its object the better training and technical education of the younger members of the profession. This is as it should be. The initiatory step has been taken in the right quarter, for the society has a large number of the junior members of the profession in its ranks. It is, however, by no means the first attempt the society has made to educate the young engineer. It has now been established for nearly thirty years, and almost from the outset it has done this to some extent in a very practical way. We refer to the visits the members are in the habit of making to engineering works and establishments of cognate interest during the vacations, and which were inaugurated by its energetic honorary secretary, Mr. Alfred Williams. Moreover, at its meetings, when professional papers are read, free and full discussion is always encouraged, and the junior members are invariably solicited to give their views on the subject before them. It would seem, therefore, most appropriate that the Society of Engineers should take up the work of the more extended education of the young engineer. In doing this in the way it proposes, it in no way trenches upon the work of other institutions, collegiate or otherwise, but marks out a distinct path for itself, which, other things being equal, should be of permanent benefit to the profession at large. It, however, yet remains for another responsible body to take up the question of examination. This, it appears to us, should be done by none other than the parent society—the Institution of Civil Engineers. The members of that body have, we understand, been sounded as to taking up the educational part, but they consider—and rightly so—that it is for the younger members of the profession to deal with that question. It, therefore, follows almost as a matter of course, if not as a natural consequence, that the institution, as the senior representative of the profession, should take the position of the examining body. In the architectural profession the Institute of British Architects is recognised as the examining body, and the Architectural Association as the educational body. Hence, upon all points the Institution of Civil Engineers should unquestionably be looked to for dealing with the question of examinations and the issue of diplomas.

It is both interesting and gratifying to know that the work of the Society will be commenced in earnest next week. Their plans have been carefully matured, and our advertising columns have, for several weeks past, borne testimony to the practical character of their proposed operations. As a first step, the council have arranged for a series of lectures, to be given during the winter by gentlemen duly qualified for the purpose, and at an exceedingly moderate fee for the three courses; for three are announced. The first course will consist of eight lectures, by Mr. Henry Adams, on "Strains in Ironwork," whilst the second course will be by Mr. A. T. Walmisley, on "Land Surveying and Levelling," and will also consist of eight lectures. The third course will consist of a similar number of lectures, by Mr. R. W. Peregrine Birch, on "Water Supply and Drainage." The lectures will be delivered in the hall of the society, in Victoria Street, Westminster, and the syllabus which is before us sufficiently indicates their scope and character to justify us in strongly recommending the younger members of the profession to attend them—for they are open as well to non-members as to members of the society.

It may be advanced by some that lectures on engineering subjects are delivered at colleges. So they are, but they are delivered at such a time as it is least possible—or, to put it plainly, almost impossible—for engineering students to attend them, that time being during the day. The society's lectures will be delivered in the evening, so that it will thus be possible for all those who are engaged in offices during the day to attend them. In every respect, in fact, the council have endeavoured to consult the convenience, and have taken pains to meet the requirements and necessities, of their junior brethren, and we think that, when the lectures have been delivered, the council will be found to have succeeded in their object. The society has from the first claimed to be the friend of the young engineer; it has always made good its claim, and is now endeavouring to substantiate it more absolutely than ever. It only remains for the senior body to assume the position we have indicated, and for which it is so eminently qualified. We shall, therefore, hope to hear of some definite and organised action, in which both the society and the institution shall play a distinctive and a distinguished part. If, however, no examination be established, the Society of Engineers, by its present course of action, will greatly widen its sphere of usefulness, and will increase its reputation, and at the same time its numbers, as well as promote the best interests of the profession at large.

IRON TRADE SUMMARY.

THE English iron market continues quiet. The demand for pig-iron is slackening. Makers, as a rule, are still working on contracts which will last them a couple of months yet; but, on the other hand, consumers are disinclined to purchase more than they can help at present rates, in the hope of seeing them lower presently. The discouraging reports from Glasgow during the week have had a depressing and weakening effect upon quotations. At Glasgow itself, the operations of the "bears" have told, and warrants have gone down still more, closing on Wednesday for sellers at 48s. 8d. cash and 48s. 10½d. a month; which represents a fall since last Wednesday of about 9d. Makers are not nearly so firm as they have been, owing to the demand from America and the Continent being not quite so good; but this falling-off is to some extent counterbalanced by enquiry on the part of local consumers who formerly bought Middlesbrough iron, but who are now turning their attention to cheaper Scotch iron. At Middlesbrough, consumers are holding back in the expectation that they will be able to buy cheaper next month, and the amount of business done at last Tuesday's market was consequently very limited. Merchants are quoting now 3d. per ton less than last week, or 43s. 6d. for No. 3; buyers, however, are not to be tempted to purchase at that price. Makers' quotations vary from 44s. to 45s. Shipments have fallen off considerably during the month at Middlesbrough. Trade in pig-iron is dull also on the Tyne, in Durham, and Lancashire; but it keeps pretty brisk in the Midlands, where prices are unaltered. Pig-iron is easier in South Wales. The hematite iron market remains very quiet. Prices are weaker, and may be stated at 57s. for No. 1, 56s. for No. 2, and 55s. for No. 3, net per ton at makers' works. The finished iron market has been quieter during the past week than it has been for some time, and prices are drooping. Shipbuilders especially are holding back such orders as they have, and if prices were reduced 2s. 6d. per ton, buying might be resumed. It cannot be said, however, that manufacturers would very willingly adopt such a course, as they maintain that present prices yield little or no profit. In Lancashire, the tendency to give way in quotations of finished iron appears to be greater than in pig-iron. A quiet time is reported with the ironmasters of the West Yorkshire district, but not more so than is usual at this time of year. New orders for finished iron are not quite so plentiful in the Midlands as could be desired. The tinplate market is very dull, and prices are lower than ever, 15s. to 15s. 3d. per box of I.C. cokes being mentioned. There is practically no alteration in hardware in which an average trade is being done. A fair amount of activity prevails at Birmingham. There is very little change to note in the heavy iron and steel trades of Sheffield. Bessemer steel has gone down a little in price. The steel trade generally shows no variation in tone. The demand is fairly maintained, especially for railway material, and merchant qualities are also in good request. Engineers, especially locomotive builders and machine tool makers, as well as naval engineers, are very busy, but fewer orders are given out for general work. In the shipbuilding yards activity continues. Numerous launches are taking place, and builders have now less difficulty in getting fresh orders, and are able to obtain better prices, with materials cheaper. The English coal market, generally speaking, is fairly active, and previous prices are obtained. In the North, shipments of steam-coal are less, but they continue on a fair scale in South Wales. The demand for house-coal is not quite so good as it has been. Manufacturing coal and coke are active.

The iron markets of the Continent are quieter. A weakness has set in in the Belgian market, extending both to pig and manufactured iron. Pig-iron is lower, and finished iron is also giving way. Bars may be bought in Belgium below 135 fr. Quietness continues in the French iron market; quotations are, however, firm. Calmness also prevails in the German market. But as works are satisfactorily engaged, better than they were this time last year, the general feeling is confidence in the immediate future. The price of puddling pig (62 marks) finds general acceptance. Luxemburg makers of pig-iron hold on to their quotation of 57 francs. The official quotation at Dortmund for bar-iron is maintained at 145 marks. Silesian iron manufacturers are bitterly complaining of the injury done them by the new Russian customs duties on iron, which, it will be remembered, were considerably raised at the beginning of the summer. The coal markets of the Continent are still active; but there is a little less animation in household fuel. The American iron market is very much unsettled, and prices are still receding. Steel rails have gone down to 40 dols. There is every probability that a general reduction of wages will shortly take effect. Quotations of Scotch iron are slowly but surely going down.

THE AMERICAN PROTECTIONIST THEORY.

WE have often been curious to hear with what arguments protectionists are prepared to defend their economic views. Of course, every one is familiar with the primary assertion that protection is essential to enable the industries of young countries to compete with those of older and well-established nations; but how its advocates accept the logical conclusions to which this first step leads, and how they seek to reconcile the maintenance of the system after the initial object has been attained, is perhaps not so well known. The recent tariff agitation in the United States has afforded an opportunity of hearing what we must take to be a complete array of the arguments which protectionists are able to adduce; and as it bears special reference to the iron and steel industries of America, it may not be without considerable interest to our readers, although the theme is perhaps a somewhat threadbare one. Whilst the Tariff Commissioners were sitting at Pittsburgh in October, a paper was laid before them for the purpose of demonstrating that the tariff on iron and steel goods has been justified by its results, and that its continuance is a matter of policy. The paper in question bears the name of Mr. James M. Swank, as secretary of the American Iron and Steel Association, and it is, therefore, evidently to be regarded as an official manifesto on the part of the trade of the United States, and it may be concluded that every available argument and illustration have been pressed into service. Let us, therefore, see what case is made out by those who enjoy the benefits of the enormous bounty which the American nation pays to the manufacturers of iron and steel. In doing so, we shall confine our attention strictly to the argumentative portion of Mr. Swank's defence, where reason can be measured against reason; it is not necessary that any notice should be taken of the terms in which it pleases Mr. Swank to speak of the commercial system and policy of this country.

It may, haply, be altogether a mere coincidence, although it is undoubtedly a striking one, that a very philanthropical desire has been manifested to maintain the present tariff of the United States "for the benefit of American labour," at the time when the elections were pending. It must be acknowledged in justice, however, that no argument is attempted in support of this new feature in protection, which has hitherto hardly appeared in so disinterested a guise. It savours too much of an electioneering cry which generally appeals more strongly to the ear than to the understanding. It would not be difficult to show that the working man would be one of the first to benefit by an abolition of the tariff system of the United States, for although it would reduce the money amount of his wages, yet their purchasing power would be increased in a greater degree by the cheapening of the necessaries of life. The higher wages

THE MERRYWEATHER TRAMWAY LOCOMOTIVE.

ON THE STOCKTON AND DARLINGTON TRAMWAYS.

(*For description, see page 460.*)

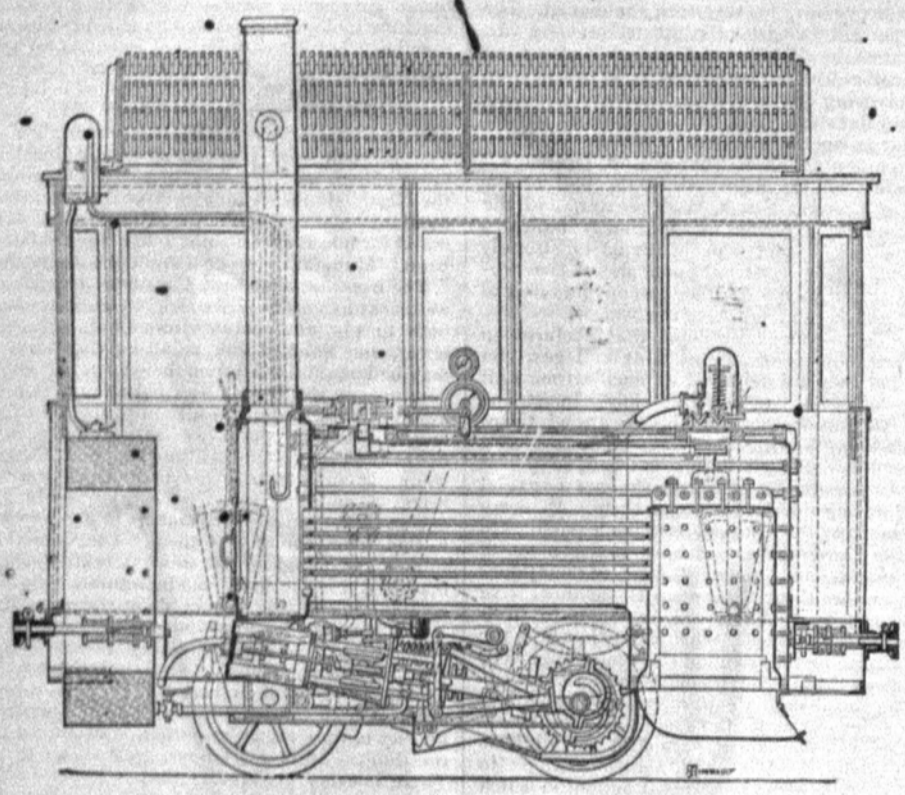


Fig. 1.

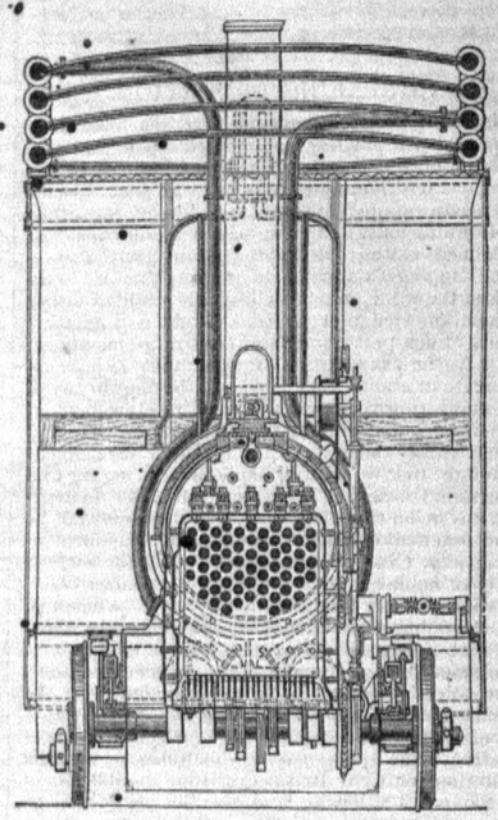


Fig. 2.

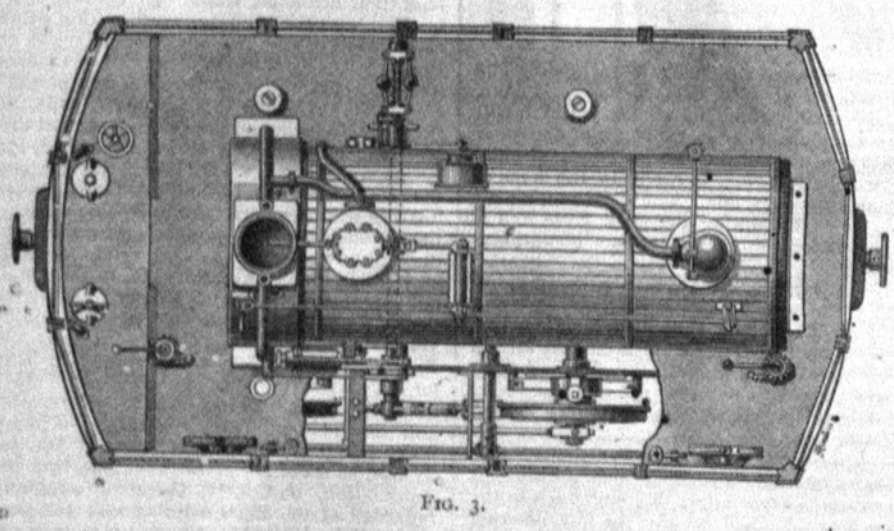


Fig. 3.

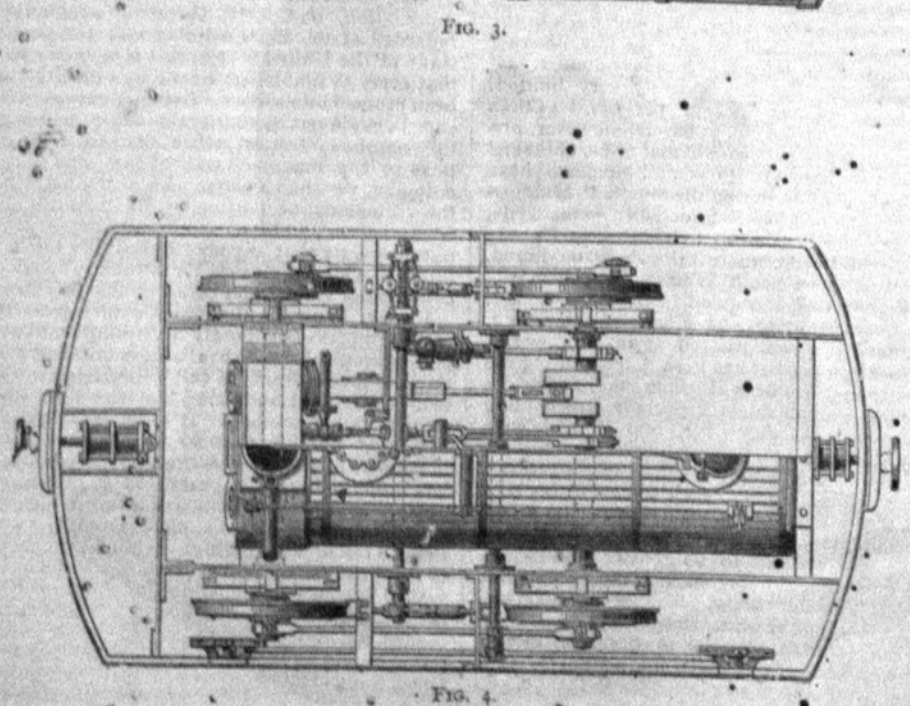


Fig. 4.

enjoyed by an American operative, and which are made so much boast of, are more fictitious than real. Competent observers have declared that on account of the higher cost of living in the States there is not much difference between the position of an artisan there and at home. But, as already said, there is no attempt made to enforce this labour view with arguments, so that we must turn elsewhere to find such as the protectionists are able to array on their side. Their grand assertion is, that the rapid strides made by the United States during the last twenty years are due largely, if not entirely, to the fostering influence of a protectionist policy. We would rather impute the wonderful development which has taken place within that time to the extraordinary resources of the country—stimulated by an everflowing tide of immigration—which have been so rapidly brought to bear upon the trade of the country, that the incubus of the tariff system has appeared but as a feather-weight to the vigorous leaps and bounds made, only, however, it is to be feared, to be followed by all the greater danger in the hour of trouble.. To show that the iron and steel industries of the United States have progressed remarkably during the last twenty years, concurrently with the imposition and enlargement of a protectionist fiscal policy, is not to prove that the former is the effect of which the latter is the cause. It may be very pertinently asked—What might the result not have been had a free-trade policy subsisted during the same period? The States, with their immense mineral wealth and the industrial genius which the inhabitants have inherited from their English ancestors, could have competed on equal terms with any manufacturer at home here or on the Continent, had they not been handicapped by the heavy duties with which they have hedged themselves round. They might then have had the world for their market; now, in their anxiety to exclude all foreign competition from their own market, they have shut themselves off from every other outlet for their productions in iron and steel. The very fact that the production of the United States has increased so largely, and that it has almost entirely been consumed within the country itself, argues, if anything, that the prosperity has been due to the urgent demands of the country, and not to the forcing process of protection. The United States, in their rapid development, required a certain amount of iron and steel, and this they would have notwithstanding what price had to be paid for it. To this circumstance is attributable the prosperity which has attended the iron and steel trades of late years. Had the protectionist system maintained these industries in a prosperous condition during years of general depression of business, or had it enabled American producers to find a market abroad when the home demand was slack, its advocates would have had better arguments in its favour than they have been able to muster. Had the development during the last twenty years, to which they point with so much pride, been exclusively

confined to the United States, their assertion, that it is due to the effects of protection, might have carried more weight with it, although even then it could not have been held to be conclusive; but the fact is, that the increase in the production of iron and steel during that period has been a world-wide phenomenon,—it has been common alike to the free-trade country and to the protected country. Great Britain made 8,377,464 tons of pig-iron last year, against 3,826,752 tons in 1860; the United States made 4,144,254 tons last year, compared with 821,223 tons in 1860.. The increase in the production of this country, although relatively smaller on account of the much higher figure from which the start is made, is, however, absolutely very much larger, having been during the twenty-one years under consideration 4,550,712 tons, against an increase in the production of the States of 3,323,031 tons. But we must leave this part of the subject, in order to glance briefly at the other arguments adduced.

The primary object for which protection was established having been gained, and the iron and steel industries of the country having become strong and vigorous, as the admirers of the system would have us believe, it might be expected that they would be able to stand alone and enter into competition with those of other lands, without the extraneous aid of a protective tariff. But, so far from this being the case, we are told "it is a great fallacy to suppose that, because the leading industries have now been built up under a policy of protection, they no longer need the same measure of protection that they have received in the past." This reads very like a confession that the industries have been reared upon a wrong method altogether, for they are not laid on such lines as to enable them to flourish, or even to exist, if once they are removed from the forcing-house of protection. Can such a result be regarded by unprejudiced eyes as a success? The protective tariff having been devised in order to allow the native industry to take root well, and various industries having been heavily taxed to accomplish this it might have been logically expected that it would be allowed that an evil had been endured in order that a great good might be secured; but, so far from this being the case, we are asked to believe that protection actually cheapens prices. The argument advanced in support of this strange assertion is that protection has increased competition by promoting the establishment of works in the United States, and that the tendency of competition, of course, is to reduce prices. Such a mode of reasoning is too puerile to deserve serious notice, for the very *raison d'être* of protection is to exclude foreign competition from the markets. The fall in the price of steel rails, upon which so much stress is laid, is due to the perfecting of the process of manufacture, to the introduction of many money-saving devices, and to the vastly increased production which has taken place, as well under the influence of free trade as under the unnatural stimulus of protection. The total make of steel rails in the United States between the years 1867 and 1881 was 4,566,358 tons, so that, leaving aside altogether the quantity imported, a sum of some £30,000,000 has been the penalty paid by the railway companies for the protective system as applied to this one article alone. It is idle to point to the rapid extension of railways which has taken place during the same time, and to say that it is evident high prices of material have proved no drawback, for how many of the American lines are in a position to pay dividends on their enormous ordinary stock, piled up as it has been owing to the costly nature of their construction? An economist, and an American too, has calculated that the people of the United States have to pay, in consequence of the protective duties, such high prices for their steel rails that it would be a good investment if the duties were abolished, and if out of state funds the existing Bessemer works were purchased and then closed, and the employés pensioned off. We need not trouble our readers with further illustrations of the arguments used by those interested in the maintenance of protection. They are all based on the erroneous assumption that the industries of the United States have been built up solely by protection, and that therefore all the advantages resulting from their prosperous condition have been gained entirely by the pursuit of that system; whereas there is every reason to believe that they would have attained as high, if not a higher degree of prosperity had a uniform system of free trade, modified only for revenue purposes, been adopted from the first.

THE FERRANTI DYNAMO MACHINE.

THE practical development of electrical science as applied to purposes of illumination still continues, and its onward progress does not appear to flag. We recently had to record the advent of the largest machine ever constructed, and now we have to notice the appearance of perhaps the smallest ever made—that is, the smallest as compared with others of similar power. We now refer to the Ferranti dynamo machine, a demonstration of which was given on Monday evening last in the presence of a large number of scientific and other gentlemen. The Ferranti system consists of two dynamo

SAWS FOR HOT IRON.

BY MESSRS. THWAITES BROTHERS, BRADFORD.

(*For description, see page* 460.)

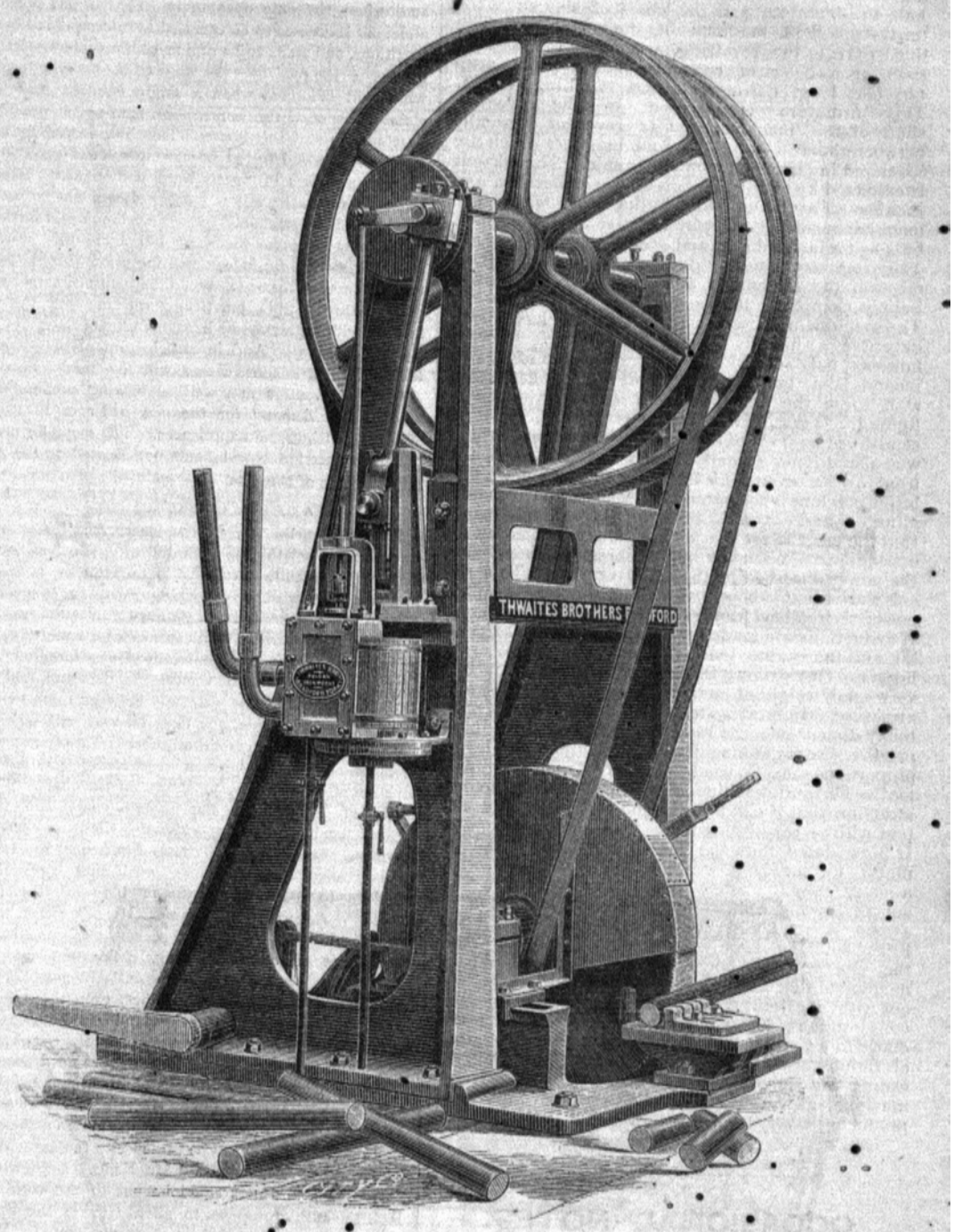


FIG. 1.

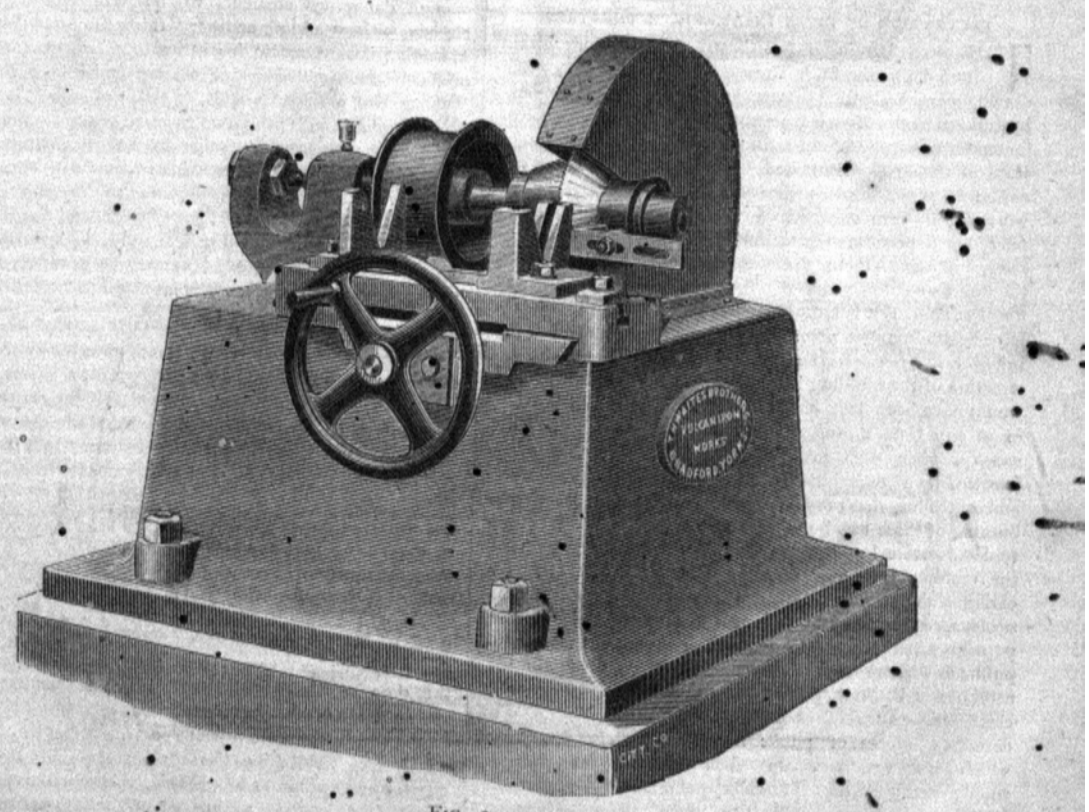


FIG. 2.

machines—one producing continuous and the other an alternating current—and an arc lamp. The machine exhibited on Monday evening was that producing an alternating current, and it is the joint invention of Sir William Thomson and Messrs. S. Ziani de Ferranti and Alfred Thompson. It consists of three main parts, the first and second being the two halves of the framing, which are cast in one with half the bedplate and the cores of sixteen of the thirty-two field magnets of the machine. The third part is the revolving armature, which consists of a helix of copper formed from a strip 120 feet long, corrugated, and weighing 18 lb. This armature is secured to the driving-shaft of the machine, and is revolved vertically between the two series of field magnets which are arranged in circles, one on either side. The current is collected by two phosphor-bronze collectors, and is taken off at the terminals in the usual way. The machine measures 2 feet by 1 foot 10 inches in plan, by 2 feet 4 inches high, and weighs 11¾ cwt. in all. The experiments on Monday took place on the premises of the Hammond Electric Light and Power Supply Company, in Cousin Lane, Cannon Street. The machine used was of the size we have been describing, which is of 500 light-power. It was, however, only supplying the current to 320 of Swan's incandescent lamps of 20 candle-power each, and with these the premises were considerably over-lighted. It was driven by one of Messrs. Fowler's semi-fixed engines of 16 horse-power nominal, which was also driving a small Siemens machine, which is used as an exciter for the Ferranti machine. The latter machine was running at 1920 revolutions per minute, and careful tests, it is stated, show that the current for the 320 lamps is produced by an expenditure of about 27 horse-power, which includes the power absorbed by the small exciter. This result shows that about twelve lamps of 20 candle-power are realised from each indicated horse-power. If deductions are made for driving the counter shafting and the engine itself, these results will be even higher. One striking feature in the machine is the very small weight of metal contained in the revolving armature. In most systems the armature is of very bulky dimensions, the result being that in multiplying the size of the machine an armature of very large proportions must be used. The great merit claimed for the Ferranti machine is that it is of such a construction that it can be enlarged to almost any extent with corresponding increase in electrical results. It was stated that the machine exhibited can be made to supply a current for 500 lights with a very slight alteration. Machines are in course of construction for supplying from 1000 to 25,000 lights, and it is said that the 2000 light machine is only very slightly larger than the one we have been describing. It should be mentioned that any number of lights may be switched out without altering the speed of the machine, the consumption of horse-power at the pulleys being reduced in exactly the same proportion as the number of lights turned out. The demonstration was in every way successful, and showed the Ferranti machine, although of small size, to be capable of producing a very large current.

OCCASIONAL NOTES.

PREVENTION OF FIRES IN AMERICAN THEATRES.

THE recent burning of two theatres in New York within two days—the Park Theatre and the Alhambra—has drawn renewed attention in America to the dangerously combustible character of such places of public resort, and the ever impending danger of public disaster so long as the present state of things is maintained. Fortunately, both fires occurred when the theatres were empty, or nearly so. A few workpeople were engaged in the Park Theatre, making ready for a performance to come off three or four hours later, and one of them, the stage carpenter, was cut off by the rapid spread of the fire. As the origin of the fire was not determined, it is impossible to say that a fire might not have arisen from the same source at any time; and from the brief interval between the discovery of the fire and the destruction of the building it is certain that a multitude of lives would have been lost had the fire broken out a little later, or at any time during a performance. As with us here, usually, when such preventible disasters occur, they are followed by a general discussion of the means of preventing and controlling fires in such places. Unfortunately, the simple burning of those two buildings, however (although it served to demonstrate the utter inadequacy, if not uselessness, of the customary interior arrangements and apparatus for extinguishing fires in theatres, owing to the almost instantaneous spread of the flames), seems to have aroused but little popular attention in America. The apathy of the general public in such matters is astonishing. The only significant utterance called out appears to be that of Mr. Esterbrook, chief inspector of buildings in New York, who describes places of public resort as largely fire traps which will yet burn up their hundreds of persons, simply because the "rascally politicians"—we admire forcible language—will not have them otherwise. Soon after the Vienna Ringtheater disaster, Mr. Esterbrook, with the co-operation of New York architects, draughted a bill which was presented to the state legislature last April, but was rejected. The proposed law provided, in addition to abundant exits and broad passage-ways, that a space of ten feet be left all around the theatre buildings; that all doors must be left unlocked and open outward; a brick wall must separate the stage from the auditorium, the only opening in it to be the proscenium arch; all staircases to be enclosed in brick walls; all floors, partitions, and stairs to be of non-combustible material; one quarter of the roof over the stage to be of skylights, which which will fall open when a single hempen cord is cut; stand-pipes of water, tanks, hose, &c., to be provided at different parts of the house. This bill, according to Mr. Esterbrook, was defeated because it was too good a law to suit the purposes of "petty ward politicians." Save this, there is "no reason why a theatre should not be safe from fire beyond all question." Mr. Esterbrook said further that he is going to press the same bill again this year. The *Scientific American*, in commenting upon this matter, says that some such measure should be, and ultimately will be, carried through, is practically certain; for the public interest will not always be held subordinate to that of speculative politicians. And in anticipation of the time when fireproof theatre construction will be made imperative, American inventors may well be making preparations for meeting the demand for the new order of theatre construction, fittings, and appliances. The scope for invention in this connection is wide, and not limited to the specific requirements of theatres.

ANOTHER GIANTS' CAUSEWAY.

Mr. J. Charles King, "engineer, &c.," has found a novel way of solving the Irish difficulty, which is, to say the least of it, certainly startling. His scheme is, as explained in a pamphlet, with accompanying chart, to connect Great Britain and Ireland by land, "so as to unite the two islands indissolubly for ever." With this view he would "construct a causeway, of the average width of one hundred yards," between the headland of Cantyre, in Scotland, and Torcor Point, in Ireland. The waterway between these two points is nineteen miles wide, 474 feet deep at mid-current, but much shallower towards either shore. This is the position selected, as offering the best engineering facilities for the creation of an isthmus, as shown on the chart. The high bluffs of Cantyre on the Scotch coast and the still higher land comprising Mounts Clady, Escart, and Carnlea, near the Irish coast—from 900 to 1200 feet high—"offer facilities for gravitating the materials requisite to form the isthmus between the opposite shores." According to the author, "there are no engineering difficulties in the way to prevent the immediate commencement of the undertaking, if favoured by national approval and commercial enterprise." We are afraid that Mr. King will fail to secure either, even though "a land junction of Great Britain and Ireland would create a more perfect homogeneity of the united peoples." His scheme is said to offer other advantages, which we need not particularise. We are further told that, "to accomplish the great national undertaking proposed, there need be no additional outlay of public money." Is not the material there? The mountains are waiting to be turned into the sea. And as to labour, employ convicts, says Mr. King. "Thirty thousand able-bodied prisoners could be put to the work at once." How the author proposes to guard "thirty thousand able-bodied prisoners" at their work is not stated. There are enough dangerous elements to be watched in Ireland already, without adding another "thirty thousand" thereto. Mr. King is as vague in his estimate of expense and time of construction. The cost of making the isthmus would be "about two million pounds," and the time it would occupy would be "from two to three years." Finally, to maintain a passage for ships to and from the North Channel to the Irish Sea, the Crinan Canal is to be enlarged, and another cut through the isthmus of Tarbert. We are bound to say that it is some time since so wild a scheme has been submitted to rational people, and, in sympathy with the author of it, it appears to us that he is as much at sea as his proposed "causeway" is intended to be.

THE NORTH OF ENGLAND FINISHED IRON TRADE.

On November 23, Sir J. W. Pease gave his award in the dispute as to wages which was referred to in our issue of October 27. It will be remembered that the masters made a claim for a reduction of 7½ per cent., while the workmen demanded an advance to the same extent. It is not necessary again to go over the various arguments used on both sides. In awarding the masters a reduction of 5 per cent. the arbitrator appears to have been guided in a great measure by the falling tendency exhibited in prices, as indicated by the accountant's return. While the average of the realised prices for the June and September quarters displayed a slight improvement as compared with that given by the orders for execution in these quarters, which were on the makers' books at the time of Sir J. W. Pease's former arbitration, the engagements of the manufacturers as they stood on October 18 showed the average price to be 2s. per ton less than that which was yielded by the commitments for the current quarter as existing in March last, the actual average figure being £6 7s. 7·50d., against £6 9s. 7·52d. per ton. The former price being but a few pence above the realised average for the quarter ending June 30, Sir J. W. Pease has thought that the requirements of the case would be met by taking from the workmen the two advances of 2½ per cent. each which they received on August 1 and September 16 respectively, under his award of last spring. The settlement thus arrived at is to embrace the four months ending on the last Saturday of February next, so that it is retrospective so far as the month of November is concerned. It is then terminable by one month's notice from either side on or after that date. Considering the distinctly quieter tone which has lately come over the iron trade, it is to be expected that the men will recognise the justice of the award, and acquiesce honourably in its terms. Both in his opening speech at the meeting of the board of arbitration and in the remarks attached to his award, Sir J. W. Pease laid great stress upon the desirability of a fresh sliding-scale being adopted, as the best means of avoiding the friction caused by references to arbitrators at frequent intervals, and securing the certainty which is so essential to the manufacturer in laying his plans in the future. In his opinion, the failure of the last sliding-scale had been brought about by the length of the periods elapsing between the different ascertainments of prices, the result being that the variations in values were not given effect to sufficiently quickly. He added that he had been informed there would be no difficulty in ascertaining the prices every month or every two months. With all its inherent weaknesses, the sliding-scale is probably the best device that has yet been discovered for the regulation of wages, and we commend Sir. J. W. Pease's remarks thereon to the careful consideration of both employers and workmen.

A NEW APPLICATION OF THE TELEPHONE.

We have heard of several suggested uses of the telephone, but never one by which the olfactory organs were to be appealed to as in the following instance, which we quote from the *Marquette Mining Journal*. Some patrons of the telephone, that paper says, have an idea that the instrument can be made to serve a great variety of uses. Now there was that Ridge Street man that we heard of the other day. He ordered a dealer to send some chickens to his house before he started down town in the morning, so that he wouldn't forget it, and after he had made sure of having something good for dinner by taking this precaution, he remarked to his wife that a telephone was a mighty handy thing to have in the house, and he really didn't see how he had ever got along without it. At noon he went home to dinner with a keen appetite for roast chicken. His wife didn't appear as cheerful as usual when he entered the house, and a very pronounced odour seemed to pervade the atmosphere. "Why, what's the matter, my dear, and what on airth is it that smells so foully?" he exclaimed. "Nice chickens, those you got me for dinner," said she in an injured tone; "just go out in the woodshed, and you'll discover where the 'fowl' smell comes from!" He did as directed. There lay the chickens, just as the butcher's boy delivered them, while from their carcasses arose the intolerable stench that had saluted his nostrils as he entered the house. He picked them up in a great rage, and started for the telephone. "Hello, exchange!" yelled he through the instrument, his voice vibrant with a passion that set the wires to dancing wildly. "Hello," responded the exchange, in dulcet, feminine tones. "Give me ———'s meat market," he demanded. It was done. After the usual exchange of "hellos," this conversation ensued:—"Say, send that confounded boy of yours up here at once to get those doubly confounded chickens!" "What's the matter with them chickens?" "What's the matter with 'em, eh? You just hold your nose to this telephone a minute while I hold 'em up to it and you'll find out!" And there he stood, holding the foul-smelling birds up to the talking machine, with a smile of exultant satisfaction on his face as he pictured to himself what a dose of nauseating odour he was pouring into that butcher's shop half a mile away, until the derisive laughter of his wife recalled him to his senses. Then he went outside and buried the birds to get rid of the smell, swearing softly to himself that he wouldn't buy another pound of meat from that butcher. To make the matter still worse, he has been fined for using "fowl" language through the telephone, and several of the subscribers insist that some of that smell got carried along the wires and keeps leaking out through their instruments yet. It was a trying experience.

LETTER-BOXES IN FOREIGN MAIL TRAINS.

Following upon the introduction of late letter-boxes in mail trains in which sorting duty is performed, the arrangement is to be extended to the foreign mail trains leaving London. We learn that a late letter-box will in future be attached to the foreign night mail train from Cannon Street to Dover, and will be available for posting late letters for the Continent, week-days and Sundays alike, up to the departure of the train. Such letters must bear an extra fee of 6d., prepaid by stamp, as in the case of letters posted in the station box from 7.30 to 8 p.m. A late letter-box will also be affixed to the foreign day mail train from Cannon Street on week-days only. Letters for the Continent can be posted in this box up to 7.45 a.m. if bearing an extra fee of 6d., prepaid by stamp. This arrangement is restricted to letters for the Continent, and no letters

for India, China, Australia, or for countries beyond Europe, the mails for which are forwarded through France, should be posted in the late letter-box attached to the mail trains, as such letters cannot be forwarded. The change now introduced is another step in the right direction; but we fail to see, as in the case of posting letters in the letter-boxes of English mail trains, why an extra, and such a heavy extra, charge should be made. It is uncalled for, as we have already pointed out.

CHEAP AT THE PRICE.

We are indebted to an American contemporary for the following account of a smart, businesslike transaction, which, if true, is probably the promptest settlement of a claim for damages in connection with a railway accident on record. It is stated that a month ago a woman about fifty years of age walked into the headquarters of a Georgia railroad, announced her name, and said she had come to make a settlement. "Settlement of what?" asked the superintendent. "For killing my old man." "When?" "Nine years ago yesterday." "Where?" "About 14 miles from Macon." And so it proved. When the circumstances were hunted out, it was found that she was the widow of a man who had been killed while walking on the track, and no one had been able to identify him. "Why didn't you come here sooner?" he asked. "Just heard of it the other day," she replied. "I suppose the old man was parading around somewhere, and would come home when his knees wanted new patches." "And what damages do you ask?" "Well, it was a long time ago, and my grief has been softened up a good deal, and I reckon that 25 dols. and a pass to Atlanta will be about right." Settlement, we are asked to believe, was made on the spot, and she took the next train for the capital.

THE TRUTH OF IT.

OUR contemporary, the *Newcastle Chronicle*, is at a loss to account for the fall in the price of pig-iron. In an issue of last week it says:—"One of the most unaccountable things in trade is the fall in the price. In this district the declension is not so marked, but in Scotland and in the Furness district it has been slow but sure for some months. The oddity about it is that there should be this falling off when there is a larger export than a year ago. From Scotland, the exports to the middle of November have been 549,892 tons this year, or 50,000 tons more than in the corresponding period of the past year. From the Tees, the shipments have been for the same time 830 987 tons, or 28,000 tons above those for the corresponding period of last year. The local consumption is believed to be as large as ever, and yet there has been a tendency in prices to fall, although the production is no greater than a year ago. It has been supposed that when pig-iron was very low, a good deal of money was invested in it by outsiders who wish now to realise, and to place money in trade. Without some such explanation, the declining tendency of prices is a mystery."

The *Darlington and Stockton Times*, in referring to this abnormal state of things—which matter, however, causes no surprise in well informed iron circles—rightly remarks that there need be no "mystery" as to the cause of "the declining tendency of prices." The facts are that Cleveland iron maintains its position, and prices of warrants are steady at about 2s. per ton more than they stood at a year ago, whereas Glasgow warrants are 2s. per ton less. Thus, Cleveland have gone up whilst Scotch have come down. But the condition of affairs in Cleveland is different from that in Scotland. In Cleveland, such has been the reduction in stocks, though they never approached those of Glasgow for quantity, that the makers have been able to face the difficulty which formerly was for ever cropping up between them and the bulls and bears. The makers are now masters of a situation they mean to keep, and the bulls and bears cannot now operate with any effect on that market. But in Scotland, things are different. There, owing to the immense stocks, the market is ruled almost entirely by bulls and bears, who, when the public have been drawn in, "bear" prices down, and after the public have been frightened into selling back to them at a loss, "bull" prices up. This is the way the Glasgow market is manipulated; and the large stocks of iron which have been lying there, we may say, almost from time immemorial, and have been transferred between the public and the bulls and bears thousands of times over, have enabled unscrupulous but wealthy operators to run prices up or down to suit their own books. At the end of last year the stocks of Scotch iron stood at about 940,000 tons, and up to now, notwithstanding the restrictive movement, this immense store has only been reduced by some 12,000 tons, so that the present stock of Scotch iron, which the bulls and bears have to play battledore and shuttlecock with, is no less than 928,000 tons. Another matter the *Chronicle* appears to overlook is that at the end of last year only 105 furnaces were in blast in Scotland, and the average over the first nine months of this year was 108, whereas the number in blast now is 115, and inasmuch as the restrictive policy has been abandoned, there is no telling how soon that number may be further increased to 130 or more. It is true that up to the middle of November the exports from Scotland exceeded those of the corresponding period of last year by 50,000 tons, but that falls far short of absorbing last year's addition to stock alone of close upon 132,000 tons, and though for the past few months Scotland may have been disposing of the iron it has produced, the time is now approaching when stocks must again begin to increase. Anyhow, judging from the depressed condition of the American iron trade, the 928,000 tons in stock are not likely to be reduced, for with winter coming on, when, as a rule, shipments fall off, and the probability of more furnaces going into blast, it is not unlikely that at the end of the present year stocks of Scotch iron may be as large or even larger than they were at the end of 1881. How under these circumstances any surprise can be felt at the "oddity" of the "falling off" it is difficult to conceive. The Glasgow "ring" now complain that the public keep aloof from purchasing, and so long as the large stocks are maintained so long should the public continue to exercise a wise discretion in avoiding both the bulls and the bears. It is not because money is wanted for trade that the public will not invest in Scotch iron. The fact is that they have been so much "fleeced" by these bulls and bears that, like a burnt child they now "dread the fire." When Scotch pig iron warrants can be bought at from 45s. to 47s. 6d. per ton, they may be worth touching as a speculation, if the trade of the country was in a fairly prosperous condition, but to go beyond 48s. with stocks as at present is only playing into the hands of unscrupulous operators who know better than the public how to take care of themselves.

PROGRESS OF THE BASIC PROCESS.

AT a meeting of the South Staffordshire Mill and Forge Manager's Association, held at Dudley on November 25, Mr. R. Edwards in the chair, a paper containing the latest information on the basic steel process, by Messrs. Thomas and Gilchrist, was read by Mr. P. C. Gilchrist. The authors remarked that the common Staffordshire pig-iron with which they experimented last June at Wednesbury had, before being melted, the following composition:—Strong forge pig—manganese, 1·12 per cent; silicon, 1·17; sulphur, 0·08: phosphorus, 2.97; grep forge pig—manganese, 1·13; silicon, 1·67; sulphur, ·05: phosphorus, 2·72. The strong and grey forge were mixed in equal proportions and melted in the air furnace, and the resulting metal contained —manganese, 0·75; silicon, 1·28; sulphur, 0·10; phosphorus 2.94. The authors presented the analysis which they had specially obtained from Mr. Windsor Richards, and which had been made by Mr. E. W. Cook, the chemist to Bolckow, Vaughan and Co., of the pigs which that company used up in the basic process on the Thursday previous to the meeting, November 23, and analyses of the rail made from it, and of the basic brick used for the lining of the converters on that day. The analyses of the brick was:—Lime, 49·91 per cent; magnesia, 30·72; alumina, 4·50; oxide of iron. 3 46; and silica 11·41. The analysis of the pig used was:—Iron, 92·85; combined carbon, 1·10; graphite 2·25; manganese, 0·60; silicon, 1·30; sulphur, 0·15; phosphorus, 1·75. The rail analysis was:—Iron, 98 25; combined carbon 0·46; manganese, 1·18; silicon. trace; sulphur, 0 05; phosphorus, 0 060. The casket of basic steel which the authors exhibited as having been presented to them by the Central Director of the Kladno Steelworks, Austria, was made from pig containing carbon, 3·05; silicon, 1·06; phosphorus, 1·86; manganese, ·48; and sulphur, 0·26 The ingot iron, of which the casket was wrought, contained carbon, 0 18; silicon, traces; phosphorus, 0·05; manganese. 0·34. The authors further stated that Messrs. Bolckow, Vaughan and Co. were now making 9600 tons of basic steel per month, and that in January next they expected to make 16,000 tons. At present they had four 12-ton converters. But the Continental steel masters were still ahead of England in their appreciation of the process. The authors had obtained returns from the continental works, showing their individual output under this process as recently as during the last month, (October). These showed a total production of 37,639 tons of steel. This was produced at one work in France, one in Belgium, eight in Germany, three in Austria, and one in Russia. The largest individual output during October at any one of these works was 7000 tons, being at the establishment of the Dortmund Union, who were employing two converters of 9½ tons each. The next largest output was at the Hoerde works, Germany, which possesses three 10-ton converters. Their output was 4100 tons. The process was likewise extending more rapidly on the Continent than in England. In Europe 25 converters were now being built, with a minimum capacity of 36,000 tons per month; while in England nine converters were being erected, which would probably produce at least a further 16,000 tons per month. The inventors made up their total of 37,639 tons as the output of steel by the Continental works, with the basic process, during the month of October, from the following details, for which they had specially written to the works named:—France—Schneider, of Creusot, with two 7-ton converters, and one 10-ton Siemens furnace, 1240 tons; Belgium—D'Angleur works, Remory, with two 6-ton converters, 1687 tons; Germany—Rothe Erde works, Aachen, three 5-ton converters, 3900 tons; Bochum, three 4½-ton converters, 2835 tons; Gutehoffnungshutte, two 6-ton converters, 1336 tons; Hoerde, three 10-ton converters, 4100 tons; Peine works, Hanover, three 10-ton converters (but only one at work, which commenced in September last), 418 tons; Rheinische Stahlwerke, two 6½-ton converters, 3000 tons: Dortmund Union, two 9½-ton converters, 7009 tons; De Wendel, Hayange, four 8-ton converters (return not received in time), estimated at 3000 tons. Austria—Kladno steelworks, three 5-ton converters, 1854 tons; Teplitz, two 6½ ton converters, 3000 tons; Witkowitz, two 8-ton converters, 3000 tons. Russia —Varsovie works, 1270 tons. In concluding their paper, Mr. Gilchrist said that amongst the steel engineers of England and abroad who stood out prominently as having by their most loyal co-operation helped to make the basic steel process a great commercial success, were the names of Martin, Windsor Richards, Schneider, Stead, Massenez, Pink, Pastor, Cooper, Snelus, Riley, Angleur, Heskett, Kupelwieser, Wahrnant and Wallrand. Samples of steel rails made by Bolckow, Vaughan and Co. were exhibited by Mr. Gilchrist, together with samples of plates, corrugated sheets in the black state unannealed, galvanised sheets, tin-plates, strips, rivets, screws, hollow-ware stampings, and a Galloway tube, all of which had been rolled out of steel produced by the basic process out of common pig-iron containing 3 per cent. of phosphorus. Most of these samples were declared by the assembled practical ironmasters to be excellent.

PHOSPHOR-BRONZE TELEGRAPH WIRES.

IT is now generally well known that phosphor-bronze wire possesses many advantages for use in connection with practical telephony; it has an ample conductive capacity combined with a resistance to rupture as high as that of the best steel. Up to the present time, however, these wires have not been applied in telegraphy, where a higher conductivity is required. M. Lazare Weiller, of Angoulême, some time since commenced to investigate the subject, and at length found a material suitable for telegraphic purposes analagous to phosphor-bronze. This material is silicious bronze, in which the deoxidant consists of a silicious metalloid, that produces a better conductor than the phosphorus. He has thus obtained a wire presenting the same resistance to rupture as the phosphor-bronze wire, but with a much higher conductibility, rendering it applicable for telegraph lines, and bringing the valuable qualities of lightness and non-oxidisability, with easy and economical installation. Specimens of these wires were exhibited by M. Weiller at the Munich Electrical Exhibition, as well as specimens of phosphor-bronze wires. M. Weiller also exhibited at his stand the following table of wires, which shows their general properties:—

I.—*Table showing Properties of Silicious Bronze Wires.*

Nature of Wire.	Diameter.		Electrical Resistance per Kilometre.	Resistance. Kilogs.	Conductibility Compared with Copper.	Resistance to Rupture.
	mm.	in.	ohms.			Tons per sq. in.
Copper	1	0·04	20·36	21·8	100	12·3
Telephone phosphor-bronze wire	1	0·04	70	70	29 3	56 3
Telephone silicious bronze wire	1·08	0·42	48	80	36	56·3
Telegraph silicious bronze wire	1·30	0·51	12·13	67	97	32·1
Silicious bronze wire covered with magnetic oxide for telegraph lines, in the vicinity of the sea, and at railway stations	1·50	0·06	5·7	91	93	33
Telegraph silicious bronze wire	1·70	0·067	8 6	137	82	38
Telegraph silicious bronze wire	1·94	0·076	5·8	140	93	33

If we take as a type of telephone conductor the wire 1 mm. in diameter, and as a type of telegraph line the wire 2 mm. in diameter, the comparison with wires in ordinary use will be as in the following table:—

II.—*Comparison of Phosphor and Silicious Bronze with Iron and Copper Wires.*

Nature of Wire.	Resistance to Rupture.	Electrical Resistance per Kilo.	Conductibility Compared with Copper = 100.	Resistance to Rupture.
	Kilo.	Ohms.		Tons per sq. in.
I. *Telephone Wires 1 mm. dia.*				
Silicious bronze, Weiller	70	56	36	56·3
Phosphor-bronze, Weiller	70	70	29·3	56·3
Phosphor-bronze, Montefiore	59	105	19	48
Swedish iron	25	135	15 8	22·7
Siemens-Martin steel ..	32	166 8	13·3	26·5
Pure copper	21 8	20·57	100	12 3
II. *Telegraph Wires 2 mm dia.*				
Silicious bronze, Weiller	157	5·1	97	33
Phosphor-bronze, Weiller	138	6·4	76	27·9
Swedish iron	113	33·8	15·8	22·7
Siemens steel	132	41 7	13·3	26·5
Pure copper	87	5	100	12·3

III.—*Weight of Different Telegraph Wires of Equal Conductivity.*

	Diameter.	Resistance.	Weight per Mile.
	Mm.	Ohms.	lb.
Silicious bronze ..	2	5·1	88·5
Phosphor-bronze ..	2·13	5·1	110 8
Swedish iron	5·10	5·1	584
Siemens steel	5·70	5·1	931

DOVE'S STEAM COCKS.

MANUFACTURED BY MESSRS. JOHN FRENCH AND CO., LONDON.

(*For description, see page 461.*)

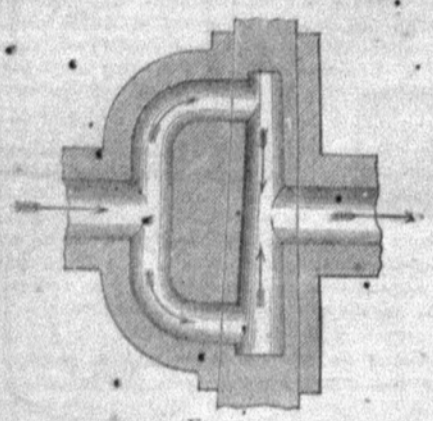


Fig. 1.

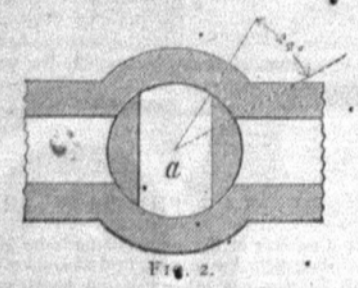


Fig. 2.

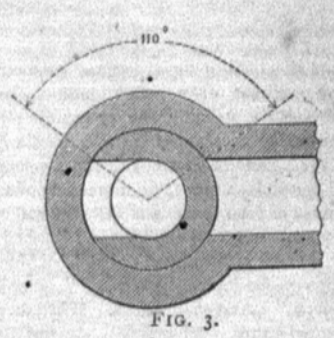


Fig. 3.

Fig. 4.

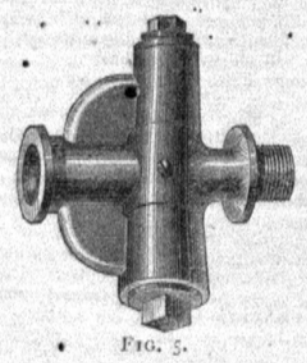


Fig. 5.

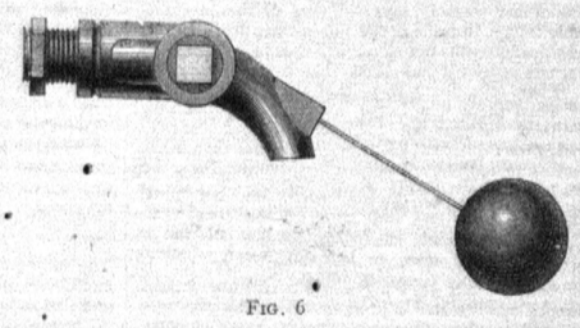


Fig. 6

THE MERRYWEATHER TRAMWAY LOCOMOTIVE.

We have more than once had occasion to notice the successful working of the locomotives on the Stockton and Darlington tramways, and we now have pleasure in placing before our readers particulars and illustrations of these engines. They were designed and constructed by Messrs. Merryweather and Sons, of Greenwich, and are similar to those supplied by the same firm for working the Dewsbury, Batley, and Birstal Tramway system. The Stockton and Darlington Steam Tramways were opened about two years since. Their total length is 4½ miles, consisting of two sections worked by six engines for over twelve months. There is a seventh locomotive, which is reserved as a spare engine. The engines were not all supplied to one order, there having been a repeat order in consequence of the successful working of those first delivered.

In our illustrations at page of 456 our present issue, fig. 1 represents a longitudinal section, and fig. 2 a transverse section of the engine, fig. 3 being a plan above the foot-plate, and fig. 4 a plan below it, the scale being 1-32nd full size. These engines, which are condensing, have cylinders 6½ inches diameter with a 10-inch stroke, and are carried on four coupled wheels 2 feet 2 inches in diameter. The cylinders are placed inside the framing, and are joined together at the middle, where they form the valve-chest, whilst a saddle is placed in each half for the purpose of supporting the boiler at the smoke-box. The guide bars are of steel, the crosshead is of cast steel, and the crosshead-slippers are of cast iron, having large wearing surfaces. The guide-bars are supported by a cross-plate, which they considerably overhang in the direction of the fire-box. The guides for the valve-spindles are carried by the same plate. The link motion is of the ordinary shifting-link type. The eccentrics and straps are of cast iron. The coupling-rods are made with solid ends, having phosphor bronze bushes. All the oil cups are forged or cast solid on the moving parts. The wheels and axles are of steel; the crank-pins in the wheels are case hardened. The brake is applied to all the wheels. The boiler is of the usual locomotive type, of Lowmoor iron throughout, double riveted in the longitudinal seam. It is fed by a feed-pump, driven by a special eccentric, and by Gifford's injector. The whole of the engine work has been made of unusual strength, in order to provide for wear and tear by dirt, dust, and rough usage. The feed tank, holding 100 gallons, is placed in front of the smoke-box. A fender-plate is fixed at each end of the engine to remove obstructions, and to obviate any chance of running over any person. Plates are also run along each side to conceal the wheels and the coupling-rods. The whole of the work is enclosed in a cab or casing of sheet iron, on angle iron framing 12 feet in length, 6 feet 4 inches in width, and about 8½ feet above the rails.

It will be seen that the condenser is placed above the roof; it consists of four horizontal layers, slightly arched, of thin copper tubes, laid transversely across the roof. The tubes are 1 inch in diameter outside, No. 26 wire gauge, or 1-55 inch in thickness, and are each 6 feet in length. There are 60 tubes in each layer, or 240 tubes in the four layers, coated with brown varnish to augment their radiating power. They are secured at the ends into 3 inch longitudinal pipes, 3 inches in diameter outside, 4 on each side, 11 feet long. The exhaust steam is discharged by two copper pipes, one to each side, into the uppermost longitudinal pipe whence it circulates through the transverse tubes. The condensation water and the remaining vapour are conducted into a separator-vessel at the front, whence the water runs down to the feed water tank, and the vapour passes away into the smoke-box, where it is mixed with and disappears with the products of combustion. So efficient is the condenser that the engine can be worked all day with one charge of the feed-water tank. This tank holds only 100 gallons, and the quantity consumed as uncondensed steam or otherwise does not exceed 50 gallons for the day.

In order to meet the requirements of the Board of Trade, a ball-governor, placed over the foot-plate at one side, is provided for the purpose of shutting off the steam and turning on a steam-brake when the maximum speed allowed —12 miles per hour—is reached. The steam-brake may also be turned on by means of a small pedal placed near the foot of the driver. Steam-levers and reversing-levers are fitted in duplicate, one of each at each end of the engine, so that the driver may take his place at the leading end of the engine, whichever end goes first. A speed indicator is also erected. The governor is driven by means of a pitch-chain from the crank-shaft, and the speed-indicator is driven by a band from the governor-spindle. The working pressure of steam in the boiler is 140 lb. per square inch. There are two safety-valves on the boiler, one of which is a lock-up valve. Steam escaping by the safety-valves is conducted to the exhaust pipe, and thence into the condenser. The steam is supplied to the cylinder through a perforated steam-pipe at the upper part of the boiler. The cylinders are, as before stated, 6½ inches diameter, with a stroke of 10 inches. The wheels are 2 feet 2 inches in diameter, placed at 4½ feet centres. The whole of the machinery is encased from below. The weight of the engine, empty, is about 6 tons; and, in working order, with water and fuel, 7 tons.

In conclusion, we give the following statement of working expenditure per day's run of 60 miles on the section between Stockton Bridge and Norton Green, which is 2½ miles in length, and has three gradients of from 1 in 18 to 1 in 28, and which particulars are on the authority of Mr. R. Satchell, the manager of the Stockton and Darlington Steam Tramways:—

	s.	d.
Coke, 4½ cwt., at 14s. 8d. per ton	3	3½
Equivalent to 8·4 lb. per mile.		
Water, 250 gallons, including water for washing out	0	2¼
Oil, three half-pints	0	7
Waste, ½ lb.	0	1½
Driver's wages	5	0
Mechanic's wages	0	10
Cleaner's wages	0	4
Man preparing coke	0	8
Total expenditure per day	11	0¼

Equivalent to 2¾d. per mile run.

The cost of working the Dewsbury, Batley, and Birstal lines is equally favourable with that on the Stockton tramways, there being a remarkable similarity in the figures submitted to us. These engines have been running four years at Batley and two years at Stockton, with, as will be seen, highly satisfactory results.

SAWS FOR HOT IRON.

In our engravings on page 457, we illustrate two forms of saws for cutting hot iron, which are manufactured by Messrs. Thwaites, Bros., of the Vulcan Ironworks, Bradford, Yorkshire. Fig. 1 represents the large saw, which is suitable for forges, and rail or other rolling mills. This saw, as will be seen from our illustration, has an engine mounted on the same frame to drive it. The machine is made to saw bars up to 6 inches diameter. The piston rod and saw shaft are made of best steel, the bearings and glands of phosphor bronze. The bar or rail is placed against the rest, and by means of a lever, the saw is rapidly brought up to the iron to be cut, and withdrawn from the iron by a counterweight. As will be seen, the saw is driven by two board belts direct off the main shaft without gearing. Fig. 2 represents a hot-iron saw, largely used in smiths' shops, and which is a simple and handy tool. These saws are made in different sizes—21 inches, 24 inches, and 30 inches diameter. The saw is mounted upon a cast steel spindle, and runs at a speed of from 1500 to 2000 revolutions per minute. The bearings are phosphor bronze, and adjustable to take up the wear. The saw runs in a water trough, which is formed in the bed. For sawing bars to a dead length a moving slide is provided. The saw is covered in with a wrought iron guard, and the bar is fed up to the saw on the slide-rest by the hand wheel at front and a quick threaded screw. The whole machine is very compact, and occupies but a small space.

DOVE'S STEAM COCKS.

RECOGNISING the imperfections usually found in the old-fashioned form of plug stop-cocks, engineers and inventors have supplied the public with many varieties of screw-down cocks, each having its own particular claim to excellence. It must, however, be admitted that the simplicity of action of the ordinary plug-cock is a very desirable quality, and one which has caused it to remain so long in favour, and will continue to do so. Mr. Dove's invention, which we are about to describe, will probably cause this form of stop cock to increase in public favour. At the late Brewers' Exhibition various forms of Mr. Dove's taps and stop-cocks were exhibited and were put to practical tests by Messrs. John French and Co., of No. 71, Commercial Street (who are the manufacturers of these cocks), the steam-traps (shown in action) fitted with these cocks being a special source of attraction to practical men. These stop-cocks are illustrated on page 460 of our present issue. Although externally this stop-cock has the appearance of the ordinary form, with the exception of two singular-looking additions of a quadrantal form, yet on a closer inspection it will be seen to differ very much therefrom. The entering steam or other fluid passes towards the plug, as clearly shown in fig. 1; but, instead of passing straight through the plug, it branches off in opposite directions, and in this manner enters the plug at each end, the two currents meeting again and passing outwards. The effect of this arrangement is that the plug has long bearing surfaces, and the contact of metal and metal to prevent leakage can be made so extensive, that leakage is entirely prevented. Another effect of this arrangement is that the cock is equally raised in temperature when used for high-pressure steam or hot liquors. A third point of excellence is insured by its long bearings, viz., steadiness of action, which renders it especially suitable for steam-traps, ball-cocks, and the like.

In addition to the longitudinal increase of contact surfaces, we may mention the circumferential increase also, as shown in figs. 2 and 3. In fig. 2 a section of an ordinary throughway cock is shown shut off; *a* is a section of the plug, and it will be seen that when the plug is turned off there is a very small circumferential surface acting as a seal—in this case it only extends to 24 degrees, the whole motion from on to off being 90 degrees, but in the patent cock the plug may be turned as much as 180 degrees, as shown in fig. 3, and this latter position gives 110 degrees of the circumferential surface of the plug and bore in contact. This amount of rotation is, of course, not always necessary, but in many cases it will be found very useful. For instance, it may be fitted to a steam-launch with the spanner pointing ahead when the steam is on, and astern when shut off, thus obviating the possibility of the mistake being made which frequently arises with screw-down valves being turned the wrong way. The quickness with which the steam can be turned off, in case of sudden necessity, is particularly useful, and diminishes the chances of collision. The rest of the figures in our engravings will be readily understood. Fig. 4 represents the steam-trap. Fig. 5 shows the general external appearance of the tap as fitted to the steam-trap, and fig. 6 is a cistern ball-cock. Having seen the steam-trap, we were struck with its prompt action. When the bell is down the cock lets out the condensed water, but directly steam issues the bell rises and turns off the cock, and so remains until, as it slowly condenses, the bell falls and lets in another whiff of steam or lets out water, whichever happens to enter from the pipe or other vessel to be drained. Altogether, we consider Mr. Dove's invention both ingenious and practical.

NOISELESS FAN BLOWER.

A FAN blower and exhauster of improved construction is illustrated in the above engravings, where fig. 1 represents an exterior elevation, and fig. 2 a transverse section of the blower. This apparatus possesses several excellent features, the first of which is the injecting principle, by which the air is drawn into the centre of the fan, preventing all back-lash of air, or all side escape or waste of wind. All the air that is taken in is made to find its outlet at the proper point of discharge This is a great point gained. It is produced by a ring around the centre inlet, projecting within the wings of the fan, occupying not quite all the space between the case of the blower and the discs that enclose the wings. The spindles are of the best cast steel, and are made long enough to drive from either side. The discs are of the best charcoal iron, and all the bearing parts are accurately balanced. The tremor of the strap axis is confined to one casting by the bearing standards being cast in one with the lower part of iron casing. The casing is also divided horizontally, as shown in our engravings, to facilitate the operation of cleaning. This machine, which is manufactured by Messrs. Frederick Orme and Co., of St. Andrew's-Street, Holborn Viaduct, London, is simple in construction, noiseless in action, and requires but a small amount of power to drive it.

THE RATIONALE OF PRACTICAL METALLURGY.

No. X.

AS we are only treating the rationale of the blast furnace, a description of mechanical details is here unnecessary. It is sufficient to state broadly that the modern blast furnace is a hollow fire tower of varying height, which ranges from 30 feet to nearly 100 feet, the lower of these belonging rather to the past than the present. It is constructed of substantial masonry braced with iron, and lined with a "shirt" of refractory material. Internally its form is, at the bottom, a cylindrical space, spreading out upwards as a truncated and inverted cone, which is surmounted by another and taller cone, narrowing upwards to a chimney or throat. (The second sudden contraction starting a third cone, shown in the diagram, is not the most modern form, which simply continues the contraction regularly to the top.) Mr. Lowthian Bell's description of a blast is happily concise, viz., "a circular column swelling in diameter from both

NOISELESS FAN BLOWER.

BY MESSRS. FREDERICK ORME AND COMPANY, LONDON.

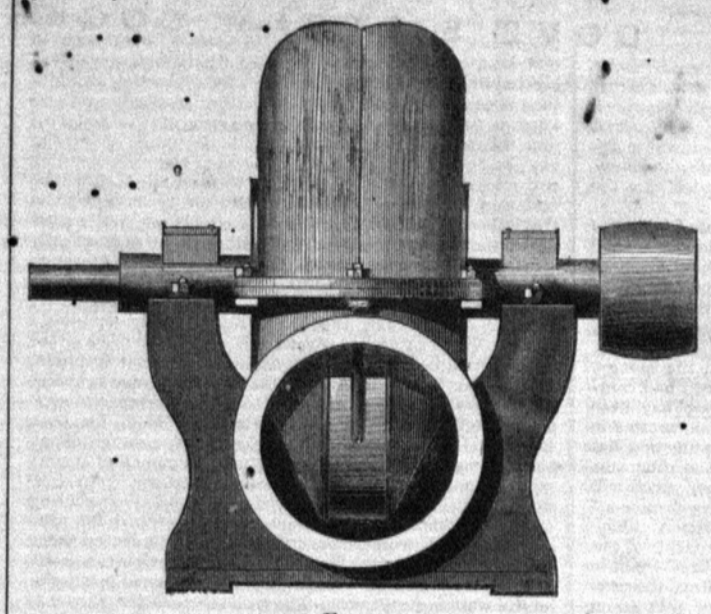


FIG. 1.

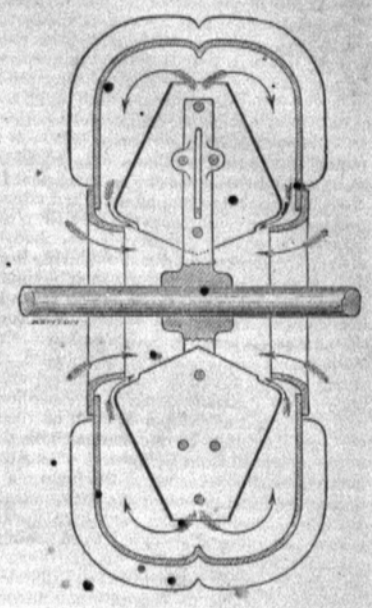
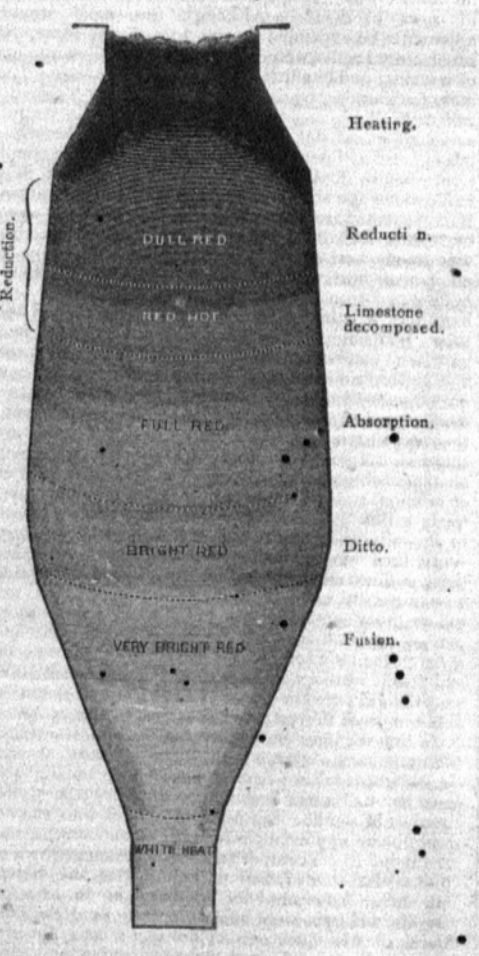


FIG 2.

extremities." The external form of the older furnaces nearly followed these variations, but in the more modern it shows a tower slightly and regularly tapering upwards. The diagram from vol. i of Stanford's *British Manufacturing Industries*, kindly lent by Mr. Stanford, is copied from Lowthian Bell's representation of zones of action in the blast furnace, excepting that the bracket is added on the left side to indicate the continuation of reduction in the "red-hot" region, as it is doubtful whether the reduction of all ores is *completed* until the limestone is decomposed. In describing the action of the different parts of the furnace it will save much circumlocution if we use a few technical terms—those generally accepted. These demand preliminary definition, especially as they are rather loosely used, and not always with the same limitations of meaning. The cylindrical portion at the top we shall call the "throat," disregarding the "tunnel head" by which it may or may



not be surmounted. The cone starting from the widest part below and continuing upwards to the throat, with or without the short upper contraction shown in the diagram, we shall call collectively the "stack." Its greatest expansion is at the bottom, where it curves into the lower inverted cone, "the boshes." (It is customary in some parts to call the widest expansion the "belly," and the slopes just below it the "boshes," which word is doubtless a corruption of the German of belly, viz., "Bauch.") The bottom portion we shall, as usual, designate the crucible. Otherwise we shall refer to the zones marked in the diagram.

The capacity of blast-furnaces has, during the last 20 years, undergone great development. Up to about 1860 a height of 60 feet, with a maximum width of 18 feet at the boshes, and a capacity of 8000 tons, was the extreme magnitude. Shortly after this great strides were made in the Cleveland district, where a height of nearly 100 feet has been attained, with 30 feet internal width at the widest part. The cubic capacity of blast-furnaces varies from a few hundred to above 30,000 feet. Writing in 1871, Mr. Lowthian Bell says that, "Within the last seven years the iron manufacturers engaged in smelting the ore found so abundantly in the Cleveland Hills, have succeeded in reducing their consumption of fuel by about 30 per cent. on a given weight of metal produced. This change—one of national importance—has been accomplished by increasing the capacity of their furnaces, and by raising the temperature of the blast." A glance at the diagram shows that the temperature is highest below, and gradually diminishes upwards. This is an apparent contradiction of the popular dictum that heat ascends, but is not quite what it appears, as there is here an ascent of heat, seeing that the materials charged into the top are cold, and the gases that come out there have a temperature a little above the melting point of lead, but which varies with the height of the furnace, it being higher in the short than in the tall furnaces, one of the advantages of the tall furnaces being the utilisation of the difference.

The true reason for the differences of temperature is simple enough: the heat in the furnace being caused by the combustion of the fuel, it is greatest where the greatest quantity and intensity of combustion occurs, and this is, of course, just at the place where it receives the fresh oxygen of the blast, viz., near the mouths of the tuyeres. If these were placed at the middle or the top, the greatest heat would be there, irrespective of ascent or descent. The cooling that occurs upwards is due, first, to the fact that, although the supply of fresh unburnt-fuel increases with the ascent, that of fresh uncombined oxygen diminishes; and secondly, because the heat generated below has work to do in ascending; the work of dissociation and the expansion of solids into gases; heat-power being as effectively exhausted in doing such work as mechanical power is in driving machinery.

There are two ways of following the work done in a blast-furnace: we may travel in imagination downwards with the charge, or upwards with the blast. After some hesitation and reflection in determining which to choose, we have decided to take both—the descending course as regards the facts, *i.e.*, the results of the action, and the ascending course for the explanation of the causes of these results. The facts in the descending course may be treated briefly and generally, but the theory which we shall have to expound in working upwards will require more lengthened discussion. We start, then, from the top with a charge of iron-stone, coal, or coke, or a mixture of these, and with limestone or lime. Let us suppose that the limestone is uncalcined, the ore is raw, and that a considerable proportion of raw coal is used.

At the temperature of the throat above named, between 600 deg. and 700 deg. Fahr., in a tall furnace, the distillation of the raw coal will commence; its water, and with some of its ammonia, will be driven off. The roasting of the raw ore will also commence with the driving off of its adhering and chemically-combined water; the latter effecting the dehydration of the hydrated oxides. Lower down, as the black heat approaches to the dull red, the bituminous matter of the coal will come off as tar and naphtha vapours, and the roasting of the ore will be completed. Here, also, the reduction commences, or according to Mr. Lowthian Bell, even before this; but this doubtless depends on the nature of the ore. A loose hematite is more easily reduced than a compact raw carbonate, and its reduction commences at a lower temperature, both on account of its structure, and because it is quite ready for reduction; but the carbonate is not so. It must first become roasted, *i.e.*, its carbonic acid must be driven off, and this driving-off of carbonic acid exhausts the heat-power, keeps down the actual temperature of the ore itself below that of its surroundings, and also lowers the temperature of the ascending gases that are in immediate contact with it. Besides this, the actual

particles of iron oxide are more or less surrounded and defended by the silicates, the alumina, and general impurities of the lower classes of ores. These confer on them a refractory character, demanding a higher temperature for their reduction; and we have little doubt that one of the reasons why the Cleveland furnaces are so exceptionally tall is that there is more work demanded of them in their upper regions on account of the impurity, poverty, and obstinacy of the Cleveland ores. Just about the temperature at which the driving-off of the carbonic acid from the ironstone is completed, the corresponding decomposition of the limestone commences, for carbonic acid holds to lime with a firmer chemical grip than to iron oxide, and accordingly requires a higher temperature to effect its dissociation by the unaided repulsive action of the heat. When a full red heat is attained all the iron oxide is reduced to the state of spongy iron, and all the limestone is decomposed to quicklime, the coal having been completely coked already.

Here, then, commences the speciality of the modern blast-furnace. It was here, as already described, that the catalan and other old processes of direct malleable iron-making finished; here or hereabouts they drew their blooms and hammered the spongy iron into bars, or by further exposure to their charcoal fires converted it into fusible steel. But, as our diagram shows, the charge is now but half-way down the modern furnace. As it proceeds the particles of reduced iron in the sponge, though pure enough in their small selves, get into bad company; they associate with the phosphorus that has been reduced from the phosphoric acid of the organic matter in the ore; they unite in like manner with the sulphur that has been separated from the pyrites of the coal; and they also combine with the carbon of the fuel in a manner which will require explanation when we make our theoretical upward journey. Besides this, they take up the silicon which is now becoming dissociated from the silicic acid of the earthly siliceous impurities of the ores, and thus we have phosphide, sulphide, carbide, and silicide of iron, the proportions of which to the original uncombined iron go on increasing as the charge proceeds downwards to the boshes, and the furnace begins to narrow. What then? All these compounds differ from pure iron in their far greater degree of fusibility. They are not only more fusible than the iron itself, but, when fused, they have the power of dissolving the less fusible iron in a manner analogous to the solution of sugar and saline substances in water; or, to take a nearer analogy, we may say resinous substances in terpentine or other essential oil, *i.e.*, of solid hydrocarbons in liquid hydrocarbons.

Now, then, we come to the rapidly contracting part of the furnace, where the heat becomes more and more concentrated as the tuyeres' mouths are approached, and here accordingly the fusion takes place, and melted metal, with its associated impurities, trickles down amidst the white-hot remains of the solid fuel, and finally reaches the crucible. But another action is going on at the same time. The lime is doing its work by combining with the silica that remains undissociated, or unreduced to silicon. This compound is also fusible; it is a lime glass, or silicate of lime. The alumina and other earthly oxides combine with silica, and form other glasses, and all these together fuse along with the impure iron; but being of lower specific gravity, they form the fluid cinder (or slag) which floats on the top of the iron, and is run off into the cinder bogies and deposited in the heaps that so questionably decorate our ironmaking districts, and still resist our efforts to fully utilise them. The melted metal goes on accumulating until it fills the crucible, and is then tapped into the larger channels of sand, or "sows," from which proceed the familiar "pigs." As already stated, the complete fusion of all that enters the furnace and is not driven off as gas is absolutely necessary for its successful working, the characteristic of which is its continuity as compared with the older furnaces, that had to be blown out and blown in again more or less completely. Besides this, it renders the great magnitude of our modern furnaces possible. A little consideration of the effect on the quantity of production and the economy of labour effected by this combination of huge charges and continuous working shows why we persist in the apparently clumsy paradox of adding impurities that have to be afterwards laboriously eliminated.

Any notable quantity of infusible matter coming down into the narrowing portion of the furnace must stop its action there, or if not there, at the outlet of the cinder, or the tapping hole of the metal. Practice has determined the selection and admixture of ores, the proportions of flux and fuel which secure this essential desideratum, with the greatest economy of material and richness of yield. There are some ores, however, that are especially troublesome by forming infusible "bears" or "wolves" on the sides and bottoms of the hearths of the furnaces. One of the most notable of these is made up chiefly of beautiful copper-coloured cubic crystals of what was once supposed to be metallic titanium, but has been shown by Wöhler to be a compound of cyanide with the nitride of titanium. The crystals are individually hard enough to scratch not only glass but agate, and, as we have seen them, are agglomerated in a glassy matrix almost equally hard. The chipping-out of such a bear when the accumulation is great is no easy task.

One of the elements of economical working which is connected with the selection of the charge and its fusion, is that of preventing the formation of iron glass by the combination of a portion of the iron in such wise as to form not merely a silicide, but a silicate, which would run off with the cinder. The old iron workers wasted a good deal thus, so much that we can now utilise some of their refuse, such as the "Dane cinders" of the Forest of Dean. The problems of how the reductions, absorptions, &c., above described are effected will be discussed in following the actions upwards from the mouths of the tuyeres to the throat of the furnace.

THE INSTITUTION OF CIVIL ENGINEERS.

AT the third meeting of the session held on Tuesday, November 28, Sir F. J. Bramwell, vice-president, in the chair, the paper read was on "American Practice in Warming Buildings by Steam," by the late Mr. Robert Briggs, M.Inst.C.E., of Philadelphia, U.S. Originating about 1840 with the late Mr. Joseph Nason, the application of steam to the warming of buildings in the United States extended very rapidly, the apparatus being constructed of small and comparatively inexpensive wrought iron welded tubes, which combined a large extent of heating surface with great strength, and with facility for transmitting heat in any direction from a central source. For securing durable steam-tight joints, the tube-ends were made with tapering screw-threads, and a paste of white and red lead was applied in screwing up. The couplings or sockets were made of cast iron, and were tapped taper to fit the tube-ends, excepting only the straight couplings, for connecting tubes in the same straight line, which were of wrought iron and tapped parallel. A table was given of the standard dimensions for the tubes, throughout the range of sizes in use; and a scale for all the dimensions of the corresponding cast-iron couplings. The steam was supplied either by boilers of the horizontal tubular or Seguin type, or else by the Babcock and Wilcox water-tube circulating boiler with horizontal steam drum overhead; either kind was practically safe from disastrous explosion. The steam circulating through the warming apparatus was either live steam direct from the boiler or exhaust steam; the two were frequently used in combination, the latter being rarely employed alone. When using live steam, the circulation was either closed throughout from communication with the atmosphere, or was open to it at certain places. In the former case the distribution of the heat was effected either by separate supply and return mains, or else by a single main for both supply and return, either with or without a longitudinal partition inside it for separating the outward current of steam-supply from the return current of condensed water. In open circulation a supply-main conveyed the steam to the radiating surfaces; whence a return main, suitably trapped for preserving the steam-pressure, conducted the condensed water either into an open tank for feeding the boiler, or into a drain. These two systems were most generally combined in any extensive warming apparatus. The steam stop-valves, known as "globe" valves, were disk or poppet valves, worked by a screwed spindle; this construction was introduced by the author in 1849, and was immediately followed by all makers. In respect to the radiating surfaces for diffusing the heat, three distinct classes of apparatus were in use. Firstly, apparatus for warming rooms by direct radiation from surfaces exposed in the rooms themselves. Secondly, apparatus for indirect warming by currents of air; the heated surfaces were placed in a chamber, though which a supply of air passed on its way into the room. In neither of these two methods was the warming accompanied by any systematic ventilation. Thirdly, apparatus for both warming and ventilating, arranged so that the warming should take effect upon the whole of the air admitted for ventilation. The temperature comfortable to Americans in cold weather was about 70 deg. Fahrenheit on the Alantic coast, rising to 80 deg. or 85 deg. for inland localities. In warming by direct radiation, the practice for many years was to arrange the steam-pipes in lines or groups along the bottom of the outside walls or under the windows. But the most recent practice, for rooms in mills, was to suspend the direct radiating pipes in rows overhead. Although the heat would here apparently be expended in the top of the room, yet very satisfactory results were thereby obtained, but in equability of warming and in efficiency of radiating surface. The radiators for warming by direct radiation consisted usually of so-called "coils," composed of ¾-inch and 1 inch steam pipes, arranged in parallel lines and coupled to branch tees or heads. Sometimes short lengths of pipe were coupled by return bends, doubling backwards and forwards in several replications one above another, and forming "return-bend coils"; when several of these sections were connected by branch tees into a compact mass of tubing, the whole was known as a "box coil." In vertical-pipe coils a number of short upright 1 inch tubes were screwed into a hollow cast-iron base or box; and were either connected together in pairs by return-bends at the top, or else each tube stood singly with its top closed, and had a hoop-iron partition extending up inside it to nearly the top. For getting rid of the air, a trap was provided, having an outlet controlled by metallic rods; as soon as all the air had escaped and the rods became heated by the unmixed steam, their expansion closed the outlet. For indirect radiating surfaces, the box-coils were the forms most used. The chambers containing them were made either of brickwork, or often of galvanised sheet iron; the coils were suspended freely within the chambers, which were themselves attached to the walls containing the air inlet flues. Where systematic ventilation was carried out in conjunction with warming, these indirect radiators and chambers were employed. The warming could be most effectually controlled by so arranging the chamber containing the radiator, that the whole or any part of the fresh air entering could be made either to pass through the radiator and be warmed, or to "by-pass" it and escape heating. The warmed and unwarmed currents were then mingled in a flue, whence a supply of fresh air suitably tempered flowed into the room, the occupant of which could thus regulate the temperature as comfort might require, while obtaining a constant supply of a definite quantity of fresh air. Where a blowing-fan was employed for impelling a current of air through a building, a large auxiliary coil, placed at the entrance of the flue leading from the fan into the building, would be an improvement for extensive apparatus, and would save about 10 per cent. of surface, while supplying a constant volume of fresh air raised to any temperature between 50° and 120°. An example of warming on an extensive scale was afforded by a large office-building in New York, containing nearly 2,000,000 cubic feet; and by the State Lunatic Asylum at Indianapolis, containing more than 2,500,000 cubic feet. Both of these buildings were heated by steam. But such instances failed to convey any idea of the very general prevalence of warming by steam in the commercial cities of America. There appeared, indeed, no limit to the future extension of systematic steam-supply for warming and for motive power.

In an appendix were enumerated the commonly accepted data which formed the basis for computing the efficiency of the warming surfaces, the size of the mains, and the proportions of the various details; and tables were given of the formulæ and figures most generally useful for working out the practical dimensions suited to any particular application.

THE CHANNEL TUNNEL OPERATIONS.

AT the usual fortnightly meeting of the members of the Manchester Association of Employers, Foremen, and Draughtsmen, held on November 25, Mr. John Craven, the president, in the chair, Colonel Beaumont, R.E., delivered an address, in which he described the mechanical operations adopted for the construction, and the means proposed for working, the Channel tunnel. There was a large attendance, both of members of the association and of other societies interested in the subject, and, although to a considerable extent the main features connected with the Channel tunnel works are now well known, one or two points referred to by Colonel Beaumont will be of interest. After disposing of any engineering or geological difficulty in the way of carrying out the project, Colonel Beaumont said the actual expense of boring the tunnel was comparatively small, as the tunnelling machine invented by himself and Captain English required only three men to work it, and was at present being driven on the French side by only this number of men. The greatest speed of driving yet attained had been 18 yards in twenty-four hours, but they expected shortly to get up to a speed of a yard per hour, and eventually to 30 yards in twenty-four hours. It was possible to cut 2 yards per hour, but this speed could not be kept up continuously. The real difficulty was not in the boring, but in the removal of the dirt, and although this was automatically delivered by the engine into waggons in the rear, it had been found impossible in removing it to keep up with the speed of the machine, and this had caused constant stoppages of work. The removal of the dirt by manual labour, which had at first been carried out, was too slow a process, and to keep up with the machine would require a man per minute. The proposal to convert the chalk into a creamy liquid and pump it out he considered altogether impracticable, and the system of rope-traction adopted in collieries for the removal of coal would not answer in the tunnel. The difficulty, he thought, would, however, be got over by means of his compressed air locomotive, of which Colonel Beaumont gave a description. Up to the present, he said, air-engines had been constructed on the principle that a reducing valve was necessary; by this means they got a very simple form of engine, but a great deal of power was sacrificed. He had constructed his engine so that the air was passed at high pressure directly into the working cylinders, and means were provided for keeping up the temperature of the air as it expanded, which was absolutely essential if they wished to preserve to the utmost the capacity of the air for doing work. The air reservoirs of the engine were constructed to carry a pressure of 1000 lb. to the square inch, and at this pressure the air-engine could be worked quite as safely as a steam-engine at 100 lb. pressure, whilst more economical results were obtained. As an illustration, he might mention that with ¾ lb. of coal 68 foot of free air could be compressed into one foot at a pressure of 1000 lb. to the square inch, and out of this cubic foot of compressed air they got work corresponding to ·5 horse-power for one minute, which was equal to a weight of three tons, moved a distance of a mile. When they got larger engines they fully expected that this result, which had been obtained after repeated trials, would be increased. The engine was constructed on the compound principle, similar to the principle recently introduced into the locomotive engine by Mr. Webb. The large and the small cylinders were on separate cranks, and there were no coupling-rods, the wheels being in reality coupled by the passage of air from one cylinder to the other. The engine and air reservoirs weighed together 80 tons, and with one feed of air would take a load of 150 tons twenty miles at a speed of forty miles an hour. In answer to several questions, Colonel Beaumont said that with the introduction of compressed air-engines the question of the ventilation of the tunnel was at once solved, as they would get more than sufficient air discharged to meet all requirements. The tunnelling machine had been adopted for driving in hard rocks, and a speed of one foot per hour had been obtained; but for this class of work a stronger construction of machine than the one at present employed in the tunnel would be required. One of these machines would also soon be at work in the Mersey tunnel, for which he had taken the contract, and he expected to get through by the 30th of June next. After some discussion, a resolution was passed in favour of the Channel Tunnel, and the proceedings closed with the usual vote of thanks.

THE PROSPECTS OF THE IRON TRADE.

MESSRS. BOLLING AND LOWE, of 2, Laurence Pountney Hill, E.C., have issued the following report on the prospects of the English iron trade:—Our farmers have reaped a harvest above the average, and favourable reports from the United States warrant the expectation of a "cheap loaf" for our working classes during the winter. With such an encouraging prospect it is not surprising that the iron and steel trades look forward to steady employment. As mentioned on a former occasion, we cannot expect shipbuilding to be continued at the same rate as during the last twelve months, but sufficient orders for vessels are on hand to provide remunerative work for some time. Instead of vessels, we should rather have said "steamers," for sailing vessels are now the exception, and the modern shipbuilding yard depends for the construction of the day upon affiliated trades supplying it with iron, steel, forgings, tubes, &c., to such an extent that we may almost regard shipbuilding as a barometer of British trade, just as were formerly cotton mills. Bridge builders, locomotive makers, wagon builders, agricultural implement makers, engine and boiler makers, &c., are full of work, for home and foreign account, and at satisfactory prices.

Manufacturers of rails, on the other hand, complain, and are endeavouring to form an alliance for improving their position. Since rail-making became a leading industry in this country, the violent fluctuations in price have always been caused through the demand from the United States, which are the great consumers of rails. They now possess 110,000 miles of railroad as against 108,000 miles in all Europe, and at the same time their production of finished rails has been rapidly increasing. Last year the United States turned out 2,150,000 tons of rails; this year's production will be about 3,110,000 tons, a sufficient quantity to

satisfy wants for renewals, and equip the new lines which are being built. Consequently the continuance of orders coming to England is exceedingly remote, unless prices in the United States should rise considerably, or a great change come over their fiscal policy, but we see no reason to expect either course. A few figures will show the exact position. Taking the cost of English steel rails, ordinary heavy section, including present low freights to New York and insurance at per ton £6 9s. 6d. ($30·50), and the import duty in United States £5 15s. 6d. ($28 00), we get at the figure of £12 1s. 0d. ($58 50). The present price of American rails at works is £8 5s. 0d. ($40·00), or £3 16s. ($18 50) per ton less than imported rails. Our "cousins" have, therefore, a good margin to fall back upon, if any alteration in the tariff should endanger their monopoly; but it is not likely that a reduction of duty of more than a few dollars at the outside will be settled upon, the protective party being still too strong and powerful for the free traders.

In order to show to what extent our exports of rails to the United States vary, we mention that during August, September and October in 1877, they amounted to twelve tons, while during the same period of 1880 they were 48,558 tons; in 1881, 55,618 tons; in 1882, 44,341 tons. It is very likely that this period of prosperity may be followed by another depression, but the above data will show how the trade fluctuates. India and our colonies, by their large demand, have helped to fill the gap caused by the decrease in orders from the United States; and we hope present prices may be maintained, as they give but a poor return on the capital invested. On the other hand, we must take into account as a set-off that in a near future new rail mills in different parts of Great Britain will increase the already existing productive power of about 1,500,000 tons by a further 300,000 tons per annum. In merchant iron, the United states are also, as we anticipated, taking less than during the same period last year, but other countries and the colonies, increasing their imports, more than make up for the loss. The ring in pig iron between Scotch and North of England makers is broken up, and prices have suffered, but the full effect will hardly be felt until we are well into the winter, when as a rule exports slacken and stocks increase; meanwhile both home consumption and shipments continue satisfactory.

On the Continent all works engaged in iron and steel making are busy. The French and Austrian works have a sufficiently high import duty to protect them from any inconvenient foreign competition. So, too, have the Belgian and German works, but as they are based on an output, in rails especially, far beyond their home consumption, philanthrophy induces them to sell cheaper to foreigners than to their own countrymen. In our own market, the recent movement for higher wages amongst the miners and iron workers has affected prices, and caused an advance in Staffordshire at the last quarterly meeting at Birmingham, which is gradually affecting the general trade. This year has brought additional telegraph communication with the south-western part of America, and further cables are in prospect between this country and the United States, enterprises in the China seas, &c. Manufacturers in this branch of business are, therefore, likely to be well occupied. In the official report of the East India Famine Commission issued last year, it is stated that the excess of mortality during the last famine in 1877-78 amounted to 5,280,000 human beings; food in abundance but unavailable for want of means of transport, was often not more than 50 miles distant from the stricken district. To diminish the effect of such catastrophes, the Indian government must either build railways and tramways on their own account, or give substantial encouragement to those who furnish the means, as the English government now do for the Irish road tramways, by advancing funds to them. The want or these railways, which might not pay at first, is of course most felt in districts which do not produce food adequate to the consumption, and therefore require it brought to them. According to an official document lately issued, the aggregate net earnings of all the railways in India, during the year ending 1881 were £6 952, 714 on 9,875¾ miles of road, or £5s. 3s. per cent. per annum, as against £4 15s. per cent. per annum in 1880. Such figures speak for themselves and should warrant the government in taking energetic action.

The political atmosphere seems more clear than it has been for some time, and it is but reasonable to believe that in India England's prestige has gained immensely since the overthrow of Arabi Pasha in Egypt. We look forward to a good steady trade for some time, but unaccompanied by any rise in present values.

As many of our readers must have occasion to effect marine insurances on goods, it may interest them to know that the mere fact of the vessel being classed A 1 at Lloyds at the time of effecting insurance does not relieve shippers from the obligation to prove the seaworthiness of the vessel at starting in order to recover the amount insured in case of loss. The impossibility, in most instances of guarding against this contingency is evident, and as underwriters have lately insisted upon such proof being given as condition for settlement, we recommend as the best means of removing any cause for dispute between merchants and underwriters, the insertion of the following clause in the policy of insurance: "For all purposes of settlement of claims under this policy, the seaworthiness of the vessel is not to be disputed by the underwriters," otherwise the shipper voluntarily accepts the position of depending entirely on the good grace of the underwriters for the settlement of his claim.

BOTTLE-NOSED WHALE OIL.

By ALFRED H. ALLEN, F.I.C., F.C.S.

I HAVE recently made a very complete examination of the oil from the bottle-nosed whale, and some of the observations are of general interest. In the first place, I find that the oil has the remarkable chemical constitution hitherto observed only in the oil from the true sperm whale, and which shows it to be allied more to the waxes than to the majority of liquid oils. Thus, all the ordinary fatty oils of animal and vegetable origin yield, on treatment with an alkali, a "soap" or compound of the alkali used with the fatty acids of the oil, together with the familiar body known as glycerine. The waxes, on the other hand, including spermaceti, yield a soap like the oils and fats, but, instead of glycerine, they furnish peculiar waxy solids varying in nature with their origin. Thus, the product of the saponification of bees'-wax is "myricyl alcohol"; Chinese wax yields "cerotyl alcohol"; while spermaceti furnishes "cetyl alcohol." On similarly saponifying sperm oil I found it to yield a soap (as usual), but instead of glycerine, I obtained a new solid body, which I propose to call "spermyl alcohol," and which I have as yet only incompletely examined. The analysis of sperm oil from different sources shows that the proportion of spermyl alcohol yielded on saponification was remarkably constant, lying, according to present experience, between 38 and 42 per cent. Thus, on saponifying ordinary animal or vegetable oils, there is obtained about 95 per cent. of fatty acids, and 10 of glycerine; but on saponifying sperm oil, there results about 60 to 64 per cent. of fatty acids, and 38 to 42 per cent. of spermyl alcohol, a white, crystalline, readily fusible solid. The bottle-nose oil has yielded me analytical results showing that it is chemically identical with sperm oil. Thus I have obtained from bottle-nose oil 64 per cent. of fatty acids, and 39 to 40 per cent. of spermyl alcohol, numbers which are practically concordant with those yielded by the oil from the true sperm whale. Up to the present time the peculiar composition first noticed by me in the case of sperm oil is not known to be common to any other oil than that from the bottle-nosed whale, so that the latter oil stands alone in its right to be considered as a perfect substitute for true sperm oil. Porpoise oil and the oils from the various species of whalebone whale are quite different in chemical nature from the oils of the sperm and bottle-nosed whales. The striking similarity in constitution—amounting, in fact, to chemical identity—between the oils from the sperm and the bottle-nosed whale suggested the probable close relationship of the two animals. On enquiry, I found this suspicion confirmed in the strongest manner. The food of the two animals is very similar, and quite different from that of the Greenland and other whalebone whales; both animals have a back-fin, which is not present in whalebone whales; and last, but not least, they both possess large cavities in the head, which are filled with oil. Whether the oils of the narwhal, dugong, and other cetacea may not possess characters similar to those of the sperm and bottle-nosed whales is an interesting question which I should like to have the opportunity of practically testing. The oils from the bottle-nosed and sperm whales being identical in chemical nature, and sharply distinguished from all other known oils, it is not surprising that their physical characters should have proved to be very similar. Thus, I find their viscosity or flowing power, their density, their flashing points, and all other physical characters, to be practically identical with each other, and different from those of ordinary oils. These characters sufficiently indicate the bottle-nose oil as a suitable substitute for sperm oil, and I have in addition found it as free from tendency to gum or thicken as could possibly be desired. If further proof be needed of the identity in nature of the oils from the sperm and bottle-nosed whales, it is to be found in the fact that they each deposit spermaceti when cooled to a low temperature. This property of sperm oil is well known, though it is often erroneously supposed to be limited to the oil from the head-cavities of the animal, whereas it is, in fact, true of the oil from all parts of the body. The spermaceti yielded by the bottle-nosed whale appears to be fully equal in quality to that furnished by the true sperm whale, but the quantity obtained is smaller. From the method of its treatment, some of the bottle-nose oil at present in the market has a somewhat strong smell, and possesses an objectionable tendency to become green in contact with copper or brass. These properties render such lots of oils as possess them unsuitable for some of the most valued uses of sperm oil. I have attempted to remedy these defects, and have succeeded in producing a refined oil of a very pale yellowish colour, having but little smell, and possessing absolutely no tendency to act on brass or other metals. In other respects it is unchanged. The amount of bottle-nose oil introduced into commerce during the last few years has been considerable, and is rapidly increasing. In some cases it has been sold under the not inappropriate name of "Arctic sperm oil," but in other instances it has been mixed with, or substituted for, real sperm oil, without any acknowledgment of its true nature. From the fact that dissatisfaction has not resulted when the oil has been thus surreptitiously substituted, as well as from the considerations already mentioned, I believe further experience will prove the refined product to be equal to the finest sperm oil, and capable of being used for every purpose to which the latter has hitherto been applied.

A NEW METHOD OF SEPARATING MINERALS.*

By F. BUETTGENBACH.

THE separation of intimately intermixed minerals from each other has hitherto been effected mainly by taking advantage of differences, in density, structure, or capacity for being rendered magnetic by calcination, while no use has been made of the striking properties evinced in differences of specific cohesive strength. The separation of minerals of unequal hardness, and by reason of their greater or less susceptibility to break down into fragments of different sizes, is not possible with the ordinary crushing or stamping mill; but it is different when the mass is thrown violently against a hard resisting surface, in which case, if the velocity is properly proportioned, only the more brittle substances are broken. In order to obtain a proper separation of iron pyrites and zinc blende, the author has been led to experiment on the use of Vapart's centrifugal breaker, not only as a crusher, but as a separating machine. When this apparatus is driven at 800 revolutions per minute, lumps of iron pyrites of 20 to 25 millimetres diameter are reduced partly to dust and partly to grains of 1 to 1½ millimetre; but when the velocity is reduced to 400 revolutions they are scarcely touched. Blende, which is of inferior hardness, is reduced to the finest flue-stuff at 800 revolutions, while at 400 it leaves the apparatus partly as dust and partly as grains of 0·5 to 3·0 millimetres in diameter. If therefore, a mixture of the two minerals is treated at the lower speed of 400 revolutions per minute the pyrites are almost entirely unaltered, while the blende, being very finely reduced, may be separated by a simple sifting process. In order to make the process continuous in action, the crushed ore is passed through a hopper into a drum sieve making nine and two-tenths revolutions to every hundred of the mill, and divided into three parts with holes of 1, 2, and 3 millimetres respectively. The coarser stuff passes into a second drum with two divisions, having holes of 6 and 8 millimetres respectively, which is driven at eight revolutions per 100 of those of the crusher. The size of the sieve holes depends upon those of the particles operated on, and it is important that these shall be as nearly uniform as possible. The operation may be carried on wet or dry, but in the latter case it is essential that the material shall be as free from moisture as possible, as the powder if damp (with about 4 per cent. of water), binds, and easily stops up the holes in the sieves. The dust is also a very great inconvenience, which, however, may be remedied by the use of a small jet of water. The separation of the two minerals is not completely effected, as the angles of the grains of pyrites are apt to break off, even at moderate speeds of the machine, and to become mixed with the fine blende; but it is sufficient for ordinary commercial purposes. The economic value is shown by the following calculation. Mixed ores with equal contents of blende and pyrites are worth at the utmost about 10s. per ton, and are not easily disposed of at that price; but when subjected to the treatment described above, the products are 1 cwt. of pyrites, with 5 per cent. of blende, worth 9s. 6d., and 9 cwt. of blende, worth 31s. 6d., or a total of 41s. for the separated products. Taking the cost of the raw material at 10s. and the working cost at 9d., the profit on the process appears to be 30s. 3d. per ton of stuff treated. The amount of material that can be crushed in a Vapart mill is about 5 tons per hour passed once through, so that a single apparatus will be sufficient for even a very productive mine, as mixed ore of this kind never forms more than a comparatively small portion of the total produce.—H. B.

* *Berg und hüttenmännische Zeitung*, vol. xli. p. 103; through *Min. Proc. Inst. Civ. Eng.* vol. lxix.

COMPARATIVE COST OF GAS AND THE ELECTRIC LIGHT.

IN order to get at the exact cost of illumination by the Gramme and the Siemens systems of electric lighting, as compared with that of coal-gas, a correspondent of our contemporary, the *Moniteur Industriel*, has taken the figures on the spot at large spinning and weaving works in the north of France. The Siemens system is preferred for the weaving department, because the light is more subdivided; but that of Gramme is adopted in the spinning mill. The weaving department has an area of 32,293 square feet, and contains about 450 looms, which were formerly lighted by the same number of gas burners. These, giving a lighting power of 2500 standard candles, at a cost of 16s. 2d. per hour, were replaced by thirty-two Siemens differential lamps of 400 candles each, or 12,800 together; that is to say, an illuminating power of more than four times the intensity. The cost of plant for the Siemens light is as follows:

	£	s.	d.
2 dynamo-electrical machines, at £148 each ..	296	0	0
32 lamps and accessories, at £13 each	416	0	0
Lubricators for the dynamo electrical machines	4	17	6
500 metres of conductor, &c.	20	17	6
Erection and setting to work	8	0	0
Total first cost of installation	751	15	0

As regards current expenses, the motive power required for the thirty-two lamps is 25 horse-power, which, spread over ten years at 5 per cent., gives;—

	s.	d.
For 600 hours of lighting yearly, per hour ..	3	3
Coal for 25 horse-power engine, per hour ..	1	0
Carbons for lamps, per hour	3	4
Labour and lubrication, per hour	0	5
Total	8	0

(Note.—The exact total is 9 fr. 86 c., rather less than 8s.)

This result, compared with the cost of gas given above, shows a saving of more than 50 per cent., with an illuminating power of more than four times the intensity. It is calculated that, if the Gramme system with twenty lamps had been adopted in the weaving department, instead of the Siemens, the first cost would have been rather higher, viz., £812 7s., but the current expense would only have been 8 fr. 61 c., or about 7s. an hour, with a light equal to that of 30,000 standard candles. The Gramme system is actually used for the spinning department, where, it appears, so great a subdivision of light is not of such importance. Six lamps are found sufficient to illuminate the area of about 3500 square feet. The first cost was about £316 10s., while the current expenses are 3 fr., or less than 2s. 6d. per hour. Each lamp gives a light equal to that of 2000 candles, or 12,000 altogether, showing a saving of more than 50 per cent., as compared with gas. The cost of each Siemens lamp of 400 candles is 3d. per hour, and of each Gramme lamp of 2000 candles a fraction over 4d. per hour.

COPIAPO MINING COMPANY.—This well-managed copper mining company has just issued a very favourable balance-sheet, showing a profit on the year ended June 30 last of £19,783. Out of this the directors propose to recommend a dividend of 8s. per share, making, with the interim quarterly dividends which have been paid, a return of 16 per cent. to the shareholders for the last twelve months. This division of the profits is subject to certain forfeited shares which the directors have decided to offer to the present shareholders, being taken up. The object in issuing these is to obtain a larger working capital, and so release a certain amount of the profits which have been absorbed therein. The management expenses are commendably low, but it is a pity to find that almost £4700 have been swallowed up by loss in exchange.

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NOTICES.

COMMUNICATIONS on literary subjects and books for review are to be forwarded to the EDITOR. Anonymous correspondence will be wholly disregarded. The return of rejected MSS. cannot be guaranteed. Correspondents are requested to write on one side of the paper only, and to mark papers sent.

All payments for Subscriptions, Advertisements and General Accounts are to be remitted to the **Office, 161, Fleet Street, E.C., London.** Cheques and Post Office Orders are to be made payable to PERRY F. NURSEY, and crossed "London and County Bank."

Advertisements and other Business Communications are to be addressed to the PUBLISHER.

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" " West Coast	1	15	0
The Continent of Europe, Egypt, and Algeria	1	10	0

Further information will be supplied on application to the PUBLISHER.

THE CONTINENT.

Messrs. GALIGNANI (Baudry, Jeancourt et Cie.), 224, Rue de Rivoli, and M. EM. TERQUEM, 15, Boulevard St.-Martin, Paris, will supply thick or thin paper copies of IRON on application, and will receive subscriptions and advertisements.

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NOTICES OF BOOKS.

Minutes of Proceedings of the Institution of Civil Engineers; with other Selected and Abstracted Papers. Vol. LXX. Edited by J. FORREST, Assoc. Inst. C.E., Secretary. London: published by the Institution. 1882.

THIS is the fourth and concluding volume of the *Proceedings* of the institution relating to the last session (1881-82). Four such volumes annually, distributed free to members in any part of the world, are a pretty good return for a year's subscription, and especially so in the case of non-resident students, whose annual contribution to the funds of the institution can hardly pay for the value they receive. As usual, the volume is well printed, well illustrated, and well edited.

The Life of the Right Hon. William Ewart Gladstone. By G. BARNETT SMITH. Jubilee Edition. London: Cassell and Co., 1882.

In less than a fortnight Mr. Gladstone will have completed his fiftieth year of public life, he having been returned on December 13, fifty years ago as member for Newark. In commemoration of this very interesting event, Messrs. Cassell have determined to re-issue Mr. Smith's very popular *Life of Gladstone* as a jubilee edition. This valuable work, which has already passed through eight editions in its library and popular editions, has been characterised as a work of national importance and the most satisfactory life of Mr. Gladstone yet given to the public. It is, in fact, a history of the past half-century, as well as a thoroughly reliable and interesting biography of the great statesman whose life it records. By reducing its price to a shilling, the publishers have placed the work in its present form of 128 closely printed quarto pages, within the reach of every household in the land.

Illustrirtes Hand- und Hülfsbuch für den praktischen Metallarbeiter. By H. SCHUBERTH. Parts 11 to 15. Vienna: A. Hattleben's Verlag, 1882.

WE have on previous occasions referred to this capital work on metal-working. The concluding parts have now been received. They are as full of useful matter as those which have gone before them. We have nothing further to add to what we have already stated; but we may finally remark that, as it comprises every department of practical metal-work, it may be commended to the attention of all specialists. The work is profusely illustrated, and contains, besides, fifteen plates printed in colours, all which help in making up a very handsome volume, which may be obtained at a very moderate expense.

The Practical Steam Engineer's Guide in the Design, Construction, and Management of American Stationary, Portable, and Steam Fire Engines, Steam Pumps, Boilers, Injectors, Governors, Indicators, Pistons and Rings, Safety Valves, and Steam Gauges. By E. EDWARDS. Illustrated. Philadelphia: Baird and Co. London: Low and Co. 1882.

THE author of this work has done for the American engineers what Mr. Reynolds has accomplished in this country for the same class of men by his *Stationary Engine Driving*. It is a well-known fact that both here and in America the great majority of those who run steam-engines are men of rather limited education, and hence a book, to be of any practical value to them, must of necessity be written in language which they can understand, and not in symbols beyond their comprehension. There are men who have had charge of steam-engines and boilers for years and years, who run them every day and all day long, who but dimly understand the principles either of construction or operation of the powerful machines over which they assume charge. Some few of them, with a laudable desire to improve themselves in this respect, fly to books on the subject for aid, but are met on the very threshold by pages upon pages of algebraic formulæ, very useful things to those that can understand and apply them, but which to these men are as meaningless and useless as so much Greek or Latin. Disappointed and disgusted, they put the book carefully away, never to make any further effort to go on in their pursuit of knowledge. Now the book before us appeals to this very class of men (as a stepping-stone for something higher and better)—men who have much to learn. The want of proper education on the part of these men is something to be deplored; but it must be remembered in their behalf that many of them were, when boys, driven by poverty to go out into the world and battle for bread, when they should have been by right at school, getting that greatest of all blessings—a good education. Knowing this, the writer has used the plainest and simplest language, so that it can be easily understood by those for whom it is intended—the worthy seekers after "more light." After a brief review of the history of the non-condensing steam-engine, will be found in this volume many of the most popular (American) makes of steam-engines, by the most celebrated builders, fully described and illustrated. The writer deals with the valves and valve-gears of each particular engine, so that no matter which one the engineer may be called upon to take charge of, he can do so intelligently, to the credit of himself and satisfaction of his employers. In presenting, therefore, the book to the engineer, firemen, and steam users, he has furnished a valuable guide and assistant in their daily labours. To the engineer and fireman it will prove a book of ready reference; and it will also enable those who own or use steam-power to exercise an intelligent supervision over their steam machinery, and those whom they employ to manage it.

CHRISTMAS BOOKS FOR CHILDREN.—We are once more called upon to notice the advances made in juvenile illustrated literature by Messrs. Dean and Son, and we readily give the matter the attention it merits, for it marks a distinctive artistic stride in a department previously neglected. Upon the present occasion we have first to notice three of Charles Harrison's facial toy books, the finished colouring of the chromo work in which has hardly been equalled in books of this class. At the backs of the chromo pictures are sketches in black and white, with full-tint surroundings, which is quite a new style of illustrating, but which is very effective, the sketches for the m[illegible]g extremely comical. Messrs. Dean are also publishing a "Rose and Lily" series of juvenile books at sixpence each. The books are bound, and considering this and the way in which the subjects are handled, and not less the delicacy of the colouring, we can certainly say we have hitherto seen nothing to equal them at the price. The same firm are also publishing a new edition, reduced in size and price, of "The Children's Kettle-drum," which we noticed about a year ago. The present book is quite in keeping with the larger edition, the illustrations possessing a quiet vein of humour which must appeal to all tastes.

LONGMAN'S MAGAZINE.—Messrs. Longman and Co. keep true to their programme. The second number of their new magazine is now before us, and fully equal in quality of matter to its predecessor. Besides the continuation of the serial tale commenced in the first number, by Mr. J. Payn, there are several very readable papers in this issue. Mr. S. Smiles supplies a biography of "John Harrison, the Chronometer Maker," who at first fared no better than other inventors struggling against adversity, but who was more fortunate than most of them, although the recognition of his valuable services rendered to science and navigation came rather late in life; still, it came. Mr. R. A. Proctor, the astronomer, contributes a highly interesting paper on "The Earth in Meteoric Shadow," explaining, from the writer's point of view, the causes of the three annually recurring cold periods of February, April, and May, and the warm period at the beginning of December. "The Norway Fjords" is the title of a well-written account of a well-spent holiday, passed by Mr. J. A. Froude with a small party of friends in some of the most charming spots of Scandinavian coast scenery, during the summer of 1881. In "The Lady's Walk," Mrs. Oliphant tells a thrilling tale of "the seen and unseen," for the continuation of which in the next issue of the magazine we look eagerly forward to. We are glad to observe that the practice of interleaving the text with showy advertisements has been judiciously discontinued.

NEW BOOKS.

A Treatise on Elementary Dynamics. By W. Garnett. Third Edition. Bell.
A Treatise on Hydro-mechanics. Part I., Hydrostatics. By W. H. Besant. Fourth Edition. Bell.
Class-Book of Elementary Mechanics. By W. Hewitt. Philip and Son.
Dumas' Art Annual, 1882. Chatto.
Electric Telegraphy. By F. S. Beechey. Second Edition. Spon.
Etcher (The). Vol. IV. (1882). Low and Co.
First Part of a Treatise on the Dynamics of a System of Rigid Bodies (The). By E. J. Routh. Fourth Edition. Macmillan and Co.
Health Lectures for the People, delivered in Manchester. Fourth and Fifth Series. In 1 Vol. J. Heywood.
Man before Metals. By N. Joly. Paul and Co. (International Scientific Series.)
Physical Optics. By R. T. Glazebrook. Longman and Co. (Text Books of Science.)
Pumps and Pumping Machinery. By F. Colyer. Spon.

BOOKS RECEIVED.

Bow of Strength (The), being the *Quiver* Annual. London: Cassell, Petter, Galpin and Co.
Greater London. By Edward Walford, M.A. Part II. London: Cassell, Petter, Galpin and Co.
Imperial Government Railways, Japan. Annual Reports by Foreign Staff, for the Twelve Months from 1st July, 1881, to 30th June, 1882. Tokio, 1882.
Land Junction of Great Britain and Ireland (The). By J. C. King, Engineer. London: R. H. Squire.
Life of Gladstone. By George Barnett Smith. London: Cassell, Petter, Galpin and Co.
Longman's Magazine. December 1882. London: Longman, Green and Co.
Papers on Mechanical Subjects. By Sir Joshua Whitworth, Bart. Part I. London: E. and F. N. Spon.
World of Wit and Humour (The). Part I. London: Cassell, Petter, Galpin and Co.
World of Wonders (The). London: Cassell, Petter, Galpin and Co.

OBITUARY.

GOOCH.—Mr. Thomas Longridge Gooch, M.Inst.C.E., who was a friend and pupil of the late George Stephenson, died at his residence, Team Lodge, Gateshead-on-Tyne, on November 23, after a brief illness, having attained the age of 75 years. Mr. Gooch acted as Stephenson's assistant, and continued as either assistant or joint engineer with him or his son Robert up to the year 1851. He was thus connected with the making of most of the early lines and railway, especially with the Liverpool and Manchester, the London and Birmingham, the Manchester and Leeds, the East Lancashire, the Leeds and Bradford Extension, and the Trent Valley. In the designing of the Manchester and Liverpool Railway Mr. Gooch acted as chief draughtsman to Stephenson, and was associated with him in the success that attended the great feat of laying the line over Chat Moss, being then only 22 years old. The deceased gentleman closed his professional career as long ago as the year 1851, the anxieties and toil of his calling having caused him, when in the full tide of success, to relinquish it.

SCIENCE AND ART.

THE CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—This society will hold their opening meeting of the session 1882-3 on Thursday, December 7, when the president, Mr. R. Harkness Twigg, M.I.C.E., will deliver his opening address.

THRESHING MACHINES DRIVEN BY ELECTRICITY.—Herren Piette and Krizik, at an agricultural gathering at Lundenburg, in Germany, have been driving an ordinary threshing machine by electricity, attaining a speed of 1400 revolutions per minute, and illuminating at the same time the yard in which the machines were exhibited.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending November 25, 1882:—On Monday, Tuesday, and Saturday (free), from 10 a.m to 10 p.m., Museum, 9028; Mercantile Marine, Indian Section, and other Collections, 2829. On Wednesday, Thursday, and Friday, (admission 6d.), from 10 a.m. to 4 p.m., Museum, 1447; Mercantile Marine, Indian Section, and other Collections, 292; total, 13,596. Average of corresponding week in former years, 12,374. Total from the opening of the Museum, 21,493,130.

THE BRITISH ASSOCIATION.—A public meeting was held at Montreal on October 26 last, under the presidency of the mayor, at which resolutions were passed expressing great satisfaction that the invitation to visit Montreal in the year 1884 had been accepted by the British Association. An influential committee was appointed to commence preparations at once, in order to secure to the association a hearty welcome to the Dominion, and to arrange with the leading railway and steamboat companies for such excursions as may be necessary to enable its members to become acquainted with the different parts of Canada.

THE SOCIETY OF ENGINEERS.—The next ordinary meeting of this society will be held on Monday, December 4 next, in the society's hall, Westminster Chambers, Victoria Street, Westminster. A paper will be read on "The Strength of Boiler Flues," by Mr. W. Martin, the leading features of which are as follows:—Introduction; importance

of the subject; flue the weakest part of a boiler—difficulty of discovering weakness by testing—theoretical investigation of strength—experimental determination of strength; Fairbairn's experiments, &c.—strength of, as affected by different methods of construction; elliptical flues; cross tubes; flues of two diameters, &c. The chair will be taken at half-past seven o'clock precisely.

THE SYDNEY EXHIBITION PALACE.—The *Melbourne Argus* states that it is the intention of the New South Wales government to build on the site of the late garden palace a permanent palace, which is to be a national gallery of art and science for the entertainment and instruction of the people. The actual design of the new building is not yet decided upon, but the idea is that the structure shall be a handsome one, that it shall be used for the purposes of the present art gallery and museum, and in other ways be available for any purposes associated with an institution such as that above mentioned. It is also probable that as some national demonstration will take place on the occasion of the centenary of the founding of the colony of New South Wales in 1888, the building will be so designed that, with some addition in the form of an annexe, it will meet all the requirements of a great exhibition.

LECTURES ON ENGINEERING.—The council of the Society of Engineers have made arrangements for the delivery in their hall during the winter of a series of lectures relating to engineering. We have referred to the subject fully in another column, but we may state here that the course will commence on Thursday, December 7, with the first of a series of lectures by Mr. Henry Adams, on "Strains in Ironwork," to be continued on ensuing Thursdays. The second course of lectures, by Mr. A. Walmisley, on "Land Surveying and Levelling," will commence on Monday, January 8. "Water Supply and Drainage" will furnish the subject of the third course, which will be delivered by Mr. Peregrine Birch on Thursday evenings in February, March, and April. The object of the movement is that of promoting the education of young engineers in technical knowledge, a very laudable one.

ROYAL INSTITUTION OF GREAT BRITAIN.—The following are the lecture arrangements for the ensuing season:—The Christmas lectures will be given by Professor Tyndall, on "Light and the Eye." Before Easter: Professor W. C. Williamson, five lectures on "The Primeval Ancestors of Existing Vegetation, and their Bearing upon the Doctrine of Evolution"; Professor R. S. Ball, four lectures on "The Supreme Discoveries in Astronomy"; Professor Dewar, nine lectures on "The Spectroscope and its Applications"; Mr. R. Bosworth Smith, on "Episodes in the Life of Lord Lawrence"; Dr. W. H. Stone, three lectures on "Singing, Speaking, and Stammering"; Mr. H. H. Statham, two lectures on "Music as a Form of Artistic Expression." After Easter courses will be given by Professors Tyndall, McKendrick, A. Geikie, and Turner (of St. Petersburg). The Friday evening discourses will probably be given by Mr. R. B. Smith, Mr. G. J. Romanes, Sir W. Thomson, Mr. M. D. Conway, Professor W. C. Williamson, Mr. W. H. Pollock, Professor Tyndall, and other gentlemen.

LONDON UNIVERSITY.—We hear that the senate of the university of London have lately come to an important decision which will do much towards removing a grievance long felt in relation to the government and practical working of the university. One of the chief causes of the agitation, which resulted in the establishment at Manchester of the Victoria University, was that, while students of the affiliated colleges were greatly affected in their studies by the London University regulations, the colleges had no influence on the governing body, which prescribed regulations or cancelled them in a purely autocratic manner. The convocation of the London University recently urged on the senate the desirableness of a change in this respect, and proposed the establishment of boards of studies in arts, laws, medicine, and science, the members of these boards to be in part chosen from the professors and teachers in the colleges and schools. The senate has assented to this proposal in principle, though not in form. The principal teaching bodies which send candidates to the University examinations are to be authorised to nominate representatives who shall attend in conference, or otherwise, to deliberate on such questions relating to the examinations as may be brought before them by the senate. This change, it is believed, will bring about a fuller harmony between the examining and teaching bodies, and tend to prevent in future collision and secession. In addition to this important reform, the senate propose that the university examiners shall meet from time to time to consider suggestions for the improvement of the examinations. It is likely that thus coherence and continuity in the practical working of the university system will be preserved, and occasion removed for such taunts as that the metropolitan university is a nebula floating about in space, with an examining board for its head, but otherwise without internal congruity and consolidation.

LIVERPOOL ENGINEERING SOCIETY.—At the last meeting of the above society on November 22, Mr. H. Bramall, vice-president, in the chair, a paper was read, by Mr. W. E. Mills, entitled, "Notes on the Mallett System of Controlled Combustion." The author, in introducing his subject, stated that the question of dealing with the cloud of smoke hanging over our large cities, and the immense waste of heat which its presence testified to, had been attempted in many ways from time to time. All engineers were familiar with the different kinds of smoke consumers and fuel economisers which were before the public, but none of which altogether achieved the end aimed at, viz., the consumption of the smoke generated by the fuel in the furnace. Mr. Mallett, of Denver, Colorado, U.S.A., who had studied the subject, saw that the difficulty with all the smoke consumers was the impossibility of entirely burning all the atoms of carbon set free in the act of combustion. He conceived the idea that, if by any means the fuel could be burnt in such a manner as not to produce any smoke at all, and so preserve all the heat which would be otherwise wasted, a great step would be gained. He effected this in the following manner:—A combustion chamber is fitted behind the boiler furnace, communicating with it by a perforated septum wall. The firebars were made hollow, and so arranged that cold air from the exterior could pass through them into the combustion chamber. The open ends of these firebars could be closed by a slide, worked by a lever, which also actuated the apertures in the ashpit doors. When coal was first put on the fire the latter openings were closed. The gases given off from the fuel passed into the combustion chamber through the apertures in the septum wall, and meeting there with the oxygen conveyed through the firebars were entirely consumed. The inventor claims that by his method, no smoke being produced, all chimneys may be done away with, and a saving of about 45 per cent. in fuel effected. The necessary draught is provided by a fan, which draws the heated gases—the ultimate products of combustion—through a condenser, in which they are cooled down, and then discharged into the open air. The application of the system to stationary, marine, and locomotive boilers was next described, with the various scientific principles involved. A discussion followed, and a vote of thanks was accorded to the author.

THE USE AND ABUSE OF FUEL.—On November 27, Professor Armstrong gave the last of a series of lectures to the people delivered during the month in the Philosophical Hall, Leeds, under the auspices of the Yorkshire College. The subject was "The Use and Abuse of Fuel," and the lecture attracted a large number of persons interested in the economical use of coal. Professor Armstrong reminded the audience that coal was our most valuable material inheritance, and were it to become greatly diminished—as trustworthy authorities stated that it might in a calculable number of years—by a too wasteful consumption, we should be required to justify such a use to posterity, inasmuch as it might entail the loss of our commercial pre-eminence. Whilst the abuse of fuel was a national disgrace, it possessed a sanitary bearing, the smoke-laden atmosphere in our large centres of industry having a pernicious influence on the physical and moral state of the people. The smoke nuisance was a hideous blot on our national credit, and should be removed. Weight for weight, coal was one of the most powerful substances in nature, and might be regarded as force in essence. To secure the perfect combustion of coal a copious supply of air and a sufficiently high temperature were needed, for by the aid of these auxiliaries the greatest heat with the least quantity of smoke were obtainable. It was not easy to determine the exact temperature at which fuel might be efficiently burnt in a boiler furnace, but 600 deg. Fahrenheit was as near the right state as could be reckoned. A well-regulated air supply could never be properly established where boiler space was insufficient. A large boiler was an economical investment, and also helped to abate the smoke nuisance. The use of steam boilers should be prohibited in large towns for all purposes which could be met by such sanitary and inoffensive motors as the Otto gas-engine. The double-flued boiler was the most suitable for smoke consumption and the proper use of coal. To maintain a suitable supply of air, it should be admitted beneath the grate bars, in the front of the boilers, and also behind the bridge; and there should be constant attention, careful and skilful stoking, and intelligent supervision. Holdsworth's pyrometer was a successful indicator of the temperature, and there could be attached a self-registering index by which the results of the stoking could be ascertained. In dealing with the domestic aspect of the question, Professor Armstrong agreed with the opinions recently expressed by Mr. T. Pridgin Teale. He said that most grates provided for a too liberal supply of air, that fires should be lighted at and fed from the top, and that fireplaces should be constructed on Rumford's plan, in order that all the heat from the fuel might be thrown into the room. The lecture was illustrated with suitable diagrams.

MEETINGS FOR THE WEEK.

MONDAY, DEC. 4.

SOCIETY OF ENGINEERS.—7.30 p.m. Mr. W. Martie, on "The Strength of Boiler Flues."
SOCIETY OF ARTS.—1st Cantor Lecture 8 p.m. Professor Silvanus P. Thompson, on "Dynamo-Electric Machinery."
ROYAL INSTITUTION.—General Monthly Meeting. 5 p.m.
ROYAL ACADEMY.—8 p.m.
MEDICAL SOCIETY.—8.30 p.m.
BRITISH ARCHITECTS' INSTITUTE.—8 p.m. Mr. R. P. Pullan, on "The Decoration of St Paul's Cathedral."
LONDON INSTITUTION.—5 p.m. Mr. J. Ruskin, on "Cistercian Architecture."
SURVEYORS' INSTITUTION.—8 p.m.
VICTORIA INSTITUTE.—8 p.m.
SOCIETY OF CHEMICAL INDUSTRY.—M. W. J. Macadam, "Incrustation in Boilers, and Purification of Water."

TUESDAY, DEC. 5.

INSTITUTION OF CIVIL ENGINEERS.—8 p.m. Discussion upon "American Practice in Heating Buildings by Steam." Mr. J. Daglish, "The Sinking of Two Shafts at Marsden for the Whi burn Coal Company."
SOCIETY OF BIBLICAL ARCHÆOLOGY.—8 p.m.
PATHOLOGICAL SOCIETY.—8.30 p.m.

WEDNESDAY, DEC. 6.

SOCIETY OF ARTS.—8 p.m. Mr. N. A. Gibbs, on "The Artificial Drying of Crops."
AMATEUR MECHANICAL SOCIETY.—Conversazione, 6 p.m.
DIALETICAL SOCIETY.—8 p.m.
BRITISH ARCHÆOLOGICAL ASSOCIATION.—8 p.m.
GEOLOGICAL SOCIETY.—8 p.m. Papers by Admiral Spratt, Rev. A. Irving, and Mr. J. Oates.
PHARMACEUTICAL SOCIETY.—8 p.m.
ENTOMOLOGICAL SOCIETY.—8 p.m.
OBSTETRAICAL SOCIETY.—8 p.m.

THURSDAY, DEC. 7.

SOCIETY OF ENGINEERS.—7.30 p.m. Mr. Henry Adams, on "Strains in Ironwork." Lecture.
CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—7 p.m. Opening Address by the President.
AGRICULTURAL SOCIETY.—General Meeting, noon.
ANTIQUARIES' SOCIETY.—8.30 p.m.
ROYAL ACADEMY.—8 p.m.
ARCHÆOLOGICAL INSTITUTE.—4 p.m.
LINNEAN SOCIETY.—8 p.m.
MID-SURREY POULTRY SHOW.—Kingston-on-Thames. (Three days.)
LONDON INSTITUTION.—7 p.m.
CHEMICAL SOCIETY.—8 p.m.

FRIDAY, DEC. 8.

ARCHITECTURAL ASSOCIATION.—7.30 p.m.
NEW SHAKESPEARE SOCIETY.—8 p.m.
CLINICAL SOCIETY.—8.30 p.m.
ASTRONOMICAL SOCIETY.—3 p.m.
QUEKETT MICROSCOPICAL CLUB.—8 p.m.

SATURDAY, DEC. 9.

BOTANIC SOCIETY.—3.45 p.m.
PHYSICAL SOCIETY.—3 p.m.

METALLURGY AND MINING.

THE LIME METHOD OF GETTING COAL.—We hear that the new lime method of getting coal has been successfully applied in Hasard Colliery, near Liége, and it appears as if the new process will be extensively used in the Belgian coal mines.

AUTOMATIC DETERMINATION OF THE MELTING POINT OF METALS AND ALLOYS.—Herr Liebermann employs electricity for determining the melting point of metals and alloys fusible at low temperatures. He interposes, in a metallic circuit provided with a bell, a rod of the metal or alloy that he wishes to study; and this rod is plunged into a bath of oil, the temperature of which is given by a thermometer. As long as the rod has not been brought to its point of fusion, the circuit remains closed, and the bell continues to ring; but, as soon as the bath attains the temperature necessary to fuse the metal, the bell ceases to ring, when the reading of the thermometer must be taken.

THE PRODUCTION OF CHARCOAL IRON IN THE UNITED STATES.—Statistics show that charcoal at present produces 18 per cent. of all the pig-iron made in the United States. During 1881 638,838 net tons of pig-iron and 84606 net tons of blooms and billets, a total of 723,444 net tons, were made with this fuel, consuming about 1,000,000 net tons of it. It is probable that 1882 will considerably exceed the product of 1881. If to the amount of fuel used at ironworks we could add that consumed in the various smelting works of the silver and other metallurgical industries, the total annual consumption of charcoal in the United States would be found to approximate 2,000,000 net tons annually.

THE NEW METHOD OF GETTING COAL.—An important meeting of the Midland Institute of Mining, Civil, and Mechanical Engineers was held at the Victoria Hotel, Sheffield, on Tuesday, when the new system of getting coal by means of lime cartridges instead of gunpowder, a question which at present creates great interest in the Yorkshire coalfield, was considered. In response to the request of the chairman, Mr. T. Carrington (the president of the institute), Major Moseley, the inventor of the new process, gave particulars of a number of trials which had recently been made with his process. At a trial in Belgium with coal of a somewhat friable nature, and lying in an inclined position, three attempts were made. The first time nine shots brought down 30 tons of coal, producing 76 per cent. of large; at the second attempt nine shots brought down 28 tons, with about 54 per cent. of large; the third time was practically the same as the first. The manager of that colliery stated that the pits had been worked since 1857, and that they had never previously got more than 20 per cent. of large coal. In Austria experiments had been made at collieries belonging to Baron Rothschild, the State Railways, and Count Lange. They were magnificent coalfields, some of the seams being 15 feet in thickness; there again the results were equally satisfactory, the advantage over the coal got by powder being very marked. The chairman said what was wanted in South Yorkshire was to get some method by which they could do away with powder, in consequence of the fiery nature of the Barnsley and Silkstone seams. That, he ventured to think, was of far more importance to the managers and owners in South Yorkshire than even the saving in small. Major Moseley said the system was absolutely safe; there was neither fire, nor flame, nor anything of that kind connected with it; it was impossible it could set a light to gas. The reason it produced so much better coal than gunpowder arose from its more gradual action. He thought there would be no loss of time on that account, as the men could go on working whilst the action of the charge was going on; whereas in the case of powder the men had to go away from the district in which the shot was fired. Replying to other questions, Major Moseley said that Mr. Bell (government inspector of mines for Durham) fully approved the process, and said it had been tried very successfully in the north. The chair asked if Major Moseley could suggest any means for obviating the delay which occurred in the lime process where in the right-hand bank they were getting the coal out and the left was ready for the lime process. Mr. A. M. Chambers said the trials at Thorncliffe Collieries had been very successful, and the men were very desirous of continuing the use of the lime, which they were convinced conduced materially to their safety. In the debate which followed, the process was highly spoken of on all hands. Several of the gentlemen present said they were experimenting with the lime cartridges, and it was accordingly resolved to adjourn the discussion pending the conclusion of the experiments and the reports thereon.

RAILWAYS & TRAMWAYS.

ITALIAN RAILWAYS AND TRAMWAYS.—From official statistics it appears that Italy has been spending public money very freely of late in the construction of public works, and is committed to a still larger expenditure in the future. Up till 1878 the budget of the Ministry of Public Works was not suffered to exceed £6,000,000. Since then, however, it has been largely augmented, and it now stands at about £12,200,000. Since 1878 there have been sanctioned 63 new enterprises, involving a total expenditure of £80,000,000, the bulk of which has to be met before the end of 1890. Of the new schemes the most important are those which provide for the construction of railways and for the improvement of roads and waterways, the estimated expenditure on those projects amounting to £78,000,000. Already the length of railways in operation has increased from 5100 miles in 1878 to 5700 miles, and since 1878 349 locomotives, 850 carriages, and 5714 wagons have been bought, and for the most part placed upon the lines. Of tramways there are now in operation about 800 miles, as compared with 260 miles in 1878; while in the past four years upwards of 670 miles of new provincial roads have been constructed.

PROPOSED RAILWAY FROM ASKABAD TO HERAT.—At the meeting of the Royal Geographical Society, on Monday, a paper was read on "M. Lessars' Reconnaisance Survey from Sarakhs and Merv to Herat." The president (Lord

Aberdare) having remarked that an account of the explorer's journey as far as Sarakhs having been published by the society in August last, there was to be given that evening a resumé of his labours in examining the country for the construction of a line of railway between Askabad and Herat. The secretary (Mr. Freshfield) read the paper, in the course of which a passing reference was made to some of the adventures of Mr. O'Donovan, the Merv correspondent of the *Daily News*, who was present. The whole length of the projected railway, via Sarakhs, would, it was stated, be 390 miles, of which the first 200 and the last 80 would require no earthwork at all; while on the middle stretch, 100 miles long, there would be no more than on an average railway in Russia in Europe. The length of road from Merv to Herat was estimated at 253 miles. Sir Henry Rawlinson made some remarks in addition to M. Lessar's paper. He observed that the writer had now supplied the missing link—the tracing of the direct line of communication between Russia and India, dissipating the fallacies which had hitherto obscured the subject, and giving them for the first time a true contour sketch of the face of the country. He had shown that, so far as physical difficulties were concerned, there was no reason why, at any time within the limitation of a few months, a continuous railway should not be built from the Caspian to the west frontier of Afghanistan; and if that were so, a week would suffice for the transport of merchandise, and therefore of troops and stores, from the Russian headquarters in the Caucasus to Herat. In concluding, Sir Henry, while congratulating Russia on the distinguished part which she had played, and was probably destined to play, in the civilisation of Central Asia, expressed a hope that the railway project in question would not be realised at any rate until England had a railway to Herat from Sibi via Quetta and Candahar. Mr. O'Donovan alluded to his personal experiences in connection with a large part of the region which would be traversed by the projected railway. As regarded the first part of the route, he expressed his belief that there were no difficulties which engineering skill could not easily overcome, and he pointed out that the construction of such a railway would practically annihilate the desert of Karakum, which had hitherto separated the northern from the southern possessions of Russia in Central Asia.

NAVAL ARCHITECTURE.

LAUNCHES.

ENGLISH.

Aberdare.—On November 25, there was launched from the Howdon yard of Palmer's Shipbuilding and Iron Company (Limited), this screw-steamer, built for Messrs. Morel Brothers and Co., Cardiff. The *Aberdare's* dimensions are:—Length, 250 feet; breadth, 33 feet; depth, 18 feet. Her engines, also by Palmer's Company, will be 130 horse-power.

Biscaye.—On November 22, there was launched from the iron shipbuilding yard of Messrs. John Blumer and Co., North Dock, Sunderland, this iron screw-steamer, built to the order of Messrs. Delmas Forreo, La Rochelle. The dimensions are 250 feet in length, by 38 feet in breadth, and 19 feet in depth; deadweight carrying capacity, 2240 tons on a mean draught of 17 feet 6 inches. Her engines will be fitted by Messrs. Thomas Clark and Co., of Elswick-on-Tyne, and will be of 150 horse-power. The estimated speed is 9 knots.

Cairo.—On November 25, Messrs. Raylton, Dixon and Co., launched from their dockyard at Middlesbrough, a similar vessel to the tea steamer *Menard Castle*, built about a year ago, her dimensions being:—Length, 340 feet; breadth, 38 feet 6 inches; and depth of hold, 26 feet, and capable of carrying 4000 tons of tea, besides her coals and stores. Her engines are of 300 horse power, from the well-known works of Messrs. Richardson, of Hartlepool.

Carina.—On November 27, Messrs. M. Pearse and Co. launched from their iron shipbuilding yard at Stockton this iron screw-steamer, of the following dimensions, viz.:—Length between perpendiculars 257 feet 6 inches; breadth, extreme, 34 feet 6 inches; depth, 20 feet 4½ inches; about 1680 tons gross register. Her engines will be of 160 horse-power nominal, by Messrs. Blair and Co. The steamer is built for Mr. H. Cloake, of Cardiff.

Daylesford.—On November 23, Messrs. Robert Thompson and Sons launched from their yard at Southwick-on-the-Wear, this steamer, built to the order of Messrs. Thompson and Wrightson. The *Daylesford* is 250 feet long over all, 34 feet broad, and 17 feet deep, and her deadweight carrying capacity on 17 feet draught of water is 1,800 tons. Engines of 130 horse-power will be supplied by Messrs. Thomas Clark and Co., of Elswick-on-Tyne.

Glenfoil.—On November 25, Messrs. Joseph L. Thompson and Sons, shipbuilders, Sunderland, launched this awning-decked steamer to the order of Messrs. Lindsay, Gracie, and Co., Newcastle-on-Tyne. Her dimensions are:—330 feet extreme length, 40 feet beam, and 29 feet depth to awning-deck. She is expected to carry about 4500 tons measurement cargo.

Hartburn.—On November 25, Messrs. Edward Withy and Co. launched from Middleton Shipyard, West Hartlepool, this iron screw-steamer, built to the order of Messrs. R. Ropner and Co., West Hartlepool. Her principal dimensions are:—Length between perpendiculars, 275 feet; beam, extreme, 35 feet 6 inches; depth, moulded, 21 feet 2 inches. Engines of 200 nominal horse-power will be supplied by Messrs. R. and W. Hawthorn, of Newcastle-on-Tyne.

Kalmia.—On November 25, Messrs. W. H. Potter and Son launched from their shipbuilding and engineering works, Queen's Dock, Liverpool, this iron sailing vessel of the following dimensions, viz.:—Length, 270 feet; breadth, 39 feet; depth in hold, 24 feet; tonnage, B.M., 1899 tons; tonnage, nett register, 1806 tons; deadweight capacity, 3950 tons. The *Kalmia* has been built to the order of Messrs. Sandbach, Tinne, and Co., of Liverpool.

Lady Ann.—On November 22, there was launched from the yard of Messrs. S. P. Austin and Son, Wear Dockyard, Sunderland, this iron screw-steamer, of the following dimensions:—Length over all, 233 feet; extreme breadth, 33 feet; depth of hold, 16 feet 6 inches. The vessel will be fitted with compound surface-condensing engines of 110 horse-power nominal. She is built to the order of Mr. H. T. Morton, of Biddick Hall.

Prince Llewellyn.—On November 25, there was launched by the Palmer Shipbuilding and Iron Company this steamer, built to the order of Messrs. R. Bovey and Co., London and Cardiff. The dimensions of the steamer are:—Length, 260 feet, by 36 feet by 20 feet. Her engines, also by the Palmer Company, are 150 horse-power nominal. She will be especially fitted out for the Black Sea trade.

Rajore.—On November 18, Messrs. Oswald, Mordaunt, and Co. launched from their shipbuilding and engineering works, Southampton, this iron sailing ship of 2050 tons register, built to the order of Messrs. Eyre Evans, and Co., of Liverpool. She is of the following dimensions, viz.:—Length, 277 feet 4 inches; breadth, 40 feet 3 inches; depth of hold, 24 feet 3 inches.

Scorton.—On November 23, Messrs. Readhead and Co., South Shields, launched this new steamer for Messrs. Chapman and Miller, of Newcastle. The vessel is 2200 tons, and 259 feet long.

SCOTCH.

Balnacraig.—On November 25, there was launched from the building yard of Messrs. Hall Russell and Co., Aberdeen, this iron screw-steamer, of the following dimensions:—Length, 255 feet; breadth, 34 feet 6 inches; depth, 26 feet; and 1640 tons gross. The vessel will be fitted with compound surface-condensing engines of 150 horse-power nominal. She has been built to the order of Messrs. J. and A. Davidson.

Cintra.—On November 28, Messrs. Napier, Shanks and Bell launched from their shipbuilding establishment at Yoker, this screw-steamer, built for the Austra'asian Steamship Navigation Company, Sydney. The *Cintra*, which is a sister ship to the *Rockton*, launched by the same firm in June last, is of the following dimensions:—Length, 270 feet; breadth, 37 feet; depth of hold, 24 feet. Her gross tonnage is 2000 tons. Her engines are being constructed by Messrs. John and James Thomson, and give a working pressure equal to 1800 horse-power.

City of Madras.—On November 28, Messrs. Barclay, Curle and Co. launched from their shipbuilding yard, Whiteinch, Glasgow, this iron sailing ship for the East India trade of Messrs. George Smith and Sons, Glasgow. The dimensions of the vessel are 252 feet by 38 feet by 23 feet, and the tonnage 1660 gross.

Clan Ogilvie.—This steamer, built by Messrs. Alexander Stephen and Sons, for the Clan Line of Messrs. Cayzer, Irvine and Co., was launched from their shipbuilding yard at Linthouse, Govan, on November 24. She is of about 2600 tons. Her engines, also built by Messrs. Stephen, are of the compound surface condensing type, with cylinders 38 inches and 68 inches diameter, by 45 inches stroke, and have ample boilers suitable for a working pressure of 85 lbs.

Devonia.—On November 23, there was launched from the shipbuilding yard of Messrs. Murdoch and Murray a screw steel steamer of the following dimensions:—140 by 21 by 10·3. She had been built to the order of Messrs. Dunsmuir and Jackson, Govan, who supply the engines.

Forth.—This new twin-screw hopper dredger, built and engined by Messrs. Wm. Simons and Co., was launched complete on November 25th, from their works at Renfrew. The vessel is the property of Messrs Lawson and Best, Glasgow; it will dredge to 30 feet depth, and carry 800 tons of its own spoil at a speed of seven knots per hour. It is intended for the deepening operations at Grangemouth, and is the second hopper dredger the builders have supplied to these works. It is fitted with two independent sets of compound engines of 400 horse-power collectively, and steam appliances throughout.

Highland Glen.—On November 23, there was launched from Messrs. Ramage and Ferguson's shipbuilding yard, at Leith, this iron sailing barque of 1000 tons net register, built to the order of Messrs. Crane, Colvil and Co., Glasgow, and intended for the Australian and East Indian trades.

Imberhorne.—On November 28, Messrs. A. M'Millan and Son launched from their dockyard at Dumbarton this iron sailing ship, registering nearly 2100 tons. This vessel has been built for Messrs. W. R. Price and Co., London.

Liverpool.—On November 25, there was launched from the shipbuilding yard of Messrs. Dobie and Co., Govan, Glasgow, this four-masted iron sailing ship, built to the order of Messrs. W. Price and Co., of Liverpool. Her dimensions are:—Length, 275 feet; breadth, 42 feet; depth, 24 feet; her register is about 2100 tons, and she will carry about 3300 tons deadweight.

Waihora.—On November 23, Messrs. William Denny and Co. launched from Leven Ship Yard, this steel screw-steamer of 1950 tons gross measurement, for the Union Steamship Company of New Zealand (Limited). The dimensions of the *Waihora* are:—Length between perpendiculars, 285 feet; breadth moulded, 36 feet; depth moulded 25 feet. She has been constructed of Siemens-Martin steel. The vessel will be fitted by Messrs. Denny and Co. with compound surface-condensing engines, having cylinders 38 inches and 68 inches diameter, and the stroke of piston 45 inches.

William Hope.—On November 23, Messrs. Hamilton and Co., Leith, launched from their shipbuilding yard this iron screw-steamer of about 140 tons, built to the order of Messrs. William Hope and Sons, merchants, Leith, for for their general coasting trade. The vessel will be fitted with compound surface-condensing engines by the builders.

TRIAL TRIPS.

Alexander.—On November 25, this steamer, built and engineered by Messrs. Pearce Brothers, had a successful trial trip. The vessel, after having the compasses adjusted, ran the measured mile, on which she attained a speed of 11½ knots. The machinery worked satisfactorily.

Lansdowne Tower.—This new steamer, built by Messrs. Wigham Richardson and Co., for Messrs. Stumore, Weston and Co., of London, was tried over the the measured mile on November 22, and the speed, half loaded, was with a point of 13 knots, and everything worked to the satisfaction of all concerned.

A NEW STEAMER FOR THE YENISEI.—Captain Johannesen, who commanded the steamer *Lena* on the Vega expedition, has arrived at Motala, to negotiate for and superintend the building at the works there of a screw-steamer of about 100 tons, to be built of Swedish Bessemer steel, to trade on the river Yenisei. She is to be delivered early next year, and will be the largest steamer on that river. The vessel is built to the order of M. Sibiriakoff, the well-known Russian merchant.

SHIPBUILDING EXTRAORDINARY.—We learn from the *Morning Post* that an order has been received by a firm of shipbuilders on the Clyde for four new steamers, to be built of steel, capable of running 13 knots regularly, and powerful enough to face any gale on the Canadian lakes, for which they are intended. The order is given by the Canada Pacific Syndicate, and the vessels, after being built on the Clyde, are to be taken to pieces, transported in sections, and put together in Canada.

STEAM LAUNCHES FOR RUSSIA.—There were recently forwarded from Stockholm to St. Petersburg two steel steam launches, built at the Lindberg Mekaniska Verkstad. The vessels, which are intended for traffic on the canals of St. Petersburg, are fitted with engines of 4 horse-power. Their dimensions are:—Length, 11·90 m.; breadth, 3·23 m.; depth 1·20 m. This contract is another example of the excellent market which Russia offers to builders of steam vessels, in spite of the duty on the same.

TORPEDO BOAT FOR THE DUTCH GOVERNMENT.—On Saturday last the official trial took place of a large sea-going torpedo boat, built by Messrs. Yarrow and Co., of Poplar, for the Dutch Government. The boat, which is 100 feet in length, by 12 feet 6 inches beam, attained a speed of over 21 knots an hour. The Dutch Government was represented by Captain Bogaert, the chief of the torpedo department, and Captain Hudig, of the Ministry of Marine, the contractors being represented by Mr. Crohn. After the trial the Dutch authorities expressed their perfect satisfaction both with the performance of the boat as well as the working of the machinery.

DISASTERS AT SEA.—Fifty-five British and foreign actual shipwrecks were reported during the past week, making a total of 1421 for the present year, or a decrease of 354 as compared with the corresponding period of last year, the decrease for the week being 36. This compares with a large total last year, when 59 English and Scotch vessels were lost, 28 going down off the Scotch coast alone. British-owned vessels amount to 21; eleven were steamers, with an aggregate tonnage of 6133 tons, eight being British steamers, with a tonnage of 4856 tons. Total tonnage lost for the week, 18,423 tons. Total number of lives lost and missing, 81. Sixteen vessels were wrecked off the coasts of the United Kingdom, 12 being British owned, two Norwegian, and two German. Two British vessels, one German, and one American sunk by collision, resulting in the loss of nine lives, two British and one German being lost off Great Britain, and one American in the United States; six were abandoned at sea. The following are the quantities of produce and merchandise lost:—Coals, 4590 tons; timber, 1412 tons; corn, 4049 tons; sugar and general goods, 2000 tons.

NEW SHIPBUILDING YARD AT HOWDON.—We learn, in connection with the extension of iron shipbuilding on the Tyne, that, in addition to the contemplated new yards at Wallsend and Elswick, another new yard is to be commenced at Howdon. Messrs. H. S. Edwards and Sons, ship repairers, Graving Dock, South Shields, are the firm about to open out business at the place named, having secured a large plot of ground on lease from the Duke of Northumberland, for the purpose of commencing iron shipbuilding. The site chosen is one well adapted for the purpose. It is immediately adjoining the Tyne Commissioners' yard at Howdon, and extends eastward down to the staithes of the Cramlington Coal Company. The ground is adjacent to the Newcastle and North Shields turnpike, is but a short distance away from the riverside railway, and has a good river frontage. Arrangements have already been made for the construction of all necessary buildings in connection with the undertaking, and the requisite machinery will be placed on the spot in time to permit of shipbuilding operations being commenced shortly after the beginning of next year.

ARMS, ARMOUR, AND EXPLOSIVES.

ARTILLERY TRIALS AT SPEZZIA.—Some experiments are being carried out at Spezzia with the 100-ton muzzle-loading gun which was fired last week at a compound plate made by Cammell, a compound plate by Brown, and a steel plate by Schneider, of Creusot. All three plates were of the same thickness, viz., 19 inches, with four feet of wood backing. The velocity of the shot was calculated to perforate a wrought-iron plate of the same thickness. According to the *Army and Navy Gazette*, the Cammell plate was not perforated, but the corner of it was separated by cracks through the whole thickness. The Schneider plate was less penetrated than the Cammell, and no cracks were apparent. The Brown plate was less penetrated than the Schneider, and only cracked in the steel facing. The wrought iron acted as a cushion; it bent a little, and so absorbed the force of the blow. On the experiments being continued, the first round was fired at Brown's plate, which broke into four large pieces and many small pieces. About three-quarters of the plate fell from the target, and the backing was much damaged. The second round was at Cammell's plate, which broke into five large and many small pieces, and fell completely from the target. The energy of the projectile in both rounds was about 33,900 tons. The plates were not penetrated in either case, but dashed to pieces. A ship would leak through the injury caused to the backing. The Whitworth shot fired at the Schneider plate failed to penetrate more than 8 inches, but completely broke up the plate, and drove in the backing. The Gregorini steel shot, fired afterwards, left the Schneider target a mass of ruin. The results of these experiments are considered to reopen the whole question of naval gunnery and armour. The gun has not yet been fired with its full battering charge.

LEGAL INTELLIGENCE.

November 24.

SUPREME COURT OF JUDICATURE.

COURT OF APPEAL.

(*Sittings at Westminster before* LORDS JUSTICES BAGGALLAY, BRETT, *and* LINDLEY.)

KAY *v.* FIELD AND CO.

In this case the plaintiff appealed from a decision of Mr. Baron Pollock disallowing a claim for 16 days' demurrage for delay in loading a steamer under a charter-party. By the terms of the charter-party the plaintiff's steamer was to proceed to Cardiff East Bute Dock, and there load in the customary manner from the defendants' agents a cargo of rail iron, the cargo to be loaded as fast as the steamer could take on board and stow within the customary working hours of the port, commencing when the steamer was in berth and ready to load, and if longer the merchants to pay £30 per day demurrage. There was also an exception that detention by frost, floods, &c., should not be reckoned as lay days. At Cardiff there are two docks, the East Bute Dock and the West Bute Dock, which are connected by a canal, the latter dock being also connected by a junction canal with the Glamorganshire Canal. There are about six shippers of rails at Cardiff, all of whom, with the exception of the defendants' agents, have wharves in one or other of the docks, and load either alongside the quays or by lighters. The defendants' agents, however, Messrs. Crawshay and Co., whose works were about twenty-four miles from Cardiff, had their wharf on the Glamorganshire Canal, by which they have for thirty years forwarded their iron by lighters alongside vessels in the East Bute Dock. When the plaintiff entered into the charter party, he did not know who were the defendants' agents at Cardiff, or in what manner they conducted their business. All the iron intended for the ship had been deposited at Messrs. Crawshay's wharf, and on the arrival of the ship at Cardiff loading was commenced at the East Bute Dock, but was stopped for sixteen days by a frost which prevented the lighters passing from the defendants' wharf to the West Bute Dock. The docks themselves, however, were not frozen. It was found by a referee that but for the frost the vessel would have been loaded according to the custom of the port within a reasonable time. In these circumstances Mr. Baron Pollock held that the conveyance of the iron in lighters from Messrs. Crawshay's wharf was part of the act of loading, and one of the customary modes of loading in the port, and therefore the defendants were protected by the exception. From this judgment the present appeal was brought.

The Solicitor-General, Mr. McIntyre, Q.C., and Mr. Brynmôr Jones appeared for the plaintiff; Mr. Butt, Q.C., Mr. Channell, and Mr. Dillwyn for the defendants.

Their Lordships, in delivering judgment, allowing the appeal, said the true construction to be put on the charter-party was that the cause of the detention must have happened after the lighters with the goods had arrived within the strict limits of the Bute Docks. Nothing done with the goods before that time was a loading within the terms of the charter-party. The ship was to go, not to Cardiff, but to the Cardiff East Bute Dock, and the goods were presupposed to be there. But they had not arrived there, and therefore the exception did not apply.

November 25.

SUPREME COURT OF JUDICATURE.

COURT OF APPEAL.

(*Sittings at Lincoln's-inn, before the* MASTER *of the* ROLLS *and* LORDS JUSTICES COTTON *and* BOWEN.)

RANSOME *v.* GRAHAM.

Mr. Aston, Q.C. (with whom were Mr. Davey, Q.C., and Mr. William Barber, Q.C.), on behalf of the plaintiffs, stated that it had been arranged that the appeal of the defendants in this case from the judgment of Vice-Chancellor Bacon should be dismissed with costs.

The case, which was one of considerable importance to the manufacturing and agricultural community, raised the question whether Messrs. Ransome, the well-known manufacturers of ploughs, were entitled to the exclusive use of, and to register as their trade marks, certain combinations of letters which they had stamped upon particular parts of their ploughs for the purpose of denoting that ploughs so marked were of their manufacture: the right of the plaintiffs to claim as trade marks combinations of letters which were alleged to be merely pattern marks being denied by the defendants. The Vice-Chancellor decided in last Easter sittings that the plaintiffs were entitled to the exclusive use of these marks as their trade marks, and the appeal having been now withdrawn, the right claimed by the plaintiffs has been established.

Mr. Rigby, Q.C., Mr. Cozens Hardy, Q.C., and Mr. Carpmael were for the defendants, the appellants.

November 27.

HOUSE OF LORDS.

(*Before* LORD CHANCELLOR, LORD BLACKBURN, and LORD WATSON.)

THE ABERDEEN STEAM NAVIGATION COMPANY *v.* LEE AND OTHERS.

This was an appeal from a decision of the Court of Appeal reversing a judgment of the Queen's Bench Division of the High Court of Justice.

Mr. Benjamin, Q.C., Mr. Holl, Q.C., and Mr. Douglas Walker, appeared for the appellants; Mr. Webster, Q.C., and Mr. English Harrison for the respondents.

The appellants own a line of steamships running between London and Aberdeen and certain lands and wharves situated in Emmett Street, Limehouse, in the port of London, and the respondents are builders and contractors carrying on business in Westminster. The action was brought by the respondents against the appellants to recover a sum of £2166, the balance of a sum of £24,209 for constructing the foundations and walls of a dock. The question was whether the respondents had sunk the cylinder foundations to a sufficient depth.

Their Lordships now affirmed the judgment of the Court below, in favour of the respondents, and dismissed the appeal with costs.

Appeal dismissed with costs.

HIGH COURT OF JUSTICE.

QUEEN'S BENCH DIVISION.

(*Sittings in Banc before* LORD COLERIDGE *and* MR. JUSTICE STEPHEN.)

COOPER *v.* THE GAS LIGHT AND COKE COMPANY.

This was a case under the Employers' Liability Act, and raised an important question as to the liabilities of parties for injuries caused by the negligence of persons in their employ who at the time are working for them on piecework. The company were having some work done at a place in Essex, which required piles to be driven, and they had contracted with a man in their employ, named Pearson, to do the pile-driving as piecework or job work at certain rates or prices. Pearson engaged the plaintiff to work at the pile-driving, and was actually working with him and others, Pearson being above, sending down the instrument called the "monkey," by which the piles are driven, and the plaintiff below, putting the piles in position; it being his duty to cry out "All right" just before the "monkey" was let fall, and Pearson's duty being on that signal to let it fall. Somehow or other Pearson let the "monkey" fall (as he said, after hearing the signal; and as the plaintiff said, without it), and it fell on the plaintiff's thumb and crushed it. The question as to negligence, at the trial before the County Court Judge, was whether or not the plaintiff had given the signal; and the jury found he had not. Then arose the question as to the liability of the company for the consequences of the accident; and on their part it was contended that Pearson was an independent contractor, and that therefore he, and not the company, was liable; while on the other side it was contended that Pearson was in their employ, and was only paid for piece-work instead of by wages, and that therefore the company were liable. The County Court Judge was of the former opinion, and therefore directed a nonsuit. The question was now raised whether that view could be sustained.

Mr. Willoughby argued, for the company, that the County Court Judge was right in his view.

Mr. M'Call argued, for the plaintiff, that the County Court Judge was wrong.

Lord Coleridge asked whether, if the company's engineer who engaged Pearson saw that he was doing the pile-driving wrongly, he could interfere; to which the company's counsel answered that he could not.

It was urged that Pearson was paid by the company, and that he paid the plaintiff; but

Lord Coleridge said that was always so when "gangers" were employed.

It was urged strenuously on the part of the company that pile-driving was work quite distinct from their own, and which, therefore, they contracted for; and it was a matter of great importance whether they should be liable for the negligence of their contractors.

Mr. Justice Stephen said no doubt it was a question of great importance, and there were dangers and difficulties both ways. On the one hand, it might seem hard that a company should be liable for the neglect of contractors; on the other hand, it would be easy for employers always to get rid of their liability by having work done by piecework.

Lord Coleridge added that here Pearson had been in the company's employ for years, and paid by them, and it could hardly be said that the company's engineer could not control him if he was pile-driving in the wrong way.

Mr. Justice Stephen said it appeared to him that it was a question, on the evidence, for the jury, and that there were considerations and facts tending both ways, and

Lord Coleridge observed that the company desired to retain control, and also relieve themselves from responsibility, which raised the difficulty.

The Court, after fully hearing the counsel for the company, came to the conclusion that the judge was right at first in leaving the case to the jury, and wrong in afterwards directing a nonsuit to be entered.

Lord Coleridge said that the question was not whether the verdict was right but whether there was any evidence for the jury, and they thought that there was, and that the question was for the jury to decide. The question was whether the person whose negligence caused the accident was in the employ of the company and intrusted with the superintendence of the work, and the jury found that Pearson was in that position. The Act of Parliament, which was sometimes said to have imposed so heavy a liability upon employers, merely extended the common liability which already existed as to others—to persons in their employ—under certain circumstances. The question, no doubt, was important, and employers could not be entitled to evade their liability merely by paying their workmen in a particular way. The law must not be allowed to be evaded, and the employers who retain control over the work must, under such circumstances, remain liable. There was ample evidence here that the company had retained a control over Pearson, who was described only as a "foreman" or a "leading hand." He was merely employed to do certain work, which he was to do as piecework instead of day-work. The principle was that if control was retained over a man he was a servant, and not a contractor. There was such control here, and, therefore, the nonsuit must be set aside and the verdict entered for the plaintiff for £75.

Mr. Justice Stephen concurred, observing that the Act was important, and should be construed as clearly as possible, and the question was important whether the employers could escape liability in this way. If the work to be done were really put out of their hands into the hands of an independent contractor as a builder, then the employer did escape liability. But it was not so where the employer only paid his own men by piece-work. If control was retained over the workmen, then the liability remained. It was often supposed that a contractor could not be a servant or a workman; but that was not so, and a person doing work under a contract might still be a servant, so that the employer would be liable.

The judgment, therefore, was given for the plaintiff.

(*Before* MR. JUSTICE GROVE *and a Special Jury.*)

CANNON *v.* HOPKINS AND SONS.

This was an action for libel. The plaintiff is a reporter and journalist, and in the month of December, 1881, wrote for defendants, who are proprietors of the *Metal Trades' Circular*, in that paper an article on an invention known as the "Duplex Check." This article contained the following passage:—"The last invention, or alleged invention of the kind, is that of Mr. John Nevill Maskelyne, of Egyptian Hall celebrity, for which a company was formed, and the enormous sum of £33,000 stated to have been paid in cash and shares to that gentleman for a patent that is believed not to be worth the cost of the parchment it is written on. . . . The story current respecting the Maskelyne patent is that some years back the talented entertainer had a clever schoolfellow in their native town of Cheltenham named Bain, who, though afterwards brought up for the law, had a great taste for mechanical studies, and invented this identical machine, and took his drawings to Mr. Maskelyne, whose conjuring apparatus maker made him a model which Mr. Bain says he has now. This machine, Mr. Bain contends, is precisely the same as the Maskelyne Company's, save the slight and altogether unimportant variation that the tickets are made to come out of the top instead of the base of the instrument—an alteration Mr. Bain does not consider an improvement. . . . The company do not venture to say that they have made or sold a single machine during the whole four months of their existence. . . ." This assault on Mr. Maskelyne's invention was the occasion of a criticism belauding another outcoming invention (advertised in the publishing paper) by Mr. J. H. Betteley, C.E. This being brought to Mr. Maskelyne's notice, his solicitor communicated with defendants, who escaped an action by the following prompt and ample withdrawal, which appeared in several newspapers:—

"Maskelyne's Checking Apparatus Company.—An article having appeared in our *Hardware Trade Circular* of December 15 last, which was sent to us by Mr. Thomas Cannon, 45, Cornhill, and 130, East Surrey Grove, under the heading 'The Duplex Check,' reflecting on the above company and containing statements tending to injure it, and also Mr. Maskelyne's reputation, and we, having made inquiries, and having convinced ourselves that the article contained inaccuracies and should not have been published, we express our regret at its publication and offer an apology to Mr. Maskelyne and the above company.—J. H. HOPKINS AND SON.

Plaintiff complained in this action of the above withdrawal of his own libellous critique to save his own employers from an action, as a libel upon himself in his quality as a journalist, and claimed £200 damages.

Mr. F. Turner appeared for the plaintiff; Mr. A. L. Smith and Mr. Hannen for the defendants.

Mr. Maskelyne, in the course of the case which was partly heard on Saturday, diametrically denied the various allegations apologised for by the defendants as inaccurate, and explained his own ingenious thief-catching apparatus.

The jury, having at an earlier stage, fruitlessly endeavoured to convince Mr. Turner that their opinion upon the matter was adverse to him, immediately after the summing up, gave their verdict for the defendants.

November 28.

SUPREME COURT OF JUDICATURE.

COURT OF APPEAL.

(*Sittings at Westminster, before* LORDS JUSTICES BAGGALLAY, BRETT, *and* LINDLEY.)

THE MARQUIS OF LONDONDERRY *v.* DAVIDSON.

In this case there were cross appeals from a judgment of Mr. Justice Mathew and Mr. Justice Cave affirming, in part, a judgment of the official referee. By an agreement of December 1, 1879, the plaintiff was to deliver to the defendants 35,000 tons of coal, to be delivered and received between the date of the agreement and December 31, 1880, in equal monthly quantities, payment to be made monthly, subject to a discount, for the coal supplied during the preceding month. The plaintiff reserved a right to cancel the agreement if the defendants did not take the coals or make the stipulated payments. Sailing vessels were to be loaded in regular turn, but steamers were to be loaded as might be eventually agreed from time to time. In November the defendants were in arrear with their payments, and the acceptances of coal had been irregular from the first. A dispute also arose as to the mode of loading, the defendants contending they were entitled to have steamers loaded, the plaintiff saying that could only be by arrangement. The plaintiff on November 25 cancelled the agreement, and sued the defendants for the price of the coal and for damages for non-acceptance. The defendants put in a counter-claim for damages for non-shipment according to the contract, and also said that after November 25 the plaintiff delivered coal under the contract, and thereby acquiesced in the breaches of the defendants. To this the plaintiff answered that these deliveries were made without prejudice to his rights. The official referee found for the plaintiff, and also that there was a custom to the effect that that defendants could not deduct discount from payments which were not made in pursuance of the terms of the agreement. The Divisional Court affirmed this report except as regarded the discount, as to which they were of opinion there was no custom as was found by the referee. From this judgment both parties appealed.

Mr. Webster, Q.C., and Mr. Edwyn Jones appeared for the defendants; the Solicitor-General and Mr. J. Edge for the plaintiff, were not called upon to argue.

Their Lordships affirmed the original report of the referee.

Lord Justice Baggallay said, as regarded the alleged acquiescence of the plaintiff, he could put no other construc-

tion on the correspondence between the parties than that there was a mere forbearance on the part of the plaintiff. It was clear on the contract that the use of stemmers was to be the subject of mutual arrangement. He was of opinion that, in the circumstances, the plaintiff had a right to determine, and did, in fact, determine, the agreement. As to the discount, there was no reason to depart from the ordinary mercantile meaning of the term, as being that to which purchasers were entitled on punctual payments; and so, even if there was no custom, the defendants, who had not conformed to the agreement, could not deduct discount. On this point, therefore, the judgment of the Divisional Court should be varied and the defendants' appeal should be dismissed.

Lords Justices Brett and Lindley gave judgment to the same effect.

November 29.

SUPREME COURT OF JUDICATURE.

COURT OF APPEAL.

(Sittings at Lincoln's Inn, before the MASTER *of the* ROLLS *and* LORDS JUSTICES COTTON *and* BOWEN.)

MUNDY *v.* THE DUKE OF RUTLAND.

This was an appeal from a decision of Mr. Justice Kay. The action was brought to restrain an alleged improper interference with some coal mines in Derbyshire, of which the plaintiffs are lessees under the Duke of Rutland. On the 19th of January, 1866, the Duke let to the plaintiffs the unworked portions of two seams of coal, called the main soft and the deep hard, lying under a part, comprising about 196 acres, of an estate of 900 acres belonging to him, for a term of 40½ years from 1862. The lease contained a covenant by the lessees to leave unworked and uninjured a certain barrier of coal which divided the demised seams from some abandoned workings on the Duke's land, which were full of water. It was agreed that nothing should prevent the Duke or his tenants from working any coal under the lands demised, and not expressly included in the demise but that they should have such powers and privileges with respect to the last-mentioned coal as if the demise had not been made, provided always that in exercising such powers and privileges the working of the coal demised by the lease should not be prevented or unnecessarily interfered with, and that reasonable compensation should be made to the lessees for any necessary interference with their workings. In October 1876, the Duke granted a lease to the Manners Colliery Company, who, as well as the Duke, were defendants in the action, of all the seams of coal lying below the deep hard, under the whole of the 900 acres, including the seams under the barrier and under the seams beyond it, which had been previously let by the Duke to the plaintiffs. Immediately below the deep hard seam is a seam of coal called the Piper, and lower still is another seam called the Kilburn. The Manners Company sunk a shaft to the Kilburn seam, and then began to drive a heading down to the barrier, with the view of passing under it and working the Kilburn seam under the barrier and under the seams demised to the plaintiffs. The plaintiffs alleged that the Duke intended to permit the Manners Company to take and carry away the coal under the barrier, and that by so doing they would injure the barrier so as to let the water through into the plaintiffs' workings. The Manners Company claimed a right to do this. The plaintiffs claimed an injunction to prevent the defendants from working the coal under the barrier so as to injure the plaintiffs' workings. Mr. Justice Kay granted an injunction as to the Kilburn seam. The defendants appealed.

Mr. W. Barber, Q.C., and Mr. French were for the Duke; Mr. Higgins, Q.C., and Mr. Seward Brice were for the Manners Company; Mr. W. W. Karslake, Q.C., Mr. Rigby, Q.C., and Mr. Dibdin were for the plaintiffs.

The Master of the Rolls said that the question to be decided was, what was the meaning of two provisions in the plaintiffs' lease; and his Lordship confessed that, after having heard an elaborate argument by four Queen's counsel, he did not know what the meaning was. The question, however, was, what was the effect of the provisoes on the rights of the plaintiffs under the lease? It was plain that a lessor could not, in the absence of agreement, derogate from the rights which he had granted to his lessee. The Duke had, therefore, had no right to let the seams which he had demised to the plaintiffs', or to let down the barrier so as to let in the water to the plaintiff's workings. The argument of the appellants went to this extent, that they could work the Piper seam, and so destroy the subject matter of the plaintiffs' demise. His Lordship could not bring his mind to believe that that was what the parties intended. At any rate, it was for the landlord to show that he had such a power reserved to him, and he had not done so.

Lord Justice Cotton and Lord Justice Bowen concurred.

The Master of the Rolls said that on the question of fact he was not satisfied by the evidence that the proposed working of the Kilburn seam would bring down the barrier. The evidence of the experts was most contradictory. Their Lordships, therefore, thought it desirable that this fact should be ascertained by the report of some gentleman of eminence who was fully acquainted with such matters. Of course, his report would not bind the Court, but it would assist them in coming to a conclusion.

The parties then suggested the name of Mr. Warrington Smyth; and

The Court appointed him to visit the property and to report to them, and reserved their decision.

HIGH COURT OF JUSTICE.

QUEEN'S BENCH DIVISION.

(Sittings in Banc, before LORD COLERIDGE *and* MR. JUSTICE STEPHENS.)

PLANT *v.* CHEADLE VALLEY COAL AND IRON COMPANY.

This case raised a question of great importance (as Lord Coleridge observed) with reference to the inspection of coal mines—whether the inspection, which by the act should be "daily," is to go on during holidays or other intervals during which the men are not actually working in the mine, though the mine is in work. The question had arisen thus: the plaintiff had been certificated manager of the mine, whose duty it was to carry out the act, which requires that "every mine shall be under the control and daily supervision of the manager"—*i.e.*, the certificated manager. The plaintiff had been absent during two or three days of the holidays during which the men were not actually working in the mine, though the mine was in working. For this neglect he was dismissed by the company, and sued them in the County Court. The Judge held that the manager was not bound to be in daily supervision when the men were not actually in the mine and working in it, and so he held that the dismissal of the plaintiff was not legally justified; and so gave judgment in his favour. The company appealed.

Mr. Bosanquet appeared on their behalf in support of their appeal; Mr. H. D. Greene appeared on behalf of the plaintiff, and argued that the Judge was right.

The argument begun yesterday continued to-day.

Lord Coleridge delivered judgment at some length in favour of the Company. The case, he said, arises on a most important Act of Parliament passed in very stringent terms, after much opposition, and after a great deal of evidence had been taken; and it deals with a very considerable interest. Notwithstanding the great pecuniary interests involved, the legislation on the subject is most stringent, because it is for the object of protecting human life, an object, certainly, of all others, well worthy the legislature of any country. That being the object of the Act it would be wrong for the Judges to lend themselves in any way to a view which would have the effect of frittering away the provisions of the Act. The certificated manager undertakes the duty imposed under the Act, and which is thus described in the Act itself—that is, "every mine is to be under the control and daily supervision of the manager"—that is, the certificated manager, and if he is absent 14 days, heavy penalties are imposed on the mine-owner, provision being made for the attendance of another person during his occasional absence for illness, &c. The mine, therefore, is to be under his daily supervision, and though the Act applies first to the mine-owner, yet when a person has undertaken the duties of a certificated manager he becomes liable for the due discharge of those duties, including such daily supervision. "Daily supervision" means simply what the words plainly express. It means supervision daily and every day, and for this reason, that if mines were not inspected daily, and day by day, it is probable that in some cases those disastrous consequences would ensue which it is the object of the Act to prevent. Experience has taught us, and the Act itself might suggest, that the neglect of the proper supervision of a mine, the neglect to see to its due ventilation, might lead to the accumulation of those noxious gases from the explosion of which such disastrous consequences sometimes ensue. It is for very good reason, therefore, that the statute requires daily supervision, and the 51st section expressly requires it. The certificated manager, therefore, is bound to inspect the mines daily. It is an onerous duty, and if he desires to be absent in holidays or on other occasions he must provide for his absence under the Act. But the duty is one on the performance of which hundreds of lives may depend, and it is not to be endured that the man on whom such a duty is imposed is at liberty to absent himself when he pleases without any provision for its discharge. When, therefore, the County Court Judge held that the manager was not bound to make daily supervision of the mine, he held that which is in direct contravention of the act, and what, if acted upon, would be of most mischievous operation. It was urged that the mine was not in work, but it was so within the meaning of the Act, though the men were not actually working in it. It would be contrary to common sense to suppose, because for a few days, for any reason, the men were absent from work, that the mine might be deprived of the benefit of supervision. The actual working of the mine was suspended for three days, but it was still in working, and it was still in need of the daily supervision. The plaintiff, therefore, had not discharged the duty imposed upon him under the Act, and there was a misdirection on the part of the Judge, the result of which is that the verdict for the plaintiff must be set aside and a new trial must take place.

Mr. Justice Stephen concurred.

PIECEWORKERS AND THEIR LABOURERS.—An important question under the Employers' Liability Act was decided last week in one of the Scotch law courts. It appears that a labourer named John Dunlop some time ago raised an action in the Glasgow Sheriff Court against Messrs. Aitken and Mansell, shipbuilders, concluding for damages in respect of injuries he sustained May 3 last while working on board a vessel in course of construction by defenders. The pursuer, who was one of six labourers employed by a squad of fitters, was seriously injured through an accident to a crane at which he was working, and had to be taken to the infirmary. The question involved was whether the Employers' Liability Act extended to labourers who were sub-employed by fitters on piecework. Sheriff Murray, before whom the case was heard, in an interlocutor, finds that pursuer sustained his injuries through the fault of the defenders, or those for whom they were in the circumstances responsible; and finds pursuer entitled to damages to the extent of £40. In a note, his lordship remarks that the somewhat difficult question arises as to whether pursuer was a workman and the defenders his employers in the meaning of the Employers' Liability Act. The question is one of great importance, as it affects many thousands of men engaged in shipbuilding and other manufactures in Glasgow and elsewhere. The pursuer without doubt was a labourer, directly engaged and paid not by defenders, but by a squad of fitters who were doing piecework. The question is, therefore, whether pieceworkers' labourers are workmen under the act. The first question to be considered is whether pieceworkers themselves are workmen under the act. The sheriff-substitute is of opinion that the evidence in the present case clearly showed that the piecework fitters were entirely under the control of the defenders' foremen, and were consequently "workmen," in the sense of the act, who had made a contract with an employer. The next question is whether the subordinate labourers engaged and paid by them are also workmen under the act, and defenders their employers in the sense of the act. If the piecework platers had been independent contractors, their labourers would certainly have been outwith the act in a question with defenders. Circumstances may be imagined where a party may be employed by a workman who is not an independent contractor, who yet may not be at all able to claim the employers of the said workmen as his own employers. This is clearly the case where the employment of the subordinate workman is not in the line of the pieceworker's work, nor subject to the control of the head employer. But it seems to his lordship that, when a workman employs other workmen, with the sanction and knowledge of his employer, to assist him in carrying out the head employer's work, in the direct line of the service which he was engaged to do for the head employer, and these subordinate workmen equally with the piece-workers are subject to the control, and are bound to conform to the orders of the foremen and managers of the head employer, and are subject to the general rules of the work, these subordinate workmen must be held, in the terms of the act of 1875, to be working under a contract with an employer, though strictly speaking they never "entered into" a contract with the head employer. If they are the servants of A's servant in the direct line of the service, they are A's servant in the sense of the act. It is further to be observed that an opposite conclusion would lead to a most inequitable result, and one which it cannot be thought the act was meant to bring about. For while the fitter himself would be benefitting by the act, his unfortunate labourer, if the act did not apply to him, would be excluded. This cannot be presumed to be the meaning of the act, and it must rather be held that common employment infers a common employer. On the whole, therefore, the sheriff-substitute came to the conclusion that pursuer was a workman, and defenders employers, in the sense of the meaning of the act. But it may be doubted whether defenders would be clear from liability even if the act did not apply. The principle of testing the crane which the foremen are allowed to apply seems insufficient and improper, and therefore even at common law there are grounds for holding defenders liable in damages to pursuers. The interpretation of the Employers' Liability Act appears to us to be the right one, and the judicial decision founded on it to be based on equitable grounds. We trust, therefore, that the defenders in this case will be bound by the decision, and not try to upset it by carrying the case further.

GENERAL NOTES.

THE JOHNSTON HARVESTER.—We are pleased to learn that the Johnston Harvester Co. were awarded a 1st and a 2nd prize, and that the driver of one of their machines was awarded a 1st prize, at a large trial of reapers held at Malmesbury, Cape Colony, on Oct. 19.

MINING FACILITIES AT COSTA RICA.—A decision, which is calculated to give a great impetus to mining enterprise at Costa Rica, has just been made by the government. All mining companies now existing or henceforth to be constituted are exempted from customs and harbour dues on machinery, tools, powder, dynamite, and all other products necessary for the raising and reduction of ores.

LARGE GUN-BORING MACHINES.—Messrs. Craven Bros., of Manchester, have received an order from the Government for two large gun-boring machines similar in construction to a couple which were made by the same firm five years ago. The present gun boring machines, which have to be made to meet the requirements of the greater length now introduced into ordnance, will be the largest of the kind yet constructed. They will each weigh 150 tons, and will have a bore of 30-inch diameter by 40 feet long.

LARGE ORDERS FOR LOCOMOTIVE TOOLS.—Machine toolmakers throughout the Manchester districts are all very busy, and for both marine and locomotive tools there are good orders in hand. Messrs. Craven Brothers are at present engaged on two orders for the complete equipment of locomotive tools capable in each case of turning out 50 engines per annum, one for the Canadian and Pacific Railway Company, and the other for a Franco-Belgian works. The firm have also a number of smaller orders in hand both for India and home railways, and of large travelling cranes ranging up to 30 tons, which is a special branch of their works. They have no less than 28 in hand at the present time.

AWARDS IN THE IRON TRADE.—The award of Sir J. W. Pease, M.P., the arbitrator for the North of England Manufactured Iron Trade Arbitration Board, is for a reduction of five per cent. in wages, instead of the 7½ per cent. advance claimed, to take effect from to-morrow till the last Saturday in February, the reason of the reduction being the lower rates of iron. The arbitrator also gives reasons why the sliding-scale should be adopted. Alderman Avery, the president arbitrator of the Mill and Forge Wages Board of South Staffordshire, has also delivered his award on the application of the ironworkers for an advance of 10 per cent. in wages. The effect of this award is to give the ironworkers about 2½ per cent. advance, commencing with January 1 next.

THE MANCHESTER STEAM USER'S ASSOCIATION.—At the last ordinary monthly meeting of the executive committee of this association, held at the offices, 9, Mount Street, Albert Square, Manchester, on November 7, 1882, Mr. Thomas Schofield, Manchester, in the chair, Mr. Lavington E. Fletcher, chief engineer, presented his report, which gave particulars of visits of inspection, and a record of boiler explosions, from April 22 to October 27 inclusive, the attention of the committee at the meetings held since April having been occupied with the consideration of other business. Of this report the following is an abstract:—From April 22 to October 27 inclusive, 3654 visits of inspection were made, and 6103 boilers examined; 3831 externally, 61 internally, 28 in the flues, and 2183 entirely, while, in addition, 48 boilers were tested by hydraulic pressure. Seven of these hydraulic tests were applied to boilers that had been already in use, to ascertain their fitness for the pressure proposed to be carried; while, in the other 41 cases, the boilers were new ones, and were not only tested by hydraulic pressure, but also specially examined, both as regards their con-

struction and complement of fittings, before leaving the maker's yard. During the above period the following defects have been met with:—Furnaces out of shape, 12; fractures, 18,—2 dangerous; blistered plates, 17; internal corrosion, 34; external ditto, 53,—6 dangerous; internal grooving, 47; feed apparatus out of order, 3; water gauges ditto, 4; blow-out apparatus ditto, 11; fusible plugs ditto, 1; safety valves ditto, 17; pressure gauges ditto, 141; boilers without glass water gauges, 1; without safety valves, 5; without pressure gauges, 3,—2 dangerous; without feed-back pressure valves, 14; cases of over-pressure, 2; cases of deficiency of water, 6. Total, 389 defects,—10 dangerous.

THE HOME IRON AND COAL TRADE.

BARNSLEY AND SOUTH YORKSHIRE.—There is very little new to note in connection with the district finished iron trade. About an average business is being done at the foundries, colliery castings being in fair request, whilst repairs find work for a large number of hands. The output of pig-iron at Milton, Chapeltown, and Parkgate is fully an average one. There is also a very good business doing in Bessemer steel rails, tires, and axles. The coal trade towards the close of the week has been improved by the seasonable weather, but even now the demand for household purposes is not so good as it was a short time ago, when consumers were laying in stocks under the impression that the collieries were about to be set down. Advices from London state that the advanced prices are being with great difficulty sustained, and nothing but a keen winter can prevent them declining. There is not near so large a tonnage of house coal passing over the Midland and Great Northern lines to the metropolis as was the case a short time ago. Steam qualities also show a decline, the Baltic and some of the other ports having closed. A fair tonnage is, however, being forwarded to Hull for the use of the steamers and domestic purposes. The demand for locomotive coal continues very fair, and some of the collieries are sending largely to the various railway depôts. In connection with this branch of trade a meeting of the South Yorkshire steam-coal owners was held at Barnsley on Monday to decide the prices at which tenders should be sent in for the North-Eastern contracts, which will be shortly in the market. There is a very fair tonnage of small coal and slack sent to the leading manufacturing districts of Lancashire and Yorkshire. Owing to the stiff demand for coke making purposes, prices keep up very well; makers of good coke find no difficulty in getting a ready sale for that produce, a large portion of which is sent away daily to North Lincolnshire. The wage question, so far as the miners is concerned, is pretty nearly settled, but a good deal of contention is going on with regard to the advance alleged to be due to the engine tenters and other surface workmen.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—There is a quiet demand for all qualities of hematite pig-iron. Only a limited business has been transacted during the week. The demand for all classes of Bessemer iron, however, though quiet for the moment, is not likely to remain so in face of the fact that the makers of steel throughout the district are largely sold forward, and are booking orders which will maintain on the one hand activity at their works, and on the other hand will necessitate a heavy production of crude iron in order to meet the consumption of the steelmakers throughout this and other districts engaged in the same branch of industry. The value of pig-iron is quiet, and not likely to increase. 56s. may be noted as the market price of mixed parcels of Bessemer iron at makers' works, and 54s. for No. 3 forge net. Some business in second-hand parcels and in other consignments has been done at rather easier values than these; but it is noticeable that makers are firm in their dealings for forward deliveries, an indication of the confidence they have in an improvement in the early future. It is expected no change for the better will take place before Christmas, but the demand in the early part of next year is likely to improve, as while for the moment sales are slow, several enquiries for spring deliveries are being made from quarters which justify the belief to some extent, at least, that a fuller demand will be experienced next year. The steel trade shows no variation in tone. The demand is fairly maintained especially for railway material, and merchant qualities are also in good request. Shipbuilders are fairly busy, and an occasional order is booked, so that it may be expected the yards in the district will be as well, if not better, employed than at present. Iron ore at 13s. to 14s. at the mines. Coal and coke in good demand.

BIRMINGHAM.—In the hardware branches of this town and district there is a fair amount of activity, and the tendency of business continues to be progressive. Although the French and United States markets are a little quieter, this is compensated for by increased briskness in connection with the Australian and South African markets. The home trade is also receiving a little stimulus on account of the Birmingham Cattle and Poultry Show, now being held in Bingley Hall, and the near approach of several provincial agricultural meetings. The electro-plate branch has derived some benefit by the manufacture of prize cups and medals. One of the leading houses is busy on cashmere art metal-work, being curious designs wrought by the natives of Cashmere, and electro-plated at the local establishment. Lamps, electroliers, and other appliances in connection with the electric light are in very brisk request, and there is a very keen competition between the representatives of the different modes of lighting, in the production of the most artistic and original designs for electroliers, globes and the like. Gas-engines for working the light are also in good request, together with gas furnaces for different manufacturing purposes, and likewise gas stoves, cooking ranges, and hot water, hot-air and other heating appliances. Agricultural and horticultural fencing is in steady demand for home and abroad, and there is an active enquiry for dairy, brewing, and laundry appliances. The builders' brass-foundry department remains inactive, and the dead season has arrived for bicycle and tricycle makers, who have been extremely busy up to the present. Metal rollers keep well engaged on cartridge sheets and brass and copper sheets for the tube makers, coppersmiths, and others. Local manufacturers of steel sheets for stamping, nail making, and other purposes are fully occupied, though some of the Glasgow houses are competing with them for the supply of the requirements of the district. There is a well-sustained demand for galvanised iron, edge tools, dredging machinery, and agricultural implements for Australia, and stamped steel and tinplate goods are in growing request for the Cape. Heavy ironfounders continue well employed on pipes, mill and forge castings and constructive ironwork, but the iron wire branch is dull, owing to the Westphalian competition.

THURSDAY.—The mills and forges keep in regular operation, except in list establishments, which are only partially occupied, and are dependent on current orders. Most of the unmarked bar firms are supplied in orders up to the end of this year, and the sheet manufacturers have anticipated their production for two or three months. Merchants and consumers sought to depress prices this afternoon, but the combination among manufacturers was well sustained, and the advance in ironworkers' wages tended to strengthen the market. Except for sheets, the orders given out to-day were of a retail character.

CARDIFF.—The news from Cyfarthfa is to the effect that a portion of the new steel works will be set going early in the new year. Merchant bar iron, it is anticipated, will be the first make. The amount of iron sent away last week was 4928 tons, a quantity which almost reminds one of the old times. From Bilbao there arrived 6690 tons of iron ore, and 5729 from other places. Campanil Somorrostro may be quoted at 15s. 6d., c.i.f.; good Rubio, 15s. 3d., c.i.f. Carthagena manganiferous ore remains firm. The tinplate trade is again exhibiting signs of weakness, as coke-mades are only fetching 16s. per box at Liverpool, while inferior brands are being sold as low as 15s. 6d., and even 15s. Trade, however, is good in these parts, and most manufacturers will not transact business under 16s. per box. The shipments of coal at the port have again fallen off in consequence of the boisterous weather. The amount sent away last week was 86,081 tons foreign, and 16,324 coastwise. Prices are firm for good colliery-screened at 11s., while inferior qualities may be had as low as 9s. 3d. and choice qualities realise as much as 11s. 6d. per ton. The pitwood trade is busy, but the supplies are not very plentiful.

CARMARTHENSHIRE.—There has been a brisk importation of pig-iron during the past week, chiefly from Middlesbro' and Barrow. Tinplates continue very low in price, though the works are all busy. Cokes are said to be changing hands at as low as 15s. 3d. to 15s. 9d. per box. There is a general agitation existing amongst both colliers and surface men. Messrs. Nevill, Druce and Co.'s men, who were recently granted 5 per cent. advance, pending the construction of a sliding-scale, now demand an additional 5 per cent., and ask that the scale be so adjusted as to give them at present prices 3s. 6d. per day. The following are the latest quotations:—Steam coal, f.o.b. Llangennech, 10s.; Cwmamman, 10s. 6d.; anthracite, Gwauncaegurwen, 7s. 6d. at pit's mouth; patent fuel, 10s. 6d. to 10s. 9d. f.o.b. Coal shipments at Llanelly are almost *nil* and the docks nearly empty. At Burryport the shipping of anthracite is brisk.

CLEVELAND.—There was very little business transacted at the iron market at Middlesbrough on Tuesday, for consumers are holding back in the expectation that they will be able to buy cheaper next month, or at any rate after Christmas, especially if the Glasgow "bears" are successful in beating down that market, as some believe they promise to be. No one is prepared to buy while there is a good probability of lower rates, and if Glasgow prices decline Cleveland must follow. Merchants have little iron to sell; but in the event of the market becoming weaker, they will no doubt buy freely. Merchants are quoting 3d. per ton for No. 3 G.M.B. less than last week, and their price is now 43s. 6d. for f.o.b. deliveries. Consumers are not, however, to be tempted to buy at that price, for they look for something lower. The producers are generally well supplied with orders for the next two months' delivery, and they are content to wait until they are compelled to sell before taking lower prices, if the market will not give them higher rates. Makers' quotations vary from 44s. to 45s., and probably most of them would not refuse a good offer to buy at 44s., though there are several who are getting 45s. for small lots from old customers. One maker is reported to have taken 43s. 6d. per ton for delivery up to March, but this is an exceptional case. Forge iron, because of its comparative scarcity, is not so much affected as No. 3 by the quietness of the market, and holders ask 9d. per ton less only. Warrants are practically unsaleable; there is scarcely an inquiry for them, and it would be a difficult matter to name a price at which a bona fide sale could be effected. On Tuesday night the stock in Messrs. Connal and Co.'s stores was 100,861 tons, as compared with 101,566 tons on the previous Tuesday, being a decrease of 705 tons. Shipments of pig-iron have been very poor this month, only 63,780 tons having been shipped up to Wednesday night, as against 94,402 tons in the corresponding period of October, and 96,491 tons in September. The shipments for the week ending November 25 amounted to 18,120, as compared with 10,829 in the previous week. Engineering continues brisk. Ironfounders are doing poorly Finished iron manufacturers are selling little, and receive few enquiries, as consumers are determined not to pay present prices, still less to give anything more. The shipbuilders are holding back such orders as they have, and if prices were reduced 2s. 6d. per ton, or so, buying might be resumed. But with the present cost of production the manufacturers are not in a position to further reduce their prices, for current rates yield little or no profit. However, quotations for the better classes are rather easier, but the minimum has not been reduced. Ship-plates are £6 12s. 6d. to £6 17s. 6d.; angles, £6; and common bars, £6 5s. per ton, all less 2½ per cent. discount. There is no alteration in the price of iron ores. The shipyards are as busy as ever. The coal trade is quiet in all departments, and there is not likely to be much doing on this side of Christmas. On all sides people are commending the iron workers of the North of England for having loyally accepted the award of Sir J. W. Pease, Bart., M.P., reducing their wages for four months.

DERBYSHIRE.—The district coal trade is not so active as many were led to believe it would be when the advance of wages was conceded to the men. Some of the collieries are doing a large business with London by the Midland, but prices are with great difficulty sustained, and all that is produced cannot be disposed of without great pressure. Those collieries which are dependent upon ironworks are the best off so far as regards hard coal for smelting and other purposes. There is very little doing in steam qualities for shipment. The enquiry for small coal and slack is not so large as the demand, and prices are not very high. A good tonnage of coke is still sent to the district furnaces from Yorkshire, but these is some talk of an effort being made in order to improve the quality of home coke so as to fit it for smelting purposes.

DURHAM.—The condition of the iron trade, whether in the pig or manufactured departments, has been very quiet, and the position less satisfactory. The iron manufacturers do not find orders come in. There would be buyers, but as they see a weakening of the pig-iron market, they anticipate that a similar influence will be brought to bear upon the manufactured iron trade, and hence they are very chary in giving out orders. Manufacturers of plates, too, find a difficulty in getting in their specifications, and it is announced that the Skerne Iron Company's Works at Darlington may have to stop or work slack time on this account, although they have orders in hand, like most of the plate firms, to carry them through the winter. These orders were taken some time back, and at good prices. Since then prices have declined. Shipbuilders, therefore, put off as long as they can the giving out of specifications, and meanwhile buy the material they are using at lessened rates. This is the case with more than one plate firm in the district. The platemakers do not see very well how they are to remedy their condition. They have now held three meetings—the last this week—to consider the question of restriction of output and how to secure better prices. They, however, seem to find their way blocked considerably, as they can come to no conclusion. They are not able to get one or two large firms with plenty of work in hand to consent to work only five days per week. The prices are easier in some cases, and we have heard of plates being delivered on the Tyne at £6 12s. 6d. The prices are £6 10s. to £6 15s., most firms asking £6 12s 6d. Bars are £6 5s.; angles, £6; sheets, £8; boiler plates, £7 15s.; less 2½ per cent. Puddled bars, £4 to £4 2s. 6d. net. The steel rail trade has lately been quiet. There was a good cargo or two sent to Italy and one to the United States last week. The latter must have been in execution of an order taken some time ago, as steel rails cannot now be taken profitably at the present American prices. The pig-iron trade has been very slack. The quotations of middlemen have been about 43s. 6d. No. 3, and in some cases rather less. Makers are about 44s., though some ask more, but a higher rate than 44s. is purely nominal. The coal trade has been less active, being more in sympathy with the iron trade. Still, manufacturing coals and coke have kept their price. Household coals are plentiful. The demand has been increasing, but prices are not altered, nor yet likely to be next month.

EAST WORCESTERSHIRE.—Business in pig-iron of local manufacture is good, but consignments of Northampton and Derbyshire pigs continue to come in. Prices are firm on the basis previously given. New orders in finished iron are not so plentiful as could be desired. Marked bars are £8 as a general basis, £7 10s. in the case of two firms, and £8 12s. 6d. for Lord Dudley's brand. The district mills and forges are working fair time, and the foundries and gasometer works are pretty fully occupied. Unmarked iron ranges from about £6 10s. to £6 15s. The award of the Arbitrator of the Mill and Forge Wages Board decrees an advance of 3d. per ton to puddlers after 31st December next; millmen's wages in proportion. The rivet-maker's in the Old Hill, Rowley, and Halesowen districts have already recommenced work at an advance of 10 per cent. The chainmaker's who were lately on strike in the districts of Old Hill, Bradley Heath, and Lye Waste resumed work last Thursday, the whole of the employers having agreed to pay the advance asked by the operatives. The block-chain operatives have now resolved to give notice for an advance of 10 per cent. The horse-nail and common-nail masters have declined to concede the advance of 3d. per 1000 and 10 per cent. respectively asked by their hands on the ground that the general condition of trade will not warrant the increase, and the operatives have decided to interview the employers on the subject. The men have also passed a resolution in favour of a conciliation board being established for the amicable settlement of trade disputes, which affords proof of a conciliatory disposition on their part. Considering the time of the year, the coal trade is certainly weak. Few of the smaller coalmasters are getting the late advance, and underselling is prevalent to a large extent. In the face of the inanimate market, the colliers' agents could scarcely have expected an affirmative reply to their request for another 10 per cent. rise in their wages as from to-day, seeing that that would have added another shilling to the price of coal. Full work, as it is, is by no means general for the miners, and another advance would have still more opened the trade of the district to the competition of outside localities. There is thought to be little or no prospect of the sliding-scale being further altered in the direction of providing a minimum therein, just yet.

FOREST OF DEAN.—The reactionary movement in the hardware industries of other districts is reflected here, in so far that enquiries are less numerous, and new orders less evident. In regard to crude iron, as stated in previous notices, the Messrs. Crawshay, who are still the only local producers, were enabled some time ago to book well forward, and they are therefore for the time being independent of new business—their entire output having been appropriated in the execution of contracts. The moiety of Forest-made pig-metal employed in the district hardware branches has been for some time reduced to a microscopic degree, owing mainly to the fact that, in the first place the entire output has been dispatched to other districts, and in the next, because other classes of metal are more largely employed in local manufacture. It is singularly unfortunate that the Forest make of crude iron is not enlarged, because prices for some time have been recovering, and no doubt is likely to arise in

regard to sales, were such to take place. On the other hand, there is an abundance of district mineral, and no difficulty could arise as to adequacy of ores for smelting. Pig-metal is fetching approximately £3 10s. in local yards. Best classes of iron ore realise 12s. per ton. On the other hand, minimum prices f.o.b. are about 8s. The Forest iron-stone miners have not yet shared in the recent advance of wages awarded to the colliers, and some discontent arises in relation thereto. An adjourned meeting of Forest makers and the colliers' council representatives was held on Monday, at the Lion Hotel, Cinderford, to consider the several points (requests) tabulated by the Forest miners, and presented at the previous meeting. The masters, after a long discussion, assented to the formation of a board of conciliation, but declined a further advance sought and weekly payments. It is stated that 3000 of the Forest men have joined in the national association of miners.

GLASGOW.—The market during the last week has been rather an unhappy one for holders of warrants, owing to the steady drooping of the market from 50s. 9d., the price obtainable a month ago, buyers withdrawing orders as they saw the price ease off, holders disinclined to stand by their purchases in the face of a lessened demand, forced sales on the part of weak holders, and the failure of two firms in the trade, the price of warrants gradually fell till on Thursday 48s. 6½d. was accepted. This price brought in many good buyers, and the market has since been rather firmer, with a steady but good business doing. The reports from America are still unfavourable from all the iron centres, and the stringency for money gave rise to fears for an advance in bank rates. The demand for pig-iron from America and the Continent has not been very good and the lower prices ruling in Middlesbrough has also told against this market, as also the decreased shipments there, owing partly, however, to the severity of the weather. One result of the fall is that consumers, who formerly bought Middlesbrough iron, are inquiring after Scotch, and already contracts for a large quantity have been booked. Some makers are very firm in their price, refusing orders at their present quotations unless for forward delivery; others, again, are a shade easier, and more disposed to book orders than they were a short time ago. No further change has been made with wages. On Thursday the market opened at 49s. 4d. cash, 49s. 7d. a month, but on intimation of failures gave way to 48s. 6½d. cash, 48s. 10d. a month. Friday was firmer, 48s. 7½d. to 49s. cash, 49s. to 49s. 2d. a month. Monday, 49s to 48s. 7½d cash, 49s. 2½d. to 48s 10d. a month. Tuesday, 48s. 10d. to 48s. 11½d. cash, 49s. to 49s. 2d. a month. Wednesday, 49s. to 48s. 8d. cash; closing: sellers, 48s. 8d cash; 48s. 10½d a month; buyers, near. A very large business was done on the 23rd, but since then the legitimate trade has been quieter. At present, there are 124 furnaces in blast, against 105 last year. The shipments from Scotch ports last week were: Foreign, 8327 tons; coastwise, 3454 tons; total, 11,781, as compared with 7131 last year. Imports into Grangemouth from Middlesbrough last week were 6771 tons, against 7564 last year. Total imports till November 25, 1882, are 224,643, against 281,041 till November 26, 1881, showing a decrease for this year of 59,398. Connal's stock now amounts to 613,495 tons, being a decrease on the week of 2877 tons. The manufactured iron trade and some of the founders are quiet, but the shipbuilders and engineers have plenty of work in hand to keep them going for some time. Spanish ore is still coming forward in considerable quantities. The demand for coal continues exceedingly active, and the masters are getting their prices.

LANCASHIRE.—Business in the iron market here continues exceedingly dull. There are neither orders nor enquiries of any importance stirring, and transactions both at Friday's and Tuesday's markets have been most limited in extent. Buyers are looking forward to lower prices, and are giving out orders as sparingly as possible, whilst makers are trying to avert a breakdown in values by working in with their contracts rather than force sales. Pig-iron makers, so far as the local and district firms are concerned, are fairly well off for orders, and are showing very little giving-way notwithstanding the unfavourable reports from outside markets, but they are doing little or nothing in the shape of new business. For Lancashire pig-iron quotations are being firmly maintained at 49s. for forge, and 50s. for foundry, less 2½ delivered equal to Manchester; Lincolnshire also remains at about the same figure, and sales of foundry have been made on the basis of 50s., less 2½; Derbyshire averages about 1s. per ton above the local iron. Some of the Yorkshire brands have been offered here at 1s. to 1s. 6d. per ton under late rates. In the finished iron trade the tendency to give way is greater than in pig-iron. Most of the forges in the district have still orders in hand to keep them going, but contracts are running off, and new work is not coming in, whilst the collapse of the American iron trade has put a check upon shipments to the United States, and one or two of the large local works are suffering seriously from the difficulty of getting specifications for iron already sold. Although there is no very great actual pressure to sell at low prices, makers, in many cases, would now be open to offers, and good specifications would be readily taken at under the current rates. For delivery into the Manchester district, the average prices are about £6 10s. to £6 12s. 6d. for bars, £7 to £7 5s. for hoops, and £8 10s. to £8 12s. 6d. for sheets. Some branches of the engineering trade, such as locomotive builders and machine-tool makers continue very busily employed, but for general engineering work there are very few new orders giving out, and many of the local firms are getting slack. In some cases the orders in hand keeping them going only to a very limited extent. In the coal trade, a rather more cheerful tone has been noticeable. Orders for house-fire coals have been coming in more freely during the week, and there are indications that the stocks taken in by consumers, both for house-fire and manufacturing purposes, are gradually getting worked off, which will shortly bring an accession of orders into the market. Business, however, is still only very moderate, and pits, in some cases, are not working more than four days a week, whilst an accumulation of stocks of round coal is still going on. There is some underselling in the market, but prices are fairly steady at about 6d. to 9d. per ton under the full advance asked at the commencement of the month; whilst the list rates of the principal Manchester firms have undergone no change. At the pit mouth the average prices are about as under:—Best coal, 10s. to 10s 6d.; seconds, 8s. to 8s. 6d.; common house-coal, 7s. to 7s. 6d.; steam and forge coal, 6s. 6d. to 7s.; burgy, 5s. to 5s. 3d; best slack, 4s. to 4s. 3d.; and common sorts, 3s. 3d. to 3s. 6d. per ton. The shipping trade has been largely interfered with, owing to the scarcity of vessels, as the result of the recent stormy weather, but there are a good many orders in hand if they could be executed. Delivered at the high level, Liverpool, or at Garston docks, steam coal remains at 8s. to 8s. 6d., and seconds house-coal at 9s. to 9s. 6d. per ton.

LEEDS AND WEST YORKSHIRE.—This is but a quiet time with the ironmasters of this district. It is not more than usually so, however, for the period of the year. There are good grounds for hoping that order books will be fairly filled to start the new year with. There are not heavy stocks of bars, sheets, hoops, plates, or any kind of merchant iron. Prices are steady at about £7 per ton on the average for common iron. Special sections will, of course, cost more, because of the extra expense of rolling. The best Yorkshire iron manufacture is but dull, except at Low Moor, where there is abundance of work—in fact, so plentiful are orders there for boiler-plates that additional puddling furnaces have been set to work. At Bowling, there is a fair trade, and some important contracts yet to be worked off. At the other best iron forges in the district there is much less doing, comparatively. Prices are unchanged, and, in fact, scarcely ever do change for this world-wide famous quality of iron. Steel making by the Siemens-Martin process does not progress as those who have recently ventured upon it would like and were led to expect. Indeed, it is stated that at one of the large Leeds forges, the attempt to make that sort of steel has been abandoned, and the costly plant, including a rail mill, rendered unproductive. In another instance, much difficulty is felt in experimenting with satisfactory results. At a large cut-nail works in Hunslet, the utilisation of steel sheets has been largely and very successfully adopted. An unusually large gas-holder is being put down for the corporation of Leeds by a local firm. There is nothing new among locomotive builders. Several first-class engines have been sent off this week for shipment. Messrs. Green and Son, Limited, are to be congratulated that the Board of Trade have approved of the Wilkinson tramway engine, the royalty for building which in the North of England they have purchased. There is active and increasing competition among inventors and makers of gas-stoves, especially those adopted for warming offices and private apartments, and the low price of gas in Leeds encourages a very general desire to make use of them. In West Yorkshire, the collieries are doing more regular work than at any previous period of this year. Prices are unchanged.

LIVERPOOL.—A marked quiescence prevails all through the metal markets here, and there seems no immediate prospect of its being removed. Pig-iron is especially dull, both on home and foreign account, and though this seems strange in the face of stocks, which have been decreasing all the year, the "teterrima causa" is to be found in the stagnation in the shape of the incubus of Glasgow stocks, to which even speculation is now failing to impart any degree of animation. The tinplate demand has vanished into thin air for the time being, and sellers are everywhere plentiful "as leaves in Vallambrosa." Prices in consequence are gently shading off, 15s. to 15s. 3d. per box for I.C. cokes now being spoken of. Americans are in the market for a few thousand tons of baling hoops, on account of the greater magnitude of the cotton crop than was expected; but, with this exception, there is no trade worth the name with the United States, and the tone prevailing there seems, not to put too fine a point on it, very gloomy. It may well be, however, that this sudden darkening is of the thunder-cloud nature, and that the skies may soon be bright again. North Staffordshire bars are not maintained at makers' prices, and may be had readily enough in other hands at £6 10s., delivered Liverpool. There is but little fresh demand for them, however, and the same sad story applies equally to hoops and sheets, &c. No one, however, seems to be taking the dulness very much to heart, from which it may be inferred that most merchants have still a good deal of business to run off, and also that they entertain convictions of a good healthy business after the old year has fled.

LONDON.—The market here shows no sign of improvement; prices generally are lower. Iron: Shipments continue fair, but manufacturers are accepting very poor limits. Scotch pigs unsettled, warrants 48s. 8d. Copper: A sudden decline has taken place the last few days, closing, spot Chili bars £65 2s. 6d. Manufactured copper steady. Tin: We notice an erratic market, with prices running counter to all statistical persuasion. Fluctuations have been considerable, closing, after a sudden drop from £99 17s. 6d. to £97 10s., for fine foreign; English ingots £103 to £104. Tinplates dull. Coke 15s. 6d. to 16s. 6d.

NEWCASTLE AND THE TYNE DISTRICT.—We have only had a moderate amount of business passing in our local crude iron market. Prices of pig-iron are receding, and the tone of the market is the reverse of encouraging. No. 3 Cleveland pig is sold with some difficulty at 45s. 9d. per ton, delivered in the Tyne, and No. 4 forge quality at 44s. 9d., these figures showing a fall of 6d. per ton since last week. The exports from the Tyne, like those from Middlesbrough, show considerable slackness at present. In the manufactured iron trade also there is a surprising dulness, considering that shipbuilders and other consumers are working up an excessive quantity of material this winter, and are likely to continue doing so. The true cause is, no doubt, over-production, and it may be assumed that the relief that manufacturers will experience by Sir Joseph Pease's award will have had some effect on the market. All kinds are quite 2s. 6d. per ton down in value since last week. Ship-plates sell here at £6 12s. 6d. to £6 15s., angle iron at £6 to £6 2s. 6d., bars at £6 5s., and boiler-plates at £7 12s. 6d. per ton, less the usual commission. Iron ores are high, Bilbao red ore being sold at 8s. per ton, with 9s. 4½d. freight to the Tyne. Numerous launches have taken place in our northern shipyards in the past few days, and in each place the builders are preparing to replace the floated vessels as quickly as possible. There is a good demand for new weight carrying steamers, and builders are getting better prices than they received three months ago in all new contracts, with materials to their hand considerably cheaper. Most of the steamship-owning partnerships in this locality have been earning good dividends this year, in a great measure by economical working, and there is a strong desire for this class of investment at present. In the engine manufacturing business there is much the same prosperity as is experienced in the shipyards; orders are plentiful, prices generally satisfactory, and work is carried on with all possible pressure. Other iron-working establishments, such as forges, foundries, bolt and rivet works, &c., have all a share of the general activity of the neighbourhood. Our coal trade is rather varied in the condition of its several branches. For Northumberland steam coals the demand is far from being brisk; indeed, at some of the large collieries little more than four or five days' work are done in the week. The price remains for the best quality of steam coals 9s. per ton less 5 per cent., but business has been done at a shade less. The coalowners are still asking 10s. per ton for next year's shipment, and at that excessive figure merchants and consumers hold aloof from business of a speculative kind. Gas and manufacturing coals sell very freely, and all the pits of North Durham are in full work; gas coals are making 7s. to 7s. 6d. per ton; manufacturing, 6s. 9d. to 7s. 3d; and smithy coals, 6s. 6d. to 7s. per ton, less 2½ per cent. House coals have been less buoyant, but are again improving since the frost set in. Coke is pretty steady and unaltered in value. Dulness pervades the market for chemicals; soda crystals are sold at £2 15s. 3d.; soda ash at 1½d. less 1½ per cent, and bleaching powder at £4 net. Rouen cliff is sparingly bought at 4s. 6d. per ton. Firebricks and cement are still having a good winter's sale.

NEWPORT.—There has been a slight falling off in the amount of new business doing during the week, and in some branches the markets are a trifle easier. Pig-iron at the moment is quieter, although prices are nominally unchanged. Very few transactions have taken place in iron ore, and the majority of buyers are evidently expecting lower figures. Campanil Somorrostro is quoted at 15s. 6d., c.i.f., and Rubio at 15s. 3d., c.i.f. The demand for the different kinds of manufacturing iron has fallen off, but makers are still able to quote full figures on account of the state of their order books. Present prices on this account are likely to be maintained until the end of the year. Bessemer blooms are dull, and only a small quantity is being exported. Scrap steel is in poor demand, and crop ends are quoted as low as £3 per ton. Few new inquiries have arrived during the week for steel rails, but the whole of the works in the district are well supplied with orders, and in this branch there will be want of employment for some months. Tinplates show no improvement, and I.C. cokes heve been sold at the low figure of 15s. 3d. in Liverpool. Prices of steam coal are well maintained, and the demand is kept up. Both house-coal and small are also in very good request, and very fair prices are being realised. There is still a very brisk demand for pitwood, and although the imports of this article have improved, prices have not receded. There is very little doing in the chartering market, and freights show little alteration. The coal clearances for the week, foreign, amounted to 24,778 tons, and coastwise to 15,604 tons, against our last returns of 32,998 tons foreign, and 14,907 tons coastwise. Of iron, &c., 4201 tons were despatched, the chief portion going to New York and Naples. The imports comprised 6787 tons of iron ore from Bilbao, and 3115 tons from other places, also 1165 tons of pitwood.

NORTH STAFFORDSHIRE.—The demand for finished iron is quieter this week than it has been for some time, but the feeling is gaining strength that an improvement is sure to be ushered in with the new year. In the meantime manufacturers find it somewhat difficult to keep their plant at work anything like full time, and, in fact, several mills have this week had to suspend operations owing to the dearth of orders. The condition of the home market is mainly responsible for this, but it is to some extent accounted for by the reluctance of merchants to specify in any large quantity at this time of the year, and to do more than supply current necessities, buying for stock being deferred until after the Christmas holidays. The shipping trade continues good, and most of the houses are receiving specifications by every mail, although the quantities are not so heavy as they were a little time back. The Australian and South African colonies are the principal purchasers, but very little is doing with Canada. Business with the United States is now almost *nil*. There is a falling off of orders for Russia, in consequence of the early closing of the Baltic ports, and great effort is being put forth at several works to clear off the orders in hand without delay. Makers are very firm with prices, and decline tempting offers by buyers who wish to avail themselves of the present lull to place lots for immediate delivery. There is, however, a slight reduction made on the quotations ruling a week or so back, but only for good and approved orders. Pig-iron finds a ready market, and prices are unaltered. The same may be said as to ironstone. The sale of house coal is brisker, and prices are a little higher, but manufacturing fuel is in no better demand, and rates are still unremunerative.

SHEFFIELD.—There is very little change to note in the condition of the heavy iron and steel trades since we last wrote, but, if anything, more workmen are being employed, so that the order sheets may be cleared before the Christmas vacation commences. Irons for immediate delivery are a shade dearer, but Bessemer steel has gone down a little in price. This is caused by the overstocked market in common descriptions, which are being largely used yet for some of the better class work in order to deal with the competition which, both in the home and foreign markets, is daily becoming more palpable. With the advent of the autumn months came a stiff demand for sheets from the shipbuilding yards in the north of England and Scotland. This demand appears rapidly to increase, and after the holidays have passed will no doubt be larger. New lists which are being issued in this line show an advance of rates; the manufacturers being compelled to put on extra terms owing to the increased cost of production caused by the conduct of the colliers, and that of the ironworkers also. Should the prices of iron still advance, the men will of course be influenced by the sliding-scale, as they are here obedient to the rules laid down by the Staffordshire Association. It was stated in IRON a fortnight ago that the ironworkers here were re-organised, and their efforts in this direction have so far been attended with considerable success, as the men appear to

appreciate the prospect of advancing wages. The miners are not, as a whole, benefitting by the advances in wages which they have obtained, as the season, being mild, has caused only a limited demand for household coal. The metropolitan market is also only sluggish. The men are now considering the advisabilty of restricting the output, and it is proposed to work the coal mines of South Yorkshire only five days per week. In the cutlery departments there is a slightly revived business doing—more especially in common classes of cutlery for export to the South American and East Indian markets. Lines are, however, very finely cut as to prices, and competition is exceedingly keen with German and French makers. The rapid advances in the prices of ivory have almost paralysed the home demand for best work, and especially in the table-knife department. We hear of table-knife manufacturers in the town offering to rebuy from stock many of the goods which they supplied to customers early in the spring, and wheresoever these purchases have been effected it has been with advantage to the original producer. In the engineering and kindred departments there will be a fair run of work for three months to come. Little change in trade will occur before the new year.

SHROPSHIRE.—Local makers of finished iron report that the demand still continues quiet, new orders being far from plentiful, and consumers being tardy in specifying on account of contracts already on hand. Quotations are unaltered, but it is believed that the recent decision of the arbitrator in the South Staffordshire district, as to wages, will have a tendency to strengthen prices. The pig-iron trade is in a fairly satisfactory state, although quiet, in sympathy with the market for finished iron. The orders on makers' books for the current quarter are being taken with great regularity, and the make of the district is going into consumption on a fair level with production. The coal trade is brisk.

SOUTH STAFFORDSHIRE.—In trade circles this week much interest is expressed concerning the confident tone in which Mr. Percy C. Gilchrist has just spoken at Dudley of the capability of the Thomas-Gilchrist process to produce from common Staffordshire pigs containing nearly 3 per cent. of phosphorus steel of sufficient quality to answer purposes in numerous branches of the hardware trades of the Midlands to which iron is now applied. On 'Change on Wednesday in Wolverhampton it transpired that the company which has been formed for manufacturing this steel in Staffordshire have appointed as manager and secretary Mr. Fitzmaurice, late of the Cwm Avon Tinplate Works. It is understood that for the present the company will not launch out upon a large scale. Marked bars are £8 12s. 6d. to £8 and £7 10s., with most business doing by the firms who accept the last figure. Strip for gas tube manufacture is £6 15s. easy. Plates for girder and tank purposes are £8 10s., and boiler sorts £9 to £9 10s. Sheets active, but hardly so firm. The bad reports of the United States iron and steel trades exercise a cautious influence upon our iron exchange; but hardware manufactures care but slightly for the news. The business which these latter are accustomed to do with the States will not, it is thought, be much checked. The coming on of the Christmas season is making the bright-ware departments of the tinplate workers, and the nickel platers, and brass burnishers busier.

SWANSEA.—In the iron and steel trades of this district considerable activity prevails. All the local works are well employed, and substantial consignments have been got off during the past week. In the 5204 tons of mineral imported, copper ore occupies the most conspicuous place; from Bilbao only 950 tons of iron ore have been received—a very exceptional occurrence. The coal shipments are well up to the average, notwithstanding the very stormy weather. The steam-coal clearances have numbered no less than—foreign, 19,607 tons, and coastwise, 6419 tons. As compared even with the figures of the previous week, the decrease is but infinitesimal—498 tons. Prices remain unaltered, though in some cases small parcels have been obtainable on easier terms for ready shipments. Demand is excellent, and supplies, generally speaking, plentiful. Sellers do not hesitate to book forward at current quotations. There is an increase in the patent fuel exports of 1335 tons. The recent advance is maintained. Steam freights are easier; there is no lack of tonnage. Pitwood, however, continues scarce, and prices are high.

WEST CUMBERLAND.—The demand for iron throughout the district remains very quiet, and the amount of business transacted of late has been inconsiderable, as compared with the orders which have been entrusted to local makers during the past month or two. There is not much alteration to note as regards the industrial position of the district, because while the furnaces are not all of them in blast, the contracts held are such as to enable makers to keep at work the greater portion of their plant. The production, therefore, shows a good average, and the deliveries to home and foreign consumers are well maintained, saving, perhaps, that less is being shipped from local ports than during the season, which practically ended in October. This state of things, however, can but be looked for, as under ordinary circumstances only a limited amount of metal is exported from the district to foreign ports during the winter months. Prices are weaker, No. 1 being quoted at 57s.; No. 2, 56s.; and No. 3, 55s. per ton nett at makers' works, three months deliveries, less being asked for prompt delivery. Iron ore finds a good market, and although less tonnage is being sold, raisers have been able to maintain their position by reason of the large contracts they already have, and the good general demand experienced from the district and other neighbourhoods. There is no change to note in the steel trade, which is well employed. Shipbuilders are doing a good trade and booking an occasional order. Though the prospect in the minor branches of industry is not very cheerful, considering the rough weather, it is not altogether an unsatisfactory one. Coal and coke in good request at unchanged values.

SCOTCH PIG-IRON SHIPMENTS.

The table below (copied from the *Public Ledger*) is a comparative statement of the weekly shipments of Scotch pig-iron from the beginning of this year and the corresponding weeks of the previous four years, up to Nov. 25. The shipments were:—

Week ending	1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
Jan. 7	3,389	6,182	6,689	6,069	6,085
14	5,267	6,677	12,288	6,291	4,532
21	7,742	4,608	7,566	6,331	6,170
28	8,041	8,906	13,383	4,969	6,550
Feb. 4	12,236	7,226	14,190	6,130	5,637
11	10,786	10,072	10,612	7,272	5,722
18	10,528	7,405	15,152	8,996	5,124
25	10,739	11,266	12,603	8,318	7,836
March 4	12,600	9,900	17,968	13,910	6,816
11	13,287	8,261	23,985	10,743	8,662
18	17,544	7,893	20,987	11,167	7,725
25	12,375	12,262	23,598	9,463	11,499
April 1	10,107	10,421	15,822	15,653	7,448
8	12,662	10,647	18,309	12,913	9,441
15	11,694	13,736	15,784	13,228	9,513
22	14,170	11,492	16,279	11,795	8,382
29	18,056	13,147	17,749	12,923	8,853
May 6	11,387	9,461	14,799	13,135	9,348
13	14,982	10,718	13,123	9,919	7,820
20	12,122	9,532	11,036	11,415	10,742
27	9,760	11,943	12,819	15,434	7,362
June 3	9,867	14,509	13,198	8,402	7,008
10	14,270	12,331	11,860	6,156	10,310
17	15,308	13,537	9,502	7,278	6,326
24	10,147	10,977	11,514	7,074	7,175
July 1	15,324	13,095	12,527	8,252	7,416
8	10,474	13,850	10,158	5,619	7,151
15	13,136	11,118	10,478	9,383	8,104
22	13,763	12,805	10,815	3,923	5,610
29	13,116	9,285	10,015	10,670	5,973
Aug. 5	13,579	12,669	12,260	7,504	5,993
12	13,258	11,700	14,252	8,652	6,162
19	14,083	10,965	15,870	7,260	8,700
26	13,151	11,239	13,530	18,312	8,493
Sept. 2	16,076	13,795	15,522	11,795	9,918
9	10,629	14,812	12,546	11,443	9,792
16	10,903	14,079	10,789	15,650	7,956
23	12,933	12,841	8,070	17,935	6,455
30	15,023	16,434	11,725	16,638	10,160
Oct. 7	12,495	11,102	10,955	20,544	10,362
14	14,199	8,708	11,196	23,323	9,994
21	13,058	12,451	9,905	22,915	8,923
28	12,116	11,981	7,566	17,000	8,702
Nov. 4	10,792	11,333	12,430	10,128	8,547
11	12,199	12,890	10,550	13,149	7,512
18	11,316	11,153	7,951	8,779	6,693
25	11,781	7,131	8,062	7,248	5,450
Totals	572,989	518,975	607,987	520,106	369,153

CLEVELAND PIG-IRON SHIPMENTS.

The following table contains comparative statements of the weekly shipments of Cleveland pig-iron from the beginning of this year and the years 1881 and 1880, up to last week, as well as the monthly shipments from January to October of 1882 and the previous four years. The shipments were:—

WEEKLY SHIPMENTS.

Week ending	1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
Jan. 7	14,992	12,331	14,347	—	—
14	18,128	13,454	21,712	—	—
21	16,125	10,246	19,384	—	—
28	18,648	6,890	15,315	—	—
Feb. 4	14,990	9,761	11,988	—	—
11	15,591	15,035	18,082	—	—
18	14,929	14,681	15,725	—	—
25	16,941	16,116	21,055	—	—
Mar. 4	25,669	19,135	28,546	—	—
11	21,245	13,474	14,322	—	—
18	19,400	17,404	18,295	—	—
25	15,433	19,370	24,241	—	—
April 1	19,850	20,498	12,138	—	—
8	17,530	13,154	22,145	—	—
15	14,934	19,390	18,835	—	—
22	16,406	19,221	17,111	—	—
29	16,286	22,946	20,878	—	—
May 6	14,000	15,537	20,509	—	—
13	16,841	15,395	19,239	—	—
20	17,609	19,480	16,471	—	—
27	16,801	21,426	21,648	—	—
June 3	8,943	17,568	22,400	—	—
10	17,678	19,796	18,368	—	—
17	15,596	21,834	17,078	—	—
24	15,715	21,827	12,312	—	—
July 1	29,803	22,802	24,117	—	—
8	18,473	15,265	18,613	—	—
15	12,349	21,159	19,190	—	—
22	14,218	22,046	17,362	—	—
29	18,477	21,529	17,135	—	—
Aug. 5	22,361	20,983	15,734	—	—
12	21,199	15,082	17,651	—	—
19	20,002	17,936	18,387	—	—
26	18,864	21,923	14,067	—	—
Sept. 2	20,536	15,027	20,609	—	—
9	26,000	22,364	15,375	—	—
16	25,491	16,866	14,472	—	—
23	17,555	17,218	19,165	—	—
30	27,395	19,903	19,657	—	—
Oct. 7	26,079	26,941	15,922	—	—
14	20,143	24,775	20,834	—	—
21	24,357	13,358	27,593	—	—
28	24,823	12,166	17,055	—	—
Nov. 4	16,308	24,052	15,610	—	—
11	15,211	19,741	20,617	—	—
18	10,829	21,383	17,649	—	—
25	18,120	17,887	16,219	—	—
Totals	859,936	841,320	864,779	—	—

MONTHLY SHIPMENTS.

Month ending	1882. Tons.	1881. Tons.	1880. Tons.	1879. Tons.	1878. Tons.
Jan. 31	71,458	47,860	78,941	39,751	47,932
Feb. 28	66,893	58,370	71,573	57,458	51,097
Mar. 31	89,837	81,609	84,375	73,105	61,386
April 30	68,909	78,894	88,018	65,250	69,256
May 31	71,405	75,729	81,829	71,456	74,043
June 30	68,373	91,577	82,186	60,808	68,804
July 31	74,311	87,580	82,306	61,825	78,628
Aug. 31	95,861	84,901	72,665	61,499	73,275
Sept. 30	100,838	78,897	78,928	101,154	66,936
Oct. 31	98,956	84,472	86,050	94,563	62,218
Totals	806,841	769,919	806,871	686,869	654,193

THE CONTINENTAL IRON AND COAL TRADE.

BELGIUM.—A decided weakness is making itself felt in the Belgian iron market, a state of matters, however, not unusual at this time of the year. This instability extends both to pig and finished iron. Luxemburg pig is sold at 54 fr., the official quotation being 55 fr. At Charleroi best brands change hands at 60 fr., but several makers are selling at 55 fr. English foundry pig is also lower, and worth only 64 fr. 50 c., delivered on trucks at Antwerp. We hear that a Belgian steelworks has contracted for 50,000 tons of hematite pig at about 80 fr., f.o.b., Antwerp. The manufactured iron market remains quiet. Business has been done this week under 135 fr. Plates are steady at 190 fr., but large parcels for export might be obtained at 185 fr.

The Belgian coal market is getting quieter, but quotations are as yet maintained.

FRANCE.—Although there is more quietness in the French iron market, its tendency is one of continued firmness.

GERMANY.—Quietness prevails in the German market. But as works are satisfactorily engaged, better than they were this time last year, the general feeling is confidence in the immediate future. The agreed price of puddled pig (60—62 marks) finds general acceptance in Westphalia. Luxemburg makers of pig-iron hold on to their quotation of 57 francs. The official quotation at Dortmund for bar-iron is maintained at 135—145 marks. Silesian iron manufacturers are bitterly complaining of the injury done them by the new Russian customs duties on iron, which, it will be remembered, were considerably raised at the beginning of the summer. Works are still fairly well employed there, but enquiry is falling off.

At Dortmund, the quotations for iron and steel, per 1000 kilogrammes at works (English descriptions per ton at port of shipment), are:—

	Nov. 20. Marks.	Nov. 27. Marks.
White-grained puddling pig	62	60—62
Spiegeleisen	76—78	75—76
German foundry pig No. 1	75	75
German foundry pig No. 2	72	72
German foundry pig No. 3	66	66
German Bessemer pig	70	68—70
English foundry pig No. 3	43	43
English Bessemer hematite pig	56	56
Luxemburg pig	47½	47½
Bar-iron	135—145	135—145
Fine-grained iron	165—170	165—170
Angle-iron	150	150
Joists	150	148—150
Boiler-plates	215—220	215—220
Boiler-plates No. 2	205—210	205—210
Fine Siegen plates	180—185	180—185
Fine-grained plates	250	250
Charcoal plates	275	275
Low Moor plates	305	305
Bessemer steel rails	152—160	152—160
Bessemer steel rails (defective)	135	135
Bessemer steel pit rails	145	145
Iron pit rails	140	140

In the Westphalian coal market, there is an active demand for industrial, gas, and coking coals, while the enquiry for household fuel is somewhat slacker, owing to the milder weather. Prices are very firm both for coke and coal. At Dortmund, quotations per 100 cwt. at the pit's mouth or at coke ovens are as follows:—

	Nov. 20. Marks.	Nov. 27. Marks.
Best coal (Stückkohle)	50	50
Cobbles	40	40—45
Large washed nuts	35—42	40—42
Washed smith's coal	34—35	34—35
Washed coking coal	28—30	28—30
Inferior coal	20—24	20—24
Gas coal	36—40	36—40
Mixed coal	30—35	32—35
Prime coke	65—70	65—70
Patent coke	70—78	70—78
Small coke	45—50	45—50

RUSSIA.—The official returns of the foreign trade of Russia during the first eight months of the current year show that business has become more active. In coal, iron, steel and machinery, the comparison with 1881 is as follows:—

	1881. Poods.*	1882. Poods.
Coal	77,184,700	45,144,200
Pig-iron	7,945,800	8,601,200
Manufactured Iron	4,620,500	3,918,100
Steel	286,700	326,800
Machinery, other than agricultural	1,214,600	609,300
Agricultural machinery	814,100	593,500

* A Russian pood is equal to 36 lb. English.

A further proof of an improvement of trade is that the railway receipts for the eight months have averaged 6288 roubles per verst, as compared with 6270 roubles in 1881.

SCOTCH PIG-IRON QUOTATIONS.

(From the *Glasgow Herald.*)

NEW YORK, Wednesday.

	Th.	Fri.	Sat.	Mon.	Tu.	Wed.
Gartsherrie (in yard)	26	26	26	26	26	26
Coltness (at quay) ..	27½	27½	27	27	27	27
Langloan	26	26½	26½	27½	26½	26
Glengarnock ..	24½	24½	24½	24½	24½	24
Carnbroe	24½	24½	24½	24½	24½	24
Summerlee	26	26	26	25½	25½	25½
Eglinton (at quay) ..	23½	23½	23	23	23	23
Shotts	27	27	27	27	27	26½
Calder	—‡	—‡	—‡	—‡	—‡	—‡
Carron	22	22	22	22	22	22
Dalmellington ..	23	23	23	23	23	23
Kinnell	24	24	24	24	24	23½

‡ None here.

NEW PATENTS.

ALL the patents are placed alphabetically, with the official numbers attached. The new applications range from No. 5520 to No. 5641, being the entries from Nov. 21 to Nov. 27, 1882.

NEW APPLICATIONS.

Combined Printing or Endorsing Stamp, &c.—*G. K Cooke, 12, Rue Turbigo, Paris, France.* [5577

Aerial Railway.—A communication.—*R. P. Alexander, 16, Southampton Buildings, Middlesex.* [5623

Antiseptics, &c.—*C. T. Kingzett, 17, Lansdowne Road, Tottenham, and M. Ziegler, 19, Buckland Crescent, Belsize Park, Middlesex.* [5578

Apparatus for Cultivating Land by Steam.—*W. Fisher, Stamfordham, Northumberland, and S. S. Robson, Sunderland, Durham.* [5638

Apparatus for Taking Soundings.—*F. Sutcliffe, Liverpool, Lancs.* [5606

Applying Motive-Power to Tramcars.—*W. H. Hindle, Blackburn, Lancs.* [5568

Attaching Lamps to Carriages.—*R. T. Dobbs, and F. Davies, Birmingham, Warwick.* [5585

Bicycles, &c.—*J. Hix, 47, Park Road, New Wandsworth, Surrey.* [5629

Block Signalling, &c., on Railways.—*P. Swift, The Green, West Drayton, Middlesex, and A. J. M. Reade, St. Leonard's Villa, Slough, Bucks.* [5610

Boiler Flues and Expansion Joints for the same.—*C. W. Dyson, Bolton, Lancs.* [5553

Breech-Loading Guns.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5556

Breech-Loading Ordnance and Small Arms.—*S. H. Berry Hackney, Middlesex.* [5576

Candle Moulding.—*E. Cowles, Hounslow, Middlesex.* [5595

Carbons.—*W. Cunliffe, 1, Harringey Grove, Hornsey, London.* [5580

Carts for Holding Mud.—*A. Bettger, Victoria Road, Kilburn, Middlesex.* [5579

Centre Valves Employed in Connection with Gas Purifiers.—*R. Dempster, jun., Elland, York.* [5550

Chains and Buckets for Dredgers.—*W. R. Kinipple, Greenock, Renfrew, N. B.* [5570

Combined Urinal and Washstand.—A communication.—*A. Albuti, 4, South Street, Finsbury, Middlesex.* [5542

Composition for Uniting Sheets of Paper at the Edges to Form Tablets.—A communication.—*C. Bond, Leadenhall Street London.* [5602

Construction of Stays or Corsets.—A communication.—*W. Rosenthal, Queen Victoria Street, London.* [5641

Cooling Apparatus.—A communication.—*S. P. Wilding, 23, Rood Lane, Middlesex.* [5540

Construction of Stoves and Fireplaces.—*F. Greatrex, 34, Hillingdon Road, Uxbridge, Middlesex.* [5598

Coupling and Uncoupling Railway Vehicles.—*W. Younghusband, L. Younghusband, and T. Hudson, Darlington, Durham.* [5639

Coupling Apparatus for Railway Waggons.—*A. S. Mildred Middlesbrough-on-Tees, N. Riding of Yorks.* [5561

Couplings.—*J. Hunt, and T. E. Milton, Birmingham, Warwickshire.* [5552

Cricket-Bat Handles.—A communication.—*H. J. Haddan, Kensington, Middlesex.* [5594

Cutting Paper.—*W. C. Kritch, and J. Garland, Leeds, Yorkshire.* [5560

Cutting up Sugar Cane.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5609

Derivatives from Coal Tar Products.—*C. Lowe, Reddish, Stockport, Lancs.* [5554

Distributing Steam in Motor Engines.—*J. W. Jordan, and J. T. Brockliss, Norwich, Norfolk.* [5534

Drain Ploughs.—A communication.—*S. Pitt, Sutton, Surrey.* [5573

Drying Grain.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5537

Dynamo-Electric Machines.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5594

Dynamo-Electric Machines.—*C. A. McEvoy, and J. Mathieson, 18, Adam Street, Adelphi, Middlesex.* [5631

Electric Bell.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5584

Embossed Plates.—*J. F. Smyth, Belfast, Antrim, Ireland.* [5593

Exhausting, &c., Fluids.—*H. S. Stewart, Palace Chambers, St. Stephen's, Westminster.* [5616

Exhausting the Bulbs of Incandescent Electric Lamps, &c.—*N. K. Chereul, Paris, France.* [5566

Extraction, &c., of Tallow.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5575

Fermenting Liquids.—A communication.—*N. Lubbock, 16, Leadenhall Street, London.* [5618

Filling, &c., Bottles.—*J. Phillips, 13, Liverpool Street, Walworth, Surrey.* [5619

Fret Saw Machines.—*R. D. Sanders, Acton, London.* [5632

Gas Engines in Connection with Tramcars, &c.—*E. Dyson, Milnsbridge, near Huddersfield, York.* [5587

Governors for Steam-Engines.—*W. M. Musgrave, Bolton, Lancs.* [5553

Handles for Saucepans.—*E. Baldwin, Stourport, Worcestershire.* [5549

Harvesting Machinery.—*A. C. Bamlett, Thirsk, York.* [5556

Imitating Leather Fabrics.—*H. Loewenberg, Wiesbaden, Germany.* [5531

Keys for Fixing the Rails of Railways.—*E. W. Swaq, Highfield, Middlesbrough, N. Riding, York, and T. G. Massicks, Oaks, Broughton-in-Furness, Cumberland.* [5588

Lamps and Burners.—*H. Salisbury, 125, Long Acre, London.* [5562

Lithographic Presses.—A communication.—*H. J. Haddan, Kensington, Middlesex.* [5532

Looms for Weaving.—*G. Keighley, Burnley, Lancs.* [5608

Machinery for Obtaining, &c., Elastic Force for Motive-Power.—*J. Graddon, Forest Hill, Kent.* [5624

Machines for Sharpening, &c., Saws.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5617

Manufacture of Benzol, &c.—*S. Mellor, Patricroft, Lancs.* [5604

Manufacture of Bobbins, &c., Employed in the Manufacture of Textile Fabrics.—*L. Heppenstall, jun., Milnsbridge, Huddersfield, York.* [5578

Manufacture of Metal Cisterns, &c.—*H. Sutcliffe, Halifax, York.* [5626

Manufacture of Ribbed Pile Fabrics.—*J. R. Hutchinson, Bury, Lancs.* [5569

Manufacture of Sugar in Lumps.—A communication.—*H. H. Lake, Southampton Buildings, Middlesex.* [5525

Measuring Liquids.—A communication.—*H. H. Lake, Southampton Buildings, Middlesex.* [5539

Measuring Men and Objects.—*E. P. Wilford, Bristol.* [5581

Mechanism Applicable to Tentering, &c.—*J. Ashworth, Rochdale, Lancs.* [5603

Metallic Bedsteads, &c.—*T. Kendrick, Birmingham, Warwick.* [5590

Metallic Fasteners.—A communication.—*A. J. Boult, 323, High Holborn, Middlesex.* [5526

Metallic Packings.—A communication.—*A. M. Clark, 53, Chancery Lane, Middlesex.* [5535

Metallic Salts.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5523

Method of Treating Material composed of Vegetable, &c., Matter.—*G. and J. E. Tolson, Dewsbury, York.* [5501

Movable Parallelogramic Support with Stopping Spring Catch for Taper Stands.—*A. Zwierschowski, Boulevard St. Denis, 1, Paris.* [5547

Nails, &c.—A communication.—*S. Watkins, 5, High Street, Wolverhampton, Staffs.* [5605

Naves of Wheels for Carriages.—*S. Andrews, Cardiff, Glamorgan.* [5582

Ordnance.—*J. Vavasseur, Bear Lane, Southwark, Surrey.* [5559

Paper Bags.—A communication.—*J. H. Johnson, 47, Lincoln's Inn Fields, Middlesex.* [5615

Piled Fabrics and Weaving the same.—*J. Holt, Bolton, Lancs.* [5630

Playing Lawn Pool.—*J. A. Adams, 5, Henrietta Street, Cavendish Square, Middlesex.* [5524

Portable Railways.—*H. A. Spalding, Jahnkow, Prussia.* [5627

Preparation of Extracts of Meat.—*F. S. Barff, 100, Abbey Road, Kilburn, Middlesex, and A. P. Wire, Leytonstone, Essex.* [5455

Prevention of Injuries to Steam-Boilers.—*A. J. Smith, Palace Chambers, Westminster.* [5621

Preventing the Flow of Sewer Gas into Buildings.—*T. Carder, Bideford, Devon.* [5636

Process of Improving Inferior Qualities of Diamonds, &c.—A communication.—*J. C. Mewburn, 169, Fleet Street, London.* [5548

Producing Designs, &c., upon Glass.—A communication.—*A. M. Clark, 53, Chancery Lane, London.* [5640

Propelling Vehicles by Hydraulic Power.—A communication.—*E. Edwards, 40, Southampton Buildings, Middlesex.* [5540

Propulsion of Row Boats.—*W. J. Sage, 77, Lorrimore Road, Walworth, Surrey.* [5563

Protecting Ships from the Effects of Collision.—*W. Beverley, Aberdeen, and G. A. MacLaverty, Glasgow, N. B.* [5571

Purifying Town Sewage.—A communication.—*P. Jensen, 33, Chancery Lane, Middlesex.* [5553

Purses.—A communication.—*G. M. Cruikshank, 135, Buchanan Street, Glasgow, Lanark, N. B.* [5574

Railway Switches.—*E. N. Molesworth-Hepworth, Manchester, Lancs.* [5587

Railways and Tramways.—*W. T. Garnett, Bradford, Yorkshire.* [5614

Regulating the Flow of Liquids.—*P. J. Catterall, and E. Birch, Manchester, Lancs.* [5611

Regulating the Raising, &c., of the Heads of Landaus, &c.—*S. C. L. Fuller, Bath, Somerset.* [5596

Removing Glaze off Enamelled Bricks.—*E. B. Brooke, Fieldhouse Fire Clay Works, Huddersfield, York.* [5528

Reservoir Penholders.—*A. Osborn, Birmingham, Warwick* [5558

Rotary Engines.—A communication.—*A. M. Clark, 53, Chancery Lane, Middlesex.* [5541

Secondary Batteries.—*A. Tribe, Denbigh Road, Notting Hill, Middlesex.* [5601

Sewing Machines.—*W. H. Beck, 139, Canyon Street, Middlesex.* [5620

Sewing Silk.—*W. Trafford, Leek, Staffs.* [5521

Shampooing.—*A. G. King, 4, Alexandra Road, St. John's Wood, Middlesex.* [5551

Shears for Cutting Paper, &c.—A communication.—*H. H. Lake, Southampton Buildings, London.* [5635

Spindles for Spinning, &c., Frames.—*D. Sheoch, Stewarton, Ayr, N. B.* [5620

Stands or Frames for Liquor and other Bottles, &c.—*C. Pembrook, and J. Dingley, Birmingham, Warwick.* [5612

Steam and Motive-Power Engines.—*W. Hornsby, and R. Edwards, Spittlegate Iron Works, Grantham, Lincoln.* [5628

Steel and Iron Tubes.—*S. Walker, Birmingham, Warwickshire.* [5597

Surgical Trusses.—A communication.—*E. Edwards, 40, Southampton Buildings, Middlesex.* [5632

Taps for Bottles.—*P. Yates, Oldham, Lancs.* [5522

Telephonic Apparatus.—A communication.—*H. H. Lake, Southampton Buildings, London.* [5633

Telephonic Apparatus.—*J. B. Speare, 31, Lombard Street, London, and J. E. Chester, 18, Talbot Street, Southport.* [5625

Tents for Military Purposes.—A communication.—*H. E. Newton, 66, Chancery Lane, Middlesex.* [5530

Tip Vans or Wagons.—*E. Hare, 252, Camberwell Road, Surrey.* [5613

Toys.—A communication.—*H. H. Lake, Southampton Buildings, London.* [5634

Travelling Grates for Furnaces.—*G. and E. Ashworth, Manchester.* [5544

Treating Mixed Solutions of Chloride of Copper, &c.—*W. Weldon, Rede Hall, Burstow, Surrey.* [5607

Tricycles.—*H. J. Hisset, Plymouth, Devon.* [5593

Trimming Soles and Heels of Boots.—*J. Keats, Bagnal, Stoke-upon-Trent, Staffs.* [5557

Tubular Steam Generators.—A communication.—*C. D. Abel, 28, Southampton Buildings, Middlesex.* [5622

Underground Conductors for Electric Currents for Lighting.—*R. J. Gelcher, Notting Hill, Middlesex.* [5586

Utilising By-Products of the Soda and Potash Manufactures.—*J. Maclear, Glasgow, Lanark, N. B.* [5545

Valves for Air-Compressors.—*G. Pilkington, and J. Forrest, Haydock, Lancs.* [5543

Voltaic Batteries.—*L. Hartmann, 55, Middleton Square, Middlesex.* [5552

Water Heater.—*E. Vermeiren, Brussels, Belgium.* [5610

Wheels and Axles for Vehicles.—A communication.—*A. M. Clark, 53, Chancery Lane, Middlesex.* [5554

Wheels for Vehicles.—A communication.—*W. R. Lake, Southampton Buildings, Middlesex.* [5538

Winding Apparatus.—*J. Farrar, Halifax, York.* [5529

Wire for Fences.—A communication.—*W. Friedlaender, Fenchurch Street, Middlesex.* [5633

Wood-Block Pavements.—*E. Hughes, Liverpool, Lancs.* [5581

ABSTRACTS OF SPECIFICATIONS RELATING TO METALS

PUBLISHED DURING THE WEEK ENDING NOV. 25, 1882.

(Prepared by PHILIP M. JUSTICE, 53, Chancery Lane, W.C.)

Grinding Mill Rolls.—1877 (1882).—*Thompson*, communicated by R. Birkholz and E. P. Allis.—The rolls are preferably porcelain. To attach the roll body to the shaft without danger of fracture, the ends of the roll are provided with bevelled faces and end plates or collars or equivalent devices for forcing the plates against the ends of the body with such pressure, that the body will be rotated by friction.

Separating Metals.—1884 (1881).—*Lake*, communicated by E. Marchese.—When galena composed of sulphur and lead is to be treated, nitrate of lead is used as the electrolyte. In the vessel in which the operation takes place are narrow boxes, the walls of which are of cloth, and which are filled with galena. Upon the surface of this galena, metallic conducting bars are caused to bear, these bars being connected to the positive pole of the electric source. The galena will in this manner constitute the anode of the system. Between the boxes of galena are plates of lead, which are connected to the negative pole, and form the cathode. A solution of nitrate of lead is introduced into the vessel. The electric current traverses the bath and decomposes the nitrate of lead. The lead deposits upon the cathode, the sulphur remaining at the anode in the form of pure sulphur.

Treating Ores.—1913 (1881).—*Clark*, communicated by A. M. G. Sebillot.—The ore is pulverised very finely. A long furnace is heated like a muffle, forming a long gallery of uniform area filled with a series of trucks containing the mixture of ore and sulphuric acid, and resting on rails, one truck being moved along and the contents dried off, another truck containing fresh mixture being added at the other end.

Bushing Material.—1934 (1881).—*Lake*, communicated by G. F. Senter. Provisional Protection only.—The bearings are provided with grooves or air channels for allowing air to pass through between the journal or spindle and bearings. The material used for the bushing is a mixture of talc or mica and plumbago in equal parts, together with some fibrous binding material, as hair, wool, &c., there being added to these during mixing liquid silicate of soda, to form the mass into a stiff paste.

Metal Rollers.—1939 (1882).—*D. Davies.* Provisional Protection only.—The rollers which are used in the manufacture of tinplates, it is proposed to make from a steel or iron tube filled in at each end with solid metal plugs.

Nut Lock.—1952 (1882).—*Haddan*, communicated by W. Courtenay.—A washer of vulcanised or gelatinised fibre is treated with an astringent, such as sulphuric acid or chloride of zinc. Over this washer some flexible metal, such as tin-plate, is cramped or bent over it. On the nut being screwed home, the part beneath it will be compressed, the sides rising up and locking the nut.

Heating and Rolling Mills.—1995 (1882).—*H. H. Andrew.*—A continuous train of rolls are employed; between each set of rolls are baths of heated lead, through which the metal is caused to pass. The lead baths are heated from the underside. The metal may be slightly oiled before it enters the lead bath, or it may pass through a gas flame, in order to burn off any slight film of lead that may have adhered to the metal.

Impregnating Mineral Substances.—4030 (1882).—*Lake*, communicated by R. Michelet and H. Tescher.—The invention consists in impregnating stone bricks, clay pipes, tiles, &c., with bituminous products by means of an air-tight receptacle, into which the bricks are placed, and which is heated to produce a vacuum. The bituminous substances are then allowed to enter the receptacle, which is then subjected to a pressure of about two atmospheres. The impregnated materials are then cooled, and are ready for use for paving, building, &c.

METROPOLITAN BOARD OF WORKS.

RETURN *of the Testings made at the Gas Testing Station during the Week ending November* 28, 1882.

Company and District.	Illuminating Power.* (In standard sperm candles.) Max.	Min.	Mean.	Sulphur. (Grains in 100 cubic feet of gas.) Max.	Min.	Mean.	Ammonia. (Grains in 100 cubic feet of gas.) Max.	Min.	Mean.	Sulphuretted Hydrogen.	Pressure.†
Gas Light and Coke Company.											
Notting Hill ...	17·7	17·0	17·3	10·1	7·8	8·8	0·2	0·0	0·1	None	In excess.
Camden ..	17·8	16·2	17·0	11·7	8·6	10·5	0·3	0·2	0·2		
Dalston... ..	17·7	16·7	17·1	13·1	9·6	12·0	0·2	0·0	0·0		
Bow	17·9	17·0	17·6	18·0	15·1	16·5	0·5	0·2	0·4		
Chelsea... ..	17·0	16·5	16·8	17·0	16·0	16·4	0·0	0·0	0·0		
Kingsland Rd.	17·4	16·7	17·1	13·2	8·4	9·8	0·1	0·0	0·0		
Westminster (cannel gas)...											
South Metropolitan Gas Company.											
Peckham ...	17·1	16·3	16·6	11·2	8·6	10·5	0·4	0·0	0·2		
Clapham ...	16·8	15·0	16·4	12·5	8·5	10·0	0·2	0·0	0·0		
Tooley Street ...	16·0	16·2	16·5	17·2	10·9	12·4	0·6	0·0	0·3		
Commercial Gas Company.											
Old Ford ...	17·4	16·7	17·0	15·9	13·0	14·0	0·2	0·0	0·1		
St. George-in-the-East ...	17·4	16·1	16·7	8·3	8·4	12·3	0·2	0·0	0·1		

W. J. DIBDIN, F.I.C., F.C.S.

Consulting Engineer and Superintending Gas Examiner.

Note.—The maximum amount of Ammonia present in the Gas supplied by the Commercial Gas Company, and tested in the St. George's-in-the-East District, during the week ending October 21st, should have been 0·2; minimum, 0·08; mean, 0·1.

* The standard illuminating power for common gas in the metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in the 100 cubic feet of gas. Ammonia not to exceed 4 grains in the 100 cubic feet of gas.

† Pressure between sunset and midnight to be equal to a column of one inch of water. Pressure between midnight and sunset to be equal to a column of six-tenths of an inch of water.

PRICE LIST OF IRON AND STEEL.

PREPARED BY

MESSRS. BOLLING & LOWE,

LAURENCE JOUNTNEY HILL, LONDON, E.C.

STAFFORDSHIRE.

List Brands at Works. Per Ton.

BARS—
- ½ in. to 3 in. rounds and squares £8 0 0
- 1 in. to 6 in. flats 8 0 0

Rounds and Squares.
- 3½ in., 10s. per ton extra.
- 4 in., 20s. ,,
- 4½ in., 40s. ,,
- 5 in., 50s. ,,

Rounds only.
- 5½ in., 70s. ,,
- 6 in., 90s. ,,
- 6½ in., 110s. ,,
- 7 in., 130s. ,,

Round and Squares,
- 7-16 in., 10s. ,,
- ½ in., 20s. ,,
- 5-16 in., 30s. ,,
- ¼ in., 40s. ,,
- 3-16 in. 70s.

HOOPS—
- 1 in. to 6 in. wide by usual guage £8 10 0
- ¼ in. wide up to 20 w. g., 20s. per ton extra.
- ⅜ in. wide up to 20 w. g., 40s. per ton extra.
- ½ in. wide up to 20 w. g., 80s. per ton extra.
- ⅝ in. wide up to 20 w. g., 120s., per ton extra.

PLATES—
- To 15 feet long by 4 feet wide, not exceeding 4 cwt. £9 10 0
- 4 to 5 cwt., 20s. per ton extra.
- 5 to 6 cwt., 25s. ,,
- 6 to 7 cwt., 50s. ,,
- 7 to 8 cwt., 75s. ,,
- 8 to 9 cwt., 110s. ,,
- 9 to 10 cwt., 120s. ,,
- 10 to 11 cwt., 140s. ,,
- 15 to 20 ft. long, 20s. ,,
- 20 to 25 ft. long, 40s. per ton.
- 4 to 4½ ft. wide, 20s. ,,
- 4½ to 5 ft. wide, 40s. ,,

SHEETS—
- Singles 11 to 20 gauge. £9 10 0
- Doubles, 30s. per ton extra.
- Lattens, 60s. ,,

ANGLES—
- 1 in. by 1 in. to 8 united inches £8 15 0

TEES—
- 1 in. by 1 in. to 8 united inches £9 0 0
- For each inch above 8 united inches 10s. per ton extra.
- Best, 20s. per ton extra.
- Best, best, 40s.
- Treble best, 60s.

STAFFORDSHIRE, MIDLAND, &c.

Ordinary Brands (at Works).

	£ s. d.	£ s. d.
Bars	6 10 0 to 7 10 0	
Hoops	7 0 0 to 7 10 0	
Plates	8 0 0 to 8 10 0	
Sheets	8 0 0 to 8 10 0	
Angles	7 0 0 to 7 10 0	
Tees	7 0 0 to 7 10 0	

Best, 10s. to 20s. per ton extra.
Best, best, 20s. to 30s. ,,
Treble best, 40s. to 60s. ,,

CLEVELAND AND NORTH OF ENGLAND BRANDS (at Works).

	£ s. d.	£ s. d.
Bars	6 0 0 to 6 5 0	
Ship Plates to 8 cwt.	6 15 0 to 7 0 0	
Angles	6 0 0 to 6 5 0	

Best, 10s. per ton extra.
Best, best, 30s. ,,
Treble best 50s. ,,

SCOTCH (at Glasgow).

	£ s. d.	£ s. d.
Bars NB crown	6 10 0	
Hoops	7 10 0	
Ship Plates	7 15 0	
Boiler ,,	8 0 0	
Angles	7 10 0	

Best, 10s. per ton extra.
Best, best, 30s. ,,
Treble best 50s. ,,

WELSH (Newport and Cardiff).

	£ s. d.	£ s. d.
Bars	5 15 0 to 6 0 0	
Plates	7 0 0 to 7 10 0	

Best, 10s. per ton extra.

BELGIAN, (f.o.b. Antwerp).

	£ s. d.	£ s. d.
Bars	5 12 6 to 6 10 0	
Hoops	6 10 0 to 7 0 0	
Plates	7 10 0 to 8 10 0	
Sheets	8 0 0 to 8 10 0	
Angles	6 0 0 to 7 10 0	
Nail rods	6 10 0 to 7 0 0	

IRON ROLLED GIRDERS—
- Narrow flanges. 6 0 0 to 7 10 0
- Wide flanges .. 6 10 0 to 8 0 0

STEEL ROLLED GIRDERS, ANGLES and CHANNELS at proportionate differences.

BEST YORKSHIRE (at Works).

BARS—

	£ s. d.
To 3½ cwt.	19 0 0
3½ to 5 cwt.	20 0 0
5 cwt. and upwards.	22 0 0

BOILER PLATES—
- To 2½ cwt. 22 0 0
- 2½ to 3 cwt. 23 0 0
- 3 to 3½ cwt. 25 0 0
- 3½ to 4 cwt. 27 0 0
- 4 to 5 cwt. 30 0 0
- 5 to 6 cwt. 33 0 0
- 6 to 7 cwt. 36 0 0
- 7 cwt. and over 39 0 0

Plates over 6 feet to 8 feet wide, 40s. per ton extra.
- Sheets 24 0 0
- Angles and Tees .. 24 0 0

	£ s. d.	£ s. d.
Tyres to 4 cwt.	19 10 0	
4 cwt. to 5½ cwt.	23 0 0	
5½ cwt. and over.	26 10 0	
Axles to 5 cwt	19 10 0	
5 cwt. to 6 cwt.	22 10 0	
6 cwt. and over	25 10 0	

RAILS (at Port nearest Works).

	£ s. d.	£ s. d.
Heavy iron	5 0 0 to 5 5 0	
,, Steel	5 5 0 to 5 10 0	
Light iron	5 10 0 to 5 15 0	
,, Steel	5 15 0 to 6 0 0	

Steel Mining Rails, 10 to 15 lb. per yard, £7 0/ to £6 10/.

Fish Plates, heavy, 20s. per ton above rails.

Fish Plates, light, 60s. to 80s. per cwt. do.

BOLTS AND NUTS, for fishes—
- Heavy ... 16 0 0 to 20 0 0
- Light ..... 26 0 0 to 28 0 0

SHIRES—
- Heavy ... 14 0 0 to 16 0 0
- Light ..... 16 0 0 to 18 0 0

PIG-IRON.

Scotch Warrants (Glasgow) 48s. 9d.
Cleveland Warrants No. 3 (Middlesborough) ... 43s. 1½d.
Cleveland No. 1 (Tyne or Tees), G.M.B. ... 47s 0d.

CASTINGS

(f.o.b. Shipping Port).

SOCKET PIPES (for gas or water)—

	£ s. d.	£ d.
1¼ to 2 in.	5 10 0 to 6 0 0	
2 to 3 in.	5 5 0 to 5 15 0	
3 to 8 in.	5 2 6 to 5 12 6	
8 to 20 in.	5 0 0 to 5 10 0	
20 to 48 in.	4 17 6 to 5 7 6	
Chairs	4 15 0 to 5 0 0	
Girders	5 15 0 to 8 0 0	
SCRAP—		
Old rails, D.H.	3 10 0 to 3 15 0	
Do. flange	3 0 0 to 3 5 0	
Engineers' heavy scrap	2 18 0 to 3 0 0	
Light do.	2 0 0 to 2 5 0	

WIRE.

Rolled Fencing Wire (at Works)

	£ s. d.	£ s. d.
Nos. 0 to 4	7 10 0 to 8 10 0	
5	8 0 0 to 9 0 0	
6	8 10 0 to 9 10 0	

Galvanized.

	£ s. d.	£ s. d.
Nos. 0 to 4	11 10 0 to 11 15 0	
5	12 0 0 to 12 5 0	
6	12 10 0 to 12 15 0	

Drawn Fencing Wire.

	£ s. d.	£ s. d.
Nos. 0 to 6	0 0 0 to 0 10	
7	9 10 0 to 10 0 0	
8	10 0 0 to 10 5 0	
9	10 10 0 to 11 0 0	
10	11 10 0 to 12 0 0	

Galvanised. £ s. d. £ s. d.

Nos. 0 to 6	12 10 0 to 13 0 0	
7	13 10 0 to 14 0 0	
8	14 5 0 to 14 15 0	
9	14 10 0 to 15 0 0	
10	15 10 0 to 16 0 0	

Drawn Bright Wire.

Nos. 1 to 6	10 0 0 to 10 10 0	
7	10 10 0 to 11 0 0	
8	10 15 0 to 11 5 0	
9	11 5 0 to 11 15 0	
10	12 0 0 to 12 10 0	

Drawn Bright Steel Wire.

Nos. 1 to 6	11 5 0 to 11 15 0	
7	11 15 0 to 12 5 0	
8	12 0 0 to 12 10 0	
9	12 10 0 to 13 0 0	
10	13 10 0 to 14 0 0	

Galvanised Fencing Strand (B.B) 7 wires.

	£ s. d.	£ s. d.
No. 0	17 0 0 to	17 10 0
1	17 10 0 to	18 0 0
2	18 0 0 to	18 10 0
3	18 10 0 to	19 0 0
4	19 0 0 to	19 10 0
5	19 10 0 to	20 0 0
6	21 0 0 to	20 10 0
7	21 5 0 to	21 15 0
8	23 0 0 to	23 10 0
9	23 5 0 to	23 15 0

3 wires.

	£ s. d.	£ s. d.
No. 0	16 10 0 to	17 0 0
1	16 15 0 to	17 5 0
2	17 10 0 to	18 0 0
3	18 0 0 to	18 10 0
4	17 15 0 to	18 5 0
5	18 0 0 to	18 10 0
6	18 15 0 to	19 5 0
7	19 10 0 to	20 0 0
8	20 0 0 to	20 10 0
9	21 10 0 to	22 0 0

STEEL (at Works).

Siemens-Martin or Bessemer.

	£ s. d.	£ s. d.
Plates	10 10 0 to	11 10 0
Sheets	11 0 0 to	14 0 0
Bars	9 0 0 to	10 0 0
Angles	9 10 0 to	11 0 0
Tees	10 0 0 to	11 10 0
Spring Stl.	12 10 0 to	14 0 0
Cast Steel for Tools	40 0 0 to	60 0

GALVANISED IRON ROOFING SHEETS (at Liverpool).

CORRUGATED SHEETS 5, 6, 7, 8 feet long.

Gauges 16, 18, and 20, £13 0s. to £14 1os.

22 and 24 gauge, £14 10 to £15 10s

26 gauge, £17 10 to £18 10.

28 gauge, £19 0s. to £20 0s.

Sheets 8 to 9 feet long, 20. per ton extra.

Sheets 9 to 10 feet lon 40s. per ton extra.

Sheets 10 to 11 feet ong, 60s. per ton extra.

Sheets 11 to 12 feet long 80s per ton extra.

LONDON PRICE-LIST OF METALS, ORES, OILS, CHEMICALS, &c.

[FOR THE PRESENT AND PAST WEEK.]

Metal Market, City, Thursday Afternoon, 4 P.M.

(*November* 30, 1882.)

METALS AND ORES.

	Nov. 23. £ s.	£ s.	Nov. 30. £ s.	£ s.
COPPER (per ton)—				
Chili, for 96 per cent.	67 7/6	70 5/	66 0/	66 5/
Wallaroo	74 10/	75 0/	74 10/	75 0/
Burra Burra	74 10/	—	74 10/	—
English Tough	72 10/	74 0	72 10/	74 0/
English Ingot, best	74 10/	76 0/	74 10/	76 0/
Sheets sheathing and rod	82 0/	—	82 0/	—
Bottoms	86 0/	—	86 0/	—
Ore per unit	—	—	—	—
PHOSPHOR BRONZE				
Special Bearing Metal (p tn)	110 0/	—	110 0/	—
Other alloys (per ton)	27 0/	142 0/	127 0/	142 0/
TIN (per ton)—				
Straits (Cash)	93 10/	93 0/	97 10/	—
Do. for arr.	—	—	—	—
Billiton	—	—	—	—
Banca	—	—	—	—
English Ingots	104 0/	102 0/	103 0/	104 0/
Do. Bars	105 0/	103 0/	104 0/	105 0/
Do. Refined	106 0/	105 0/	106 0/	—
Australian	99 10/	99 0/	97 10/	—
TIN PLATES, per box, I.C. coke f.o.b. London	0 16/	0 17/	0 15 6	0 16 6
IX. do.	0 21/	0 22/	0 20 6	0 21 6
I.C. charcoal	0 19 6	0 22/	0 19 6	0 22/
I.X ,,	0 25/	0 27/	0 25/	0 27/
Red lead	15 6/	16 0/	15 0/	16 0/
White	21 10/	—	21 10/	—
Patent shot	17 0/	17 6	17 0/	17 6/
ZINC (per ton)—from No. 9 Gauge.				
Sheets, rolled	19 10	—	19 10/	—
Do., foreign	19 5/	—	19 5/	—
LEAD (per ton)—				
Soft English pig	14 5/	14 10	14 5/	14 10
Do. W.B.	—	—	—	—
Spanish soft	13 10/	—	13 10/	—
Do. with silver	—	—	—	—
SPELTER (per ton)—				
Silesian, com	17 5/	—	17 5/	—
Rhenish	—	—	—	—
English	—	—	—	—
QUICKSILVER, bot.	5 17 6	—	5 15/	—
ANTIMONY ore (per ton)—				
Australian	—	—	—	—
Spanish	—	—	—	—
French Star	5 0	55 0/	0/	55 0/
Regulus—				
Crude (per cwt.)	1 14/	—	1 14/	—
NICKEL (per lb.)	0 3/3	—	0 3/3	—
BRASS (per lb.)—				
Sheets, 48×24	0 0/8	—	0 0/8	—
Tubes	0 0/11	0 1/	0 0/11	0 1/
Wire	0 0/8½	—	0 0/8½	—
Yellow metal	0 0/6¾	0 0/7	0 0/6¾	0 0/7
ASBESTOS (per lb.)	0 0/3	0 0/6	0 0/3	0 0/6
PLUMBAGO (per cwt.)—				
Ceylon lump	0 16 6	1 2/	0 16 6	1 2/
Do. chip	0 10/	0 14/	0 10/	0 14/
Do. dust	0 10/	0 12/	0 10/	0 12/
COALS (per ton)—				
East Hartlepool	1 2/	—	1 2/	—
Wambton	1 4/	—	1 4/	—
Tees	1 4/	—	1 4/	—
Hartley	1 2/	—	1 2/	—
Hetton	1 4/	—	1 4/	—
Hawthorn	1 3/	—	1 3/	—
Tunstall	1 2/	—	1 2/	—

OILS, CHEMICALS, &c.

	Nov. 23. £ s.	£ s.	Nov. 30. £ s.	£ s.
OILS (per ton)—				
Olive, Galloli	—	—	—	—
Do. Gioja	—	—	—	—
Do. Levant	36 0/	36 10/	36 0/	36 10/
Do. Seville	—	—	—	—
Do. Corfu	—	—	—	—
Seal, pale	35 0/	36 0/	35 0/	36 0/
Sperm head	70 0/	72 0/	70 0/	71 0/
Cod	38 0/	39 0/	38 10/	39 0/
E.I. Fish	—	—	—	—
Rape, English, brown	31 10/	32 0/	31 10/	32 0/
Do. refined	—	—	—	—
Foreign Refined	—	—	—	—
Ground nut and Gingelly Madr.	—	—	—	—
Palm oil, fine	37 10/	39 0/	37 10/	39 0/
Palm nut oil	—	—	—	—
Linseed oil	21 10/	22 0/	21 0/	21 10/
Cottonseed (per ton), Crude	26 10/	23 0/	26 10/	21 0/
Refined	28 0/	29 0/	26 0/	27 0/
Hull	25 15/	—	25 15/	—
Lard, English	70 0/	67 0/	70 0/	66 0/
Cocoanut, Cochin	36 0/	37 0/	36 0/	37 0/
Do. Ceylon pipes	31 0/	31 5/	31 0/	31 5/
Sydney	—	—	—	—
OIL CAKE (per ton)—				
Linseed, Lndn.	7 15/	8 0/	7 15/	8 0/
American barrels	8 12 6	7 15/	8 12/6	7 15/
Do. bags	—	—	—	—
Marseilles	8 5/	—	8 5/	—
Rapeseed	5 10/	6 0/	5 10/	6 0/
Cottonseed	5 10/	5 12/6	5 10/	5 12/6
TALLOW—PYC. old (per cwt.)	51 0/	52 0/	51 0/	52 0/
S.American. Beef	—	—	—	—
N. American ,,	—	—	—	—
Australian Beef (fine) (per cwt)	0 41/	0 42/	0 41/	0 42/
Do. Sheep ,, (per ton)	0 44/	0 45 6	0 45/	0 46/
PETROLEUM OIL—(per gal.)	0/7½	0 0 7½	0/7	0/7½
Refined coal oil	—	—	—	—
Naphtha	0 0/7	0 0 8	0 0/7	0 0/8
TURPENTINE—(per cwt.)				
French Spirits	—	—	—	—
American do.	—	—	—	—
WHALEFINS (per. ton)—				
Davis' Straits	900/	1000/	900/	1000/
Arctic	900/	1000/	900/	1000/
BRIMSTONE (per ton)—				
Rough 3rds	6 15/	—	6 15/	—
Roll	9 5/	9 10/	9 5/	9 10/
Flour	10 15	12 10/	10 15/	12 10/
ACID, (per lb.)				
Acetic	0 18/	0 26/	0 18	0 26/
Second quality (per gal.)	—	—	—	—
Citric (per lb.)	—	1/10	—	1/10½
Muriatic (sp. salts per cwt.)	0 4/6	0 7 6	0 4/	7/
Nordhausen 50 per cent.	0 45/	0 50/	0 45/	0 50/
Nitros	0 0/2½	0 0/4½	0 0/2½	0 0/4½
Oxalic (per lb.)	0 /6	—	0 /6	—
Do. Brown	0 0/0½	0 0/1	0 0/0½	0 0 1
Tartaric Crystal	0 1/8½	0 1/7½	0 1/8½	0 1/8
Do. Powdered	—	—	—	—
AMMONIA—				
Carbonate, per lb	0 0/6¼	0 0/6¾	0 0/6¼	0 0/6¾
Sulphate, Best White (per ton)	20 0/	20 5/	20 0/	21 0/
ARSENIC—White Lump (per cwt.)	0 24/	0 25/	0 21/	0 25/
Powdered do	0 10 5	0 10/3	0 12/6	0 10/3

RATES OF FREIGHT.

THE current rates for coal and iron are :—

	Newport, Newcastle Cardiff, or Sunderland, Swansea. s. d.	s. d.	Newport Newcastle Cardiff or Sunderland, Swansea. s. d.	s. d.
Alexandria	11 9	13 9	Messina	10 9	11 6
Alicante	12 0	13 9	Montevideo	—	21 0
Ancona	—	13 0	Montreal	—	—
Aden	—	18 0	Muscat	—	—
Athens	—	11 0	New York	—	9 0
Batoum	—	13 6	New Orleans	—	11 0
Bombay	18 6	18 9	Naples	—	—
Bahia	18 6	18 6	Odessa	9 3	10 6
Barbadoes	—	15 0	Oporto	—	10 6
Barcelona	—	10 0	Penang	—	19 0
Brindisi	—	11 3	Pernambuco	—	17 6
Buenos Ayres	—	24 0	Palermo	11 6	12 6
Bermuda	—	12 0	Panama	—	22 6
Bussorah	—	—	Para	18 0	18 0
Cadiz	—	10 0	Padang	—	—
Cagliari	—	12 6	Port-au-Prince	—	18 0
Calcutta	—	14 0	Porto Rico	11 0	11 0
Callao	—	—	Port Said	11 0	13 0
Cape Good Hope	21 0	—	Reunion	—	—
Cape de Verds	—	—	Rio Grande do Sul	—	47 6
Carthagena	—	11 6	Rio Janeiro	—	22 6
Cardenas	—	14 6	Rosario	—	32 6
Cienfuegos	—	11 0	Seychelles	—	—
Coconada	—	—	Singapore	18 6	19 6
Civita Vecchia	12 0	12 3	Saigon	—	—
Colombo	—	20 0	Shanghae	—	—
Constantinople	10 0	11 6	San Sebastian	—	—
Corfu	—	11 0	San Francisco	18 0	18 0
Demerara	—	19 0	St. Catherine's	—	26 0
Fayal	—	14 0	St. Paul de Loando	—	27 0
Fiume	—	—	St. Thomas	—	11 0
Galle	—	18 0	St. Jago de Cuba	—	—
Genoa	10 0	12 0	St. Lucia	—	12 0
Gibraltar	—	0 0	Santos	21 0	24 0
Galatz	—	13 6	Savona	—	11 6
Havana	—	11 0	Seville	—	11 3
Hong Kong	—	22 6	Smyrna	—	13 0
Hiogo	—	—	Spezzia	—	13 0
Iquique	21 0	21 0	Syra	—	10 9
Jamaica	—	11 0	Sierra Leone	—	16 0
Java	20 0	20 0	Sebastopol	—	11 6
Kertch	—	—	Taganrog	—	—
Kurrachee	—	20 0	Tarragona	—	14 6
Lisbon	8 9	9 0	Teneriffe	—	14 6
Leghorn	11 0	11 6	Tientsin	—	—
Madras	—	—	Trieste	13 0	11 6
Madeira	—	11 0	Trincomalee	—	—
Malaga	12 0	11 6	Trinidad	—	15 0
Malta	—	10 3	Valencia	12 0	12 0
Maranham	—	17 0	Valparaiso	22 6	22 0
Martinique	—	—	Venice	14 0	14 6
Mauritius	—	21 0	Yokohama	—	—
Marseilles	12 3	14tcs.	Zanzibar	—	—

PRICES CURRENT OF MANUFACTURED GOODS OF BIRMINGHAM AND DISTRICT.

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The quotations given are manufacturers' average prices, dependent, of course, on terms of payment as well as the quality and quantity of goods ordered, and fluctuations in cost of raw material.

The Prices and Discounts quoted are carefully revised every week, and great pains are taken to render this List thoroughly reliable.

November 29.

There are no alterations to quote at present, prices of iron and metals and the state of trade generally in this district remaining much the same. Australian orders for various hardwares are being placed more freely, but other markets abroad are not so good. The home trade is quieter excepting in certain cases where the manufacturers are pressed to finish up orders before the Christmas holidays commence.

ABRIDGED LIST.

AMERICAN WIRE HOBS, 1 lb., 42/5; 1½ lb., 36/6; 2 lb., 3/6; 2½ lb., 31/6; 3 lb., 30/6 per cwt.

ANCHORS, common, 1 to 10 cwt. 14/ per cwt.

ANVILS (Common), 17/3 per cwt.; Best anvils, not warranted 20/6 per cwt.; Best warranted anvils (bicks tied in 1 to 5 cwt.), 22/ per cwt.

AUGERS (shell), ½ inch to 2 inch, 11/ to 44/ per doz., less 57½; (screw), ½ inch to 2 inch, 16/ to 64/ per doz., less 50.

AXES, ship carpenters', /4½ to /5½ per lb.; Kent and house carpenters' ditto, /4 to /5; ditto, steel polished, 5 to 6, felling axes, /4½ to /4½; bright and blued, solid steel, /7 to /8. American felling or wedge axes, steel, polished, /11 per lb.

AXLE PULLEYS, iron, 8/ to 26/6, 1¼ inch; Brass face ditto 26/6 to 46/6, 1¼ inch.

AXLES, 35 to 45%

BASINS.—Bright tinned, shallow, 8 inch, 2/6; 9 inch, 2/9; 10 inch, 3/4; 11 inch, 4/; 12 inch, 4/6; 13 inch, 5/; 14 inch, 6/; 16 inch, 8/9 per doz.; galvanised ditto, 8 inch, 2/3; 9 inch, 2/6; 10 inch, 3/; 11 inch, 3.9; 12 inch, 4/3; 13 inch, 4/9; 14 inch, 5/9; 16 inch, 7/9 per doz.

BASTARD BELLOWS, 52½ %; best extra nailed bastard bellows, 47½%; best improved long Bristol, 42½%; common smiths' bellows, 62½%; best warranted extra double nailed, 45 to 50%; ditto, with movable pipe for shipment, 52½%.

BELLS.—House brass, rough, /8 to /10 per lb.; turned edge, 8/ to /10 per lb.; turned and lacquered on edge, 1/5 to 1/10 per lb.; cattle and sheep bells, with brass loops, 1/1 to 1/3 per lb.; clock bells, 1/6 to 1/6 per lb.

BELL STAPLES (fine tinned) ⅜ inch, /11; ½, /13; ⅝, /21; ¾, 3/; ⅞, 2./5; 1", /6 per gross.

BED SCREWS, London, black heads, 6, and 7-16, and ½ inch, 8/6 to 10/6 per gross; London heads, with bright turned collar, 6 and 7-16, and ½ inch nuts, 11-9 to 12/9; black welded heads, 8/3 to 9/3; common slit heads, 6, and ½, and ⅝ inch, 8/9 to 9/6; bright turned notched heads, 6, and 7-16, and ½ inch, 12.3 to 13 3; black notched heads, 10/ to 11/ per gross. Bedsteads, cheap stump, 6 feet by 3 feet 6 inches, 7/6 to 9/6 each; cheap French, 6 feet by 3 feet 6 inches, 8/6 to 10/6 each, rising 6 for every 6 inches.

BOLTS.—Solid end tower, 72½ to 75%; ditto, solid end Barrel, 67½ to 70%; best solid tower bolts, 75%; japanned Scotch tower bolts, 55%. Bolts and nuts, black, ¼, and 5-16 to 2 inch and under, 5/6 and 4/1, ⅝ 5/6, 7-16 6/7 per gross, ½ and 9-16 23/, ⅝ and 11-16 21/, ¾ to 1 inch 20/ per cwt.; 1¼ to 1½ inch, ¼, 4/, 5-16 26/, ⅝ 6 6, 7-16 7/10 per gross, ½ and 9-16 24/, ⅝ and 11-16 19/, ¾ to 1¼ 18/ per cwt. Square heads, round necks, square nuts, bright engineers hexagon heads ¼ to 1 inch, ¼ 22/, 5-16 24/, ⅜ 27/ 7-16 31/ ½ 45/ 9-16 51/ ⅝ 67/ ¾ 69/ ⅞ 126 each 18/ per gross. Bright engineers hexagon nuts, ¼ 10/, ⅜ 12/ ½ 14/, 26/, ⅝ ¾ 25/, 1 inch 36/ per gross. Black nuts, square, blank, ⅜ inch 16/6, ½ 14/6, 1 inch 14/6, 1¼ inch 16/6 per cwt. delivered.

BRASS HEAD NAILS, 57½ to 65%; star head, 50%; brass plated countersunk head, 30 to 35%; blacksmith's tongs, 23/ per cwt.; real fine wrought box irons, 20 to 25%; fine cast, 60%; middle cast, 50, to 60; Victoria charcoal box irons, 45 to 50%; ordinary charcoal ditto, 60 to 65%; brushes, painters', 50 to 75%; best ditto, 15 to 50%; brass rolled, 2 to 12 inches wide to 30 W.G., /73 per lb. Brass sheets, 24 and 26 inch, 8 lb. and upwards, or 27 W.G., /85 per lb.; ship and turret bells, 1/4 per lb. Battery kettles, 125/ per cwt.; brass jelly pans, with bails, /01 to /05; without bails, /10½ to /10½; Muslin kettles, cast, 4 to 10 inch, /0 to /03 per lb. Brass shoe bills, /9 per lb.; brass scale pans, 1/6; brass toddy kettles, 15 to 20%.

BRASS CORNICE POLE RINGS, light, middle and strong, 45%.

BRASS WIRE, /8 per lb. up to No. 20 W. G.; back bands, 1 lb. and larger, 20/9 per cwt.; ditto, smaller, 2/ per cwt. extra; double swivel ditto, 1/ per cwt. extra.

CART TRACES, 9 to 12 links to foot, 16/9 to 10/3 per cwt.

CHAIN, machine made, Wire, single link, "Iron," 55%; double link ditto, 55%; machine-made Wire Chain, single link, "Brass," 55%; registered ditto, 55%; close link brass chain, 50%; oval link brass chain, 55%; brass clock chain, 55%; short link tested (rigging) chain, 3-16 inch, 19/9; ¼, 17/; 5-16, 15/3; ⅜, 15/; 7-16, 13/6; ½, 12/9; ⅝, 12/; ¾, 11/6; 1 inch, 11/ per cwt.; well chain, twisted or straight link, ¼ inch, 25/3; 3-16, 18/; ⅜, 16/; 5-16, 14/9 per cwt. delivered.

CHAIR NAILS (brass), lacquered or gold colour, No. 1 to 12, 6/ to 7/6 per 1000; machine polished, 1/9 to 2/3 per 1000; lacquered or gold coloured, 2/ to 1/2½ per lb.; discount per 1000, 57½% per lb., 5% delivered.

CHIPPING CHISELS, solid cast steel, /6 per lb.

COACH BOLTS AND NUTS, round or cheese heads, square necks and nuts, black, 3 inch by ¼, 4/1; ⅜, 4/5; ½, 5/1; ⅝, 5/7; ¾ inch, 6/1 per gross. Bright, 3 inch by ¼, 4/9; ⅜, 5/3; ½, 6/1; ⅝ inch 6/9 per gross. Black, 3 inch by 5-16, 4/9; ⅜, 5/3; ½, 5/9; ⅝, 6/3; ¾ inch, 6/9 per gross. Bright, 3 inch by 5-16, 5/6; ⅜, 6/; ½, 6/6; ⅝, 7/; ¾ inch, 7/6 per gross delivered.

COACH SCREWS.—Patent bright pointed, 2 inch and under, ¼ inch, 3/1; 5-16, 3/6; ⅜, 4.6; 7-16, 5/4 per gross; ½ inch, 26/; ⅝ inch, 23/; ¾, 22 per cwt.; 4½ to 6 inches long, ⅜ inch, 26/6; 7-16, 25/; ½, 21/; ⅝, 19/; ¾, 18/ per cwt.; above 6 inch, ⅜ inch, 25/6; 7-16, 24/; ½, 20/; ⅝, 18/; ¾, 17/ per cwt.; 1/ per cwt. extra for hexagon heads, delivered.

COACH SPRINGS, 40%.

COCKS.—Brass range cocks, ½ inch, 30/; ⅝, 42/; ¾, 53/6; 1, 64/; inch 75/ per doz., less 30% discount; brass racking cocks, fast key, 1¼ inch, 11/; 5-16, 13/; ⅜, 15/; 7-16, 18/; ½, 23/; 9-16, 34/; ⅝, 38/; ¾ 45/; 1 inch, 59/; 1¼ inch, 66/ per doz.; loose key, 1/ to 28/ per doz. extra discount, 60%.

COFFIN FURNITURE, registered, 50%; ditto, common, 75%.

COPPER BOAT NAILS, ¾ inch to 2 inches and above, 1/8 to /11½ per lb.; copper boat roves, ¾ to 1 inch and above, 1/6 to 1/ per lb.; cut copper nails and tacks, ½ inch to 1 inch and above, 1/ to /10 per lb.

COPPER WIRE, /10 per lb. up to No. 20, W. G

COMPOSITION Sheathing and Slating Nails, ¾ inch, /8½ per lb. Copper brads and bills, /10 per lb.; round copper kettles, bare rivets, 1/ to 1/9 per lb.; light round covered rivets, 1/6 to 1/7 per lb.; loaded 1/5 to 1/6; oval copper kettles, bare rivets, 1/10 to 1/11 per lb.; oval bare rivets, raise down, 1/11 to 2/1 per lb. Copper slating nails (cut), 1 to 1½ inch and upwards, /10½ to /11½ per lb.; copper scale pans, 1/9 to 1/10 per lb. Copper nails and tacks (wrought), ¼ inch, 1/2 per lb. Chair webbing, No. 0, 4/5; 1, 4/; 2, 4/; 3, 3/6; 4, 3/; Cocoa, 4/6 per gross of 66 yards. Carpet rings, 1/ to 1/4 per gross. Cornice poles, 2 inch, brass, best burnished, 4/6 per foot, less 45%; 1 covered brass poles, 1/2 per foot, less 45%; 2½ inch real birch cornice poles, polished, self or mahogany colour, with ends and rings complete, /8 per foot; 2½ inch real mahogany cornice poles, with ends and rings complete, 1/7 per foot; 2½ inch birch rings, polished, self or mahogany colour, 10/ per gross; 2½ inch real mahogany rings, 28/ per gross net; japanned pillar chains, 1 yard, 10 by 6, 5/8 to 6/6 per doz. Japanned manger chains, 1½ yard, 15 by 6, 7/3 to 8/6; japanned rack, 1 yard, 18 by 6, 5/ to 6/; japanned dog, 1½ yard, 18 by 7, 5/6 to 6/6; 2 yards, 14 by 6, 10/ to 11/. Cowties, 6/6 to 8/6; open ring, 6/6 to 8/6; close ring, 5/6 to 6/6 per doz.; japanned watering chains, 14 by 6, 4/ to 5/; tinned ditto, 4/6 to 5/6; bullock chains, inch hook at each end, 14/6 to 15/6; chest handles, improved japanned, 82½%; broad plate, strong and extra strong, 15 to 65%. Curtain rings (brass), 45 to 50%; square box coffee mills, 30 to 60%; common post coffee mills, 30 to 40%; best brass bushed mills 40 to 45%; London mills, 40 to 45%.

CUT NAILS.—Clasp, rose, and clout, 3 to 9 inch, 0/3; 2½ and 2¾ inch, 0/0; 2 and 2½ inch, 10/3; 1¾ inch, 10/9; 1½ inch, 11/3; 1¼ inch, 12/3; 1 inch, 14/3; ¾ inch, 16/6 per cwt.

DISH COVERS, blue japanned wire, 3/1 to 5/6 per set of 6.

DOOR SPRINGS, X, 85%; XX, 77½; XXX, 72½; XXXX, 65%; brass circular and iron circular, 55 to 65%; brass reliance, 10 to 20%; climax, 50%; universal, 55 to 60%; paragon, 20%; O'Connor's patent lever hinge springs, 10 to 20%. O'Connor's vertical spring hinge door spring, 15 to 25%; Gerish's spring hinges, iron, 20 to 25%; brass 10 to 20%.

FILES, 55% the list.

FLOOR BRADS.—2 inch, 9/9; 2½ inch, 7/6; 2½ inch, 9/6; **FRY PANS**, 7½ inch to 17 inch, oval, bright, 12/ to 55/ per doz.; tinned, 14 to 50/ per doz.; fry pans, 5½ inch to 10 inch round bright, 10/ to 30/ per doz.; tinned, 11/6 to 20/ per doz.; fry pans, 10½ inch to 15 inch round, bright, 30/ to 60/ per doz.; tinned, 33/ to 64/ per doz., all fry pans 72½ and 5% delivered. Fire-irons, kitchen, in sets, 5/3 to 7/ per lb.; tongs, /5½ to /6; pokers, /4½ and /5; fishhooks, best, 40 to 45%; common, 60 to 65%; light kitchen fenders, 5 inch, assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 28/ to 36/ per doz.; bright fronts, 31/6 to 34/. Manchester pattern kitchen fenders, 3 feet, 1 inch top, black front, 2 feet 9 inch to 3 feet 3 inch, 32/6 to 42/ per doz. 4 feet 3 inch to 5 feet 6 inch, 49/6 to 67/6 per doz.

GALVANISED BUCKETS, 10 inch, 38 lb. to the doz., 6/; 11 inch, 6/6; 12 inch, 7/6; 13 inch, 8/6; 14 inch, 10/; 16 inch, 42 lb., 9/; 17 inch, 7/; 18 inch, 8/; 19 inch, 9/; 20 inch, 10/6.

GALVANISED WASHING TUBS, oval, 22 to 28 inch, 36 to 72 lb. per doz., 4d. per lb; 24 to 30 inch, 84 to 156 lb. per doz., 3½d. per lb. delivered.

GALVANISED WIRE NETTING, 2½ inch mesh and larger, 7½; 1½ inch mesh and smaller, 72½, delivered.

GIMP PINS.—Best black iron wire, ¾ by 18, ½ by 18, ⅜ by 18, all /34 per lb.; 19 gauge, ¾ per lb. extra; coloured, /1 extra; best bright iron panel pins in 1 lb. packets, ½, ¾, and ⅞ by 17 inch, ⅞ by 1 and 1¼ by 16 inch, /34; 1½ by 15 inch, /3 per lb.; tinned, /12 per lb. extra; brass panel pins, /03 per lb., all sizes; copper ditto, 1/1 per lb. all sizes; brass escutcheon pins, ½ by 16, ⅝ by 15, ¾ by 15, ⅞ by 14, 1 by 14, 1¼ by 13 inch, /03 per lb.; brass gimp pins, 19 gauge, 1/ per lb.; ditto, 18 gauge, /12½ per lb.

GRID IRONS, London pattern, fluted, 70%; light ditto, 77½; hanging round bar, 60%; doublet, 45%; round bar, /4 per bar, 67½; best fluted bar, 67½%; flat bar, 67½%; common flat bar, 67½%; common gridirons, /1 1/2 and /2 per bar less, 65 to 75%; gimblets, 50%.

HAMMERS.—Cast steel stone breaking and quarry, per cwt.; solid cast steel engineers' hand, 1½ lb. each and above, /8 per lb.; solid cast steel boiler makers' hand hammers, 1¼ lb. each and above, /84 per lb.; iron and steel boiler makers' sledge hammers, 6 lb. and above, 17/ per cwt.; iron and steel sledge hammers, 6 lb. and above, 18/6 per cwt.; solid cast steel sledge, 28/ per cwt.; platelayers' keying, 28/ per cwt.; holdfasts, japanned, 18/ to 20/ per cwt.; common Kent hand hammers, 55%; patent hasps and staples, 20 to 25%.

HINGES.—Patent, edge butts, 60 to 70%; patent Scotch butts, 55 to 60%; broad and narrow same discounts; patent table, bed, and back-flap hinges, 57½%; patent chest hinges, 55%; patent strap hinges, 55%; H hinges, 55%; HL hinges, 55%; japanned and Garnett hinges, double washered, light and strong, 40%; best best, London or Lancashire patent tees, 67½%; patent light japanned Scoth tees, 67½%; light patent hook hinges on plate and to drive, 30 to 35%; weighty Gothic, 20/ to 24/; scolloped edges, not japanned, 22/ to 24/; Scotch japanned tees, double washered, 20/ to 23/; Gothic Scotch japanned tees, 19/ to 22/; Gothic Scotch tees, self colour, 17/ to 21/; light "patent" broad Butts, polished joint, No. 200, 50%; ditto, No. 563, 35%; box hinges, 40%; light Parliament hinges, best strong 45%; best best ditto, 35% off list. Wrought hinges, common, 55%; best, 52½%; best best, 50% off list. Heavy wrought hinges, common black, 13/6 per cwt.; ditto, common bright, 18/ per cwt.; filed edges, 17/6; japanned Gothic fancy, 15/6 to 18/; common bright, broad eye, 17/ to 18/; japanned, broad eye, fancy, 18/6; best bright, 21/ to 23/; best broad eye, 21/ to 23/ per cwt.; cast hinges, polished joint, light patent tariff butts, 200, 50%; 133, 42½%; 504, 35%; pressed hinges, common, 65 to 70%; best, 57½ to 62½%; common brass butt hinges, 1½ inch, 14/ per gross pairs net; very light, 8/6.

HOLLOWWARE.—Best, 45%; common, 55 and 50%; enamelled ditto, best, 30%; common, 35%.

HORSESHOES.—Fullered fore, 16/ to 18; fullered hind, 17/ to 19/; stamped fore, 16/6 to 18/6; hind, 17.6 to 19/6.

IRONFOUNDRY, GENERAL.—Ash grates, 7/9 to 9/ per cwt., air bricks, 2/9 to 3/6; half-single, 3/3 to 3/6; double, 5/6 to 6/ bars and bearers, 7/3 to 8/3; barrow wheels, 8/; bake pans, 8/6 to 9/6; camp ovens, 9/; cooking stoves, 9/ to 10/; cellar grating, 8/6; clock weights, 7/6; Dutch stoves, 8/6 to 10/; dumb bells, common, 7/ to 9/; best best japanned, 15 to 17/6; furnaces up to 50 gallons, /3½ to /4; galvanised ditto, /7 to /9 per gallon; furnace doors, 9/6 to 12/; furnace grates, 8/6; heaters for box irons, 6/6 to 7/6; heaters for urns, 8/6 to 9/6; oven doors and frames, 8/6 to 10/6; three legged pots, Danish and plumbers' 9/; plumb bobs, 10/6; pudding pans, 10/6 to 11/6; pump spous, 10/6 to 13/; sash weights, 4/6; ditto, with pulleys, 7/ to 8/6; shoe anvils, 8/6; Italian irons, 50%.

MELTING LADLES, 2 inch to 8 inch, 2/ to 16/ per doz., less 15%; Pitch Ladles, 3 inch to 6 inch, 3/6 to 12/ per doz., less 10%.

NAILS.—Patent forged nails, "Iron or Steel." Strong rose flat points), 1 inch, 4 lb., 45/6; 1½ inch, 6 lb., 38/; 1½ inch, 7 lb., 36/; 1⅝ inch, 8 lb., 34/6; 2 inch, 10 lb., 32/6; 2½ inch, 12 lb., 31/; 2½ inch, 17 lb., 28/6; 2¾ inch, 20 lb., 28/; 3 inch, 23 lb., 27/9 per cwt. Fine Rose (flat points), 1 inch, 2½ lb., 72/6; 1½ inch, 3½ lb., 58/6; 1½ inch 4 lb., 54/6; 1¾ inch, 5 lb., 48/6; 2 inch, 7 lb., 43/6; 2¼ inch, 8 lb 41/6; 2½ inch, 10 lb., 37/9; 2¾ inch, 14 lb., 34/; 3 inch, 17 lb., 32/ per cwt. Coopers' rose (sharp points), 1½ inch, 7 lb. per m., 2/4; 1¾ inch, 8 lb., 2/7; 2 inch, 10 lb., 3/; 2¼ inch, 12 lb., 3/5; 2½ inch, 17 lb., 4/5½; 2¾ inch, 20 lb., 5/2; 3 inch, 23 lb., 5/11 per m. Fine Clasp (sharp points), 1½ inch, 4 lb. per m., 2/1; 1¾ inch, 5 lb., 2/4½ 2 inch 7 lb., 2/10; 2¼ inch, 8 lb., 3/03; 2½ inch, 10 lb., 3/8½; 3 inch, 14 lb., 4/4½ per m. Best Canada (sharp pointed), 1½ inch, 4 lb. per m., 2/ 2 inch, 7 lb., 2/9; 2½ inch, 8 lb., 3/03; 2¾ inch, 12½ lb., 4/03; 3 inch 14 lb., 4/4½ per m. Pound Nails, 6dy, 2¼ inch, 28/6; 8dy, 2½ inch, 27/; 10dy, 3½ inch, 23/6; 20dy, 4 inch, 23/ per cwt., discounts 50½% off iron, 45½% off steel. Nails, cast lath, 9 per cwt.; wall nails, cast, 8/6 per cwt.; cast headed bills, ⅜ by 8 oz., 12/ to 14/; fine round cast bills, ⅜ inch, 11/ to 15/; strong round ditto, ⅜ inch, 12/6 to 14/; cast slate pegs, 10/ to 12/; black coffin nails, 53 to 60%; white ditto 45 to 55%; black coffin bullens, 50 to 55%; white ditto, 40 to 45%.

PICKS, iron and steel excavators, /3 to /5 per lb.

RAILWAY BEATER PICKS, /3 to /5 per lb. delivered in London or Liverpool. Rakes, light garden, 50 to 60%; light solid end rakes, 47½ to 52½%; bolstered teeth garden rakes, 50%; solid end, bolstered teeth garden rakes, 40 to 45%.

RIDDLES, common, ½ inch by 18, 21/ per doz.; do foundry or gravel, ½ by 18, 27/ per doz., less 55%.

RIVETS.—Copper hose, ⅜ by 8 and above, at /11 per lb.

RIVETS, Machine-made Wire, No. 6, 18/1 per wt.; iron boat rivets, 24/ to 25/ per cwt.; brass ditto, /9½ per lb. Ship, tank and girder Rivets, ¾ inch, 17/; ⅝, 13/6; 7-16, 13/; ½ inch, 12/6 per cwt.; Best Boiler Rivets, 1/ per cwt. extra. Ship scrapers, black stee blades, 50 to 55%; bright, 47½ to 52½%; cast steel black, 47½ to 52½%; bright, 42½ to 47½%; best cast steel black, 40 to 45%; bright, 30 to 40 p.c.; sash chain, copper, 55 p.c.; zinc, 55 p.c.; iron prepared ditto, 50 p.c.

SAD IRONS, common, 7.6 to 8/ per cwt., delivered; best japanned, 12/6 to 13/6 per cwt.; best best opanned, 15/6 to 18/6 per cwt

SCALES, copper, 72½ to 75½%.

SCREWS, iron wood screws, 70% brass ditto, 60%; copper wood screws, 35%; stove ditto, 65%; do wel ditto, 70%; brass headlock screws, 40%.

SHOVELS, common iron, round back, dust, 4 inch to 8 inch, 1/9 to 6/ per doz., less 25%; socket handles, 1/ per doz. extra; Bell mouth Shovels, 7 inch to 10 inch, 2/ to 4/ per doz., net; ditto, japanned, with wood handles, 3/4 to 5/6 per doz. net. Shovels, all steel, crutch handles, No. 2, 17 No. 3, 18/3; No. 4, 19/9 per doz.; No. 5, 20/9. per doz.; eye-handles; 1/ per doz. extra; riveted ditto, 2/ per doz extra; Spades and bovels, common, 62½%; second, 52½%; best, 42½% discount off the list

SPLIT COTTERS, 60% off list. American Wire Tacks, 70% off list.—**W. Gorse and Son**, Icknield Square, Birmingham.

SPOKES.—Steel bicycle and perambulator, tinned, cut to lengths, and headed, No. 6. 20/9; 7, 30/3; 8, 30/6; 9, 31/; 10, 31/6; 11, 32/ 12, 32/9 per cwt. Bright, 9/ per cwt. less.

STAIR RODS, turned ends, 85%; ditto, solid fancy ends, 85%.

STAPLES, Wire fencing, 1½ to 2 inch, No. 6, W.G., 12/3; No.

STEEL TOYS, 10 to 30% off the list.

STEELYARDS, 65%.

TACKS, fine cut, in 1 and 7 lb. parcels, ¼ inch, 20/6; ⅜ inch 28/ 6; ½ inch, 19/9; ⅝ inch, 18/3; ¾ inch, 17/6; ⅞ inch, 15/9; 1 inch 16/9 per cwt., tinned, 8/ per cwt. extra; in ½ cwt. bags, 1/ per cwt, less.

TIP NAILS, in 1 and 5 lb. parcels, ⅜ inch, 17/9; ½ inch, 16/3; 1 inch, 15/3; 1¼ inch, 14/3; 1½ inch, 13/3; best iron, 2/; charcoal, per cwt. extra. Tinplates, best charcoal I.C., 22/ per box; 2nd quality ditto, 21/ per box; best coke 19/; coke, 18/ per box.

TRAPS, bow spring, sham Dorset and real Dorset rabbit traps, 45 to 65%, list prices; common traps, 4 inch, 5/6 to 8/ per doz. net rat traps, 2½ inch, 4/ to 8/6 per doz.; bird traps, 3/9 to 4/ per doz. wolf and other double flat spring, common bridge, 1/; axle bridge 1/4 per lb., 40 to 45%; hawk or pole traps, 50 to 60%; wrought mole traps japanned, 2/6 to 3/9; galvanised, 3/6 to 4/9.

TUBES, iron gas, 70%; fittings, 75%; galvanised iron gas tubes, 55% fittings 60%; lap welded boiler tubes, 50%, delivered: bell tube, nine 33 to 35/ per cwt.; patent cased tube, 57½ to 62½%, cut to lengths if required; polished and lacquered twisted brass tube, 40%; patent cased taper iron tube, 40 to 45%; patent taper iron tube, 40 to 45%; parallel iron brased tube, 40 to 45%; twisted iron parallel tube, 40%; patent cased parallel tube, 40%; Brass Tubes, plain, rough, ⅜ inch and above, /9½; other shapes /10½ to /11½ per lb. Bell cop per tube, ⅜ inch and upwards, 1/0 to 1/1 per lb.; brass ditto, 1/2 to 1/4; locomotive and marine boiler tubes, seamless, 1½ to 3½ outside diameter, to 14 W.G., 1/0 per lb.

VICES, best warranted, "Black" staple, solid box, 26/6 per cwt. Best warranted, "Bright" staple, solid box vices, 28/6 to 30/6 per cwt.; vice boxes and pins, 67/ per cwt.

WASHERS.—Light iron, 77½%; heavy washers, 13 to 16 W.G 12/ per cwt.

WIRE.—Iron, bright, 0 to 6, 10/3; 7, 10/9; 8, 11/ 9, 11/3; 10/, 12/; 11, 12/6; 12, 13/3; 13, 13/9; 14, 14/3; 15, 15/; 16, 15/9 17, 16/3; 18, 17/2; 19, 18/3 per cwt.; galvanised, 0 to 6, 3/0 per cwt. extra; best annealed drawn fence wire, oiled, 0 to 6, £9 10/; 7, £10 1s; 8, £10 5 9, £10 15/ per ton; galvanised, 0 to 6, £12 15/; 7, £13 5/; 8, £13 15/ 9, £14 5/ per ton. Steel fence wire, round or oval, £2 per ton extra Black rolled fence wire, 4 or 5, £7 5/ per ton. Tinned bottling wire, No. 22, 31/6; 23, 33/6; 24, 35/6 per cwt., cut in lengths and made up in 7 lb. parcels. Fine galvanised iron wire, No. 23, 4/3 per stone of 14 lb.; cast steel wire, /5 per lb.; charcoal iron wire, 4/ per cwt. extra; tinned ditto, 9/ per cwt. extra, delivered in London; 5/ per ton less in Liverpool.

WROUGHT, boat, countersunk clout and cone head Nails 1 inch, 20/9; 1½ inch, 25/3; 2 inch, 22/6; 2½ inch, 20/3 per cwt.; Best fine Swedish iron countersunk horse nails, stamped, 6 lb. per m., 53/ per cwt.; 8 lb. per m. 49/; 10 lb. per m. 45/9 per cwt.; 12 lb. per m, 43/6 per cwt., or subject to 45% Derby list. Wrought rose and dock head spikes, 4 inch, 12/9; 5 inch, 11/6; 6 inch, 10/9; 7 inch, 10/3 per cwt.; galvanised, 4 9 per cwt. extra; Wrought rose nails and or sharp points, 2 inch, 22/3; 2¼, 21/3; 2½, 19/6; 3, 18/ per cwt. Wrought nails, May 1826 list, 40 to 45% wrought Bromsgrove nails March 1878 list, 30 to 35 p.c.

Smithfield Show, 1882, Dec. 4 to 8, Stand No. 210, Berner's Gallery.

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INVENTORS AND SOLE PROPRIETORS OF THE "ORIGINAL"

STOCK-BREEDERS' MEDICINE CHESTS,

For all Disorders in Horses, Cattle, Calves, Sheep and Lambs; and Inventors of the First Animal Medicines ever known as "DAY'S."

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Which contain every Essential to Give Health to Weakly, Sickly, and Prostrate Animals, to cure the ever-dreaded Diarrhœa in Sheep and Lambs, the most unhealing Wounds and Sores, the worst forms of Colic and Gripe Pains in Horses and Cattle, and, lastly—though not least—that fearful malady, the Husk or Hoose in Lambs, Heifers, and Calves.

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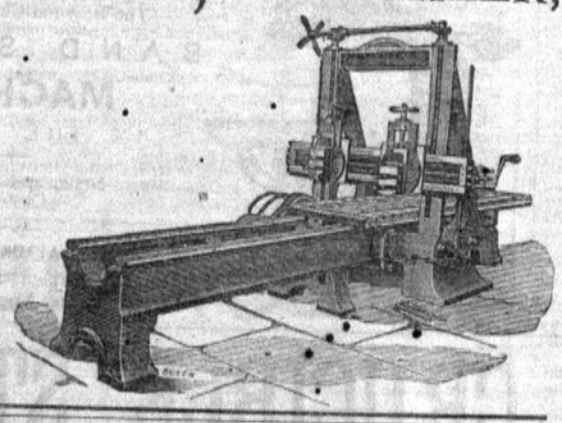

Catalogue for 1882 on application.

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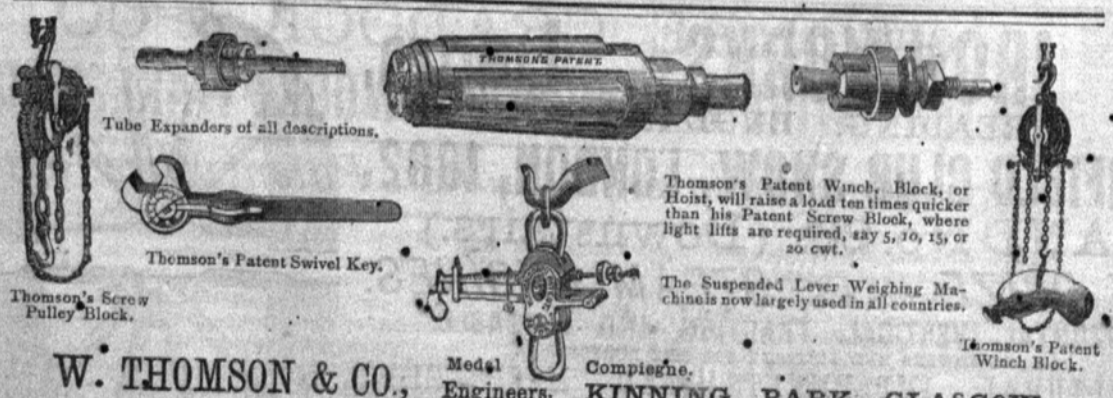

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NEW COMPANIES.

"ASHLEIGH BROOK" STEAMSHIP COMPANY, LIMITED.—Registered on the 18th inst., with a capital of £10,500, in £10 shares, to purchase and work the s.s. *Ashleigh Brook*.

AVILA STEAMSHIP COMPANY, LIMITED.—Registered on the 20th inst., with a capital of £9000, in £20 shares to purchase the iron steamship *Druid*, registered No. 54822, for the sum of £9000, with a rebate of £500 to be carried to the credit of the company.

CARRIAGE DETACHING APPARATUS COMPANY (WALKER'S PATENT), LIMITED.—Incorporated on the 16th inst., with a capital of £3500, in £10 shares, to acquire and work Walker's patent carriage detaching apparatus.

EAGLE CYCLE COMPANY, LIMITED.—Upon terms of an agreement of the 14th inst., this company proposes to acquire the business of blacksmith, machine maker, and engineer, carried on by Wm. Jenkins, at Westgate Street, Cardiff. It was registered on the 15th inst., with a capital of £5000, in £10 shares.

GARSON BLAKE AND SON, LIMITED.—This is the conversion to a company of the business of coal merchant, shipowner, and brick, lime, cement, and general business agent, carried on at Great Yarmouth, by Lovewell Blake, under the style of Garson Blake and Son. It was registered on the 21st inst., with a capital of £5000, in £5 shares.

GARTH MERTHYR STEAM NAVIGATION COLLIERIES COMPANY, LIMITED.—This company proposes to acquire, work, and develop the Garth Collieries, situate in the parish of Llangonoyd, county of Glamorgan. It was registered on the 20th inst., with a capital of £50,700 in £10 shares.

INCANDESCENT ELECTRIC LIGHTING COMPANY, LIMITED.—This company was registered on the 15th inst., with a capital of £250,000, in £5 shares, to carry on the business of an electric light and power company, and also to deal in cables, wires, instruments, and telegraphic or electric materials and appliances.

IOLO MORGANWG STEAMSHIP COMPANY, LIMITED.—Registered on the 17th inst., with a capital of £22,800, in £100 shares, to carry on business as steamship owners.

LONDON AND SOUTH-WEST COAST STEAMSHIP COMPANY, LIMITED.—This company was registered on the 20th inst., with a capital of £19,980 in 666 shares of £30 each, for the general business of a steamship company.

MALAGA AND GIBRALTAR RAILWAY COMPANY, LIMITED.—This company proposes to acquire a concession granted by the Government of Spain for the construction of a railway between the city of Malaga and Campamento, in the province of Cadiz. It was registered on the 16th inst., with a capital of £600,000, in £20 shares.

MERTHYR STEAMSHIP COMPANY, LIMITED.—Registered on the 15th inst., with a capital of £24,000, in £240 shares, to carry on the business of a steamship owner.

PERIM COAL COMPANY, LIMITED.—This company proposes to establish and maintain coaling stations afloat and on shore, at such places as may from time to time be determined. It was registered on the 20th inst., with a capital of £50,000 in £25 shares.

RAILWAYS AND PUBLIC WORKS CONSTRUCTION COMPANY LIMITED.—This company proposes to acquire concessions, contracts, &c., for the construction, working, and management of railways, tramways, and other undertakings of public works, both British and Foreign. It was registered on the 15th inst., with a capital of £250 100, divided into 25,000 ordinary shares of £10 each, and 100 fully paid founders' shares of £1 each.

RYDAL WATER STEAMSHIP.—Registered on the 17th inst., with a capital of £32,500 in £10 shares for carrying on the business of steamship owners.

THAMES FREIGHT AND PASSENGER NAVIGATION COMPANY, LIMITED.—This company proposes to convey passengers and goods upon the Thames by means of steam and ferry boats, floating bridges, &c., and to carry on the business of lightermen. It was registered on the 17th inst., with a capital of £200,000, divided into 19,995 shares of £10 each, and 50 founders' shares of £1 each.

TRANSVAAL GOLD EXPLORATION AND LAND COMPANY, LIMITED.—This company was registered with a capital of £200,000, in £1 shares to acquire certain lands in the district of Lydenburg, in the South African Republic, known as Ponieskrantz, Lobovine, Waterhoutboom, Grootfontein, Belvedere, and Driekop (otherwise known as Pilgrim's Rest), and the benefit of a concession of the mineral right over the same, dated 7th November, 1881.

WEST AFRICAN MINING AND TRADING ASSOCIATION, LIMITED.—This association proposes to carry on mining and trading operations in West Africa or elsewhere. It was registered on the 21st inst., with a capital of £2000 in £1 shares.

IRON.

No. 517.

LONDON, FRIDAY, DECEMBER 8, 1882.

THE SMITHFIELD CLUB SHOW.

[FIRST NOTICE.]

THAT unfailing herald of Christmas, the Smithfield Club Show, is once more being held, and Islington provides the chief London attraction for the present week. This is the eighty-fifth annual exhibition, and it is a very good one, although possessing no striking novelty for special notice. There is, as usual, plenty to be seen, and there is also—which is not so usual—ample room for inspecting the machines and implements. This arises from two causes: in the first place, we believe the authorities have been somewhat more circumspect in their selection of exhibits, rigidly excluding all such articles—except, of course, in the bazaar—which did not directly bear upon agricultural pursuits. In the second place, the number of exhibitors is smaller than last year, when it was smaller than the previous year. The figures for 1880 were 333; for 1881 they were 295; whilst for 1882 they are 232, although the exhibits of the intending occupier of the stand bearing the number last mentioned, and who is Mr. C. E. Hall, of Sheffield, were not there. Turning, however, to those that were in position, we may first note the substantial display made by Messrs. John Fowler and Co., of the Steam Plough Works, Leeds. The leading feature in their exhibits this year is that the engines are for the first time all constructed on the compound principle. The firm exhibit a 16 horse-power compound ploughing engine, which is constructed of steel throughout where practicable, the axles, shafts, and motion work being all of this material. The main brackets are either of wrought or cast malleable iron. They also have a road locomotive, which is likewise made of steel wherever practicable. The steerage, which is of the worm type, has been improved by leading the chains round a circular table, which also forms a convenient tool box, on the front axle. By this arrangement they are kept evenly taut in all positions, and not, as hitherto, allowing the greatest freedom at the point where it is least desirable. Another improvement is a new attachment for the draw-bar, which is carried forward to the horn plates themselves, and is so arranged that the bar finds its own position when coupling up. An 8-horse compound "Yorkshire" semi-portable engine completes the exhibits of this class, and to these may be added one of the firm's 4-farrow wedge ploughs, and a working model of their portable railway with Greig's patent sleeper. Messrs. Charles Burrell and Sons, of St. Nicholas Works, Thetford, exhibit one of their well-finished agricultural locomotives, fitted with their useful clutch gear for throwing the road gear in and out, and with all their other improvements. They also show one of their portable engines, in which the eccentrics for controlling the slide valves are, when desired, arranged so that they can be adjusted to form an efficient expansion gear, to cut off the steam at any portion of the stroke. This is very desirable when the work to which an engine is applied is of a variable nature, as it economises fuel.

Messrs. Aveling and Porter, of Rochester, exhibit an 8 horse-power agricultural locomotive, which is fitted with a small quick-speed governor, and which has been improved in many points, the gearing having been simplified and strengthened, but without involving any increase of weight. They also exhibit an 8 horse-power ploughing engine for working on the double-engine system. Messrs. Holmes and Son, of Prospect Place Works, Norwich, exhibit one of their 4 feet 6-inch thrashing-machines, the new feature in which is that it is fitted with a short drum barley hummeller. Mr. W. Allchin, of the Globe Works, Northampton, exhibits an 8 horse-power traction-engine, of his usual type, but in which the details generally have been improved. These offer many points for notice, but we must restrict ourselves to a few of the most important. In the first place, the jacket round the cylinder has been made of sufficient width to enable the cores to be cleaned out thoroughly, so as to prevent any possibility of having the space, which ought to be open for draining, filled with sand and rendered useless. This large space has also the advantage of containing a sufficient body of steam to supply heat to that in the cylinder directly any of the jacket steam is condensed, thus providing a constant source of heat, without having to wait for fresh steam to come from the boiler to take the place of that condensed. A large receiver or steam space has been cast above the working barrel of the cylinder to contain a sufficient supply of dry steam to feed the cylinder at all times, without any rush taking place from the boiler, which rush is one of the chief causes of priming. This receiver is supplied with steam by two large passages, one at each end of the cylinder, situated as far apart as practicable, in order to distribute the flow of steam over as large an area as possible. The steam for working the engine is taken from the highest part of the receiver, thus providing always a plentiful supply of dry steam. The receiver is drained directly by a large passage leading from its lowest point to the bottom of the jacket; and from there the drainage water is conveyed back to the boiler by two passages altogether distinct from those which supply the engine with steam. By this means the receiver and jacket are kept perfectly free from water. The diameter of the cylinder is 9 inches, the length of stroke 12 inches, and the engine makes 133 revolutions per minute, when driving from its fly-wheel, and 200 revolutions per minute when travelling. Although nominally an 8 horse-power engine yet when working at 150 lb. pressure per square inch, the indicated horse-power is stated to be more than 70. Cast-iron eccentrics and eccentric straps have been adopted, it having been found that by giving very large wearing surfaces, they are to be preferred to brass ones, both as regards wearing qualities and strength. Steel is largely used in the construction of this engine. The main axle and the intermediate shaft are both of Bessemer steel, the former being 4⅞ inches diameter in the bearings, and the latter 3½ inches diameter. The road wheels are 5 feet 6 inches diameter by 16 inches wide. The boiler has 146·49 square feet of heating surface, and 5·63 square feet of grate area; it has been tested by hydraulic pressure to 300 lb. per square inch. Mr. Allchin also exhibits a 5 horse-power horizontal engine, and a 2 horse-power vertical engine and boiler combined. The 5 horse-power horizontal is simple and strong. The 2 horse-power vertical is a neat combination, the engine being detached from the boiler and placed on a cast-iron base plate, which also carries the boiler and forms a water tank.

Messrs. Clayton and Shuttleworth, of Lincoln, exhibit an excellent 8 horse-power portable engine, fitted with jacketed cylinders of large area and an improved water-heater. It has a simple reversing eccentric, which admits of the fly-wheel revolving in either direction, and can readily be altered. The fire-boxes of all engines manufactured by this firm are of extra large size, and amply sufficient under ordinary circumstances for burning wood, peat, or other fuel, as well as coal. The boilers are tested by hydraulic pressure at 120 lb. per square inch, the working pressure being 60 lb. They also exhibit an agricultural engine (locomotive) with cylinder 8½ inches diameter. The boiler is tested by hydraulic pressure at 200 lb. per square inch for a working pressure of 100 lb. It is provided with tender of ample size for carrying a supply of water and fuel, and a steam water lift with long suction hose for filling the tank from a roadside pond or brook. It also has a winding drum for drawing thrashing machines or other loads out of places inaccessible to the engine or up very steep hills, where the engine has to be taken up alone and the load drawn up by means of a steel wire rope while the engine remains stationary. They have also a 20 horse-power horizontal fixed steam engine of simple design, and fitted with a very good expansion gear adjustable by hand while the engine is running. Messrs. Clayton and Shuttleworth also show one of their thrashing, finishing, and chaff-bagging machines, with drum 4 feet 6 inches wide, to which every improvement has been added to ensure the grain being properly dressed for the market, the straw being delivered in a clean and perfect condition. The frame is of English oak, and being trussed, secures the greatest rigidity to the whole of the machine. Portable chaff-cutting, riddling, and bagging machines, and other farm requisites of this class, complete the excellent show of exhibits made by this firm.

Messrs. Marshall, Sons and Co., of the Britannia Ironworks, Gainsborough, make an excellent show of their engines of various classes, prominent amongst which is an 8 horse-power stationary compound-engine underneath a locomotive multitubular boiler with firebox, suitable for burning coal or coke. The high-pressure cylinder is 5 inches diameter, and the low-pressure cylinder 9 inches diameter, both having a 12-inch stroke. The engine is fitted with automatic expansion valve gear, Korting's injector, and is specially adapted for driving electric light machinery. The engine and boiler throughout are of extra strength, and capable of withstanding a continuous working pressure of 140 lb. per square inch. It is mounted complete on a wrought-iron girder foundation. Then there is a 6 horse-power horizontal stationary steam-engine, with a single steam-jacketed cylinder 8½ inches diameter by 12 inches stroke, fitted with automatic expansion valve gear and mounted on a cast-iron foundation. This engine, which we describe and illustrate on another page, is also suitable for driving electric light machinery, or any other work requiring steady running under frequent variations of load. Messrs. Marshall also exhibit an 8 horse-power traction engine, or agricultural locomotive, with two speeds of best crucible cast steel spur-gearing compensating gear for turning sharp curves. The travelling wheels are riveted up by special hydraulic machinery, and provided with appliances for travelling over hard or soft ground. The engine is also fitted with a water lifter for filling the tank from a wayside pond or stream without manual labour, and a winding forward drum for hauling wagons, &c., out of places inaccessible to the engine. They also show a 10 horse-power portable engine, with one cylinder, having a flange all round the base to give an extended bearing on the boiler, and fitted with automatic expansion valve gear. An 8 horse-power portable single-cylinder engine, fitted with cross arm, quick-speed governor, and equilibrium throttle valve completes their extensive show of heavy engines. They have also a 2½ horse-power independent vertical engine and boiler, and a 1 horse-power independent vertical engine without boiler, as well as a very good finishing thrashing machine with a patent safety drum guard. Mr. Edward Humphries, of the Atlas Works, Pershore, exhibits a 7 horse-power portable engine, which we describe and illustrate on another page, and one of his large size thrashing machines. These engines are equally well adapted for contractors and every other use to which portable engines can be put. They are well made and of good design, and the high speed direct-acting governors with which they are fitted render them especially adapted for driving electric light machinery, at which work we understand they have proved very successful. The thrashing machines are fitted with wood spring hangers, and by this appliance the number of oiling places has been greatly reduced, and a considerable saving of wear-and-tear effected. Messrs. Barrows and Stewart, of the Cherwell Works, Banbury, have a good 8 horse-power portable engine, and a 3 horse-power vertical engine and boiler combined. They also show a 4 feet 6 inches thrashing and finishing machine. Messrs. J. and H. McLaren, of the Midland Engine Works, Hunslet, exhibit one of their ordinary 6-horse agricultural locomotives. It is of their new "Standard" type, and has all their latest improvements, which are mostly in detail, and do not call for any lengthened description. The whole design, however, is good, and is well carried out.

Messrs. James and Frederick Howard, of the Britannia Ironworks, Bedford, make, as usual, a fine display of tillage and harvesting implements and machines. Steam-ploughing is represented by a strong four-furrow balance plough, on which is shown some good forms of mould-boards and shares for various styles of ploughing and digging. The tillage implements for animal power include a series of wrought-iron and steel "Simplex" ploughs, for which there is a good demand, both at home and in the colonies. Besides these, there are specimens of the "Champion" plough and of the double mould-board or ridging plough for roots. A deep tillage plough, with a wide cutting share and flat breast, and a new Anglo-American plough, with double-ribbed iron beam, are representatives of special implements much in favour in the Midlands and in Scotland, where the pulverised condition in which they leave the furrow slice is greatly approved. The mould-board of the Anglo-American plough, which is provided with a tail-piece or presser, is water-chilled in the process of casting. This water-chill process Messrs. Howard have adopted in the manufacture of all their plough shares. An attractive novelty in the collection is a balance plough, in which Messrs. Howard have combined Mr. Sleep's patent with their own. This plough is described and illustrated on another page. The chief attraction in Messrs. Howard's harvesting machinery is their "Simplex" string sheaf binder, in which are embodied various important improvements, as the result of the working both at home and abroad during the late harvest. The recent alterations include a shifting binding table for more effectually dealing with the longest or shortest strawed crops; an improved arrangement of the gathering reel, which can be adjusted for straw of any height; a new needle and tying mechanism much more simple than that hitherto used, and an ingenious device for preventing the machine from making "baby" sheaves, when working in tangled crops; and a more effective throwing-out arrangement for separating and delivering the sheaves. Under the control of the driver there is also a device which enables him to deposit the sheaves at the corners, out of reach of the horses' feet when turning. The transport attachments have also been improved and made less bulky—in short, the whole of the modifications are in the right direction, adding to the simplicity, durability and handiness of the machine, and making it more suitable for the class of workmen in whose hands these machines have to be left during the most critical period of harvest. The "Simplex" slide delivery reaper has been further improved by the main driving wheel being provided with a wrought iron tyre, which secures the rim from breakage on bad roads. The "Simplex" mower, a horse-rake of large size on Messrs. Howard's self-lifting system, and their Anglo-American self-acting horse-rake made with steel teeth of large capacity, and with large wrought-iron wheels, occupy a prominent position on their stand.

Messrs. Robey and Co., of the Globe Works, Lincoln, make a good show of their combined vertical engines and boilers, which are simple in design and solid in construction. The boiler is of Messrs. Robey's patent tubular pattern, which has been described and illustrated by us, and which possesses many advantages. The circulation of the water is very perfect, and thus the generation of steam is facilitated and incrustation is prevented. The firm also show a Robey fixed engine and locomotive

HORIZONTAL ENGINE.

BY MESSRS. MARSHALL, SONS AND COMPANY, GAINSBOROUGH.

(*For description, see page* 481.)

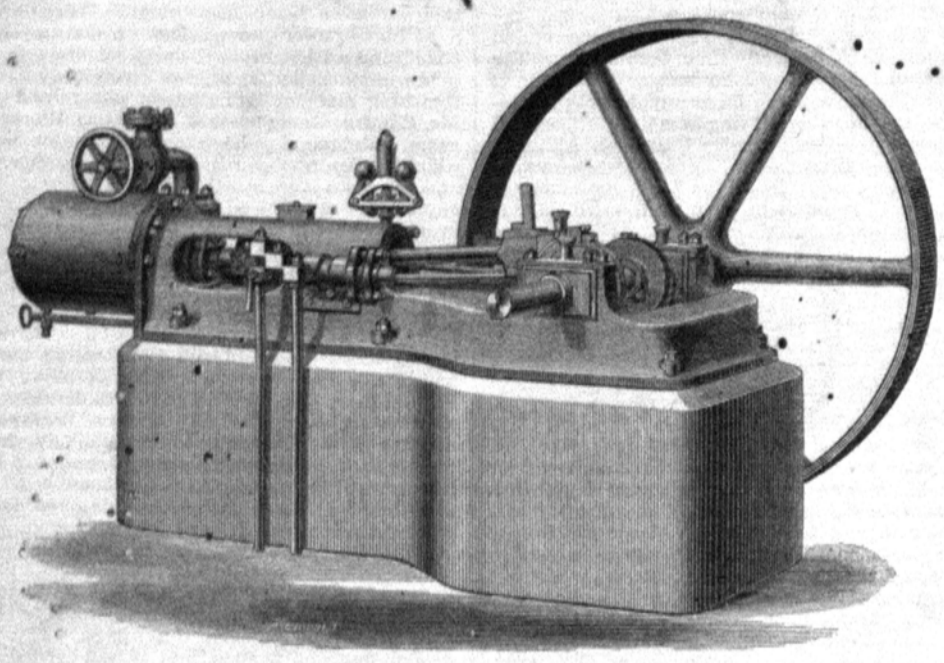


FIG. 1.

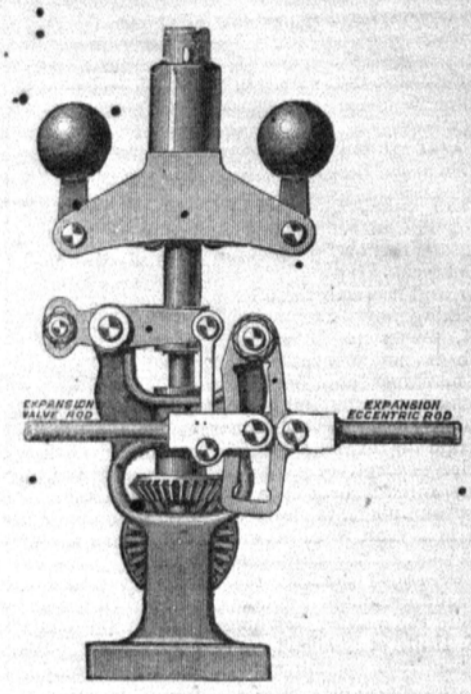
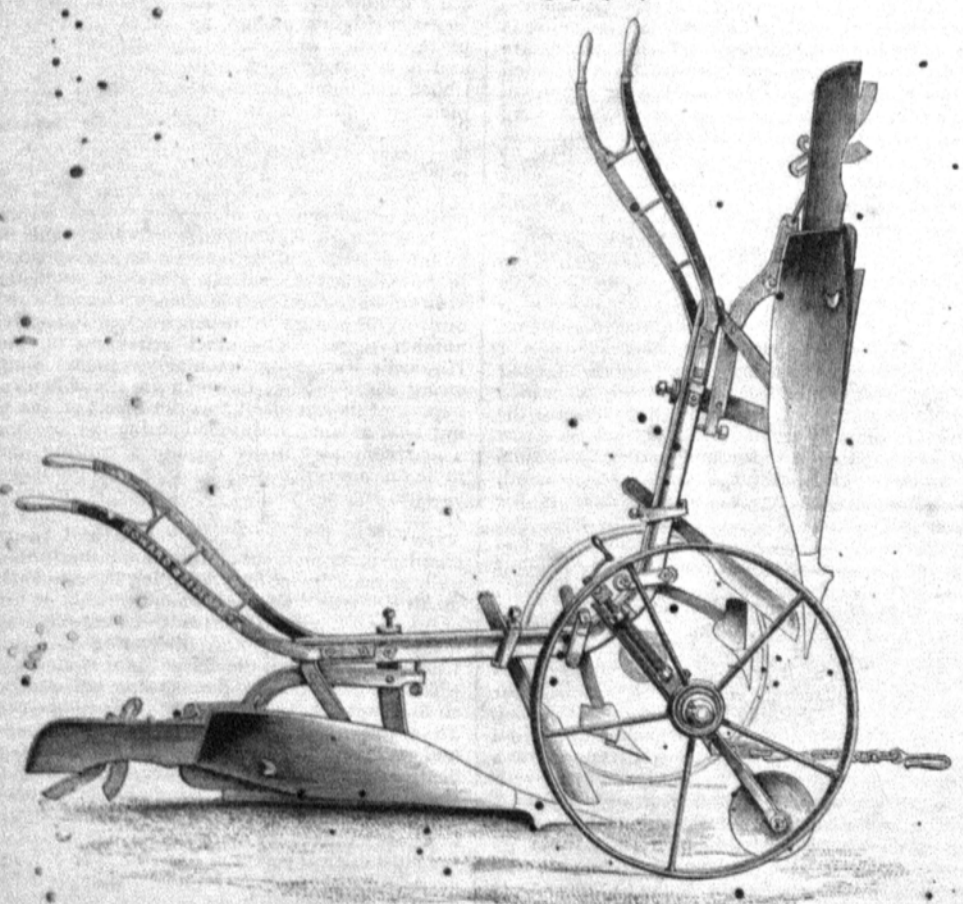


FIG. 2.

BALANCE PLOUGH.

BY MESSRS. J. AND F. HOWARD, BEDFORD.

(*For description, see page* 482.)



boiler combined, and which is specially designed for providing economical steam power in a small space. The boiler is connected to the engine by being bolted to the cylinder only, and is carried by rollers working in grooves at the firebox end, thus relieving the boiler of all strain. The base-plate is formed at one end into an ash pit with damper doors, and is made suitable for receiving the firebox end of the boiler, the other end of which is carried by a crutch-shaped casting fixed over the cylinders. The end of the base-plate under the cylinders is formed into a feed-water heater tank, into which the cylinder cocks discharge all condensed water, and into which a portion of the exhaust is so directed as to heat the feed-water to nearly boiling point before going into the boiler. Messrs. Robey's new traction engine possesses several improvements in detail. Amongst other things, instead of securing the crank counter-shaft and axle-bearings to a prolongation of the firebox shell, they are carried on the side plates of the tender, which are made specially strong. This method of construction removes all danger of straining the boiler and causing leaky seams down the front. The boiler is also attached to the tender in an improved manner, so as to prevent all straining of steam joints by the side pull of the tender in turning corners. Messrs. Robey also exhibit their thrashing and finishing machines, with improved adjustable screen for finishing the corn for market. These machines are built on wrought angle-iron frames. Since the last show, Messrs. Robey have made some important improvements in their portable engines, especially in connection with the cylinders. The improvement recently made consists in the manner in which the steam is taken into the cylinder and in the method of controlling the rate of admission. Instead of the usual wing throttle-valve, these engines are now fitted with a double-beat equilibrium valve, which, with a very small movement, gives a wide range of admission. This valve is controlled by a very sensitive high speed governor, and as it works in equilibrium, the slightest variation in speed of the engine is at once felt and counteracted upon, and the utmost regularity in speed is secured. Messrs. Brown and May, of North Wilts Foundry, Devizes, exhibit specimens of their established type of portable engines, viz., a 7½ horse-power, and an 8 horse-power, which are of good design and finish. Messrs. Davey, Paxman and Co., of the Standard Ironworks, Colchester, make a good show of their excellent engines, which upon the present occasion comprise, first a 10 horse-power double cylinder portable engine, and next an 8 horse-power single cylinder portable. Then there is a 10 horse-power horizontal engine fitted with variable expansion gear, and a 2 horse-power vertical engine and boiler combined, and containing all the most recent improvements of this firm. They also show a 4 feet 6 inches double-blast finishing thrashing machine, fitted with a chaff-bagging apparatus. The whole of the work, both as regards design and manufacture, is of the usual high standard of this firm.

Messrs. Ransomes, Head, and Jefferies, of the Orwell Works, Ipswich, exhibit several new ploughs, namely, a garden plough, so called because it produces work very much like that done with a spade; a new double-furrow plough, with wood beam and handles; a three-furrow plough, for light land, which we understand has been been in great demand during the past season; also two Newcastle ploughs, one especially adapted for doing crested work, and the other made with a solid frame to meet the demand for a less expensive implement. This firm also show their "star" and Anglo American horse rakes. Messrs. Ransomes show two portable engines, of 6 and 8 horse-power respectively; a 12 horse-power semi-portable engine, with reversing gear; a 6 horse-power agricultural locomotive, with steel road gear; a vertical engine and boiler; and a 4 feet 6 inches finishing thrashing machine, with self-acting drum-guard and chaff-bagger, making altogether a very good display. Messrs. Richard Garrett and Sons, of Leiston Works, Saxmundham, have a good show of engines and thrashers, amongst which may be noticed a portable engine, with compound cylinders, calculated to indicate 25 horse-power, and placed on a machine-flanged colonial boiler, with wide firebox, and provided with Garrett's combustion chamber and heated air tubes. There is also an 8 horse-power single-cylinder portable engine, mounted on a machine-flanged boiler, with a corrugated firebox. Their combined thrashing and finishing corn-dressing machine has a drum 48 inches wide, and is fitted with a self-acting drum-

guard. Messrs. Woods and Long, of Stowmarket, exhibit several sizes of their vertical engines, from 1 horse-power upwards. We believe they were the first to introduce this simple form of combined boiler and engine for agricultural purposes, such as corn grinding, chaff-cutting, and the like operations. They also show a variety of food-preparing machines, including root-pulpers, cake-breakers, and turnip-cutters. Messrs. Wallis and Steevens, of the North Hants Ironworks, Basingstoke, show an 8 horse-power traction engine and a 54-inch thrashing and finishing machine of their usual good build. We understand that the engines of this firm, which have for so long past been doing duty in driving the electric light machinery at the British Museum and elsewhere, continue to give satisfaction. Mr. F. Savage, of St. Nicholas Ironworks, King's Lynn, exhibits a 10 horse-power agricultural engine, the new feature in which is the steam jacketing of the cylinder. It has also an extra large firebox. Mr. Savage also exhibits the Goss and Savage horse hoe, which is specially adapted for hoeing young plants as soon as they appear above the ground, without covering or injuring them.

Messrs. E. R. and F. Turner, of Ipswich, have the usual display of their specialities. Conspicuous amongst these is one of their patent automatic expansion portable engines, of 8 horse-power. These engines are now well known and appreciated from their great economy of fuel and regularity of speed which is secured by the patent governor. A 4 horse-power portable engine of the ordinary type is also shown. The "Gippeswyk" engine appears in two of its various forms, viz., as a vertical portable engine, mounted upon iron travelling wheels, and as a horizontal fixed engine. These engines present a novel feature, which is a decided step in advance, being fitted with the new Turner-Hartnell automatic expansion governor, which we describe and illustrate on another page, and which is a special adaptation of the Hartnell patent governor, which has been so successful on the larger sizes of Messrs. Turner's engines. This new form of the Hartnell governor has been subjected by the makers for some months past to long and careful trials, being thoroughly tested both as to efficiency and durability. Corn mills—another leading speciality of this firm—are well represented, a number of mills of different sizes being shown. Messrs. W. Tasker and Sons, of the Waterloo Iron Works, Andover, exhibit an 8 horse-power portable engine, and a 4 feet 6 inches thrashing machine. They also show a good chaff-cutting and bagging machine for power.

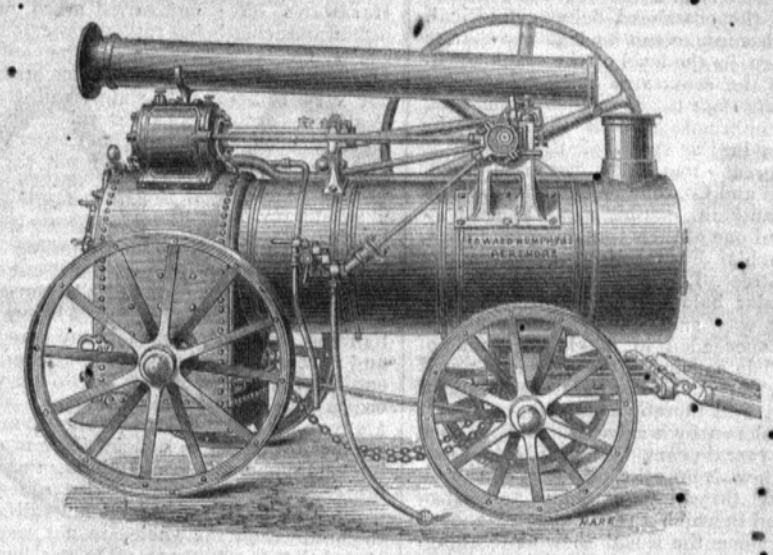
The Reading Ironworks Company, of Reading, make an effective show with their engines, the first for notice being an 8 horse-power portable of good construction. The rear axle is cranked under the firebox, and the travelling wheels are of wrought iron. There is next a 10 horse-power horizontal engine of the "Reading" type. The cylinder, which is 10½ inches diameter with a 16-inch stroke, is not overhung, but rests on a pedestal, thus preventing strain on the joint. They also show a 6 horse-power horizontal engine, with a cylinder 8 inches diameter and 14 inches stroke, and a 3 horse-power vertical engine, mounted on a strong iron bedplate, in combination with a boiler fitted with Galloway cross tubes, specially designed for farm and dairy purposes, for light work. The Reading Company likewise show one of their "Colonial" thrashing machines for horse power, and their new bullock gear for four oxen, which, with the larger gear for eight oxen, has been introduced into India with good results, and has been favourably reported upon by the Government engineer. This gear has been described and illustrated by us. Messrs. Ruston, Proctor and Co., of the Sheaf Ironworks, Lincoln, have also a good show of engines. They have a 6 horse-power horizontal expansive engine, with an 8-inch cylinder and 16-inch stroke, fitted with automatic expansion gear, and capable of working up to 18 or 20 horse-power. Their chief exhibit, however, is their compound portable engine, which is of 12 horse-power nominal, with two cylinders of 7 inches and 11 inches diameter respectively, to use steam of 120 lb. per square inch, which is admitted first into the smaller cylinder and expanded to twice its original volume, and then passing to the larger cylinder is again expanded, escaping into the air with a final pressure of about 10 lb. In one of the trials of this engine, with a load of 30·26 horse-power on the brake, it ran for 3 hours 45½ minutes with only 300 lb. of Welsh coal, equivalent to the extraordinarily low consumption of 2·63 lb. per effective horse-power per hour, or about 2·4 lb. per indicated horse-power; whilst the feed-water required was only 20·46 lb. per E. horse-power per hour. Such economy speaks for itself. The next engine is an 8 horse-power portable, of the standard type of the firm, and having a 10-inch cylinder with a 12-inch stroke. There is also a 6 horse-power traction engine, and a 5 feet finishing thrashing machine, which latter is fitted with a self-acting feeder, which affords protection to the attendants and reduces the amount of manual labour required.

Messrs. R. Hornsby and Sons, of Spittlegate Ironworks, Grantham, have a good display of their traction, portable, and vertical engines, besides ploughs, reapers and thrashing machines. Their novelty is an excellent automatic expansion gear, with an arrangement for preventing the angular action of the

PORTABLE ENGINE.

BY MR. EDWARD HUMPHRIES, PERSHORE.

(*For description, see page* 482.)



THE TURNER-HARTNELL GOVERNOR.

BY MESSRS. E. R. AND F. TURNER, IPSWICH.

(*For description, see page* 483.)

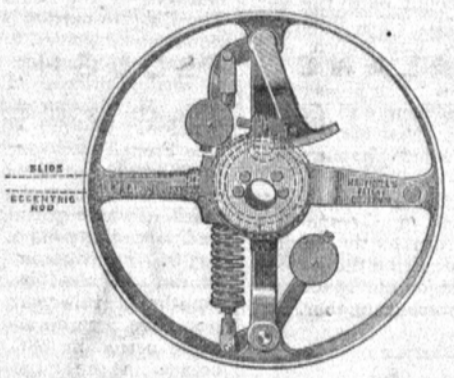
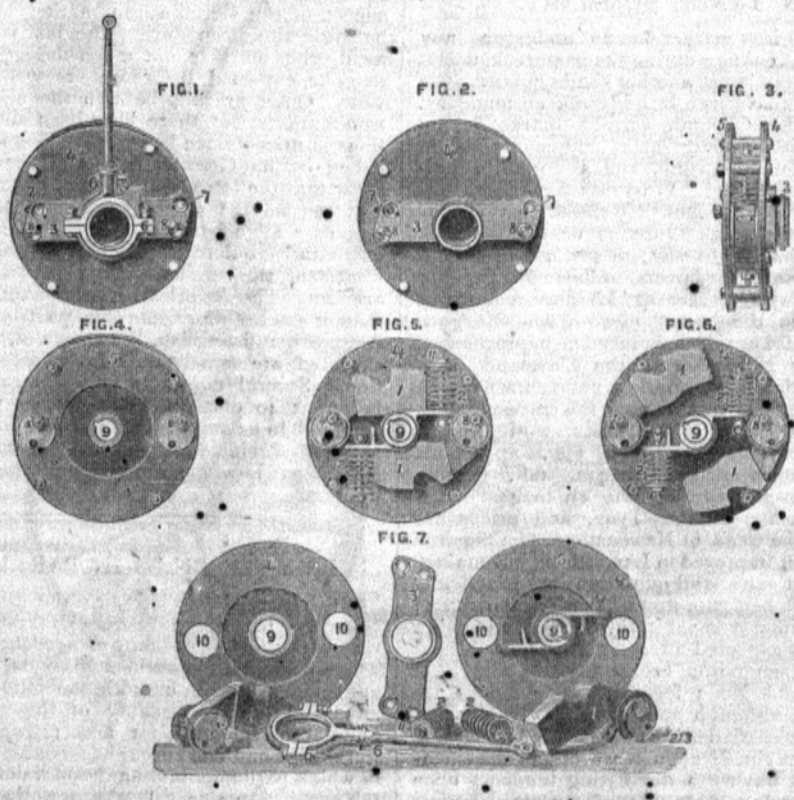


FIG. 1A.



link affecting the governor. This is done in a neat and simple manner by the interposition of an eccentric. This arrangement is shown fitted to a 10 horse-power horizontal engine. Another leading exhibit of this firm is a 10 horse-power compound under-type semi-portable engine. They also show a 6 horse-power traction, an 8 horse-power portable, and a 3 horse-power vertical engine and boiler combined, as well as their sheaf-binder, which has now been rendered practically perfect. Messrs. W. Croskill and Sons, of Beverley, make their usual good display of bone mills, clod crushers and waggons. Messrs. William Foster and Co., of Wellington Foundry, Lincoln, show a good 10 horse-power portable engine, fitted with Starkey's automatic expansion gear. This apparatus is under the direct control of the governor, so that the power of the engine is always exactly proportioned to the work to be done, no matter how much or how rapidly this may vary. Messrs. Gibbons and Robinson, of the

Vale of White Horse Iron Works, Wantage, exhibit a small but very compact 3 horse-power portable engine, and a 4 feet 6 inch thrashing machine. The portable engine is one of a new type, which has been designed to afford a large amount of power within a small compass. The old plan of using four guide bars is discarded in favour of a trunk, which is bored out so as to be perfectly in a line with the cylinder, and the guide for the crosshead being cylindrical, the connecting rod is free to suit itself to any change that may take place in the level of the crank shaft. The governor is of the cross-arm quick-speed type, its revolutions being four to one of the engine, and, owing to the equilibrium valve of the firm, the slightest variation in the speed of the engine is checked, and great regularity is maintained. Messrs. Hempsted and Co., of the Phœnix Iron and Crank Works, Grantham, exhibit a portable and a vertical engine and one of their thrashing machines. Walter C. Church's Engineering Company, of No. 10, London Street, London, exhibit specimens of Church's circular balanced slide-valves, which have found their way successfully into practice. Mr. Church has succeeded in making the slide of circular form, and in causing it to turn partly round as it reciprocates, thus ensuring a constant change of the rubbing parts, and thereby equalising the wear. This result was shown by a valve which had been under steam for several years. Messrs. Nalder and Nalder, of Challow Ironworks, Wantage, exhibit their single-crank thrashing machine and straw elevator, combined in which the details have been further improved since the Royal Show at Reading. The india-rubber spring connection has been superseded by one of wood, and syphon oil cups have been fitted to the inside bearings of the shaker crank. The floor of the elevator is now constructed of lattice work, which has enabled the other parts to be made lighter. Mr. Wm. A. Gibbs, of Gillwell Park, Chingford, exhibits some of his harvest-saving appliances, the most recent of which is a portable furnace and fan for field purposes. The fire having been lighted, the machine is driven through a field, and the heated air is directed on to the wet grass, which is laid in ridges. Mr. Thos. Pilter, of Paris, exhibits one of his now well-known and equally well-appreciated hay presses, in which the bales are made cylindrical in form. The press exhibited is made by Messrs. Samuelson and Co., of Banbury, and we are glad to know that Mr. Pilter's system is coming more and more into favour as its merits become known.

And here for the present we must leave the subject of the Smithfield Club Show, which in all respects is proving a success. We shall return to the subject next week, when we propos to describe the leading exhibits in the galleries, pressure on our space preventing a notice of them in the present number.

IRON TRADE SUMMARY.

THE English iron market has not undergone any very great change during the past week, unless it be that business is yet another shade quieter. The pig-iron markets have been flat and weaker in tendency. The tone of the Glasgow warrant market is not healthy, notwithstanding good shipments, large decrease in Connal's store, and a normal condition of the home trade. Warrants have been unsteady during the week, but they closed on Wednesday at about the same figure as on the previous Wednesday—that is to say, at 48s. 9d. cash and 48s. 11½d. a month for buyers, sellers 3d. per ton more. Tuesday's market at Middlesbrough was dull, and even the better news from Glasgow, announcing a rise in prices, induced no improvement, the returns for November of the Cleveland Ironmasters' Association comparing unfavourably with those of the previous month and the corresponding month of last year. Merchants sold No. 3, prompt, at from 42s. 9d. to 43s., and some makers are open to sell at 43s. 6d., leading manufacturers, however, holding on to 44s. Pig-iron is also heavy on the Tyne, and prices are 9d. lower on the week at Newcastle. The pig-iron business has not improved in Lancashire, but makers do not press for sales, and quotations are practically unaltered. The hematite iron market is unchanged; but a decided improvement in the demand on foreign account is fully expected after the new year. Mixed parcels of Bessemer iron are quoted at 56s. per ton net at works, and No. 3 forge at 54s. Stocks are not increasing, although operations at the furnaces are very briskly carried on. In the finished iron trade, complaints turn chiefly upon a scarcity of specifications, this fact having a depressing tendency upon the market, and causing manufacturers to be less confident than the actual state of matters would seem to warrant, for up to the present time their works have been kept going steadily, and are still very fairly employed on old orders. Contracts for common bars are taken in Cleveland and Durham at £6 per ton, and angles at £6 to £5 17s. 6d., while ordinary plates are about £6 10s., and boiler plates £7 10s. At Newcastle, bars are making no more than £6 5s., while ship plates are offered at £6 12s. 6d., boiler plates at £7 10s. to £7 12s. 6d., and angle iron at £6, delivered in the Tyne. In Lancashire bars remain at £6 10s. In the Midlands business is decidedly quieter, and there is less confidence in the revival of trade with the turn of the year, although a slight improvement is expected after quarter-day. New specifications are getting much scarcer, and on that account manufacturers are somewhat easier in their terms. The tinplate trade shows some improvement, but prices remain at the present unsatisfactory figure. Hardwares have not varied much, business in the lighter branches being rather quieter, but better in the heavy goods department. The outlook for the Sheffield trades, if we except sheets and plates, is not very brilliant. The steel rail trade of South Wales is active, and several fresh orders have recently been booked. The Ebbw Vale Company have secured a contract from the London and South-Western Railway of 31,000 tons of double-headed rails, with 820 tons of fish-plates to match. Generally speaking, steel makers are experiencing no falling off in orders. Shipbuilding yards are very busy, but operations are beginning to be interfered with by the severe weather. Forges and foundries are full of heavy work for shipbuilding purposes, and the same may be said of bolt and rivet works and anchor and chain shops. The engineering trades of the North are very busy, and orders appear to be still coming in. Naval engineers are reaping a rich harvest, while locomotive builders are just as brisk. In Lancashire, however, engineering establishments are beginning to get slack. The bridge, girder, and roofing departments are full of work. The English coal market is still fairly active, but the outlook, on the whole, is not very bright. It is stated that the advance of 10 per cent. in miners' wages generally secured by the coal-miners of England threatens to be short-lived. The anticipations that an advance in wages would lead to a temporary increase in the selling price of coal have proved fallacious. There is a movement in progress with coal-owners throughout the country to take steps at the proper time to bring wages back to their former level.

Very few changes have taken place in the iron markets of the Continent during the past week. The Belgian market is still very quiet, and no alteration is now expected before the beginning of next year. There is an absence of new business, which tends to weaken prices. Pig-iron is beginning to give way. Manufactured iron may be bought at 130 fr. per ton. Enquiry still continues good for plates. The French iron market is steady. But although ironmasters are very firm in their quotations, a decided weakening has taken place in the Paris market, where plating sections are sold at 200 fr. and mixed parcels of merchant and plating iron at 195 fr. The figures, just published, of the imports of iron and steel into France during the first ten months of this year show that the imports of pig-iron have been on about the same scale as during the same period in 1881, while there has been a large increase in the imports of manufactured iron and steel this year as compared with 1881. The aspect of the German iron market has undergone but little alteration during the last few weeks, and, as in other markets, not much change for the better need be expected before we are well into the new year. Quiet prevails both in the pig and finished iron markets, but there have been no further reductions in prices since last week. The statistics published by the German Iron and Steel Association show that the total production of pig-iron during the first ten months of this year was 2,424,552 tons, against 2,237,980 tons in 1881. Notwithstanding the comparative quietness of the iron markets of the Continent, the various coal markets are active. Prices are firm. The American iron market is now duller than it has been for some time past. Pig-iron, both American and English, is very quiet, and the orders executed are mostly only for immediate consumption. Several contracts for steel rails have been taken at 40 dols., a price not so very long ago declared to be ruinous for the manufacturer. The Northern Pacific Railroad has ordered 40,000 tons. Reductions in wages are being accepted by the iron-workers.

PRIVATE BILLS IN PARLIAMENT.

TWELVE MONTHS ago the prospects of the iron trade for 1882 were generally regarded as very encouraging, not only on account of the activity which pervaded the various markets, and which had appeared to gain in breadth and solidity as the year advanced, but also because of the unusually large number of schemes for new railways and other works that had been brought forward, and in respect of which parliamentary sanction was to be sought in the ensuing session. It was anticipated that if any considerable proportion of these projects were to be carried through, the effect on trade would be to widen and deepen the improvement which had set in; but, unfortunately, two sets of circumstances, in themselves entirely different, combined to prevent the realisation of these expectations. The financial panic in Paris in the early part of the year, with its sequel of dear money on this side, interrupted many enterprises which were in progress, and gave a decided check to the development of the improvement; while the course of matters in Ireland, and the time and attention which Irish affairs consequently demanded of the legislature, put an insurmountable barrier in the way of private legislation from which so much had been expected.

As if in sympathy with the much less hopeful feeling which prevails throughout many branches of trade now, compared with a year ago, there is a falling off in the number of railway projects which will demand the attention of Parliament during the next session. It may, however, turn out that 1883 will, under the new rules of procedure adopted, prove more fruitful of accomplished legislation in this direction than the present year has been. The number of railway bills in respect of which the standing orders of Parliament have been complied with and plans lodged by November 30 at the Railway and Harbour Departments of the Board of Trade is 122, against 135 last year; of tramway bills there are 31, against 26 in 1881; and of miscellaneous bills 8, compared with 7 last year. The total number of schemes to be brought under the consideration of the legislature will, however, be very much increased if we include the applications for provisional orders under the Electric-lighting Act of 1882, in connection with which 156 maps and copies of advertisements have been deposited.

As usual, a good proportion of the projects for new railways or the extension of existing ones affects the the metropolis, or its immediate neighbourhood. The Mid-Metropolitan Railway scheme is to be brought forward again, but with considerable alterations. Last year it was proposed to obtain powers for the construction of four railways on the pneumatic principle; this year the promoters have revived only what may be called the main one, the one to run from west to east; and this one, instead of starting from Hammersmith as originally intended, is to commence at the Lancaster Gate of Kensington Gardens. The terminating point, however, will be at the Minories, as before. A company is to be incorporated, under the title of the Kent and Essex Junction Railway, with the object of obtaining powers to construct a series of railways, commencing in a junction with the London, Chatham, and Dover Railway, near Swanley Junction Station, and terminating in a junction with the Great Eastern Railway, near Silvertown Station. The projected railway would also have connections formed with the lines which were authorised this year under the Metropolitan Outer Circle Railway Act and the Regent's Canal, City, and Docks Railway Act; while, on the south side of the river, two junctions would be effected with the South-Eastern Railway system. For the purposes of the undertaking, a road tunnel or subway under the Thames would be constructed between Woolwich and a point near the North Woolwich Gardens. Another project affecting the East-end of the metropolis is the Poplar and Canning Town Railway, which is to connect the London and Blackwall Railway with the Great Eastern Railway near Canning Town. The last-mentioned company also intend to apply for authority to push their Chingford line on to High Beech. So far as London is concerned, the greatest activity in new undertakings certainly promises to be in the eastern portion of the metropolis, for we find that another important scheme for the purpose of connecting the northern and southern banks of the Thames in that direction will seek parliamentary sanction next year. The Greenwich and Northern Lines Connecting Railway proposes to construct a line commencing in a junction with the extension railway authorised by the London, Blackwall, and Millwall Extension Act of 1865, and terminating in a junction with the Blackheath branch of the London, Chatham, and Dover Railway, being connected also with the South-Eastern system. The Charing Cross and Waterloo Electric Railway will seek powers to make several extensions, the most important being a line commencing near the southern extremity of their original line, and running along the Surrey shore of the Thames as far as Blackfriars Road, then striking across under the river in the direction of the point where Queen Street intersects Upper Thames Street, and terminating in Cornhill, near the Royal Exchange. An important, albeit a short line, in the west, will be the proposed junction between the Broadway Station of the District Railway at Hammersmith and the terminus of the Metropolitan line at the same place. This connection, when carried out, will remove what has long been felt to be an anomaly, and, in connection with the completion of the junction between the two systems in the City, will form a second circular railway for the portion of the metropolis which lies on the northern bank of the Thames. Amongst the other schemes affecting London may be mentioned the East of London, Crystal Palace, and South-Eastern Junction Railway, the Hounslow and Metropolitan Railway, the London, Hendon, and Harrow Railway, and the Oxford, Aylesbury, and Metropolitan Junction Railway.

Throughout the provinces a fair amount of activity is foreshadowed. All the principal railways have lodged bills, seeking authority for the construction of new lines—mostly short connecting railways, at different parts of their systems—or asking for additional powers in connection with already existing lines; for the amalgamation with them of various undertakings; and for miscellaneous purposes. The London and North-Western Company, for instance, besides some half-a-dozen of such junction railways as just mentioned, seeks powers to

take over the Lancashire Union Railway; the Great Western Railway has ten new lines, four of which, however, are merely the widening of existing tracks, and, in addition, desires authority to take over the Stratford-upon-Avon Railway, and the Watlington and Princes Risborough Railway. The Midland Railway Company intends to ask parliamentary approval to various extensions and junction lines, the most important amongst which is the new railway between Skipton and Ilkley. The London and South-Western Company, amongst a variety of projects, brings forward one, the Bournemouth Direct Railway, with a view of improving the communication with Bournemouth by means of a junction between the Company's Ringwood, Christchurch, and Bournemouth Railway and their Southampton and Dorchester Railway. There are several new undertakings for which powers will be sought. Amongst these may be named the West of England and South Wales Railway, commencing in a junction with the Swindon and Cheltenham Extension Railway, now in course of construction, and terminating in a junction with the Nailsworth branch of the Midland Railway; while another section will connect the Severn and Wye and Severn Bridge Railway with the Brecon and Merthyr and the Great Western Railways. The Ilkeston and Alfreton Railway will connect the town of Alfreton with the Derby and Stafford line of the Great Northern Railway. Despite the cold water which has been thrown on their scheme in certain quarters, the promoters of the Channel tunnel will face parliament next session with the object of obtaining, in conjunction with the South-Eastern Railway Company, authority to construct a line beginning at a given point under the bed of the Channel, and forming junctions with the South-Eastern and the London, Chatham and Dover Railways, while the Submarine Continental Railway Company would continue the tunnel seawards to a point 51 deg. 4 min. 41 sec. N. and 1 deg. 22 min. 49 sec. E. The Lancashire Plateway, to which we recently drew attention at length, will also be brought under the notice of Parliament.

So far as tramways are concerned, there is no sign of any diminution in the number of new lines projected, nor in the extensions for which existing companies will seek powers. Especially is this so round about London: on the north, south, east, and west fresh lines are to be laid down, while attempts will be made to penetrate the hitherto sacred precincts of the City. Amongst the latter we may refer to the line proposed by the Blackfriars Bridge and Holborn Valley Tramways Company, which is to start from Farringdon Street, pass through Ludgate Circus, along New Bridge Street, and across Blackfriars Bridge. Of the remaining schemes it will be sufficient to name the following:—Brentford and Isleworth Tramways; Edgware and Uxbridge Road Tramways; Haverstock Hill and Hampstead Tramways; and North-West Metropolitan Tramways. In the provinces, Dublin, Edinburgh, Norwich, Portsmouth, and St. Helen's have projects to submit to Parliament; while the South Staffordshire and Birmingham District Steam Tramways Company brings forward extensions for approval.

The most important of the miscellaneous bills is undoubtedly that referring to the Manchester Ship Canal, which has already been alluded to in these columns. The promoters seek to procure powers to vest in the company the privileges of the proprietors of the Mersey and Irwell Navigation, and the Bridgwater Navigation Company, and to acquire the undertakings known as the Duke of Bridgwater's Canals, the Runcorn and Weston Canal, and the Manchester and Salford Junction Canal; besides which they desire authority to construct a new navigable canal or channel, commencing at the Mersey, in the township of Runcorn, and terminating in the townships of Salford and Stretford, Manchester; and to form docks at Manchester and Warrington.

So far as the number of maps and copies of advertisements deposited in connection with applications to be made for provisional orders is any indication, electric lighting will demand a considerable share of the attention of our legislators in the coming session. A large majority of the applications will be made by local boards, corporations, improvement commissioners, or other public bodies, but the various lighting companies are bestirring themselves also. The Metropolitan Brush Co. have lodged 25 applications, the Provincial Brush Co. 10, the South-Eastern Brush Co. 9, the Union Co. 8, and so on, while in numerous instances one or other of these companies appears in competition with the local bodies.

OCCASIONAL NOTES.

THE UNITED STATES TARIFF COMMISSION.

THE report of the Tariff Commission will, no doubt, take our protectionist friends in America by surprise, the recommendations of reductions it contains being of a far more liberal and systematic nature than was expected. It had been universally believed that the commission would make an inconsequential report, leaving the tariff about as at present. Instead of this, it recommends a reduction of from 20 to 25 per cent. In the duties on chemicals, the average reduction recommended is from 25 to 30 per cent., and the removal of the duty on raw materials, and a reduction of 10 per cent. on products advanced one stage in manufacture, is also advocated. With regard to metals, the changes most important are the duty on Bessemer rails, reduced from 28 dols. per ton to 17 dols. 92 cents; on the tax on iron the reduction is from 10 to 20 per cent. on wire 20 to 30, and on miscellaneous articles 15 to 25. The report also recommends the establishment of a customs court, where appeals from the decisions of the collectors may be decided within ninety days. The comments of the American press on the document vary, of course. The *Tribune* commends the report heartily, and urges Congress to give it careful attention. The *Times* says the report has unexpected merits. The *World*, a democratic and free trade organ, says the report is a valuable concession to public opinion, which, as it grows stronger and more enlightened, will demand much more than this sop. The *Philadelphia Press*, speaking for the Pennsylvania protectionists, receives the report with caution, saying of the present depression in the iron and steel trade that the proposed reductions in the duties would force prices lower, adding, "Whether it is wise to expose our manufacturers to this foreign raid on a depressed and falling home market is a question for Congress to consider." Nothing definite is known yet concerning the attitude of Congress on the Tariff Report; but, whatever that body may do or omit to do, we are brought face to face with the fact—unexpected by a good many, it is true—that protection is not looked upon by the American people as the unqualified boon its advocates would like to represent it to be, and that protectionist tariffs have the support only of the manufacturers—certainly a very powerful class—of the United States.

THE ELECTRIC LIGHTING BILLS.

The corporations of the United Kingdom are bestirring themselves in the matter of the various electric lighting bills which are waiting to be submitted to Parliament next session. At the interview which they had with the President of the Board of Trade this week with the object of getting clauses inserted in all electric bills which would render it permissive instead of obligatory, as at present, to use the electric light, it was stated that the corporations, although in many cases owners of gasworks, are not blind to the benefits of electric lighting, and are perfectly ready and willing to take steps to favour its introduction. They do, however, feel very strongly, it was said on their behalf, that they should maintain the principle of local self-government, and that they should be allowed to be guided by the wishes of their constituents. They do not desire to have companies compulsorily within their boroughs. Not that they do not want the electric light, but they want a discretion in the matter. The deputation received a very appropriate reply. Mr. Chamberlain—who, certainly, cannot be said to have shown by his attitude on electric light legislation that he has a leaning towards the companies—said in reply that, looking at the Act of Parliament, he thought it was the evident feeling of Parliament that no obstacles should be put in the way of the full development of electricity, and he did not think this would be done if the powers were given to the local authorities to keep out possible competitors without doing anything themselves. The alarm felt by the corporations seemed to him to be exaggerated, having regard to the conditions under which companies were to be allowed to intrude. Mr. Chamberlain thinks the spirit of the Act would not be carried out unless the corporation undertook an obligatory order with regard to at least a portion of the district. If that is done, there is no objection to a permissive undertaking with respect to the rest of the borough, but this permission must be subject to certain conditions. There is no possibility of a monopoly under the Act.

AN INTERNATIONAL IRON AND STEEL INSTITUTE.

At the recent meeting at Vienna the idea was privately discussed of making the Iron and Steel Institute the nucleus of an international association. It was thought that its rules and great number of foreign members would supply a very good basis for such an organisation. Those suppositions are no doubt correct, but it may be questioned whether the plan as sketched out would be successful. It has already been pointed out in another quarter that English iron and steel masters, who form the great majority of the members of the institute, would probably be unwilling to sacrifice its essentially British character. It is hardly likely that they would feel disposed to abandon individual action to a common aim merely commercial in nature. But, on the other hand, we also think that the plan of a more active intercourse between the various associations connected with the iron trade would be of benefit. It would more especially foster that dissemination of correct commercial principles which are indispensable to the development of a healthy trade, and which most Continentals fail to appreciate; not to mention the advantages that would accrue to the iron and steel industry from a scientific aspect. We doubt very much, however, whether English manufacturers would be willing to enter into any compact savouring of the regulation of prices, for this seems to be one of the aims of the programme put forth by our Continental friends. We have had recently in this country an illustration of a very beneficial combination for regulating, or, speaking more correctly, for checking, the excessive output of iron, in the convention of Scotch and Cleveland ironmasters, now, unfortunately for the trade, abandoned. But it is a very different thing to attempt to regulate prices. To such an arrangement, international or otherwise, men brought up on principles of free trade would not consent, and it would be vain to expect Englishmen to forsake principles which have become almost a tradition with them.

THE TRAFFIC THROUGH THE SUEZ CANAL.

From the information supplied by the Liverpool Chamber of Commerce to the Board of Trade, at the latter's request, concerning the value of cargoes passing through the Suez Canal to and from the United Kingdom it appears that the total import and export trade of British India, the Straits Settlements, Ceylon, China, the chief Australian provinces, and New Zealand during last year amounted to £142,000,000. The special articles in this trade represented £114,000,000, of which £73,000,000 passed through the canal, or two-thirds of the whole. A balance of £28,000,000 of unenumerated articles remained to be distributed to the respective routes, and of this sum £17,000,000 were estimated to pass through the canal, thus swelling the £73,000,000 to £90,000,000. The Board of Trade had asked the chamber to furnish figures on another basis to their own, and the East India and China Trade Committee had done so as follows. The total trade of India, Ceylon, the Straits Settlements, China, Japan, Persia, Philippine Islands, &c., or eastern countries lying beyond the Isthmus of Suez and north of the equator, amounted to £103,000,000, including £5,000,000 of treasure, and of this £92,000,000, or more than five-sixths of the whole, passed through the canal. To specialise the leading countries, it may be said that five-sixths of the trade of India, two-thirds of the trade of Ceylon, the Straits Settlements, and the Philippine Islands, and within a fraction of the whole trade of China and Japan—a total alone of £25,000,000—passed through the Suez Canal. The Australian trade does not show such a large percentage. The total trade of Australasia with the United Kingdom was £55,000,000, including £5,000,000 of the precious metals. Of this, nearly one fourth passed through the canal, and, without gold, one-seventh passed through. The Australian trade through the canal was increasing, about 20 per cent. of wool in the present year having passed through, against 12 per cent. in 1881, an increase representing £1,000,000. It is interesting to note that, although during the five years ending 1879 the tonnage passing through the canal has been almost stationary, yet in 1880 the increase was 50 per cent., and again in 1881 33½ per cent. more, or a total of over 4,000,000 tons, doubling the tonnage of 1879.

THE PULLMAN CAR DISASTER.

The official report of Colonel Yolland on the fire in a Pullman car on the Midland Railway, by which Dr. Arthur lost his life, whilst it throws no fresh light upon the accident, fixes the blame for it upon the company. Colonel Yolland states that there is no positive evidence to show how the fire originated; but he can see no way of accounting for it other than by supposing that it was occasioned by the lighted reading-lamp in Mr. Cranston's berth, either while burning and igniting some substance or, in the act of its being blown out, by some spark or sparks coming into contact with some combustible material. As to the cord communication on the train, Colonel Yolland says that a system of cord communication, practically known as Harrison's cord communication, was submitted by a committee of the general managers of the principal railway companies, of which Mr. Allport, of the Midland Railway, was chairman, and provisionally sanctioned by the Board of Trade for the railway companies who had applied on February 27, 1869. This provisional sanction was finally withdrawn by the Board of Trade on and after August 1, 1873, and no subsequent sanction has since been given by the Board of Trade for any other cord communication, so that the system in use on the Midland down night Scotch express on October 28 and 29 was not approved by the Board of Trade as required by the act, and the company appears to be liable to the penalties named in the act. The cord attached to the train was not, Colonel Yolland adds, such a means of communication as the Board of Trade could properly sanction, and the company's rule respecting the cord communication appears to him to be wholly unsuitable for all properly equipped passenger trains running on lines where the traffic is worked on the absolute block system. If the train had been stopped as soon as the alarm whistle was sounded, he thinks it highly probable that Dr. Arthur's life would have been saved. Colonel Yolland adds that in all cases of murder or outrages in trains, or of carriages taking fire, seconds of time saved are invaluable, and he trusts that no long time will elapse before the rule referred to will be altogether changed. He also thinks that lighted reading-lamps should not be permitted in sleeping berths occupied by passengers. The public will be curious to learn how the Midland Company will meet so serious a charge as that implied in the report.

OVERHEAD TELEGRAPH WIRES.

It seems certainly an anomalous state of the law that, whilst local authorities are liable for any damage or injury caused by overhead wires, they should have no control in the matter of fixing them up. But that such is the case appears from what was stated by the

deputation from the Westminster Board of Works who waited, last week, upon Mr. W. H. Smith and Lord Algernon Percy, the members for Westminster. Last year, no less than nineteen miles of telephone wires were put up, and as some of them are sure to come down during the winter, especially if heavy snowstorms should set in, the danger to life, already too great in the metropolis, will be still further increased. The Government are powerless at present to stop the erection of overhead wires by private companies, and they, on their part, have done their best to do away with them, substituting underground wires. The matter is of great public importance, and the present condition a public grievance. It is but fair that the power of local authorities should be in accord with their liabilities. Legislation in the direction of protecting the public appears necessary. The electrical engineer, who has been styled the "spider of civilisation," is, no doubt, a public benefactor; but it has now been shown that he may also inflict a great deal of harm. It will be necessary to curtail his powers of doing mischief. If the views that were advanced by the Westminster deputation—which, it should be added, are shared by the majority of the community, and on that account will be acted upon sooner or later—are enforced, that useful person will have to change his habit: he will have to burrow in the ground like the mole.

AN UNDERGROUND ELECTRIC RAILWAY.

The first electric railway in a mine is that in the Royal Saxon Collieries, near Zauckerode. It has just been opened, and is said to work excellently. This electric mine railway serves for transporting coal in a traverse heading of the 250-metre level. The locomotive, only 2 feet 7 inches broad, weighs, according to *Glaser's Annalen*, 1500 kilogrammes (about 1½ tons), and moves ten trucks weighing, loaded, 10 tons each at a rate of 10 feet per second. The transmission of power is not effected by a centre rail, but by a small contact carriage provided with brushes, running upon ⊥-shaped iron rails, which is fixed, isolated, to the roof of the heading. The railway is at work from 4 a.m. to 11 p.m. Judging by the experiences of the Paris electric railways, it may be advisable to let the contact carriage run along a pipe instead of rails, to prevent its derailment. We hear that the Berlin Westend Electric Railway is being reconstructed on this principle.

THE SIEMENS DIRECT PROCESS.

By Mr. James Davis, New Steel Works, Landore.

In this paper I desire to embody the result of a long practical experience of the working of the Siemens direct process, in making wrought iron direct from the ore, and in making metallic iron for the Spongy Iron and Purifying Company at Landore and Towcester respectively. The ore to be smelted is broken up into fragments not exceeding the size of peas or beans, and to it is added lime or other fluxing material, in such a proportion that the gangue contained in the ore and flux combines, with only a little oxide of iron, into fluid slag. A charge, say, 20 cwt. of ore, 12 cwt. of role or hammer scale, together with 6 cwt. of soft free coal well mixed together is charged into the furnace when fully heated. The coal is charged with the ore. During the first hour very little gas is required, but after this the rotative velocity is increased, together with the heat, for a short time. At this stage a rapid reaction is the result, the peroxide of iron, being reduced to magnetic oxide, commences to fuse, and at the same time metallic iron is precipitated by each price of carbon, while the fluxing materials form a fluid slag, with the silicious gangue of the ore. The slow rotative action is again resorted to when the mass of iron is turned over and over, presenting continually new surfaces to the heated lining and to the flame within the rotator. As soon as the metal is gathered together a little the slag is tapped, which brings with it sulphur and phosphorus; the velocity at this point is increased to one revolution in five minutes, so as to gather up the loose masses of iron into five or six metallic balls. These are then shingled with a steam-hammer or squeezers into a bloom, which, when re-heated, is rolled into a bar similar to an ordinary puddled bar. The balls must be worked as quickly as possible, and then it will stand as much work as common puddled iron. With reference to the amount of coal used at the producers, the abstract report appended hereto shows that I have succeeded in making what Dr. Siemens stated in his paper, read before the Institution of Mechanical Engineers in 1873, could be done—that is, one ton of iron made to one ton of producer coal used with the direct process. I would suggest that the Siemens open hearth furnaces should be worked in connection with this process, as all the small ore can be utilised and all the blooms can be used also to a great advantage and profit. As regards the statement made by G. W. Maynard, that the blooms are only fit for the open hearth furnace, I must differ, as I have worked the blooms which have been rolled into good merchant bars. The following is the analyses:—Iron, 99·1988; silicon, ·400; carbon, ·150; phosphorus, ·0502; sulphur trace manganese, ·201. Fracture good.

A great deal has been said respecting the class of bricks to be used in the lining of these rotative furnaces. Experience has proved that the drum should have 3½ inch best fire bricks all round, the ends to have a few bauxcite or magnesia bricks just where the balls are mostly wearing. After testing the magnesia bricks made at Landore, side by side with the bauxcite, I find that the magnesia stand best. Added to this is an oxide lining of about two inches in thickness, made with scale and ore. I venture to say that, with proper care and management, the rotators can be kept in working order for at least three months without stoppage. At the end of that period probably the rings may want renewing, which would only cause a delay of about three days, so that with the cost being so low, and the output good, as the table shows, it must necessarily be a commercial success. It has been proved without doubt that the chemical results are all that can be desired. The furnace is arranged in the following manner: the gas is made in two ordinary Siemens producers—size, 8 feet by 7 feet, by 7 feet—which are at the back of the regenerators. The gas comes through a fire-brick flue, direct into the furnace. There are two chambers filled with bricks forming a checker-work from top to bottom—size, 19 feet 6 inches high, by 7 feet 6 inches wide, by 10 feet long. These are called regenerators, and are worked alternately, the waste heat from the furnace passing first through one chamber and then through the other for certain periods, making the checker-work hot; by this means we get hot air, and thus the furnace is heated to a high temperature. The drum, or rotator, is 10 feet 4 inches diameter inside and 10 feet 4 inches long. There are four 1½ inch diameter pipes for circulating water from front to back, keeping the tubes cool, which have two large bends for turning over the metal and for dividing it into five or six balls. This is one of the greatest improvements that has been made since the working of plant at Towcester, as there is no danger now of having a sliding charge. There is also a water cylinder at the back of the furnace, connected with the front by means of the four 1½ inch pipes, and which serves as a reservoir for keeping the top pipes full of water, and especially for keeping the ring and back end of the furnace cool. The furnace is revolved on four wheels, driven by a small pinion working into a large spur-wheel, which is in segments, and fixed to the furnace by means of brackets. The furnace is carried on a carriage for convenience of removing for repairs, &c. The charge is taken up by elevators and deposited in a tank during the time the furnace is working, and then, when ready to charge, a slide is removed and the furnace is charged in about ten minutes. I give the following as an approximate cost of a ton of iron made by this process, that is by working two rotators jointly:—

		£	s.	d.
Small Somorrostro ore,	1 ton at 8s. per ton	0	8	0
Hammer or roll scale	12 cwt. „ 10s. „	0	6	0
Producer coal	1 ton „ 7s. „	0	7	0
Reducing coal	6 cwt. „ 6s. „	0	1	9
Repairs and sundries	5s. „	0	5	0
Wages for labour	5s. „	0	5	0
		1	12	9

Abstracts of Reports of the Working of the Rotator at Landore.

Date.	No. of Heats.	Charges: Particulars of Charge.	Charges: Ore.	Charges: Coal for Reducing.	Charges: Scale.	Coal delivered to Gas Producers.	Product: Weight of Blooms.
1882,		Dys.hrs.	Tns	Tns.cwt	Tns.cwt	Tns.cwt	Tns.cwt.qrs
May 22, 6.30 a.m., to May 27, 11.30 p.m.	32	5 5	32	9 12	19 4	38 0	35 8 2
May 31, 8.30 a.m., to June 3, 1.30 p.m.	20	3 5	20	6 0	12 0	24 0	22 4 1
June 5, 6.30 a.m., to June 10, 11.30 a.m.	32	5 5	32	9 12	19 4	37 0	35 2 2
June 12, 6.30 a.m., to June 17, 12.30 p.m.	32	5 6	32	9 12	19 4	36 0	31 19 1
June 19, 6.30 a.m., to June 24, 12.30 p.m.	31	5 6	31	9 6	18 12	34 0	33 3 3
June 26, 10.30 a.m., to June 29, 5.30 a.m.	23	3 10	23	6 18	13 16	25 0	24 7 0
July 3, 9 a.m., to July 8, 8 a.m.	30	4 23	30	9 0	18 0	33 0	32 0 0
	217	21	200	60 0	120 0	227 0	217 5 1

SOCIETY OF ENGINEERS.

At the meeting of the Society of Engineers, held on Monday evening last, December 4, in the society's hall, Victoria Street, Westminster, Mr. Jabez Church, president, in the chair, a paper was read on "The Strength of Boiler Flues," by Mr. W. Martin. The author said that in the construction of steam boilers, more than in most other cases of mechanical engineering, it is of special importance that the principles involved should be clearly established, since cases of failure may produce such wide-spread and disastrous effects. This being so of boilers in general is so particularly with regard to long cylindrical flues, which, unless specially strengthened, are, as a rule, much the weakest part of the boiler. In fact, the majority of cases in which Lancashire and similar boilers fail from inherent structural weakness are cases of flue collapse. It may be said also that there is no part of the boiler in which faulty construction may produce such a reduction of strength as in the flue. Moreover, unless dangerous, almost collapsing, pressures are used, it is extremely difficult, owing to the smallness of distortion, &c., to detect any weakness in such structures by testing. This makes the construction of the flue a matter of peculiar importance. Notwithstanding this, however, and the interesting nature of the problem, the knowledge available with regard to it is not of the fullest, and the application of the formula in use may be made to produce somewhat anomalous results. The solution of the problem of flue strength, like most others of mechanical engineering, must of course come ultimately from experiment. Theoretical considerations can, however, do a little towards it, and that little is worth notice, because it makes the problem clearer, and the formula, when obtained, of wider application. By considering each circumferential strip of a cylinder sustaining external pressure, as in a condition analogous to that of a long column, it is possible by the application of the theory of such columns, to show that the strength depends upon the moment of inertia of the longitudinal section, and upon the modulus of elasticity of the material. This enables comparisons to be made between flues of different materials, or different qualities of the same material, and also between flues differing in section. If the theoretical formula for wrought-iron columns be compared with that obtained by Hodgkinson, it is found that whereas the first makes the strength depend upon $\frac{d^3}{l^2}$, in the latter case the corresponding rate is $\frac{d^{2\cdot76}}{l^2}$, not very much different. Now, making the corresponding comparison for flues of thickness t, the terms are t^3 and $t^{2\cdot19}$, showing a greater divergence. A recent examination, however, by Prof. Unwin, of the basis of the formula in the case of flues has resulted in an increase of the index 2·19. With regard to the experimental determination of the strength of flues, the only series of experiments which have been extensive and systematically made are those made by Sir William Fairbairn twenty-four years ago. Those experiments were of very great importance, especially considering the ignorance prevailing at the time upon the subject. They, moreover, immediately suggested simple and effective methods of strengthening flues, both old and new. Notwithstanding all this, however, the subjects of the experiments were too dissimilar in size and construction to working boiler flues, for the formula obtained to be thoroughly trustworthy. In addition to being small, they were under totally different conditions, especially in regard to longitudinal stress, and almost all the experiments which were comparable, as being with similarly constructed tubes, were upon one thickness of material. The results of this series of experiments, indeed, cannot be considered final; and it is much to be wished that these could be supplemented by further systematic experimental enquiry, in which should be included experiments to determine the strength of elliptical flues, the increase of strength due to introduction of "Galloway" tubes, &c.

HORIZONTAL ENGINE.

A well-made and useful engine which we found at the stand of Messrs. Marshall, Sons and Co., of the Britannia Ironworks, Gainsborough, at the Smithfield Club Show, is illustrated at fig. 1 of the engravings on page 478 of our present issue. This is one of their 6 horse-power self-contained horizontal stationary engines, with inside crank, having both the bearings on the engine bed-plate. The bed-plate itself is of a special form to insure the maximum strength and rigidity in working: the further end of the bed being bored to form the guide surfaces for the cross-head, and turned to receive the cylinder, which is constructed with a separate liner tightly forced into the main-casting, and the other casing is well felted and covered with a steel plate. The piston and valve-rods are of steel, the cross-head slipper adjustable, and the stop-valve is arranged with independent feed to the jacket, which also forms an effectual drain for the steam pipe. The engine, as will be seen, has a turned fly-wheel of ample size and width to receive a driving belt capable of giving off the full power of the engine. It is fitted with a treble valve force-pump, worked by a separate eccentric from the engine crank shaft. The governors are of Messrs. Marshall's patent type, fitted with Hartnell's patent automatic expansion valve gear, as shown at fig. 2 of our engravings, and which effects a great saving in fuel, and enables the engine to give off its maximum power with perfectly steady running under great variations of load. The arrangement consists of a highly sensitive and powerful governor acting through a link and die on to an expansion cut-off valve, working at the back of the main slide valve. The ordinary throttle-valve is dispensed with, and the speed of the engine is thoroughly controlled by means of the expansion-valve, which regulates the admission of steam into the cylinder exactly in proportion to the duty performed by the engine. This gear is very simple and reliable in its action, automatically regulating the speed with every varying load, and is thoroughly adapted either for heavy or light work. Engines equipped with it are specially adapted for driving electric light machinery, for which purpose we understand there are a number in use with satisfactory results.

BALANCE PLOUGH.

In the engraving at page 478 of our present issue we illustrate a new balance plough exhibited by Messrs. J. and F. Howard, of the Britannia Iron Works, Bedford, at the Smithfield Club Show. This implement is on the well-known balance principle—so long adopted for steam ploughs. It possesses advantages over any other reversible plough, not only on account of its great rigidity, durability, and facility of changing at land's end, but because it leaves narrower headlands. The screw adjustment to the wheels allows the depth to be regulated without trouble or loss of time, and with the disc guide wheel there is the further advantage of a wider wheel carriage, which ensures steadiness in working upon hill-sides. By a simple screw adjustment on each plough-frame, the share may be regulated to the pitch required. The handles are rigidly fixed at each end of the beam, so that in work the plough is as easily managed as the ordinary single plough.

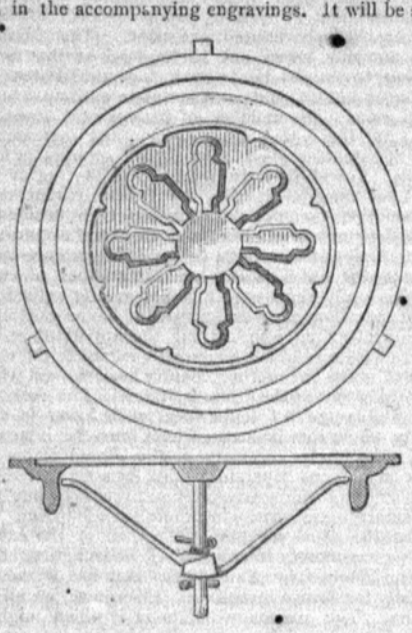
PORTABLE ENGINE.

One of the exhibits at the stand of Mr. Edward Humphries, of Pershore, at the Smithfield Club Show is the 7-horse portable engine, which we illustrate at page 479 of our present issue. The cylinders of these engines are steam-jacketed and made of a special mixture of the best iron, cast in one-piece with the steam-chest, and the steam ports are so arranged that no steam is wasted in

filling up unnecessary space. The brackets which support the crank-shaft in its bearings are rigidly stayed to the cylinder by wrought-iron bars, and are also fitted with a sliding plummer block. This relieves the boiler from all strain by the working of the engine, and admits the use of light brackets. The engines are made to run in either direction, by simply changing the position of a set screw in the eccentric. The boilers are of the locomotive type, efficiently stayed, and are proved by hydraulic test to four times their working pressure. The wheels are of a special make and of wrought iron. The naves are so constructed that when the bush is worn it can be easily replaced by a new one. These engines are adapted for semi portable and stationary engines by being mounted on metal supports in place of wheels and axles, the fixing under the fire-box forming the ash-pit, and the one under smoke-box a feed-water cistern.

LODGE'S SELF-LOCKING COAL-PLATE.

ACCIDENTS to pedestrians by the dislodgement of coal-plates are not uncommon. One has recently been the cause of an action in our law courts, resulting in a verdict in favour of the injured party. We have more than once stepped on one of these traps for the unwary, and have many times, more than once, pushed a displaced plate into proper position. Hence we are glad to see an invention by which this dangerous defect may be remedied. This is effected by the self-locking coal-plate of Mr. Lodge, which is being introduced by Mr. Payne, of 11, Chapel Street, Edgware Road, London. We illustrate it in plan and section in the accompanying engravings. It will be seen to



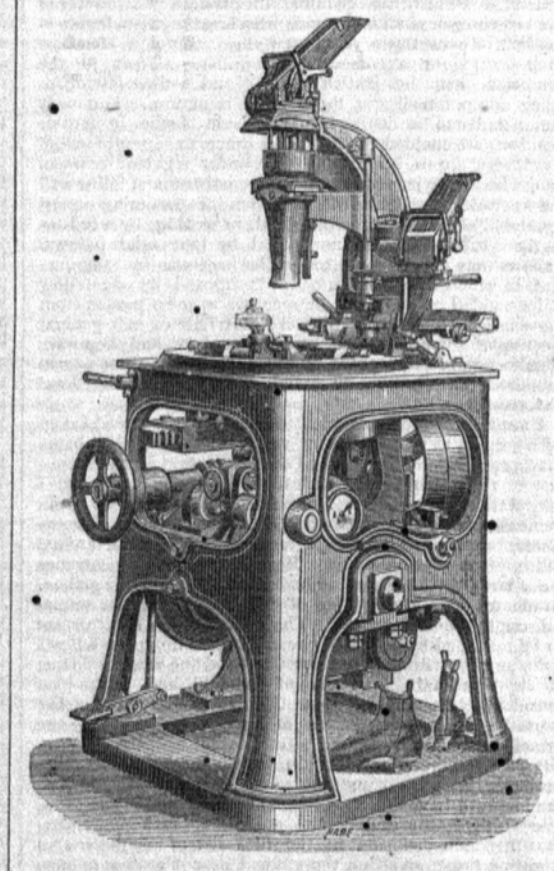
consist of a plate, into the centre of which, on the underside, is cast a stud-pin, which carries two loose arms, held in place by means of two split keys. The plate is dropped into its place, and the loose arms fall against the side of the ring, and any attempt to remove it from the outside causes it to grip more tightly. It is easily opened from the inside by simply lifting one of the arms and pushing the plate out. It is claimed by the inventor that accidents are impossible where these plates are used, and we think the claim to be most reasonable. We understand that a number of these plates are already in satisfactory use, and, on public grounds, we trust that number will be rapidly and largely increased.

THE TURNER-HARTNELL GOVERNOR.

ONE of the few novelties which we found at the Islington Show was the automatic expansion governor, which we found at the stand of Messrs. E. R. and F. Turner, of St. Peter's Ironworks, Ipswich. This is the Turner-Hartnell governor, which is a simplification of the Hartnell governor, and both of which we illustrate in the engravings at page 479 of our present issue. Fig. 1a represents the Hartnell governor as applied to the cut-off valve of the horizontal engines. Briefly described, the governor may be said to consist of a pulley, keyed to the engine-crank shaft in the same manner as an ordinary pulley. Two weights are suspended on pins to the arms of this pulley, and rotate with it round the crank-shaft in a vertical plane. These weights are controlled by a spiral spring to prevent their flying out too readily. The weights are connected by a coupling link, so that the centrifugal force of the two weights act together. The cut-off valve eccentric forms in reality a part of the governor. Connected to the weights is a curved lever or quadrant, the curvature of which passes through a slot in the boss of this eccentric. The action of the governor is as follows:—Any variation in the work on the engine, say the sudden variation which follows the completion of a heavy cut by a circular saw, naturally tends suddenly to increase the speed. This causes the weights to radiate by centrifugal force, and to overcome at once the restraint of the spiral spring. The weights in flying out carry with them the quadrant or curved lever, which is fixed to them in such a way that in altering its position it shifts the cut-off valve eccentric, and diminishes its stroke, thus lessening the travel of the cut-off slide valve, and reducing the steam supply. When the saw cut again comes on, the reverse takes place. The spiral spring draws the weights close together, and the stroke of the slide valve is instantly increased, so that the required steam supply is obtained. Figures 1 to 7 represent in detail the new simplified form of this governor—the Turner-Hartnell patent. In these engravings the various parts are denoted by figures as follows, viz.:—1. The weights; 2. The springs; 3 The eccentric sheave; 4 and 5. Covers; 6. The eccentric rod and ring; 7. Holes to receive studs for reversing the engine; 8. Studs to fit into the holes; 9. Hole for engine crank shaft; 10. Holes in which the weights swing; and 11. Nuts for adjustment of speed. This form of governor is specially produced to suit the smaller sizes of the "Gippeswyks," manufactured by Messrs. Turner, the original Hartnell governor being better adapted to the larger engines. From our illustrations, and from what we have stated, it will be seen that the Hartnell governor is simple and reliable in its action. It is found to be sufficiently sensitive to vary the steam supply simultaneously with any variation of its working load, and to ensure regularity in speed under varying loads.

THE COWBURN HEELING MACHINE.

WHEN the members of the Iron and Steel Institute visited Graz, last September, they inspected a number of works in its neighbourhood, which, as a rule, were connected with the manufacture of iron and steel. There was, however, one exception, and that was the Wiener Schuhe-Fabrik of Messrs. D. H. Pollak and Co., which is situated a short distance from the railway station at Graz. We briefly noted this fact at the time, and we now propose to add a few particulars of these works, and then to describe a most ingenious machine for fixing and shaping the heels of boots and shoes, which we saw in use there. The machine is the invention of Mr. Thomas Cowburn, the director of the Schuhe-Fabrik, who is an Englishman, and who gave his visitors a right hearty English welcome. These works are divided into several departments, but the main workshop is 230 feet long by 226 feet wide, and contains 175 machines of various kinds, including Keat's and that which we are about to describe. About 600 workpeople of both sexes are employed in this one room, and there is also a staff of mechanics, lastmakers, carpenters, and packers. There is also an outside staff of workpeople employed in the production of hand-made goods. The leathers are all cut at the Vienna works of the company, and sent to Graz to be worked up into boots and shoes of every conceivable variety, the annual production being about two million pairs, which are sent to all parts of the world. The Cowburn heeling machine attracted considerable attention, and well it might, for it automatically feeds itself with nails, makes and attaches the heel, and simultaneously sprigs on the top-piece, pares the heel to any desired shape, and breasts it, leaving the heel ready for colour, at one operation, or during one revolution of main shaft.



A perspective view of this machine is given in the above engraving. The lower parts are carried within a substantial cast-iron frame about 2 feet 6 inches square at the base, and about 3 feet in height, in which the heavier cams and their adjuncts work. Above and upon this rise the lighter working parts, and the moveable head, from which is suspended the arm or ram, upon which the boot to be heeled is placed. Rising above all, and inclining towards the back of the machine, is a rack communicating with a number of hollow tubes, and containing a quantity of ordinary heel pins, such as are used in putting on the heels of riveted, or machine-sewn boots, these pins being suspended by their heads, in the same manner as though they were held in the teeth of a comb. On the right of the operator rises a second rack, also communicating with hollow tubes containing brass rivets intended for securing the top-pieces, suspended in the same way as previously described. In front of the operator and resting upon the table is a steel block, the upper part of which is similar in shape to a top-piece, having a number of perforations in it, corresponding to the quantity of rivets used in nailing top-pieces in the ordinary way. Above this is an iron cup, shaped interiorly like the heel of a boot, and at the left-hand side stands a knife, the upper end of it being placed in a guide, which, when put in motion, travels round the seat of the boot operated upon. The descending ram, upon the lower end of which the boot is placed, is provided with a die or presser, corresponding with the heel of a last, and perforated with a number of holes equal to the number of heel-pins required for fastening on the lifts, the holes following the angle at which it is necessary the pins should be driven. These holes directly communicate with passages in the cheeks of the ram through which, having been delivered from the rack, the pins descend.

In working this machine the operator first swings forward on its hinge the rack containing the top-piece rivets, until the tubes connected with it come into position over the steel block before referred to. The action of moving forward releases a bar, which has previously held the bottom row of rivets in place, while a second bar is by the same movement placed so as to prevent more than the single row being set free. The rivets released, are received by a supporting tumbler turned by a lever, which, raising their points, causes them to descend heads downwards through the tubes, and from there into the holes prepared for their reception in the steel block. Having delivered the rivets, the rack is returned to its former position, the action of returning releasing the second bar, and placing the first in its original position. The iron cup being then brought into its place over the block, receives first, a top-piece, and next the requisite quantity of lifts to form the heel. The boot required to be heeled is then placed on the ram, and is fixed there at the back by a spring. A row of heel-pins from the upper rack is then released by a similar bar arrangement to that above mentioned; but, in this case, as the points are required downwards, the tumbler is unnecessary. The boot, and the heel stuff to be attached to it, being now in position, the depression of a foot lever brings down the ram, and with it the boot, a set of punches descends through the holes in the ram and drives the pins through the insole, soles and lifts, and immediately after, the brass rivets in the lower block are forced by a corresponding set of punches through the top-piece, and secure it in its place. The heel being now securely attached to the boot, the cup is by an automatic arrangement drawn back out of the way before the pressing apparatus comes into play; the knife then comes into position, and pares the heel to the required shape. The action of this knife and of the movement supporting it is the most remarkable point of this interesting machine, for it adjusts itself to the varying angles the conformation of the heel requires its cutting edge to assume, without hitching or jerking in any way. The action of the knife may be explained as follows:—The knife is carried on a lever or arm pivotted on a horizontal axis level with the top of the rest; the pivots are carried on a rocking frame with a horizontal axis at right angles to the knife lever. The bearing in which the rocking frame works is made to slide to or from the rest to adjust the knife to various sizes of heels. The slide, and with it the knife-lever and knife, are carried in a plate or disc on the top of frame, which has a reciprocating rotary motion imparted to it, and which carries the knife round three sides of the heel. The form of the bottom of the heel (or top-piece) is given by eccentrics, which carry round the disc or plate in the different circles from which the sides and backs of heels are struck. For guiding the upper part of knife a roller or wheel is mounted on the knife-lever, and is caused to press against the upper of the boot or shoe, and as the disc and knife move round the heel, the roller runs round the upper. The roller is hollowed out on the underside, leaving the rim of such a thickness as it is desired the heel should project from the upper, the knife being made to pass up inside the rim of roller. For cutting heels with considerable variation between top and bottom, it is necessary that the cutting edge of the knife should be moved backwards and forwards from vertical lines. This is done by a guide placed under the disc or plate, with a roller and levers connected with the rocking frame, and is adjustable, so that any desired amount of rocking may be given to the frame according to the requirements of the form of heel. The cut having been completed, the knife, with the same undulating motion as that with which it advanced, returns to its original position, and meanwhile a second knife, actuated by the movement of a lever worked by a cam beneath, rises, and, with a clean cut, takes out the front of the heel, thus completing the operation which from first to last does not occupy more than half a minute. Such is the Cowburn heeling machine, the quiet smooth, rapid, and efficient working of which we witnessed at Graz. It is a masterpiece of ingenuity, and has stood the test of actual work for some time, having come into considerable use in the boot and shoe trade. It was awarded both the gold and bronze medals at the Frankfort International Exhibition last year. We should add that the machine is made by Messrs. Fielding and Platt, of the Atlas Iron Works, Gloucester, in which city Mr. Cowburn resided for some years.

A NEW METHOD OF COKE BURNING.

THERE is now in operation at the chemical works of Messrs. H. L. Pattinson and Co., Felling, a new method of utilising the volatile products of coal as they are evolved in the process of coke making. The inventor of the novel process is Mr. J. Jameson, of the firm of Jameson and Schaeffer, consulting engineers, Avenside Hill, Newcastle. He has succeeded in inventing an apparatus by which the valuable matters volatilised from coal under the action of heat may be secured, whilst at the same time the residual coke is produced in good marketable condition. Mr. Jameson's method of working attains these ends by means so simple that after seeing it in action, one wonders why it has never been thought of before. Broadly speaking, the system aims at drawing away gases and vapours from the bottom of the coke oven by slight but steady suction, and condensing these products in a series of cooling pipes. The plan differs entirely from the existing methods of forcing out gases, &c., from the top of the oven or furnace, and the results, whether in regard to the cheapness of plant or to the quantity and value of the products obtained, appear to be in favour of Mr. Jameson's invention. An idea of the economy of the process may be formed from the fact that the entire apparatus can be applied to the coke ovens now in common use at a very slight cost. The bottom of the oven is perforated, and into it is introduced the end of a suction pipe. This pipe may be

made of length suitable to the requirements of any special situation; but at Messrs. Pattinson's it is sunk under the ovens, and emerges in a trench a few feet below the surface, and perhaps half a dozen yards from the coking furnaces. Here it communicates with the condensing pipes, from which, at intervals, the liquid products are drawn off, whilst the incondensable gas is, for the present, allowed to escape. The suction pipe is at the Felling works, operated by a blower driven by a small steam-engine, but the power required is so very slight that almost any sort of spare or waste force about a factory may be used for the purpose. The suction exercised amounts to only half an inch of water, and a fan is the best and most easily controllable means of supplying it. The entire plant comes into very small compass, consisting, as it does, of only a couple of short ranges of piping, a few receiving tanks, and the means of procuring the trifling suction power that is necessary.

The principle illustrated by the working of the process is an important one. In making the ordinary hard coke of commerce, the coal with which the oven is charged is ignited at the top, and burns downwards. With the gradually increasing heat the coal begins to "cake" at the surface, or, in scientific parlance, an agglomeration of its particles takes place. The gases and vapours emitted rise to the intensely heated surface of the charge, where the ammoniacal products are decomposed and altogether lost, whilst the carbon of the hydrocarbon gas is burnt and wasted. The pitchy hydrocarbons of the coal being more fluid than volatile, set in the charge, and become valuable constituents in the coke, affecting, as they do to so important a degree, its density and hardness. By means of Mr. Jameson's apparatus, a considerable quantity of these pitchy constituents of the coal could be withdrawn from the oven, but the result would be to leave the coke in a comparatively soft and porous state. The object aimed at is to extract such valuable elements of the charge as may be taken without adversely affecting the market value of the coke, and, therefore, this process is not proceeded with. The suction is so managed as to cause no actual passage of air through the charge. In short, the "caking" of the coal, or agglomeration of particles before alluded to, is permitted to act as a seal over the top of the charge. Thus the gases and vapours formed as ignition spreads downwards are gradually drawn off at the bottom by the suction pipe, and they are never permitted to rise and break the seal of agglomerated particles which has formed over the surface of the charge of coal. The process distillation which goes on within the oven is conducted with a low degree of heat, and one result of this is a material advantage in regard to the quality and quantity of of the oil, which is a leading product of the system. In the plans by which the distilling process is carried on at great degrees of heat, many of the hydrocarbons are converted into incondensable gas, and, of course, cannot be extracted for the enrichment of the oils. By the Jameson method of working the volatile matters formed at the lowest heat are at once drawn away through a cooler stratum of coal—that which is lower in the oven—while the least volatile constituents of the charge are left to maintain the mercantile value of the coke.

The most important products at present obtained from the coking ovens by the Jameson process are mineral oil and ammonia. The mineral oil produced at Messrs. Pattinson and Co.'s works contains from 10 to 15 per cent. of solid paraffin, whereas Scotch cannel coal is good if it produces 10 per cent. The oil is used for illumination, for sanitary purposes, for the preservation of timber, and for lubrication. It will probably come in quantities for sale to the consumers by the time that the American supply, to the copiousness of which there are now apparent limits, begins to run low. The new mineral oil can, it is expected, be placed in the market for 3d. or 4d. per gallon, and at that price its richness in paraffin should secure it a ready sale. However, there need be no fear of over-stocking the consumers with it. The Pennsylvania oil district alone yields about 1,500 000,000 of gallons of crude oil per annum, and there are other fields of production in Europe and Asia opening out. The extreme quantity that could possibly be made under the Jameson patent would only satisfy a portion of the home demand. For the ammonia which is produced by the process the demand for agricultural purposes alone is practically unlimited, and from this point of view considerable importance must be attached to a new and economical means of obtaining a copious supply of a substance so necessary to the success of farming operations. Something less than 20 millions of tons of coal are coked annually, and the utmost quantity of ammonia that can be extracted from most of it is probably about 10 lb. per ton. The actual amount extracted is upon an average about 5 lb. per ton, and supposing the system to be unanimously adopted 100,000,000 lb. of ammonia per annum would be produced. We may mention that four coke ovens have been fitted up with the apparatus—which necessitates no differences from the ordinary modes of erecting and working the ovens—at Messrs. Pattinson and Co.'s, and that for three months they have been in regular work. During that period experiments have been made with many different qualities of Northumberland and Durham coal, but although there were differences of quality and quantity in the products of the several coals, yet the system has acted constantly and unfailingly upon all. Of course, the invention is patented, and the coke manufacturers who are now fitting up the apparatus to their ovens do so under the usual conditions.

INSTITUTE OF PATENT AGENTS.

THE inaugural meeting of this body was held on November 29, at 87, Chancery Lane, the president, Mr. J. H. Johnson, in the chair. The report of the council (which was read by the secretary, Mr. H. H. Graham), after reciting the steps taken by the council to obtain the incorporation of the institute, stated that the original number of subscribers was forty-eight, including ten members of the council. The balance at present in the banker's hands was £363 10s. 3d., all the preliminary expenses having been defrayed. The council had received very valuable assistance from Mr. Hardingham, who had acted as secretary, and suggested that as some slight recognition of his services he should henceforth be requested to hold the office of hon. secretary. The council would be glad to receive original papers on subjects likely to be of interest to be read at the meetings of the present session, and also applications from gentlemen desiring to become members.

The president then delivered the inaugural address. He said:—You will probably think it due from me—elected, as I have been, to the honourable post of first president of our institute—that I should say a few words at what, I hope, will be the commencement of a long series of annual meetings. In the first place, I must express my sincere thanks for the great honour which has been done me, and I trust that the institute will have no ground during my tenure of office to regret the choice which it has made. The Institute of Patent Agents has been in the minds of some of us for many years. Probably there is no profession which has more need of such an institution. You are aware that the objects for which the association is established are:—(1) To form a representative body of the patent agents of the United Kingdom for the purpose of promoting improvements in the patent laws and in the regulations under which they are administered; (2) To frame and establish rules for the observance of patent agents in all matters appertaining to their professional practice; and (3) To extend their opportunities and facilities for meeting, correspondence, discussion, and interchanging ideas respecting matters connected with their professional practice, and generally to aid in the acquisition and dissemination of knowledge appertaining to their profession. The institute is to be composed of fellows, associates, foreign members, and honorary members, with a class of graduates. The first fellows of the institute are the gentlemen who joined it on its formation; including, I think I may fairly say, all the prominent patent agents of the day, both in London and in the country. For the future, a fellow must be more than twenty-five years of age, and must come within one of the following conditions:—(*a*) He shall have practised on his own account in the United Kingdom for at least five years, and have acquired good repute in the profession of a patent agent; or (*b*) He shall have been for, at least, seven years engaged as a pupil or assistant in the business of a fellow of the institute, and have acquired such knowledge as to qualify him to practice as a patent agent; or (*c*) He shall have passed an examination in patent law and practise in mechanical drawing and in such technical or other subjects as the council may deem requisite; such examination being conducted by the council or by examiners appointed by them. Associates are to be persons of more than twenty-five years of age who are not patent agents by profession, but who, by their connection with the law, science, or the arts, are, in the opinion of the council of the institute, qualified to advance the objects of the institute, or shall be persons who have been graduates of the institute of three years' standing. Foreign members shall be patent agents established in practice in foreign countries or in the British colonies, and neither having an office nor practising in the United Kingdom. Honorary members are to be distinguished individuals who, from their position, are enabled to render assistance to the profession. Graduates are to be persons not under eighteen years of ago, who are or have been pupils or assistants of fellows of the institute, and have the intention of becoming patent agents. Fellows are to be proposed, in writing, by a fellow of the institute, and recommended by four other fellows. Fellows may also be admitted to the institute by examination, in which case they must be proposed by one fellow and seconded by another. A member may be passed from the class of associates to the class of fellows at a general meeting of the institute. Foreign members and honorary members must be proposed by the council, and their names submitted for election by ballot, as in the case of fellows and associates.

I need not trouble you with the further steps to be taken with respect to the election of various classes of members; they can always be ascertained on application to the secretary of the institute; but with regard to the fees payable, I may state that:—Fellows are to pay an entrance fee of six guineas, and an annual subscription of four guineas. Associates, an entrance fee of three guineas, and an annual subscription of two guineas. Foreign members, an entrance fee of two guineas, and an annual subscription of one guinea. Graduates, an entrance fee of one guinea, and an annual subscription of one guinea. The affairs of the institute are to be managed by a council chosen from among the fellows only, and consisting of one president and one vice-president, of eight ordinary members of council, and of the past presidents. It will be seen that the present list of the council comprises the names of members of most of the principal London firms, and of one patent agent residing in Glasgow, and one residing in Birmingham. It is quite probable that some patent agents entitled to admission to the institute have not been invited to assist in its formation. We wish it to be understood, as to any such gentlemen, that their non-inclusion in the first list of members is no slight on them, and that the council do not profess to have invited the co-operation of all qualified practitioners, but only of those with whom some member of the council was acquainted. They considered it necessary, in the first instance, to adopt this method of procedure, as no other means of selection appeared to be open to them. The council could not undertake the personal responsibility of approving every name they heard of as that of a patent agent without knowing anything whatever of the position or qualifications of the person referred to. It was, therefore, deemed best to invite the assistance of a sufficient number to form a nucleus for electing applicants in accordance with the formalities prescribed by the regulations. The course they have followed has been prompted solely by regard for the interests of the institute, and has not been in any sense attributable to a desire to exclude any patent agent who can be regarded as properly qualified for admission. On the contrary, they will be happy to receive applications for admission from gentlemen practising the profession who are not yet members. The moneys of the institute are to be entirely devoted to the prosecution of the objects for which it was formed; but I am afraid that its funds—at all events, during its early stages—will scarcely do more than pay the current expenses which it is absolutely necessary for the institute to incur.

Our idea in forming the Institute of Patent Agents has been that it will be useful in making us better acquainted with each other on the ground of common interest, and in facilitating discussion on all questions of interest to patentees, and to ourselves. There are, frequently, questions arising of great moment to our clients upon which an individual agent can exert but little influence; and it is hoped that this institute will be able to deal with such questions with an authority no individual member could hope to possess. Much good has been done by professional institutes founded, like ours, for the purpose of drawing together the members of the profession, and for extending their opportunities and facilities for meeting, correspondence, discussion, and for the interchanging of ideas connected with matters relating to their professional practice. I need only refer you to the Law Institution (which has done much to elevate the status of solicitors), the Institution of Civil Engineers, the Royal Institute of British Architects, the Institute of Surveyors, and the Institute of Chartered Accountants. All these bodies number a great many more members than we do at present, or are likely to do; but the profession of a patent agent, properly carried on, relates to as important a class of interests, and requires the possession of as great a degree of trained skill and aptitude, as do the professions represented by the institutes to which I have referred. The institute will, we trust, give us a greatly improved status; and we look forward to the time when our institute will have as important an influence on our profession as the institutes referred to have in the professions to which they relate. The profession of a patent agent has not been carried on as a separate branch of business in this country for more than sixty years. My own personal knowledge of it extends to a period of something like thirty-three years. Prior to the passing of the Patent Law Amendment Act, 1882, patent agents' business was of a comparatively limited character. The number of patents annually taken out in England at that time not amounting to more than 550; but the Patent Law Amendment Act was the precursor of an entirely new era in the profession. The number of patents was greatly increased, and there was also a very great increase in the number of patents applied for by British subjects in foreign countries. I need scarcely remind you that prior to the Patent Law Amendment Act, the British patent covered our colonial possessions; but as it was then decided that the British patent should not from that time extend to the British Colonies, nearly every colony of importance has now passed a patent law of its own, and the number of colonial patents has vastly increased; this has greatly extended the sphere of operations of patent agents, and has necessitated the establishment of agencies in all the important colonies. Much has been said of late years with regard to the number of patents taken out in this country as compared with the number taken out in the United States. The fees in the United States are no doubt very much lower in amount than they are in this country; but it must be remembered that it is absolutely necessary in the United States for an inventor to take out separate patents for a number of heads of the invention, which may all be covered by one patent in this country; and that, when there are conflicting applicants for the same invention, the cost of the American patent is enormously increased. I believe that, on the whole, the Patent Law Amendment Act has worked very successfully for British inventors. Of course, we all of us know that there are many points in it which might very well be amended, and I cannot help thinking that one great blot in our patent system consists in the fact that numerous patents are granted upon mere application for inventions which any man of intelligence must know to be perfectly old. It therefore appears to me that any act to amend the law of patents should certainly contain some provision with respect to the examination of the applications, and that the applicant should at least have pointed out to him by the Patent Office the specifications of similar inventions which are already existing in that office.

It is not possible, in the limited time at my command, to go into any details as to the mode in which an examination should be conducted, or the principle upon which applications should be rejected. It is sufficient at present to draw your attention to the question—which is certain to be brought forward whenever Parliament can afford time to take up patent law reform. It may be well, therefore, that we should give the matter our serious consideration beforehand, so as to be prepared to deal with it at the proper time. Various bills which have been brought before Parliament for the last ten or twelve years have all received the close attention of a committee of patent agents sitting in London, and their recommendations have, from time to time, been brought before the gentlemen in charge of the several bills, the law officers of the Crown, and the Lord Chancellor. It may not be irrelevant here to state that our suggestions have always been met with courtesy, and we have found many of these suggestions adopted in bills of a later date. The bill which appeared most likely to meet the views of inventors, and to be of most advantage to this country, was the one brought in by Sir John Holker in the year 1879; and the patent agents to whom I have before referred were in great hopes that the bill, with some modifications, might pass, as it would have been a great advance on the present state of legislation on the subject. The bill was, however, blocked in the House of Commons, and it is to be feared that inventors will find some difficulty in getting the Government again to look upon their interests with the same liberal view they did at that time. You are aware that the Government proposed to bring in a bill for the amendment of the patent laws last year, but the state of business in Parliament clearly prevented their dealing with the subject. It is now understood that the Board of Trade have a bill under their consideration, and that it is to be introduced as soon as there is any chance of its obtaining proper discussion. When that bill is introduced it will be one of the chief duties of the institute to keep the closest watch upon it, and upon all bills that may come before Parliament on the subject; to do our best to point out where they are faulty, and how they may be improved. The bills we have hitherto seen all contain provisions more or less crude, more or less impracticable, and more or less dangerous to the interests of inventors. For instance, I cannot help thinking that every plan for making licenses compulsory is unworkable, that the patentees and the public should be left free to settle their business in their own way, and that any attempt to interfere with them will be

entirely abortive, and will do more harm than good. As to these and other questions relating to the same important subject, it must be manifest to all that the suggestions of our institute, founded on the mature deliberations of the body of patent agents, will have much more weight than those of individuals. Here and there we meet with persons who preach the doctrine of "No Patents"; but I firmly believe that so long as Government deems it just and expedient to give copyright to authors it will extend patent rights to inventors. I shall not waste your time by arguing on this point, feeling convinced that everyone who hears me knows that it would be the height of injustice to deprive the inventor of the fruits of his labour. It is intended to hold, at regular intervals, meetings of the institute, at which papers will be read by members on subjects of interest to the profession. It is hoped that these meetings will also afford the opportunity for discussing questions relating, not only to procedure and practice in this country, but in foreign countries and in the colonies, where the interests of patentees are now becoming of great importance.

The institute will also afford opportunities for prompt intercommunication of legal decisions in patent cases. It may probably be possible to arrange for the communication to the institute of all legal decisions of importance considerably in advance of the publication of such cases in the ordinary law reports, whilst decisions in matters of practice before the law officers (as to which there is often much obscurity) may also, with great benefit to the profession generally, be brought to the knowledge of the institute by the members engaged. Patent agents are accustomed to be consulted by inventors, not only on the policy of securing their inventions by letters patent, but upon their commercial dealing with the inventions after they are protected; and our clients are entitled to expect from us the most honourable and straightforward advice. One part of our duty is to restrain them from rushing into litigation when their patents afford no fair grounds for such a course. We all know that the inventor has an extreme idea of the value of his own invention; and we can all repeat instances of clients who cannot understand that the consideration of their particular invention is not the most important subject of the moment. Patent agents are also very frequently in a position of much delicacy as regards the claims of rival inventors through the feeling of jealousy which one inventor has of another. I believe that where the patents agents employed are men of honour and position, there is little ground for any jealousy of this kind. I have frequently found that the knowledge I possessed of rival inventions and rival inventors, which was confined to my own office, has been of great benefit by enabling me to warn subsequent inventors of dangers they might otherwise have rushed into. There has also been considerable difficulty at all times in the selection of proper scales of charges for procuring patents and for other services in relation to patents; but I think the members of an institute of this kind may, by communication with each other, agree on what should be fair to themselves and to their clients. This subject is a kindred one to that of the charges of solicitors, as to which there has also been much recent discussion, finally concluded by an Act of Parliament, in the preparation of which the Law Institution had no small part.

It is our great wish to do everything that can be done to maintain the honourable position of patent agents, and to give them a place in the estimation of the public, which has scarcely yet been fully attained. If this institute can attain the position of a central authority, we shall do much to effect the objects I have mentioned; it being our desire, on the one hand, to provide a check against all irregularities in professional practice, and, on the other hand, to secure to the members of the institute that fair consideration from their clients to which they are entitled. The council have power, by the articles of association, to exclude from membership of the institute all persons convicted of any irregularity in the practice of patent agency. The members may rely upon it that no part of the duties of the council will be more onerous or more unwillingly undertaken; and it is hoped that there will be few, if any, cases in which this authority has to be exercised. You will observe that we have taken power to admit, as members of the institute, patent agents practising in the different foreign states. We shall be in constant communication with these agents; and I cannot help thinking that much may be done to facilitate the labours of English agents by a well-arranged system of such correspondence. We look forward to the time when we may collect a library that shall be valuable to our members and to all interested in patents in this country; but we may be some time in attaining this object, owing to the expense that must necessarily be the formation and preservation of such a library. The council will be, at all times, willing and desirous to receive communications from agents upon all subjects connected with the objects of the institute and the well-being of the profession; and as we shall meet at frequent intervals, all such communications will have our most careful consideration. The selection of a competent person to fill the office of secretary has been a matter of considerable difficulty and anxiety to the council. The development of the institute must necessarily depend to some extent on the ability and energy of this officer. It will be essential that the existence and importance of the institute, and the qualifications necessary for admission thereto, be made widely known; otherwise influence cannot be acquired for itself as a body or for its members individually. The labour involved in securing these results will principally devolve on the secretary, in addition to the routine business of the institute. The council believes that the gentleman selected (who has had considerable experience in the formation of other institutions) possesses the qualifications necessary for the effective fulfilment of the duties of the office. Having put before you the objects and interests of this institution, it is only for me to say that our success can only be assured by the hearty co-operation of all its members; and this, I hope, we are already assured of, as the formation of an institute of this kind seems in itself a proof that the members are desirous of effecting the objects I have pointed out.

Mr. Imray, vice-president, in proposing the election of Mr. C. F. Kemp as auditor, expressed the pleasure which he felt at the formation of the institute, and alluded to the benefits to be obtained by the opportunity of co-operation which its establishment afforded. Hitherto patent agents had formed themselves into small bodies, but the action of such bodies could never be so effective as that of an institute representing the entire profession. Among the subjects which the institute could advantageously deal with was the question of international patent law. It would also endeavour to maintain the status and respectability of the profession, and, he hoped, be able to exclude those who adopted dishonest or dishonourable practices. Mr. Carpmael seconded the motion, which was unanimously adopted. The president then proposed that a vote of thanks should be given to Mr. Hardingham for his services, and that he be requested to fill the post of hon. secretary. Mr. Abel seconded the motion, which was unanimously agreed to. Mr. Hardingham briefly acknowledged the compliment paid him, and expressed the pleasure he felt that his functions as wet nurse to the institute were no longer needed.

Mr. Newton, in proposing a vote of thanks to the president for his address, said that the institute had many useful functions to perform, and there were many subjects which the members might advantageously discuss. One of its great objects would be to maintain the respectability of the profession, by preventing the frauds occasionally perpetrated by those who were a disgrace to it. Mr. Carpmael seconded the motion. Mr. Spence, in supporting the motion, said that having passed his professional golden wedding day, he desired to express the satisfaction he felt at the establishment of the institute, and his conviction that it would be a great benefit in promoting the interests, and maintaining the status, of the profession. The motion was agreed to and briefly acknowledged by the president.

Several suggestions were then made by the members with reference to subjects of discussion at the meetings of the institute; and it was also proposed by Mr. A. M. Clarke that application should be made to the commissioners of patents for a formal recognition of the institute, and for permission to have a list of members placed in the office to which intending patentees could be referred. The meeting then separated.

NOTICES OF BOOKS.

Electric Illumination. (*Engineering* Series.) Edited by J. DREDGE. London: Office of *Engineering*, 1882.

NOWHERE has the practical history of the development of electric lighting been more correctly or more fully written than in the pages of our contemporary, *Engineering*. Aided by a staff of competent electricians both in England and on the Continent, the editors have produced a series of articles of permanent value upon this interesting and important subject. They are, however, of necessity scattered through several volumes, and in this respect are not very easy of access for reference. To render them more useful for this purpose, they have been collected and judiciously arranged by Mr. Dredge in a handsome and bulky volume, which is now before us, consisting of 900 pages of matter, interspersed with 800 wood engravings. The work is divided into four sections, the first of which treats of the theoretical portion of the subject. The second section is devoted to the generators, the third to the conductors and carbons, whilst the fourth has reference to the arc and the incandescent lamps and to the Jablochkoff candle. The whole book is full of interest, and carries us back to the earliest dawn of electric generators. By it we are reminded that in this country the modern revival of electric illumination dates from 1873, when, by the aid of a Gramme machine, Mr. Conrad Cooke flashed a signal light nightly from the clock tower of the Houses of Parliament. In the same year a factory in Paris was also first permanently lighted by electricity, whilst contemporaneously Messrs. Siemens Brothers, of Berlin, maintained an electric signal on the top of the central dome of the Vienna Exhibition. Although the volume has been chiefly compiled from *Engineering*, it has not been wholly so, inasmuch as about one-third of what appears in the book is entirely new matter. Besides this there is a voluminous appendix, consisting of abstracts of specifications having reference to electric lighting. The work is capitally printed. But we may draw attention to one or two points in which the general excellence of execution is interfered with. The reference numbers in the text are simply ugly. The reference numbers and descriptions under the cuts are too large, which objection more particularly applies in the case of the small illustrations, which thus appear overbalanced. These merely technical defects, however, are only trifling matters, and by no means detract from the high merits of the work. We observe it is intended that the present volume shall be followed by a second one, in which the practical application of the various systems of electric lighting will be largely dealt with. We shall look forward to its appearance with interest, in the meantime commending the present work to those who wish to possess a faithful record of the progressive history of electric lighting.

Papers on Mechanical Subjects. By SIR JOSEPH WHITWORTH, Bart., F.R.S. Part I. True Planes, Screw Threads, and Standard Measures. London: E. and F. N. Spon, 1882.

THE work that some men do is not always to be measured by itself, nor by its immediate results. These are sometimes so outspreading and far-stretching, so ramified and interwoven with a thousand things that are out of general sight and knowledge that they cannot be fully realised in estimating the value of the source from whence they sprang. Nor does the matter end here, for often, long after the master mind has ceased to take a prominent interest in its earlier works, the principles underlying them are applied in diverse ways by the direct suggestion of the works themselves. Hence, when those works are of solid value, it is good that they should be brought to the front even years after their inception, that others may be reminded of them, and may haply apply their principles in some beneficial direction hitherto unserved thereby. It is therefore with satisfaction that we welcome the re-publication by Sir Joseph Whitworth of a series of papers on mechanical subjects of which he is the author. These papers refer to true planes, screw threads, and standard measures, and we need not stay to point out the great benefits Sir Joseph has conferred upon practical science by his labours in these branches. It suffices to say that the papers are connected together by a general unity of purpose, as they all tend to the promotion of improvements which will assist in enabling England to hold her own as the head of the manufacturing nations of the world. But, although Sir Joseph has done much, there is yet much more to be accomplished, and the re-publication of these papers may be instrumental in leading others to take up the work where the author has left it. And yet not wholly left it, for Sir Joseph points out many directions in which uniformity of size and interchangeability of parts is most desirable, and would lead to improvements in the products of manufacture. The true planes, the uniform threads, the measuring machine, and the difference gauges are all connected together, and it is only by a full comprehension of the former that the latter can be correctly estimated. We commend these papers, not only to the engineering student, but also to the practising engineer, to whom it is sometimes useful—if it be not wise—to go back for a while to first principles, especially when their truths are enunciated by a master, and when they involve such important national results. Other volumes are to follow the present one; we are sure they will be welcome.

The Journal of the Iron and Steel Institute. No. 1. 1882. London: E. and F. N. Spon.

THE volume of the *Journal* now issued contains the full report of the spring meeting of the institute; the list of new members; the report of the council and the balance-sheet for 1881; a review of the progress of the iron industry of the United Kingdom during the first six months of 1882; and a similar report on the foreign iron trades in 1882 (? 1881). Some of the statistics contained in this section—notably those referring to Austria and Belgium—had previously appeared in IRON, and have apparently been culled from its pages. The omission to credit us with this information is, no doubt, unintentional.

The Metallurgy of Iron. By H. BAUERMAN, F.G.S. Fifth edition, revised and enlarged. Illustrated with numerous wood engravings. London: Lockwood and Co., 1882.

METALLURGISTS are too well acquainted with the merits of Mr. Bauerman's book to need reminding; but we may state for the information of students that the treatise, of which we now welcome the fifth edition, furnishes such information connected with the metallurgy of iron as may be necessary for the elucidation of the general principles upon which the processes used in the reduction of iron from its ores are based. While referring them for the detailed discussion of the various points to the larger works on the same subject, the principal facts and opinions current in the modern practice of iron smelting are brought to their notice in as succinct a manner as is possible, considering the nature of the subject. The progress made since the last edition of the volume in the Siemens and Bessemer processes of steel manufacture, notably in the latter by Thomas and Gilchrist, is the cause of considerable additions to the chapter devoted to steelmaking in the present issue. In the chemical section the notation has been revised, and notices of newer analytical methods for the determination of manganese have been added. Students could not consult a better book.

"THE CITY."—We have received a copy of this paper of December 2, with which is published as a supplement a well-executed crayon portrait of Mr. John Pender, M.P. The paper itself contains a biography of that gentleman.

MESSRS. CASSELL'S PUBLICATIONS.—*The World of Wit and Humour*, containing a collection of humorous and witty sayings, comic stories, puns, anecdotes, and sketches from English, Scotch, Irish, and American humorists, is something which ought to drive away bad humour. It is funnily illustrated. We have also received the second part of *The World of Wonders*, a book full of marvels, one of the latter being the quaintly-tattooed back of a Japanese servant, which forms the frontispiece to this part. Part 2 of *Greater London* deals with Hounslow and Hanworth, and Twickenham, with its many historical associations, and is another instalment of what promises to be a very good history of the surroundings of London. *The Bow of Strength*, the *Quiver* Annual for 1882, contains some very pretty stories.

NEW BOOKS.

A New Theory of Nature, containing Observations on Weather, Tides, &c. By D. Dewar. Reeves.
Architecture: Classic, Gothic, and Renaissance. By T. Roger Smith. Low and Co.
Botanical Atlas (The). By D. McAlpine. Vol. I. (Phanerogams). W. and A. K. Johnston.
Handbooks of the Farm Series: The Soil of the Farm. By J. Scott and J. C. Morton. Bradbury and Co.
Painting: Classic, Teutonic, and Italian. By E. J. Poynder. Low and Co.
State Aid and State Interference. Illustrated by Results in Commerce and Industry. By G. Baden-Powell. Chapman and Hall.

BOOKS RECEIVED.

Engineer and Building Trades Almanac for 1883 (The). London: Simpkin, Marshall and Co.
Gold: Its Occurrence and Extraction. By Alfred C. Lock, F.R.G.S. London: E. and F. N. Spon.
Institution of Mechanical Engineers. Proceedings, August, 1882. Leeds Meeting. Published by the Institution.
Metropolitan Sewage and What to Do with it. Part I. By E. Monson, Ass. M.I.C.E. London: Prentice and Monson, 47, Upper Thames Street, E.C., 1882.
Our Little Ones. Vol. III., No. 2. December, 1882. London: Griffith and Farran.
Pumps and Pumping Machinery. By Fredk. Colyer, C.E. London: E. and F. Spon.
Railway Brakes. The Vacuum Principle: Startling Facts. The Westinghouse Brake Co.

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NOTICES.

Communications on literary subjects and books for review are to be forwarded to the Editor. Anonymous correspondence will be wholly disregarded. The return of rejected MSS. cannot be guaranteed. Correspondents are requested to write on one side of the paper only, and to mark papers sent.

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THE CONTINENT.

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[*The Editor does not hold himself responsible for opinions expressed by correspondents.*]

THE PORTRUSH ELECTRIC RAILWAY.

To the Editor of Iron.

Sir,—We note that, in your impression of November 24, you state that the electric tramcars for the Portrush Company were built by the Metropolitan Railway Carriage and Waggon Company, Limited. We beg to inform you that the whole of the rolling stock for the Portrush Electric Tramcar Company were built by the Midland Railway Carriage and Waggon Company, Limited. Kindly correct the error in your first impression, and very much oblige yours, &c.,

D. Velson Arnold,
General Manager, Midland Railway Carriage and Waggon Co.
Birmingham, December 4, 1882.

THE WILKINSON TRAMWAY ENGINE.

To the Editor of Iron.

Sir,—Having lately seen several statements in your paper in reference to the Wilkinson tramway locomotive which certainly do not agree with our experience of its working, I beg to hand you the following statement of working expenses of four of them now running on our Wigan and Pemberton line, which, by the way, is not one of the best to work, as there are gradients of 1 in 16, 1 in 19, and 1 in 21, with scarcely any level parts in its entire length, and would ask if you will have the kindness to give the publicity to it, which I think is only due to Messrs. Wilkinson and Co., the builders of the engine. Total distance run during 9 months, ending October 31, 37,564 miles.

	£	s.	d.
Cost of maintenance, including fitters' wages, one new set of wheel tires, and returning old ones, &c.	65	1	10

Or equal to ·42d. per mile run.

Working expenses for one week of No. 3 engine:—

Miles run in 7 days 410

	£	s.	d.
Drivers' wages	1	10	0
Cleaners' wages (half) one man to two engines	0	12	0
Coke, 32½ cwt. (common furnace) at 13s.	1	1	1½
Water, 2000 gallons at 1s. per 1000	0	2	0
Oil, 7 pints at 3s. 6d. per gallon	0	3	0¾
Tallow, 6 lb. at 6d. per lb.	0	3	0
Waste for cleaning 10 lb. at 2d. per lb.	0	1	8
Depreciation at the rate of 15 per cent. on first cost of engine, at 5s. 9d. per day	2	0	3
Repairs on 410 miles at ·42d. per mile, or say 3·75d. per car mile run	0	14	4½
	£6	7	5¾

J. Y. Mawson,
Manager and Secretary, Wigan Tramways Co.
Wigan, December 6, 1882.

P.S.—No repairs of any kind have been required to be done to the boiler up to date, and from all appearance none will be requisite for a long time.—J. Y. M.

[We have also received a communication from Messrs. Marple and Co., of 240 Dashwood House, New Broad Street, who state they are the agents in London for the Wilkinson engine and the proprietors of the foreign patent rights, requesting us to correct the remarks which appeared in our issue for November 17 last. This, Messrs. Marple will see, was fully done by us in our issue of the following week by the insertion of Messrs. Wilkinson's letter on the subject, and the publication of the reports of the preliminary trial and official inspection of the engine.—Ed.]

OBITUARY.

Draper.—American papers announce the death, on November 20, of Professor Henry Draper. The deceased was born in Virginia in 1837, and was the son of Professor John W. Draper, the professor of chemistry in New York University, to whose chair he ultimately succeeded. Professor Draper was educated in the common schools of this city, and at an early age entered the university, where he took the medical course, graduating in 1858, at the age of 21. After his return from a European trip in 1859, he was appointed a member of the medical staff of Bellevue Hospital, in which capacity he served for a year and a half. He was then elected to the chair of physiology in the academic department of the university, and six years later was installed in the chair of physiology in the medical department. When still an undergraduate, his attention was drawn to the possibilities of microscopical photography, and by the aid of this science he began, when only 20 years old, to experiment on the functions of the spleen. This research laid the foundation of his subsequent reputation. After returning from Europe, he constructed a 15½ inch reflecting telescope, with the aid of which he obtained a photograph of the moon 50 inches in diameter. His methods of grinding, polishing, and testing reflecting mirrors were noticed extensively, being the subject of a publication by the Smithsonian Institute. Professor Draper was the first to obtain a photograph of the fixed lines in the spectra of stars. His observatory at Hastings-on-Hudson and his laboratory in New York City were said to be the best equipped of any in the United States, if not in the world, containing all the best appliances of science that are known. In 1874 Professor Draper was appointed by Congress to the commission created to observe the transit of Venus across the disk of the sun, and by this commission he was appointed superintendent of the photographic department, in which position he was highly successful.

Newman.—Mr. Edward Newman, R.N., Chief Engineer of Portsmouth Dockyard, died on December 4, at the age of 50. He was born at Newton Abbot, Devonshire, and studied practical engineering at the Swindon Locomotive Works. He entered the Navy in 1853 as a second-class assistant-engineer, and became engineer in 1859, and chief engineer in 1866. After serving with distinction afloat, during which period he received a medal, he became first assistant to the chief engineer at Portsmouth about fifteen years ago, and was promoted to the superintendence of the steam department of the yard in 1872. He died from an abscess in the brain, partly owing, it is supposed, to the great shock which he suffered at the explosion on board the *Thunderer* in July, 1876. He was at the time superintending the trial of the engines, and was in the act of going down the engine-room hatch when the boiler burst. Mr. Newman was sent for treatment to Haslar Hospital, but on the hopelessness of his case being manifest, he was brought back to his official residence in the dockyard, where he died. He will be interred with full naval honours at Haslar today.

Svanberg.—The death is announced of Dr. Gustav Svanberg, formerly professor of astronomy and director of the observatory of Upsala University. He died on November 21, in his eighty-first year.

THE HISTORY OF NAVAL ARCHITECTURE.

The following paper was read by Mr. W. John, the general manager of the Barrow Shipbuilding Company, on November 20, at a meeting of the Barrow Shipbuilding interest. The lecturer said:—

The subject of this lecture is, I think, one that cannot fail to be of some interest in this institution. Situated as we are in a town largely supported by shipbuilding—our library even within the boundary of a large shipbuilding establishment—and most of our members being engaged in some branch of shipbuilding or marine engineering, and being all of us deeply interested in education, both technical and otherwise, I am persuaded you will join with me in an endeavour to look at the subject I am about to bring before you with critical intelligence, and with a desire to see if any practical good can be extracted from it. We have heard and read a great deal of late years about technical education, and about the necessity for a greater spread of it in this country, if we are to hold our own in manufacturing and other competitions with Americans and the more enlightened continental nations. There doubtless was much truth in the fear which crept over this country after the Great Exhibition of 1851, that we were sadly lagging behind in many respects, and for which this was the only cure: and everyone must look with interest at the steps—important steps—that are at last being taken in various directions to promote technical schools and universities. Shipbuilding, however, stands in a somewhat peculiar position among trades, and is perhaps too isolated for its members to benefit much by these great general movements, and this makes it the more necessary for us to look to our resources to foster organisations for affording the best training to those who enter, as a profession, upon the career of a shipbuilder. In some parts of the country this is being attended to in a way that is highly praiseworthy; in other parts of the country, where shipbuilding is even on a larger scale than at Barrow, it is almost entirely neglected. I fear we have not made much progress in Barrow. If any of you present, engaged as you are in shipbuilding and engineering—and perhaps fond of it, as I hope you all are—desired to bring up a son to the profession and see him rise in his profession, you would, I fear, be rather puzzled to know how to go about it, and where to get him trained. He might have a facility for the business and be ever so industrious; but without a pretty sound training in early life it is an up-hill struggle in after life to master the intricate principles which underlie and surround naval architecture. I hope to show you before I have done that it is not impracticable to very materially improve this state of things in a town where we have undoubtedly one of the finest, if not the finest, mercantile shipbuilding yard in the country; another one rapidly assuming important proportions, and the possibility of others still to come. Before dealing with this, however, I may perhaps be allowed to digress a little, and to offer a few general remarks on the subject. If any body of men have just cause to feel a tinge of vanity, or rather pride, in their calling, and in the fruits of their labour, I think the shipbuilders have. If we look at the magnitude of the operations of building, launching, engineering, and completing a modern passenger ship of the first rank, and regard the completeness of the arrangements and beauty of finish now expected, and then think this structure has to brave the elements, make regular passages, convey thousands of human souls and ten thousands of tons of merchandise every year across the ocean we cannot but feel that we are occupied in useful human labour. Men in all walks of life, I do not doubt, ask themselves the question whether they are really doing useful work in the world? and gain internal satisfaction or otherwise from the answer they are liable to give themselves, quite apart from the question of worldly gain. There can be no doubt of the answer in a shipbuilder's mind—that is, if he builds good ships. But more than this, there is a public sentiment which surrounds ships that no other mechanical structures can command. The glamour that attaches to the sea, seamen, and ships, in the minds of people living in inland towns is easily observable; and any one acquainted with the landing-stage at Liverpool, the London Docks, and other points of arrival and departure of shipping, knows that ships are talked about and their merits discussed, in the tone, and with the interest that usually associates itself with animate rather than inanimate objects. Beautiful churches, grand buildings, huge structures of all kinds, have a certain interest pertaining to them, but it is different in kind from that which surrounds a ship. The one is fixed, immovable, inert: the other here to-day and gone to-morrow, building up a history from day to day, with a reputation as sensitive as a woman's to calumny, and like her, consequently, often a bone of contention as well as an object of admiration. On these grounds, therefore, I should contend that a shipbuilder's life, unlike the policeman's in the "Pirates of Penzance," should "be a happy one." It not always is though, I am free to confess, and even with men who have devoted a lifetime to the careful, intelligent study of it. What it must be to those who have pursued it in a desultory, rule-of-thumb manner I cannot conceive. I know there are points connected with naval architecture that the best men in the profession have misgivings about, that the ablest mathematicians have failed as yet to reach the elementary theory of, which, on the other hand, people uninformed dogmatise with the utmost confidence. This is the most fertile source of blunders in connection with ships. So long as one ship follows another with but little change there is not much chance of going wrong. It is when new departures have to be made that a sound knowledge of the principles which govern the matter is of invaluable assistance in keeping out serious error, even if the data is not sufficient to ensure going right with perfect accuracy. And before going from this part of the subject I should like to say that I do not know any one subject which is so rife with amusing fallacies as about every feature connected with the behaviour of ships. The fallacies that have been promulgated in relation to their strength, their stability, their behaviour at sea, and their speeds, would fill a volume; and some of them exist to the present day. Many of them have been scotched within the last twenty years; but all fallacies connected with shipping die very hard. The fact is that the laws which govern wave motion at sea, and the laws which govern the resistance of ships in motion were practically unknown till within that period. Chiefly owing to the patient untiring genius of the late Mr. Froude, and next to him Professor Rankine, naval architects, have now some sound light to guide them; but there is much investigation still to be done before anyone can count with absolute certainty upon distinctly novel new designs. Within ordinary limits novelties can be provided for with tolerable success; but until the principles are absolutely fixed they will have to be dealt with cautiously. It

would be well, perhaps, if I here sketch briefly the position in which we stand at the present time, and the steps by which this position has been arrived at. The sketch, of course, must be only a mere outline.

The first elementary principle concerning the flotation of a ship in the water is this: that when she is afloat she is displacing as much water as would weigh exactly equal to the weight of the ship herself. This is the celebrated law that was discovered by Archimedes, when he rushed out of his bath, in undress, crying "Eureka!" (I have found it!) The tale, as told by Dr. Brewer, is, that "Hiero, king of Syracuse, delivered a certain weight of gold to a workman to be made into a votive crown, but suspecting that the workman had alloyed the gold with an inferior metal, asked Archimedes to test the crown. The philosopher went to bathe, and in stepping into the bath, which was quite full, observed that some of the water ran over. It immediately struck him that a body must remove its own bulk of water when it is immersed, and, putting his idea to the test, found his surmise to be correct. Now, then, for the crown. Silver is lighter than gold; therefore, a pound weight of silver will be more bulky than a pound weight of gold, and being of greater bulk will remove more water. Vitruvius says: When the idea flashed across his mind the philosopher jumped out of the bath, exclaiming 'Heureka! heureka!' and, without waiting to dress himself, ran home to try the experiment." There is another fact, however, in connection with Archimedes that is perhaps not so often repeated relating to this discovery, viz., that he himself was either directly or indirectly connected with the building of at least one enormous ship, as great a phenomenon of the times, or perhaps greater than the *Great Eastern*, or the *City of Rome*, or other huge vessels of the present day. In fact, I may perhaps again digress here, to mention what may not be known to all my hearers, that this period, about 2,100 years ago, is the only epoch of which we read between the time of the ark, which was unquestionably a monster for her times and the present day, when monsters in ship construction are becoming familiar, when we have anything to compare in size either with one period or the other. It would be a curious matter to speculate upon the reasons which induced Hiero, king of the small island like Syracuse, and guided by a man of genius like Archimedes, to vie in the construction of huge floating structures with the kings of Egypt of the time, namely, the Ptolemies. The small craft which the Phœnicians—better known in Scripture as the Philistines—had multiplied on the Mediterranean in pursuance of the earlier aspirations of their ancestors, or supposed ancestors, the Chaldeans, on the Persian Gulf, in earlier times, could have given no encouragement to the hope of such monsters being properly managed with oars, or being commercially successful. The Phœnicians were practically a maritime people, founding cities on the shores of the Mediterranean, of which Carthage and Marseilles are notable examples, and extending their trade as far as Cornwall, from whence they exported tin, but they never indulged in such excesses for mere purposes of display. The Egyptians, we know, by their Pyramids, obelisks, &c., were given to great display, and this may account for the large galleys culminating in the enormous vessel known in history as having been built by Ptolemy Philopater, of which the following leading particulars are given by Sharpe. She was 420 feet long by 57 feet wide, with 40 banks of oars. The longest oars were 57 feet long, and weighted with lead at the handles that they might be the more easily moved. This huge ship was to be rowed by 4000 rowers, its sails were to be shifted by 400 sailors, and 3000 soldiers were to stand in ranks upon deck. There, were seven beaks in front, by which it was to strike and sink the ships of the enemy. The Syracusans were not dominated by similar productions, so far as history records, but they seem at this time to have been carried away, either by the example of the Egyptians or the traditions of the ark in the construction of a vessel which was afterwards sent on a voyage to Egypt, and presented by Hiero to Ptolemy Philopater, and which is said to have surpassed in fittings and ornaments even those built by himself. It is said that its timbers would have made sixty triremes. Besides baths and rooms for pleasures of all kinds, it had a library and astronomical instruments, not only for navigation as in modern ships, but for study, as in an observatory. It was a ship of war, and had eight towers, from each of which stones were to be thrown at the enemy by six men. Its machines, like modern cannon, could throw stones of 300 lb. weight, and arrows of 18 feet in length. It had four anchors of wood and eight of iron. It was called the ship of Syracuse; but after it had been given to Philopater it was known by the name of the ship of Alexandria. I have given you these particulars, thinking they may be interesting, although outside the subject of the lecture. The point which I wish to bring to your notice in connection with Archimedes, the man who discovered the first law of flotation, and which is supposed to have been discovered in connection with the king's crown is, that his mind must have been powerfully devoted to such questions by being associated, as it was in the construction of large ships. There is nothing to show, however, that his discovery was influenced by his connection in this respect with shipping, or that he even applied it to the flotation of a ship, although the probabilities are that he did.

The first trace we have of the law which states that the weight of a ship afloat is equal to the weight of water the ship displaces, being practically applied to shipbuilding in England, was in the time of the Stuarts, and is recorded in Pepy's diary in the following curious paragraph:—"Mr. Deane (afterwards Sir Anthony Deane) and I did discourse about his ship the *Rupert*, which succeeds so well, as he has got great honour by it, and I some by recommending him. The King, Duke, and everybody say it is the best ship that was ever built. And then he fell to explain to me his manner of casting the draught of water which a ship will draw beforehand, which is a secret, the king and all admire in him; and he is the first that hath come to any certainty beforehand of foretelling the draught of water of a ship before she is launched." It is true errors are sometimes made even in the present day, in the calculation of what draught of water a ship will float in, but this throws no discredit whatever upon the law which is abundantly proved and demonstratable. The only point where errors can arise is either in the calculation of what amount of water a ship will displace at a certain draught of water, or in the calculation of what weights are actually to go in to complete the structure of the ship and fittings, and other weights on board of her. The former is a much simpler and shorter calculation than the latter, and is usually about correct. The error, whenever it does arise, is almost certain to be in the latter, which you will easily understand is a laborious affair, and is always more or less a source of anxiety to a shipbuilder. However, assuming that the calculations in this respect are correct, the next point which arises is, whether the ship when floating at this given draught of water is capable of remaining upright, and, if sent to sea, whether she is capable of keeping upright, or rather, of not capsizing when tossed about, as she is bound to be, among waves. Here enters the question which is one of much more recent investigation than the question of buoyancy; and the first real step in this direction, which has become historical, was made by a Frenchman named Bouguer, about 130 years ago, when he investigated and gave a name to the point since become so well known among naval architects as the meta-centre. His investigations were in a great measure confined to ships in an upright condition, or within the range of modern angles of inclination; and it was some seventy years later before the theory of stability of floating bodies was discussed on a really broad and comprehensive basis from a geometrical point of view by Dupin, another French writer. English writers, until a much more recent date, did comparatively nothing to advance the science of naval architecture. Indeed, it is a source of humiliation, and realised by all naval architects, that throughout the last century, and the early part of the present one, all the great advances made in the science of naval architecture, were done in foreign countries; and the student who wishes to acquaint himself at first hand with the history of that period, has to search the works of distinguished Frenchmen like Bouguer, Dupin, Euler, D'Alembert, the Abbe Bossut, the distinguished Spaniard Don Juan, and Chapman, the celebrated chief constructor of the Swedish navy. On all questions of flotation and stability in still water, they had advanced as far, or nearly as far, as we have at the present time. Their investigations in reference to the rolling of a ship among waves, although learned and elaborate, have since been proved to be in the main erroneous. This latter subject, though largely discoursed upon during the present century at home and abroad, was really in a state of chaos until down so late as 1861, when the late Mr. Froude, of Torquay, after much careful thought and investigation, and experiment, enunciated at the Institution of Naval Architects an entirely new, striking, and at the first flush incredible theory, which has since been absolutely proved to be the sound one. I know it would be out of place in a lecture like this to enter into technicalities, and I will therefore only give you a few brief words on the fundamental difference between the views prevailing up to that time, and those which are now the accepted ones. Previous to Mr. Froude's paper the action of waves upon a ship were considered in the light of so many blows on the side of the vessel to windward, tending to throw her over in the opposite direction. The water was considered to be acting on the ship like so many masses thrown at her side, and this is to a certain extent true in the case of a large ship floating among small waves. Mr. Froude started from an entirely different point of view—that of a small ship floating among very large waves, in which case, as you will easily see, the ship is carried bodily round over the waves, and nothing in the shape of a blow takes place. The action is then like that of a body in a swing. What, then, became the nature of the influence which arose between the ship and the water? In the first place, the actual movement of the water had to be arrived at, and Mr. Froude, who had thoroughly grasped the subject, assumed what is now known as the trochoidal theory of motion, but which he was not able absolutely to prove until the following year, when he did so at the Institution of Naval Architects, simultaneously with Professor Rankine's proof of the same thing before the Royal Society. I will here give you an illustration of this; and before doing so I may mention that I scarcely expect you will believe it immediately. I say this in no uncomplimentary spirit to you, but as based upon my own experience. And I may also mention a curious fact in illustration of this. It is known to one or two in the room, who were present, that not long ago on board a rather famous ship, which most of you know, we were at sea, and after a trial trip a number of people were assembled in one of the cabins, discussing the behaviour of ships under different circumstances, and I may say that all those present were people who spoke with a certain amount of confidence and experience on the subject. Some had been to sea for years, when, on being appealed to, I mentioned and illustrated one elementary fact, which lies at the root of the whole question of rolling among the waves, to my great amusement I found that one and all were thinking I was playing a joke upon them, and trying it on too far. However, when they found that my amusement was even greater than theirs, they kept pegging away on the subject, and I think at least a few had become converts before we got on shore. I am sorry I have not a model or a black board to explain the matter, but will endeavour to get you a simple working model which will soon convince you. It is this—that if you take a raft and fix up a small pendulum or plumb-bob on it, say over the centre, and then put that raft afloat among waves (I mean long, rolling, waves, not broken water) the bob would continue to hang over the centre. It would not hang vertical at all except when the raft was on the crest or hollow, but would on the slopes hang in square towards the surface of the water. Or to put it another way; if there was a round marble on the raft, it would have no more tendency to roll downhill towards the hollow of the wave when the raft was inclined on the slope than it would have to roll uphill towards the crest. But this is another digression, and I must get back to the point I was aiming at. Experiments out of number have been made in confirmation of this theory on board her Majesty's ships, on board ships of the French Navy, and in some cases on board of merchant ships, and there can be no doubt that the lessons derived from them have tended in a great degree to modify the designs of vessels, and to lead to their better behaviour at sea. Further investigations in reference to the question of stability have arisen out of terrible disasters, such as those of the *Captain*, *Eurydice*, *Atalanta*, and a number of merchant ships, all tending to increase our knowledge of the conditions under which a ship should proceed to sea, free from the horrible danger of capsizing, either under steam or sail. If the danger has not been entirely averted—and we have only too great reason to believe it has not—by recent disasters that have occurred, such as that of the great screw-steamer *Austral*, recently capsized in Sydney harbour, and some other merchant ships recently capsized at sea, the danger is not owing to the want of accurate knowledge of the subject, or of well-defined rules for carrying them out, but to the fact that those rules are either ignored or carelessly or incorrectly applied.

Leaving the question of stability, I will next touch upon the question of speed, a far more difficult and intricate subject, and on which, up to the present, knowledge is less precise and defined. Heaps of experiments have been made at different times and by different persons, and heaps of rules have been formulated thereon; but it is well within the mark to say that our ancestors, or rather our predecessors, in the profession, even including the celebrated foreign names I have already mentioned, were hopelessly adrift, and that until within the last 20 years the elements of the problem were not fairly comprehended. We know the analogies that have been drawn between the forms of ships and the forms of various fishes celebrated for speed, and at one time the theory of the cod's head and mackerel tail became almost a proverb, as the correct form for ships. Again, experiments were made with blocks of wood with wedge-shape entrances, for the purpose of ascertaining what angle of entrance was best for certain speeds, but all this led to little or nothing. Sir Isaac Newton investigated mathematically the form of least resistance, and found it to be a parabolic form, and this has been perpetuated down in books on hydro-dynamics even to the present day. But for purposes of naval architecture it was equally misleading. A really tangible start was made by the late Mr. Scott Russell many years ago, from his observations of the waves when canal boats were drawn at comparatively high speeds, and upon it he based his celebrated wave-line principle of construction, and he followed it up in practice. It is perhaps not unfair to assume that most people thought there was a good deal in the principles enunciated by Mr. Scott Russell, and copied them when designing ships, although they did not allow the principle to fetter them to any large extent in the form of their models. And there is no doubt there was a good deal in it, but the deductions derived were not exactly those drawn by Mr. Scott Russell, of whom it is no discredit to say he did not fully realise the scientific aspect of the case. Professor Rankine soon afterwards made a considerable advance in our knowledge of the subject by his writing on what is now termed the stream-line theory, and it was again reserved for Mr. Froude to get at the root of the matter. It would be useless here to attempt to enumerate even the various investigations of Froude and Rankine on this subject, or even to sketch the various steps by which Mr. Froude advanced by painstaking research and beautifully-contrived model experiments, from point to point, until he had got the matter well within his grasp. He it was who first discovered the law by which, with any pretence of accuracy, experiments with models could be made to afford valuable data for the resistance of full-sized ships. He it was who first brought it home to the ordinary comprehension, why ships and models floating on the surface, or partially immersed in water, appeared so difficult to drive at high speeds, while fish, with little apparent muscular exertion or disturbance in the water, could go at speeds almost incredible. Few men of science in our present day have enunciated such apparently startling propositions as Mr. Froude, and made them so abundantly clear that they were almost immediately accepted as laws. Mr. Froude showed that a body of any form, deeply immersed in a boundless fluid with no friction, could move uniformly, if once set going, without any further addition of force, and that when it came to a medium like water, which has some friction, friction was the only thing which caused resistance. This explained at once how fish with smooth slippery coats were able to move with apparent ease with little expenditure of energy. Coming from a totally submerged body, to one partly in and partly out of the water, the case he showed became entirely different. The friction on the immersed portion of course remained, but the waves raised on the surface of the water were shown to carry away much of the energy devoted to propulsion, and prevented that closing in of the water so firmly on the stern of the ship as to give back the pressures exerted by the fore-body; and the study of these waves, hence, has become a matter of very much greater moment than it was formerly considered to be. To press this matter more closely home, I would ask any of you who have watched the beautiful effect produced by wave disturbances—say round one of the steamers on Lake Windermere, when the surface of the lake is calm as a mirror—to imagine for a moment what the effect would be if you could surround the vessel closely by a large sheet of glass just level with the water, and moving with the ship in such a way that those waves would not rise. It would be that the pressure on the water produced at the bow would be transmitted to water astern, and would close in with greater pressure round the stern, and give back to the vessel that energy which is now expended in producing wave motions; and, as a consequence, the vessel would travel much faster through the water with the same degree of horse-power. Of course, this is an impracticable thing to carry out, and I only use it for the purpose of illustration. Closely allied with this question of resistance is the question of forms and sizes of the screw propellers, which is still in a very unsatisfactory state from a scientific point of view; and people have to proceed very carefully and tentatively from ship to ship, guided as they can be by experience.

One other feature of ship-construction I will allude to, and that is, the question of strength. Here we have passed through many phases, and taken enormous strides during the present century. The mere change from wood to iron was in itself a revolution of the most thorough-going kind; and again the changes in iron ships from 100, 200, and 300, up to 400, 500, and 600 feet in length, have required most careful watching. Errors have been made, of course, as may have been expected, but the marvel is that they have been so few, and that so

little in the way of disaster to human life has resulted therefrom. The very rapidity of the changes that have taken place strengthens our cause for congratulation. In my own case, I have been employed in the construction of what are now known as obsolete wooden frigates and line-of-battle ships, and worked as a youth on the old *Howe*, the last of the 120-ton three-deckers. I witnessed the change in the Government dock yards from these vessels to the armour-plated wooden vessels to the *Prince Consort* type; and from that again to the iron armour-plated ships of the navy. We have all seen the wonderful growth in the size of iron merchant steamers, and we are now witnessing another change from iron to steel which is slowly but surely taking place. In times like these, with changes so vast taking place, in a single generation, it is simply impossible to think of being content to follow blindly the dictates of practice from one ship to another. And corresponding and equally important changes have been going on in the marine engine, where the pressure of steam has gradually risen from 20 lb. to 30 lb., to 125 lb., and even 130 lb., and where the consumption of the fuel per indicated horse-power has been reduced from about 4 lb., with a jet condensing engine to a sea consumption of 1¾ lb., with the best type of compound engines, and even this promises to be still further reduced by using triple expansion compound engines.

I have given you this brief but imperfect sketch to show you that there is much in naval architecture worth study—in fact, enough to fire the mind of any young man to a determination to work hard during his younger days, when he has plenty of time and leisure on his hands, to grasp the salient points and make him understand thoroughly the profession to which he is about to devote his life. I will next endeavour to trace out some of the steps that have been taken in this country to provide the means for supplying a very sound training in naval architecture. And here it must be admitted at once that the efforts have been, until a comparatively recent period, confined to the Royal Dockyards. The Government service is to some extent curiously constituted in this respect. They aim, and have aimed for years, at training all their own men, from youth upwards, and it is the greatest exception in the world for a man in middle life to obtain any high position at once in the Government service. The consequence is the need has always been felt, more or less, to provide educational means within the dockyards themselves, and although we never hear it mentioned in speeches on technical education, yet it is a simple fact that the Government have for years spent large sums of money on this one single object of giving technical education, and in the highest sense of the term to those employed in the Royal Dockyards, and even in the form of compulsory education. Under Conservative as well as Liberal Governments apprentices have been invariably compelled to attend school at certain intervals, part of which were within the ordinary working hours, and part in the form of evening classes. Over and above this the Government have on three successive occasions instituted central schools of naval architecture for the purpose of providing those most distinguished in the Local Dockyard Schools to undergo a still higher course of instruction. The first of these was established at Portsmouth in 1810, and lasted for 23 years. The second was again established at Portsmouth in 1844, after the want had again been keenly felt, and lasted till 1853. The third was established in London in 1864, after pressure had been brought upon the Government of the day by the Institution of Naval Architects. It was placed for the time being under the auspices of the Science and Art Department at South Kensington, and has since been merged into the still greater establishment of the Royal Naval College at Greenwich, where it is still in existence. Students in naval architecture and in marine engineering are selected from the several dockyards every year, and go to the college for a course of three years, the winter months of which are devoted, under able professors, in the study of mathematics, physics, chemistry, ship design and calculations; and the summer months are devoted to practical work in the dockyards.

Now, it is a question which has always been rising in my mind, and in the mind of many others, as to how an institution of this kind can be made useful to the mercantile marine, without impairing its efficiency as a Government establishment. Nominally, it is open at the present time to any student upon payment of certain fees, and provided he can pass a certain preliminary examination. I have these regulations here, but it would tire you if I were to read them. I will leave them in the Library for any one sufficiently interested to enquire for them. The fee, I may mention, is £30 for each year, or £75 for the full course, and of course the student would have to live in lodgings during this time and support himself. This, you will say, at once puts the matter out of the reach of the sons of working men; but it is not quite so, for the Admiralty have very wisely made a condition that any applicants passing up to a certain standard in the examination will be received into the college as free students; and there is a further competition open to all comers for two scholarships of £50 a year: one presented by the Admiralty, and the other by Lloyd's Registry, both being tenable for three years. Now the remarkable part, to my mind, is that these scholarships have been absolutely open for several years, and although they are capable of supporting six students at a time, at £50 a year each, and giving them the highest training in naval architecture or marine engineering—whichever line they may choose for themselves—(the Admiralty grant being £150 a year, and Lloyd's £150), yet there has been scarcely a single competitor presented himself. When one looks round to seek for the cause of this, it is only to be found, to my mind, in defective local organisations to train young men up to a sufficient standard to enable them to take such a strong interest in their profession, that they will sacrifice their time and make a determined effort in their spare hours of an evening to qualify themselves to pass these examinations and obtain scholarships.

This brings me to another step in an organisation already prepared, and only requiring to be properly utilised to supply all our requirements. I allude now to the Science and Art Classes established throughout the country, promoted, largely encouraged, and to some extent subsidised by the Science and Art Department at South Kensington. Such classes are already in existence in Barrow, in the Abbey Road, for the promotion of study in some branches of learning, but have not yet extended their influence to naval architecture. I have reason to know that the promoters of the present classes would welcome their extension in the direction which would be most welcome to us. Such professional classes, when combined with mathematical and other classes, should be such as to bring the training of persevering and talented young men up to the standard necessary to secure the £50 a year competitive scholarships now going begging at the Royal Naval College. And where success is achieved, a little local aid should be forthcoming (and I do not doubt that it would) where necessary, to supplement this, and enable young men who would be a real credit to the town, to maintain themselves fitly during their three years of laborious study. This is no visionary scheme. Such classes do at the present time exist in Dumbarton, Newcastle, and many other towns, and they are producing marked results. But the results up to the present are nothing compared to what they will arrive at when the teaching becomes more systematic, and emulation between the students increases. Local aid has not as yet taken a practical shape, so far as I am aware; but I know it has been in contemplation, at least in Dumbarton, where Mr. Peter Denny, his son, Mr. William Denny, and all the members of their firm are heart and soul in the work of promoting the intellectual development of their native town. And so, when this matter is taken hold of firmly and manfully in any shipbuilding centre, most assuredly will that locality produce a race of naval architects which will largely absorb the leading positions in the profession in the next generation, and reflect the highest form of credit and prestige on the place in return. And it will be no mean return either. The following are some particulars of what has already been done. According to the Report of the Department last year, there were no less than 280 students attending the Naval Architecture Classes. In Dumbarton alone there were by the last data 20 pupils, and the class had succeeded in obtaining four medals for naval architecture, including one gold medal, the only one that has yet reached Scotland.

And now I have taken up so much of your time that I must bring this lecture to a close. I have done little more than skim over the surface of the higher branches of naval architecture. The whole routine daily duties of a shipyard I have left untouched. There is a vast amount for all young men entering the profession to learn in them, in the ordering of material, arranging plans, and carrying them in detail, and these are of the utmost importance. In fact, they are absolutely necessary for the every-day life of the yard, and must, and will always receive their due share of attention. And for this reason only, not in the least degree undervaluing their importance, have I not dwelt upon them. There is only one other point I will touch upon, and that only because it involves a difference in the conditions under which a young man enters upon a career of shipbuilding in the present day, and the conditions prevailing in earlier times, such as the days of wood shipbuilding. The present division of labour, to some extent, precludes his passing through all the branches of the trade. The trade itself has also changed materially. The very odour of chips, shavings, Stockholm tar, and oakum which pervaded the old wooden ships is gone for ever. The men who laid off and moulded the elaborate head-rails, counter-timbers, quarter-galleries, and all the complications of the old days have lost their occupation. But there is still enough left in shipbuilding to render it one of the most interesting occupations in existence; and as such I hope it will always be regarded by the inhabitants of Barrow, whose prosperity is inseparably bound up with it beyond recall.

THE RECENT LANDSLIPS IN THE SALT DISTRICTS OF CHESHIRE.*

By Mr. E. L. Williams, M. Inst. C.E.

THE large landslips of recent occurrence in the neighbourhood of Northwich, and the more gradual subsidence that has been going on for the last fifty years in the greater part of the Cheshire salt districts, form a subject of considerable interest, particularly when considered in connection with the geology of the country, and the method by which the manufacture of salt is carried on. Lakes are being formed, part of the towns of Winsford and Northwich have had to be rebuilt, and the locks, weirs, and bridges on the River Weaver Navigation have required to be re-constructed and re-arranged. The whole of the subsidence arises from the rock salt beds which underlie the district being dissolved, and the brine thus formed being pumped to the surface, where by evaporation it is made into white salt. Rock-salt has been considered by some geologists to be the product of volcanic agency, but it is now generally believed to be the result of deposit in super-saturated lagoons or lakes. If a line be drawn from the estuary of the River Mersey through Cheshire, along the valley of the rivers Weaver, Dane, and Wheelock, and be thence continued through Shropshire and Staffordshire, to Stoke and Droitwich in Worcestershire, it will pass through all the principal rock-salt beds in England. This line also continuously traverses the marl and clay beds of the triassic system, formerly called the saliferous marls, which are evidently the result of sedimentary deposit. There is no evidence of the beds of rock-salt in this country forming continuous strata over large districts; no outcrop of rock-salt is known in England. This has been accounted for on the grounds that the rock-salt has been dissolved; but if this were true, deep subsidence would show the lines of the original outcrops. No such change of surface level is, however, found where the rock-salt beds must have appeared at the surface had they been continuous. Supposing that successive elevations and submergences of the land took place during the formation of the marl and clay beds, and that evaporation at the same time was going on, it is easy to conceive that beds of salt would be formed in lake basins, and being afterwards subjected to great pressure, would take the form of rock-salt. The alternate beds of marl, clay, and rock-salt, the difference in the thickness of the various strata, and the circumscribed areas in which rock-salt is found, are all corroborative of this theory. The salt beds would thus be formed at the lowest points of the original drainage area, and they are now principally found in the valleys of the rivers that drain the district. The salt beds at Northwich and Winsford occur in the following order, commencing at a level of 80 feet above ordnance datum:—

NORTHWICH.

	Feet.
Drift composed of sand and clay ..	27
Brown and blue marls with veins of gypsum	106
Rock-salt	84
Hard brown and blue marls	30
Rock-salt	34
Marls with thin veins of rock-salt ..	87
Rock-salt	3
Marls with thin veins of rock-salt ..	81
Rock-salt	6
Hard blue marl not sunk through ..	18
Total depth from surface	526

WINSFORD.

	Feet.
Drift composed of sand and clay.. ..	6
Variegated marls, with beds of hard marlstone and veins of gypsum ..	190
Rock-salt	18
Marlstone	3
Rock-salt	33
Hard blue marl	3
Rock-salt	69
Brown and blue marls with veins of rock-salt	35
Rock-salt	121
Brown and blue marls with veins of rock-salt	30
Rock-salt	3
Marls with veins of rock-salt	35
Total depth from surface.. ..	513

The salt district of Cheshire forms a large plain, situated in the new red marls, overlaid with boulder clay or sand. The main drain is the river Weaver, which falls into the river Mersey near Runcorn. Winsford, now the principal seat of the salt manufacture, is situated on the first-named river, about 18 miles from the Mersey, and is the terminus of the Weaver Navigation. Northwich is five miles lower down the river, where it is joined by the river Dane, which is only navigable for a short distance; but on its banks, and those of its tributary the Wheelock, are the saltworks of Sandbach and Middlewich. Nantwich, originally the main seat of the salt trade, has long ceased to manufacture salt, owing to the brine having become weaker, and not having the great facilities of deep water carriage that Winsford and Northwich now possess. Cheshire contains a number of small lakes, locally called meres. Combermere is nearly a mile in length; Rostherne Mere is also of large size, and Tabley Mere, Oakmere, and others are considerable sheets of water. These meres have been considered by some geologists to have been formed by local subsidence, owing to the dissolving of rock salt. If this were so, and the rock-salt beds were continuous, it might be supposed that the area of these meres would be constantly extending; but this is not the case, and neither by borings or otherwise has proof been given that the rock-salt beds extend so far from Northwich. Most of the recent landslips are near shafts from which brine is pumped; others can be shown to have connection with them, by lines of subsidence. In addition to land springs the river Weaver probably supplies water to the rock-salt to form brine. Near Northwich some old shafts are now submerged under the river, and at other places fissures have been formed by the ground sinking, down which river water can find its way. To a small extent, natural causes may induce subsidence in Cheshire, as elsewhere; the rivers carry away considerable quantities of various salts in solution to the sea. No salt-springs, however, now rise to the surface in the sinking districts, and if they did in former times, the land was not injuriously affected as now, the operations of nature being slow and gradual. Near Nantwich some springs rise to the level of the ground, and flow into the river Weaver, but no subsidence takes place near these springs. The author found the river, in times of ordinary flow, to contain 8 grains of chloride of sodium to the gallon, or more than eight times the ordinary amount in inland river water in this country. At Northwich the river Weaver is charged with much more salt; also the river Dane, but this is due to the waste from the saltworks. The large volume of brine pumped has reduced the height of the brine considerably below sea-level, and consequently in the Northwich and Winsford districts there can be no direct or indirect flow to the sea. The constantly decreasing height of the brine is shown by the records kept by Mr. H. E. Falk, at the Meadow Bank Works, near Winsford, which prove that the abstraction of brine by pumping is greater than the rainfall. The level in February, 1865, was 99 feet below the surface; in February, 1870, 118 feet; in February, 1875, 132 feet; and in February, 1880, 144 feet; the rate at which the brine lowers in level being almost uniform. At Winsford twenty-eight and at Northwich eleven brine shafts are worked, the brine being pumped to the surface by steam power. Nine rock salt mines are also worked, eight of which are near Northwich, and one near Winsford. The brine used for salt making, when of proper strength, contains about 2 lb. 8 oz. of salt to the gallon, or 25 per cent., being nearly a saturated solution. It is more economical to pump the brine and evaporate it than to raise the rock-salt, with its various impurities, and dissolve it on the surface. Its composition is as follows:

	Per cent.
Chloride of sodium	96·70
,, calcium	0·68
Sulphate of lime	0·25
Water	0·63
Insoluble matter	1·74
	100·00

The proportion of chloride of sodium varies, to a small extent, and traces of magnesium and potassium are sometimes

* From Selected Papers, *Min. Proc. Inst. Civ. Eng.*