

11. Domestic economy. 12. Sanitary knowledge. 13. Theory of music. 14. Practical music. In addition to the above subjects, the society will provide for an examination in any other subject which may fairly be comprised in "Commercial Knowledge," and of which the council approve, provided not less than 25 candidates are guaranteed for such subject. The examinations, in all the subjects, except practical music, will be held on the evenings of Monday, April 9, Tuesday, April 10, and Wednesday, April 11. The complete programmes can be had upon application to the secretary of the Society of Arts, John Street, Adelphi, W.C.

### MEETINGS FOR THE WEEK.

MONDAY, SEPTEMBER 4.  
LIVERPOOL AUTUMN EXHIBITION OF PICTURES OPENS.  
TUESDAY, SEPTEMBER 5.  
LID ARY ASSOCIATION.—Annual Meeting, Cambridge.  
MANCHESTER, LIVERPOOL &c., AGRICULTURAL SOCIETY SHOW.  
Preston (four days).  
WEDNESDAY, SEPTEMBER 6.  
ISLE OF WIGHT AGRICULTURAL SOCIETY SHOW. Newport,  
(two days).  
FRIDAY, SEPTEMBER 8.  
CRYSTAL PALACE.—Great Fruit Show (two days).  
SATURDAY, SEPTEMBER 9.  
ZOOLOGICAL SOCIETY, 4 p.m.

### METALLURGY AND MINING.

**FINNISH SILVER.**—A block of pure silver, weighing 44 lb., produced at the Pitkananta copper mines in Finland, was forwarded recently to the Imperial mint at St. Petersburg. This is said to be the first Finnish silver used for the coinage of Russian money.

**METALLIC FRACTURES SHOWN BY THE DISSOLVING VIEW APPARATUS.**—M. Eward, manager of the Firmly Ironworks, has projected upon the screen luminous enlargements of the fractures of steel and iron bars. In this way all defects in the metal are made apparent with remarkable clearness. By means of a new instrument—the megascope—M. Eward has been enabled to project images of a metallic appearance, which are thus very easily examined.

**A LONG BLAST.**—On August 6, Tecumseh Furnace, owned by the Tecumseh Iron Company (Alabama), was blown out, having been in continuous operation with charcoal for fuel for seven years, one month, and nineteen days, on one hearth. The furnace was still doing fair work, but it was thought good policy to blow out to make thorough repairs and achieve some improvements. This we (*Bulletin*) believe is the longest blast on record for a charcoal furnace.

**UTILISATION OF OLD CASTINGS TOO LARGE TO BREAK UP.**—Acting on the principle that, if the mountain will not go to Mahomet, Mahomet must go to the mountain, Herr F. Becker, of Neuss, Germany, wishing to utilise an old casting that was too large to take to the cupola, and could not conveniently be broken up, hit upon the expedient of building a furnace against it, and tapping it off on the spot. Carefully covering the mass with refractory material to prevent the radiation of heat, he lighted a coke fire at one corner, and, as soon as that portion became melted, ran it off into a ladle. He next proceeded in the same manner with the other corners, until the shell could be moved and broken up. We should have thought a few dynamite shots would have overcome the difficulty in a simpler manner, but, perhaps, there were buildings near which might have been injured by the riven fragments.

**STEEL WORKS IN CANADA.**—The first establishment for the working and manufacture of steel in Canada has been started at New Glasgow, Nova Scotia. The main building, 60 feet wide, is already up, a branch siding from the Intercolonial Railroad has been laid, and the work of building foundations for furnace, regenerators, &c., is proceeding with. The works are in charge of Mr. Graham Fraser, whose skill and energy developed the adjoining forgeworks out of a modest nail factory. Mr. Fraser has just returned from England, where he has ordered the necessary plant of what is believed to be of the best modern type. For instance, the steel ingots will be worked up under the rolls, instead of as usual under a steam hammer by a reversing engine of two 30-inch cylinders. The site of the works is well selected, near the well-known Pictou coal-fields, and on the bank of the East river, where cheap fuel should give them a decided advantage over rival establishments in Canada. —*Engineering and Mining Journal*.

**THE UTILISATION OF BASIC CINDER FOR AGRICULTURAL PURPOSES.**—The high percentage of phosphoric acid in the cinder obtained in the basic Bessemer process has suggested the possibility of using it for agricultural purposes in the place of phosphate. A German contemporary gives the results of some investigations made at a large steelworks in Westphalia. The cinder contained the following:—

	Per cent.
Silica .. .. .	6.20
Carbonic acid .. .	1.72
Sulphur .. .. .	0.56
Phosphoric acid ..	19.33
Iron .. .. .	9.74
Manganese .. .. .	9.50
Lime .. .. .	47.60
Alumina .. .. .	2.68

The result of tests was, that this cinder would do well as phosphate manure, and that it will not be necessary for this purpose to treat it with sulphuric acid, because a considerable proportion of the phosphoric acid is in a form which will allow it to be assimilated readily.

**TIRES OF MIXED METALS.**—The Saint Chamond works have recently begun to manufacture tires of mixed metal—half iron and steel—and which, it is claimed, will have the hardness of the latter without its fragility. The body of the tire is composed of a ring made of pieces of puddled steel, and inserted between two hoops of fine iron, which form the outer side of the section. The whole is welded together by

the hammer. The principles of this manufacture are as follows, but they have not been developed very far as yet. A bar of fine iron, which is to serve as the core, is first rolled, and then a hoop of fine iron is put on at each end cold. One of these hoops is afterward to form the flange, and is composed of three coils of equal size. The other is formed of a single coil, and is to make the outer face of the tire. Wedges of puddled steel are then placed obliquely in the space between the two hoops, thus making so many spirals inclined on the axis of the tire. This arrangement brings the wedges together when the hammer is applied, and thus a complete welding is obtained. The wedges are cut from rolled bars; they should be of hard steel, but yet soft enough to weld easily with fine iron. The round pieces thus obtained are forged and welded with the hammer. Four heats are requisite to obtain a ring like those used in the ordinary processes. The welding is completed by the rolling, and it brings the inside core to such a small thickness that it disappears altogether in the boring.

**THE RAISE OF MINERALS IN EUROPE.**—The French Department of Public Works have issued some comparative statistics of the state of mining industry in Europe for 1880, from which it appears that the quantity of ore raised in that year was 380,657,000 tons, representing a value of £124,304,544. The following figures give the production of the principal countries, with the corresponding value:—

	Tons.	£
England .. .. .	171,061,476	72,794,566
Germany .. .. .	59,680,754	15,925,837
France .. .. .	23,257,657	11,511,407
Belgium .. .. .	17,172,749	6,994,280
Austria .. .. .	14,216,282	6,133,899
Spain .. .. .	2,584,361	4,351,279
Hungary .. .. .	2,281,373	2,269,454
Italy .. .. .	1,107,624	2,292,400
	291,362,276	122,273,188

These figures include coal and other mineral fuel; iron, lead, copper, zinc, tin, and manganese ores; sulphur, antimony, sea salt, and rock salt. The extraction of iron ore amounted in England to 18,296,000 tons, in Germany to 4,245,000 tons, in France to 2,874,000 tons, in Luxembourg to 1,614,000 tons, and in Austria to 631,680 tons. The number of hands engaged in iron mining in France was 9000, and in Algeria 3000, the annual wages amounting to £400,000.

### RAILWAYS & TRAMWAYS.

**A NEW RAILWAY BETWEEN SWEDEN AND NORWAY.**—A railway, some hundreds of miles in length, and which has cost £800,000 to construct, running right across Scandinavia from Ostersund, in Sweden, to Drontheim, in Norway, has been opened for public traffic. The new line will be of great importance to the Swedish iron trade, as it will connect the interior provinces of Sweden and their large iron deposits with the harbours on the west coast of Norway, which are open to navigation all the year round.

**THE RAILWAYS OF EUROPE.**—An official statement of the Direction of Railways depending on the French Ministry of Public Works gives the following as the actual length of railways completed on December 31, 1881, in the following countries of Europe:—Germany, 21,323 miles; Great Britain, 18,165; France, 17,141; Russia, 14,511; Austria, 11,885; Italy, 5452; Spain, 4871; Sweden, 4618; Belgium, 2562; Switzerland 1557; Holland, 1427; Denmark, 1054; Roumania, 916; Turkey, 867; Portugal, 757; Greece, 6 miles; total, 107,112 miles.

**CONTINUOUS BRAKES.**—A blue book issued recently gives a return for the six months ended June 30 last of the extent to which continuous brakes have been used on the lines in the United Kingdom and the manner of their working during that period. It appears that the number of locomotive engines and tenders used for passenger service and fitted with continuous brakes during the above period was 2773; the number of passenger carriages, 203,366; and the number of other vehicles fitted with continuous brakes was 2453. The number of locomotives not fitted with continuous brakes was 2622; and the number of passenger and other carriages used for passenger trains not fitted with continuous brakes was 17,727. Smith's vacuum is the brake which appears to be the most general use, being adopted to a greater or less extent by nineteen railway companies; but the Westinghouse automatic brake, though in use by only fifteen companies, is applied to a greater number of vehicles. Clark and Webb's brake, though only in use by five companies, is in proportion more extensively applied, the London and North-Western Company alone applying it to 5600 carriages. Sanders and Bolitho's automatic vacuum and Smith's automatic vacuum are amongst those in a lesser, but still extensive, degree adopted.

**A NEW OVERLAND ROUTE FROM INDIA TO CHINA.**—Mr. C. H. Lepper read a paper last week before the British Association on the question of an overland route to China from India via Assam. He pointed out that the inhabitants of the country through which this extension of the railway would have to pass are Singhphoes, who are very friendly to the English and are quite independent of the Burmese and also of the Chinese. The Singhphoes had expressed a desire that the road should be made, as they are alive to the advantages they would derive from it. Should a road or railway be made from Makum to Irrawaddi, a distance of about 120 miles, there can be little doubt that the adventurous Chinese traders who now traffic on the Irrawaddi would be induced to come to us for British merchandise. Thus the whole of Western China would be thrown open to British commerce, without the necessity of any treaty with China, and without any European having to cross the Chinese frontier. Eastern Tibet would also be opened to British commerce, and English goods would take the place of Russian goods, which now almost exclusively represent European markets in Western China and Eastern Tibet. He explained the advantages which would be derived from the opening of this route by British merchants, owners of tea properties in Assam, the Public Works Department of Assam, and last, but not least, by Bengal in its times of famine.

### NAVAL ARCHITECTURE.

#### CLYDE SHIPBUILDING IN AUGUST.

**DURING** the month of August the Clyde shipbuilding trade has been characterised by great activity in the later stages of ship construction. In all twenty vessels (sixteen steamers, three sailing ships, and one steam launch), of an aggregate tonnage of 27,940 tons, were put into the water by the various firms on the river. These figures represent a large amount of work, and compare favourably with the returns for the corresponding period in previous years. The following figures give some idea of the value of the returns for the month of August. In July last the returns amounted to 25,480 tons; in August 1881, to 30,000 tons; in August, 1880, to 17,982 tons; in August, 1879, to 10,000 tons; in August, 1878, to 23,932 tons; in August, 1877, to 11,300 tons; in August, 1876, to 21,400 tons; in August, 1875, to 20,200 tons; and in August, 1874, to 25,100 tons. The position of the trade is fairly satisfactory. The amount of work on hand is considerable, but builders in the upper reaches are not booking new orders so freely as formerly; and vacancies caused by launches are not being filled quite so rapidly as they were six months ago. These remarks do not, however, apply to the lower reaches, where the number of new orders keeps pace with the output. A strike of joiners has somewhat complicated matters in the upper reaches of the river, and should it continue for any length of time, it must entail considerable loss on both employers and employed.

There were launched during the month in the upper reaches of the river fifteen vessels, of an aggregate tonnage of 20,880 tons, as compared with fourteen vessels, aggregating 17,730 tons during the month of July. The following are the details:—Messrs. John Elder and Co., Fairfield, launched the *Princess Wilhelmina*, an iron screw-steamer of 2600 tons gross for the Stoomvaart Maatschappij, Nederland. Messrs. H. M'Intyre and Co., Paisley, launched the *Rowan*, an iron screw-steamer of 1300 tons, for Messrs. P. H. Dixon and Co., Glasgow. Messrs. M'Intyre and Co., also launched the *Akwatiro*, an iron screw-steamer of 750 tons, built to the order of the Westport Colliery Company of New Zealand. Messrs. A. M'Millan and Son, Dumbarton, launched the *Lady Isabella*, of 1705 tons, the first of two double-bottomed iron sailing ships which are being built to the order of the North British Shipping Company of Glasgow. Messrs. Barclay, Curle and Co., Whiteinch, launched the *Limpet*, a steamer of 480 tons, for the Irish trade of Messrs. G. and J. Burns. Messrs. Dobie and Co., Govan, launched the *Firth of Olna*, an iron sailing ship of 1250 tons, built to the order of Messrs. James Spencer and Co., Glasgow. Messrs. Lobnitz and Co., Renfrew, launched a screw-steamer, named the *Hypolite Worms*, of 1200 tons N.M., for Messrs. Worms, Josse and Co., of Havre. Messrs. Napier, Shanks and Bell, Yoker, launched the *Clan Sinclair*, a vessel of 3000 tons, for Messrs. Caysier, Irvine and Co.'s Indian Service. Messrs. Alexander Stephen and Sons, Linthouse, also launched for the same owners the *Clan Forbes*, a vessel of 2600 tons. Messrs. Scott and Co., Bowling, launched the *William*, a screw-steamer of 250 tons, for Messrs. J. and J. Macfarlane, Glasgow. Mr. John M'Adam, Govan, launched a steam launch of about 25 tons for Mr. Laughton, Isle of Man. Mr. W. B. Thompson, Whiteinch, launched the *Parahyba*, a steel screw-steamer of 770 tons and 150 horse power nominal, for the Brazilian trade of Messrs. Fry, Miers and Co., London. Messrs. Wm. Denny and Bros., Dumbarton, launched the *Hanoto*, a steamer of 1800 tons and 2000 horse-power, for the Union Steamship Company of New Zealand. The London and Glasgow Shipbuilding Company, Govan, launched the s.s. No. 228, a vessel of 650 tons, for Messrs. Murray Brothers and Co. Messrs. J. and G. Thompson, Clydebank, launched to-day the Hamburg American Company's vessel *Hammonia*.

In the lower reaches of the river, which include Port Glasgow and Greenock, five vessels, including one sailing ship, were launched, with an aggregate burden of 7060 tons. Two of the steamers were built of steel. This is against 7750 tons last month, 12,120 tons in August, 1881, and 4568 tons in August, 1880. The trade continues in a very prosperous condition in the district, every yard being well employed. Messrs. Russell and Co. are now getting their new Kingston yard into working order, and several vessels are now on the stocks there. The number of orders again fully keeps pace with the output, as there are 57 vessels on hand, against 48 last month, and 44 in August, 1881. The following are the details of the launches:—Messrs. R. Steele and Co., Greenock, launched the *Seraglio*, a fine steel screw steamer of 1700 tons, with engines of 200 horse-power. She has been built for Messrs. Raeburn and Birrell, Glasgow, for general trade. Messrs. Scott and Co., Greenock, launched an iron screw-steamer, named the *Whampoa*, of 1750 tons. She is for Messrs. Swire and Sons, London, and is intended for the China trade. Mr. William Watson, of the Ladyburn Boiler Works, launched the *Talisman*, an iron screw-steamer of 1600 tons. She is owned by Messrs. William M'Lachlan and Co., Glasgow, and will be employed in the fish trade. Messrs. R. Duncan and Co., Port-Glasgow, launched the *Eclfechan*, a splendid four-masted iron sailing ship of 2000 tons. She has been built to the order of Messrs. M'Donald, Hood and Co., Glasgow, and is intended for the East Indian trade. Messrs. Blackwood and Gordon, Port-Glasgow, launched a fine steel screw-steamer named the *Ardanacarrach*. She is 1150 tons gross, with engines of 120 horse-power, and has water ballast capacity of 350 tons in a double bottom. The vessel has been built to the order of Messrs. MacLaren, Crum and Co., for the Mediterranean and Black Sea trade. —*Glasgow Herald*.

#### LAUNCHES.

##### ENGLISH.

**Flaxman.**—On August 26, there was launched from the shipbuilding and engineering works of Messrs. Oswald, Mordaunt and Co., this iron screw-steamer, built to the order of Messrs. Lamport and Holt, Liverpool, of the following dimensions, viz.:—Length, 300 feet; breadth, 36 feet; depth of hold to floors, 24 feet; gross tonnage about 200 tons. The engines, by the same firm, are on the com-



pound principle, having cylinders 32 inches and 64 inches, and a stroke of 42 inches, steam being supplied by two single-ended boilers 14 feet 3 inches diameter.

**Glenhorne.**—Messrs. Campbell, Mackintosh, and Bowstead have launched from their yard at Scotswood a cargo steamer, which has been built by them for Messrs. Calliford and Clark, of Sunderland. The dimensions of the steamer are:—Length, 277 feet; breadth, 37 feet 6 inches; depth, 23 feet 4 inches. After the launch she was taken to Sir Wm. Armstrong's crane, to have her machinery put on board by Messrs. Thomas Clarke and Co., of Elswick Marine Engine Works.

## SCOTCH.

**Falcon.**—On August 29, Messrs. A. G. Gifford and Co., shipbuilders, Leith, launched from their yard in Bridge Street, Leith, a screw-steamer of the following dimensions:—Length, 92 feet; breadth, 18 feet 6 inches; depth, 9 feet 6 inches. The vessel, which is built to the order of the Scottish Steam Fishing and Shipping Company, is 93 tons gross register, and her engines, of 35 horse-power, will be supplied by Messrs. John Cran and Co., Albert Engine Works, Leith.

**Louise.**—On August 30, this steamer, of about 200 tons deadweight, was launched from the Abercorn Shipbuilding Yard for the Douglas Steam Navigation Company (Limited), Isle of Man. She was originally contracted for by Messrs. M. Kinney and Rafferty for their fish trade. Dimensions—120 feet long between perpendiculars by 21 feet beam by 9 feet 9 inches. She is to be propelled by a pair of compound surface-condensing engines, 50 nominal horse-power, supplied by Messrs. King and Co., Glasgow, and the vessel is expected to attain a high rate of speed. The vessel is to trade between Liverpool and the Isle of Man.

**Parahyba.**—This iron screw-steamer, of 770 tons, built to the order of Messrs. Fry, Miers, and Co., London, and intended for the Brazilian coasting trade, has been launched by Mr. W. B. Thompson, Whiteinch, on the Clyde. She is 200 feet long, 28 feet broad, and 14 feet deep. The vessel will be supplied with engines of 150 horse-power nominal, with cylinders of 30 inches and 60 inches diameter and 36 inches stroke, by the builder from his Tay foundry.

**Silksworth.**—On August 30, Messrs. Edward Withy and Co. launched from Middleton Ship Yard, West Hartlepool, this iron screw-steamer, which has been built to the order of the Marquis of Londonderry, for his Sunderland trade. Her principal dimensions are:—Length between perpendiculars, 245 feet; beam extreme, 34 feet; depth moulded, 18 feet 2 inches. Engines of 130 nominal horse-power, will be supplied by Messrs. T. Richardson and Sons, of Hartlepool. This vessel is No. 111 in the builders' yard, and the fourth built by them for the same owners.

**Whampoa.**—On August 24, Messrs. Scott and Co., shipbuilders, launched this steamer, of the following dimensions:—Length, 270 feet; breadth, 34 feet; depth, 25 feet; and registered tonnage, 1750. The steamer is owned by Messrs. Stire and Sons, London, and is intended for the China trade.

## TRIAL TRIPS.

**Grecian Monarch.**—On August 17, this vessel, built by Earle's Shipbuilding and Engineering Company, Hull, for the Royal Exchange Shipping Company, the owners of the Monarch Line, was put upon her official trial trip. She left the Hull Roads about 10 o'clock in the forenoon. The compasses having been adjusted in the Grimsby Roads, the vessel put to sea, steering northward for the measured mile at Withernsea. Several runs were made, the mean of which showed 12½ knots. The vessel was in fair trim for a trial trip, drawing over 20 feet water aft, having part of her outward cargo on board. The steamer is 400 feet long, 43 feet broad, and 33 feet 3 inches deep. She is 4364 tons gross, and 2832 tons net register. Provision is made for 850 tons water ballast in the double bottom, which is constructed on the cellular principle.

**Olof.**—This steamer, built by the Gothenburg Engineering Works, went on her trial trip recently at Gothenburg. Her dimensions are:—Length, 155 feet; breadth, 25 feet; draught of water, with a cargo of 500 tons deadweight, 11 feet. The engines, which are compound and of 50 horse-power, propelled her during the trial at the rate of nine knots per hour. She has been built to the order of Herr F. Hansson, who has placed an order for three similar vessels, to be delivered as quickly as possible, in the hands of the above works.

**Tellus.**—This steamer, built at the Motala Engineering Works, went on her trial trip recently from Motala to Stockholm. Her dimensions are:—Length, 222 feet over all; width, 30 feet 6 inches; depth in hold, 17 feet 6 inches. She loads 1200 tons deadweight, and is constructed entirely of Bessemer steel, to the order of the Stockholm Steam-owners' Company, trading on London. She attained at her trial a speed of 10½ knots with 84 revolutions, and 70 lb. steam-pressure, and a coal consumption of 14·4 cubic feet.

**DISASTERS AT SEA.**—There were nineteen British and foreign actual shipwrecks reported during the past week, making a total of 930 for the present year, or a decrease of 175 as compared with the corresponding period of last year. British-owned vessels numbered 12. Three were steamers (all British), with an aggregate tonnage of 2063 tons. Total tonnage lost for the week, 7132 tons. Total number of lives lost and missing, 40. Five vessels were wrecked off the coasts of the United Kingdom, four being British-owned and one Danish. Missing vessels numbered three. 1810 tons of coal were lost.

**SHIPBUILDING IN SWEDEN.**—The returns for the past seven months show that a greater number of steamers of all kinds have left the Swedish yards than in any previous period. The engineering works at Bergsund, Lindholmen, Kockum, and Gothenburg, have been finishing the orders received during the early part of the year from Russia, Denmark and Norway as fast as their accommodation has permitted, whilst fresh orders are daily arriving. The Motala works, the largest of the Swedish engineering works, has, up to the end of July, launched a total of fifteen steamers, nearly all built of Bessemer steel, and further delivered to the Swedish railways six engines with tenders, and three iron railway bridges. The rolling mills and the forges have here been in incessant activity all through the year. The last delivery made from those works was on August 9, and consisted of

two steam tugs, entirely built of Bessemer steel, with engines of 10 horse-power each. At the Kockum works at Malmö the chief feature of interest at present appears to be several enormous steam ferries building for account of the Danish government for the transport service between Korsör and Nyborg, and which in case of war will be capable of conveying an entire field park. Each of these will be fitted with engines of 1900 horse-power, and accomplish a speed of nearly 14 knots per hour. They are built of steel.

## GENERAL NOTES.

**NEW MACHINERY.**—Messrs. De Bergue and Co., of Manchester, have on hand a new model of an angle and T iron horizontal rolling mill for rolling boiler rings hot. The machine consists of three rolls working on the top of a large table, and capable of making rings from 15 inches up to 6 feet 8 inches diameter, and the gearing and driving power are all beneath the floor of the shop. In connection with the new riveting machine with yielding pillar recently brought out by Messrs. De Bergue, the firm have adopted a dead weight balance arrangement in the place of hydraulic power at first introduced.

**SHEAF BINDING MACHINES.**—At the Highland and Agricultural Society's Show (held in Glasgow in July last), the directors offered three premiums of £100, £50, and £25 for combined reapers and binders, or lifting and binding machines. No fewer than eight makers entered for this competition, but only three finally competed. These were Messrs. J. and F. Howard, Bedford; Mr. Walter A. Wood, London; and Messrs. Richard Hornsby and Sons, Grantham. The trials took place yesterday, when the machines were first tried on a field of 20 acres of wheat on a hill, and afterwards on a flat field of barley of five acres and a field of oats of 20 acres, where they worked most satisfactorily. In the result the Hornsby machine stood first, the Walter A. Wood second, and the Howard third.

**INTERCHANGEABLE SYSTEMS OF MANUFACTURE.**—Among the various phases of the manufacturing interest it is worth calling attention to the rapidly increasing development in the United States of the interchangeable system, which has of late years become so important and been applied to so many different branches, that it has been thought worth while to devote a special report to it in the census investigations. Mr. Fitch, to whose hands this inquiry was intrusted, remarks that not only American manufacturers, but also American agriculture, depend largely for their success upon the application of this particular feature. The art of making complete machines or implements, each part of which may be introduced into any machine of the same kind, and especially the adaptation of special tools, by which hand-work in fitting the parts is often entirely avoided, is one of American origin. The farming classes have benefited in an extraordinary degree by the interchangeable system, for they are enabled to provide themselves with every kind of implement at a great reduction of price as well as of manual or muscular exertion, while the durability and working performances of the implements are notably increased. Nor is it only agricultural machinery that is thus affected, the system being applied with equal success to sewing machines, watches, firearms, railway cars, locomotives, &c. The development of one of these branches of manufacture—firearms—has been very great in the United States, there being now 38 establishments on the interchangeable plan, mostly in Connecticut, Massachusetts, and Pennsylvania, employing nearly 6000 hands, and having a capital of over 8,000,000 dollars. America stands high in the estimation of the world for firearms and ammunition, since 1867 the Danish, Swedish, Spanish, Egyptian and Japanese Governments being supplied with American arms and machinery, as well as Chili, Peru, Mexico, and the Argentine Republic. During the late Turco-Russian War both belligerents were furnished from American armouries, and the Prussian Government arsenals at Spandau, Erfurt and Dantzig are supplied with American gun-making plant.

**PROTECTION IN VICTORIA.**—A Commission on Tariffs has been sitting for some time past at Melbourne, and has been taking evidence on the effect which the protective system of the colony of Victoria has had on various industries. The inquiry was directed especially to the trade in implements and machinery. The opinion expressed by the colonial manufacturers generally was strongly in favour of the retention of the duties. Opposed to them were the views of the representatives of foreign firms trading in the colony. A local manufacturer of grates and such like articles was in favour of the tariff, as also were firms of lamp makers, tinplate workers, workers in galvanised iron and stamped iron, and tin workers, with the brass founders and candlestick manufacturers. Only one witness supported the retention of the duty on horse-nails, and it transpired that he was the only manufacturer of them in the colony. Two firms of colonial iron smelters urged that a duty of £2 per ton should be placed on imported pig-lead, but, on the other hand, a firm of sheet lead workers opposed the duty unless a similar advantage was obtained by the manufacturers. On the application of the maltsters it was decided to recommend to the Commissioner of Customs that he should allow malting in bond to be undertaken in the colony. With respect to the trade materials of plumbers and gasfitters, it was admitted by the colonial manufacturers that their productions were inferior to those of the English, and opinions seemed to be divided as to the advantage or disadvantage of retaining the duties. Letters were read from two firms of manufacturers and importers of chandeliers respectively, who had had a dispute on the question before the Commission. An English firm, importing small brass fittings, was in favour of the remission of the duty on such goods, and opposed to them was an iron safe maker of Melbourne. Several manufacturers of agricultural implements were in favour of the tariff, a partner of one of the firms advocating on his own account inter-colonial free trade. A firm of ironmoulders urged that the duty on iron pipes should be increased by 10s. per ton, and the Australian Lithofractor Company that the duty on imported explosives should be increased by 6d. per lb., and an importer of watchmakers' tools that the duty on crucibles should be remitted.

## THE HOME IRON AND COAL TRADE.

## BARNESLEY AND SOUTH YORKSHIRE.

The finished iron trade in this district is pretty active, many of the works being run full time. Merchant iron is in fair demand, and there is a good inquiry for Bessemer steel rails, tires, axles, &c. About an average number of furnaces are kept in blast, and are producing a large tonnage of pig iron. The coal trade is somewhat firmer, and the improvement recently noticed is fully sustained. The demand for London and the south has of late improved, and efforts have been made to raise the prices of coal slightly, but this course is found to be somewhat difficult owing to the large output which is taking place in the district. There also seems to be some increase in steam coal for exportation and steamship use, so that a large tonnage is still sent to Hull and Grimsby. The demand for engine fuel and slack is about the same as when last noted, the tonnage sent to the Lancashire manufacturing districts being large. More is being done in gas coal for the Midland counties and other districts where contracts have been placed. From the Manvers Main and several other large district pits a very good tonnage of locomotive coal continues to be drawn. The coke trade displays considerable activity at many places. The whole of the workable ovens are kept going, but the output at the ovens owned by the Frodingham Iron Company at Silkstone Common is not so large, only a moderate number being at work. Many rumours are current with respect to the re-opening of the North Gawber Hall Colliery. It is stated on good authority that negotiations are nearer than they were, but the order of the Court of Chancery must be secured before this can be accomplished. The East Gawber Hall Colliery has been set down for more than a week, owing to the removal of a large haulage engine from the pit bottom to the surface.

## BARROW-IN-FURNESS AND NORTH LANCASHIRE.

There is a continued firm tone in the hematite iron trade of this district, and although no practical advance has been made in the position as compared with a week or two ago, makers report that they have made some very heavy sales and that a large tonnage of pig-iron has changed hands. The demand for America has been very strong and continues so. It is more than probable that some heavy contracts will yet be booked, which will require early attention, and the makers in the district are of opinion from the present outlook, that America will continue one of the best customers for the hematite iron of this district during the remainder of the year. On Continental account there is still a very heavy business doing, and large consignments of metal will be delivered at Continental ports during the ensuing two months, in respect of contracts entered into some time ago. The colonies are also taking very considerable cargoes of iron, and the enquiry from this quarter shows every sign of being thoroughly well maintained for all the various qualities of metal produced here. Prices show no quotable variation, but in many instances sellers have advanced their quotations. Barrow iron, for instance, is quoted at Birmingham at £3 8s. 6d., whereas the official net quotation of the district stands at about 58s. for fixed qualities of Bessemer iron. Prices are to a great extent regulated by the position—favourable or otherwise—of the seller, and as most of the makers are very well sold forward, the general rule is that prices are held with firmness. No. 3 forge of iron is quoted at about 57s. net per ton, at works. Iron ore varies at from 14s. to 14s. 6d. for average qualities at the mines. There is a very good demand, but raisers are well sold forward, and are likely to find employment, for the whole of the mines for some months to come, apart from any new business they may do at the present. Large orders, it is reported, have been given for iron ships, but although there is some truth in the statement, it requires official confirmation. The engineering, iron-founding, boiler-making, and railway rolling-stock manufacturing industries are briskly employed, and have lots of work on hand. Steel wire is in large output, and the American demand especially is good. Coal and coke steady at rather better prices. The shipping trade is more briskly employed than ever, and the tonnage of exports during the season bids fair to exceed the returns of any previous year.

**CARDIFF.**—There is a decided improvement in the iron and steel industries of the district, and prices are hardening. At Tredegar, which is now one of the finest steel works in the kingdom, a successful attempt at steel rail making was made on the 26th ult. The capital of this company is now about one million sterling. It is expected that the works of Mr. Fothergill, or a portion of them, at any rate, at Merthyr and Aberdare, will be set going soon, as purchasers have been found for them. Cyfarthfa is also showing renewed signs of activity, and the Messrs. Crawshaw are in treaty for 2200 acres of coal in the Rhondda Valley. The amount of iron sent away last week was 3820 tons. Iron ore came in to the extent of 10,829 tons from Bilbao, and 2408 tons from other places. Campanil Somorostro is quoted at 15s. 3d., c.i.f.; good Rubio, 15s., c.i.f.; Carthagenan manganese ores still maintain their firmness. The price of tinplates still tends upwards. Good coke-mades are quoted at 16s. 6d. to 16s. 9d. per box at Liverpool, and charcoal mades from 19s. 6d. to 20s. The steam-coal trade maintains its activity. The clearances last week amounted to 102,275 tons foreign and 19,129 coastwise. It is anticipated that there will be a rise in price in all contracts just about being made for the year 1883, but it will only be a small one. Good colliery-screened may be about 3d. per ton, and the rise anticipated may be about 3d. per ton. The failure of Mr. Thomas Joseph for £150,000, which has just been announced, has been the principal topic of conversation at the Cardiff Dock the last few days. The men at the pits will not return to work unless they are paid £2500 arrears of wages due to them. The receiver promised them the current wages, but they have refused it. It will be a calamity if the pits are stopped, and will only tend to make matters worse. The estate of Mr. Joseph is reported to be a good one, as there will be a large balance in hand after 20s. in the pound have been paid. A short time since his property was estimated to be worth £250,000, but what it may realise if brought to the hammer is doubtful.



**CLEVELAND.**—The attendance at the iron market at Middlebrough on Tuesday was larger than it has been for some time, and better than that of the tone of business was very encouraging. Both merchants and consumers were more eager to complete purchases than they have been for several weeks past. The fact is that merchants have exhausted the supplies they secured during the spurt of last month, and iron is very scarce in second hands again. There is, therefore, a general desire to make purchases, and makers, having already their order books well filled, can practically secure their own prices. They could sell for several months ahead if they were so disposed, but as there is every appearance of better prices ruling further on in the autumn, they seldom entertain the offers made to them. The market is thus in a very cheerful condition, the more so as it is fully expected that on Wednesday the Scottish makers will have consented to renew for another six months the current agreement to restrict the output. Some heavy sales have been made during the last few days by makers who report they have seldom found buyers so pressing—in fact, some of the producers' offices have, as the saying is, hardly "had time to cool" between the visits, and the demand is held to be a legitimate one, and in no degree speculative. Not only are merchants buying, but consumers are also making purchases direct, and the producers have no difficulty in securing their own terms, which are, as a rule, on the basis of 44s. 6d. per ton for f.o.b. early deliveries of No. 3 G.M.B. Merchants have put up their prices to 44s. 3d. for No. 3, but iron in their hands at present is rather scarce. Warrants are in poor request, though they are rather better than they were, and 44s. can now be got for Connal's No. 3 f.o.b. warrants. The stock in Connal's Middlebrough stores on Tuesday was 116,981 tons, or 370 tons less than on the former Tuesday. Forge iron is quoted at 43s. 6d. per ton. The shipments of iron from Middlebrough have been extraordinarily good recently, and up to Wednesday night 93,377 tons have been shipped, as compared with 74,311 tons for the whole of July. It is probable that they will reach 95,000 tons odd, and if this should be the case, we will have to record the heaviest exportation of iron in a month we have had since September, 1879, the shipments for that month having been 101,154 tons. Of the quantity of iron shipped about 1700 tons have gone to America, but a good deal of Cleveland iron has gone from Hartlepool and other ports, of one brand only nearly 7000 tons having been exported to the States. Clarence and Redcar iron appear to be the brands in favour out there. The manufactured iron trade remains quiet, but if anything a little firmer. Plate makers are very busy, but chiefly on old orders. On Tuesday quotations were:—Ship plates, £6 15s.; boiler plates, £7 15s.; sheets, £8; and common bars and angles, £6 5s. per ton, all less the usual 2½ per cent. discount. Puddled bars, £4 2s. 6d., net. There are a few more inquiries being received for steel, and it is to be hoped some good orders will result from the negotiations. Ironfoundries are still very quiet. The prices of Cleveland and Spanish iron ores are the same as quoted last week. The coal trade is brisker in all departments, and the deliveries of coke are more extensive than they have been before.

**THURSDAY NIGHT.**—In consequence of the determination of the Scotch makers to terminate the restriction agreement, the market is somewhat flat to-day, and No. 3 has fallen from 38s. to 37s. per ton on Tuesday's quotations. Makers are, however, firm at 41s. 6d. The total shipments for August are 95,861 tons.

**DERBYSHIRE.**—The local coal trade seems to be somewhat improved, and some of the pits are working better than they were a short time ago. Those collieries which do a large trade with London and the South seem to be also better off for orders. The tonnage by the Midland from the neighbourhood of Clay Cross and Elkington seems to be rather better, whilst more of the best house-coal is being sent to the Midland counties. Steam and locomotive coal have also improved in demand, but at some of the pits the change has not increased the working time. Small coal and slack, suitable for steam generating purposes is not in over good demand. There is no material change to note in the iron trade, which, however, continues fairly active. The make of pig-iron holds well up, and there is also a fair output of merchant iron of various sorts. It is stated that the removal of the Dronfield Steel Works to Workington has so far progressed that Mr. W. Tomlinson, of Dronfield, has been appointed clerk of the works for the new erection.

**DURHAM.**—The pig-iron trade has been much stiffer this week. Prices have been firm and the demand much greater. Makers' prices have been usually 41s. 6d. No. 3, and 43s. 6d. No. 4 forpe. Purchases, however, have been secured in some instances at rather less than these rates, though there is now much more difficulty in doing so. Merchants have been at about 3d. less per ton than makers. The condition of the manufactured iron trade is differently spoken of, most of the manufactures producing shipbuilding material are well booked ahead—have, in fact, about as much work as they can execute for some months to come. The case, however, is different with many bar producers, who are getting through with their orders, and find some difficulty in getting work on a large scale at the current prices which are quoted. They have generally failed in establishing an advance, although they have now to pay more for their pig-iron than was the case a few weeks back, while at the same time they have had to make an advance of wages, and will have to give their men more during September. The same remarks apply pretty much in the same way to the angle producers, who fail in getting the improved prices which they tried for some time back, although they are generally better off for work than the bar producers. The prices of manufactured iron are about: bars, £6 2s. 6d. to £6 5s.; angles, £6 5s.; ship-plates, £6 15s.; boiler plates, £7 15s.; sheets, £8; rails, £5 7s. 6d. to £5 10s., less 2½ per cent.; puddled bars, £4 2s. 6d., net. The engineering trade is steadily maintained. The forge works are generally busy, especially with marine work. The strike which was threatened in the Durham coal trade has been averted, as the claims made by Messrs. Pease's miners have been withdrawn, and the question referred to the ordinary means for dealing with disputes. The household coal trade is gradually improving, and there has been rather more enquiry for coke. The prices of coke are 9s. 6d. to 10s. 6d. at the ovens for furnace coals, foundry coke 1s. per ton more.

Steam-coals are rather quiet, no change in manufacturing sorts.

**EAST WORCESTERSHIRE.**—There is little or no change to report in pig-iron, which maintains an average request. The number of furnaces blowing in South Staffordshire and East Worcestershire is forty-eight, the Pelsall Company having blown in a furnace. This was the furnace blown out a short time ago for repairs. Quotations are well maintained, and have a tendency to stiffen. The following are the present prices:—For all-mine hot-air, £3 7s. 6d. to £3 10s.; for part-mine, £2 10s. to £2 12s. 6d.; for common cinder iron, £2 to £2 2s. 6d. Stocks are limited, the demand fully absorbing the present output. In the finished-iron trade most of the works are running full time. The cooler weather of the last few days has enabled the iron-workers to follow their work closely, and consequently the tonnage output for the last two weeks will rank very high. The general opinion, indeed, seems to be that the volume of trade is increasing. In the bridge, girder, and iron roofing departments extensive contracts are being placed with local firms, more particularly as regards large roofs for the Indian States Railway, the substitution of several iron bridges for existing wooden structures on the part of certain railway companies in the United Kingdom, and the execution of a contract for a large iron bridge for Bedminster, near Bristol. The manufacture of cast iron pipes for the Liverpool water supply still goes forward, and promises to do so for some time. Marked bars are still upon the general basis of £7 10s., with £8 2s. 6d. for the Earl of Dudley's brand. The better qualities of unmarked iron come up in price to within 10s. of the ordinary standard of marked bars. A little more seems to be doing in coal for forge and furnace purposes, and the demand for household requirements has also increased. Still, the state of trade in fuel is very far from what it might be; but, with the approach of autumn, we may hope to see a durable improvement. The official prices are still 9s. 6d. and 10s. for furnace coal west and east of Dudley respectively, the last named figure governing a rate of wage to the thick-coal collier of 3s. 4d. per day, and to the thin coal miner of 2s. 8d. per day or stint. The demand for slack is good. The flint glass trade of East Worcestershire has considerably improved of late, and briskness in this industry means more demand for fine fuel. The fire-brick and retort trades are also very active.

**FOREST OF DEAN.**—The iron trades show no improvement on reports which have recently appeared, and whilst a lesser export of pig metal has arisen, a weakening tendency of prices has likewise accrued. How far the stiffening incidents of the north of England iron trade may be reflected in districts such as this is at present not a determinable matter. Consumers are driven under prevailing low prices of manufactured iron to obtain crude metal at the lowest cost. This applies especially to tinplate manufacture, hence better classes of pig-iron have to be sacrificed for inferior makes. Forest pig—best brands—are barely fetching 60s. per ton in the yards. This week a cargo of Barrow iron has been imported for local tinplate manufacture. The mineral branch is showing no pulse of activity, in fact, the demand for Forest ores continues to be restricted. Quotations are variable. Whilst the western ores may be had at the banks at 7s. to 8s. per ton, the richer mineral on the east side is quoted as high as 15s. This, however, it should be said, is a maximum quotation for a mineral averaging 50 per cent. of metallic iron. Hematite quality contracts, it may be further explained, could be made under somewhat easier conditions. The tinplate branch is generally active. With regard to the house-coal industry, its position is manifesting a very marked improvement, and this has given rise to a private conference to the Forest colliery owners with a view to a lift of prices. The position is strengthened by the fact that Welsh prices have sprung of late, and to-day there is an arrival of vessels at Lydney from Newport for fuel, which demonstrates that Forest prices induce the same. The district pits are now in full work, and this week's arrival at the local ports is a larger one, stocks at the yards having been cleared.

**GLASGOW.**—The warrant market has fluctuated up and down this week in accordance with the rumours as to what was likely to be the result of the ironmasters' meeting this week. The meeting, now that it has been held, has proved rather a disappointment to many, as it was understood the masters generally were willing to continue the restrictive policy of last year; but at the meeting, Messrs. William Baird and Co., expressed their dissent, and consequently the agreement with the Middlebrough makers cannot be renewed at its expiring on the 30th of September. It is understood Messrs. Baird are well supplied with orders, and consider the present position of the trade renders any combined restriction unnecessary. Shipments keep up on a large scale, and the local consumption is at present very large, so makers have a good demand for their iron, and, hitherto, have steadily maintained prices, many of them having comparatively small stocks in their yards. The splendid harvests in America and elsewhere are also expected to exercise a favourable influence on our market. On Thursday the price fluctuated between 50s. 1d. and 50s. 4d. cash, and 50s. 6d. a month. On Friday a few lots changed hands at from 50s. 1d. to 50s. 4d. cash, and 50s. 3d. to 50s. 6d. one month. On Monday there was more confidence, and 50s. 2d. to 50s. 6d. cash, and 50s. 6d. to 50s. 9d. a month was paid. On Tuesday the price rose to 50s. 9d. cash, and 50s. 11d. a month, afterwards declining to 50s. 5d. cash, and 50s. 7d. a month. On Wednesday forenoon 50s. 4d. to 50s. 7d. cash, and 50s. 7d. to 50s. 10d. a month was paid; in the afternoon, when the result of the ironmasters' meeting was known, the price dropped to 50s. 1d. cash, and 50s. 3d. a month, to 49s. 10s. cash, and 50s. 1d. one month. Closing: sellers, 49s. 10d. cash, and 50s. 1d. one month; buyers, one penny per ton less. The shipments of pig-iron from Scotland last week were: Foreign, 10,844 tons; coastwise, 2307 tons; total, 13,151 tons, against 11,239 tons in the corresponding period of last year. Since Christmas the shipments show an increase for this year of 50,066 tons. The imports of Middlebrough pig-iron into Grangemouth last week were 3760 tons, against 8107 tons in the similar period of last year. The total imports till August 27, 1881, are 146,856 tons, against 196,567 tons till August 27, 1881, showing decrease for this year of 49,711 tons. The stock in Connal's store is now 629,990 tons, a decrease for the week of 548 tons, while Connal's Middlebrough store has

decreased 520 tons. The works in the manufactured iron trade are all busy, and have quite satisfactory prospects for the next few months; prices are unchanged. The exports last week were:—Iron manufactures valued at £1,150, sewing machines valued at £5930, and machinery at £15,500. The aggregate tonnage of vessels launched on the Clyde during August amounts to 25,440 tons, against 25,840 tons in August, 1881. All the yards are busy, and prospects are fairly satisfactory, though recently there have not been quite so many orders booked in the Glasgow district. Last week the imports of iron ore were small, the price of Spanish is 17s. to 17s. 6d. per ton. Large business continues to be done in coals, both for export and for home use, and as merchants will soon be laying in their winter stocks prices are expected to get firmer. The founders and engineers continue as busy as ever.

**LANCASHIRE.**—The iron market here continues very quiet. In pig-iron there is extremely little doing in the shape of new orders going out. Buyers see no indication of the market getting up, and prefer to run off their present contracts before placing out further orders in the belief that by holding back they may possibly gain some advantage. Makers are kept busy with deliveries against contracts, and their quotations are unaltered. There is, however, really little or nothing doing to actually test the market, but so far as any tendency one way or the other can be seen, it is in the direction of somewhat less firmness in prices. In Lancashire pig-iron the business doing during the week has been of the most limited character; local smelters are, however, not only sending away the whole of their make, but are taking out of stock to meet deliveries on account of iron already sold, and they are firm at their full rates of 46s. per ton, less 2½ for both forge and foundry qualities delivered equal to Manchester; district brands of pig-iron, although only being sold in small quantities, are also unaltered in price, Lancashire being still quoted at 47s. 6d. to 49s., and Derbyshire 48s. 6d. to 50s., less 2½ delivered here, whilst G.M.B. Middlebrough is quoted at 52s. 6d. per ton net cash. Finished-iron makers throughout this district are all busy, although there is not actually a great weight of work coming in on home accounts. Specifications for iron sold are being freely placed, and there is a very fair business being done for shipment. Of sheets large quantities are being taken by the galvanising trade for shipment to Australia; a good deal of business is being done for Russia, and considerable quantities of finished are at present being shipped to India. For delivery equal to Manchester or Liverpool prices are firm at about £6 7s. 6d. for bars, £6 15s. to £6 12s. 6d. for hoops and £8 7s. 6d. to £8 12s. 6d. for sheets. Amongst founders there is a good deal of the heavy class of work in hand, such as cast-iron columns and girders for constructive purposes. The engineering branches of trade continue generally busy, although in some departments, such as machine makers and engine builders there is rather a falling off in the amount of new work coming forward. In the coal business continues to improve slightly, and the pits are making better time; but there is still an abundance of coal offering in the market, and it is only in exceptional cases where any advance in prices is at present contemplated. Generally, prices may be said to be steady at late rates, best coal averaging 8s. to 8s. 6d., seconds 6s. to 7s., common round coal 4s. 9d. to 5s. 6d., burgy 4s. 3d. to 4s. 6d., and good slack 3s. 3d. to 3s. 6d. per ton at the pit mouth. An increased quantity of coal is going away for shipment, and vessels have not been quite so difficult to get, but prices continue low, Lancashire steam-coal delivered at the high level, Liverpool, or the Garston Docks still averaging 6s. 6d. to 7s., and seconds (h. use coal) 8s. 3d. to 8s. 6d. per ton. For coke, a good demand is maintained at full rates.

**LEEDS AND WEST YORKSHIRE.**—The forges in this district are working at the rate of four days weekly. Although this shows no improvement upon what has been the rate of output for two or three months past, there is no reason but to expect that the demand for best Yorkshire iron will much improve. Whenever there are warlike operations in progress, the demand for this description of iron has generally gone up enormously, but up to the present time there has not been much appearance of anything like it. Merchants are placing orders rather freely for bars, sheets, and angles, in the expectation that when there is not so much uncertainty as to the result of the harvest, the general trade of the country will show a decided improvement. With respect to the engineering shops there is nothing new to report, but it is satisfactory to know that they, almost without exception, are well employed. Some of the smaller machine makers have received a repetition of orders for specialties connected with the peculiar industries of the Colonies. There is nothing new to report with respect to the cut nail manufacture. The production continues to be heavy, and yet prices do not show any tendency to improvement. The West Yorkshire coal trade is quiet, except that the export trade, as reported last week, shows some improvement.

**LIVERPOOL.**—A quieter feeling than that of the last few weeks prevails, and buyers seem to be staying their hand again. There is no pressure to sell, however, and everything seems to rest on a steady and reliable platform, and the present lull may only be the precursor of an even more lively period of buying. Pig-iron is just in steady demand, and perhaps a little speculation has been indulged in on the strength of the proposed continued reduction of output in Cleveland and Glasgow. There is yet no sign of American business in this direction. Tinplates are a shade quieter under the influence of the reduction in the price of tin and an absence of buying from America. Buyers are open at 10s. per box for prime coals, but sellers hold back at this. Heavy shipments of iron continue to Bombay, but freights have now been raised in consequence, and this will probably check further operations. Home demand is rather sluggish, and has no doubt been affected by the extremely adverse weather. Shipbuilders here have had some fresh enquiry without much resulting so far, but it is understood that orders have been placed in other parts of the coast.

**LONDON.**—The metal market has been steadily progressing. Orders are not plentiful, but makers are well employed. Iron.—There was a strong tone in the pig-iron market, as it seemed almost a *fait accompli* that the masters would continue the reduced output, but some disagreement at the last moment shattered expectations, and prices im-



mediately dropped from 50s. 11d. to 49s. 9d., then 49s. 6d., now closing 49s. 9d. Copper steady, spot Chili bars 67½s. Tin.—We have a very strong market. Cash: Fine foreign, 102; English ingots, 105. Tinplates rather easier. Cokes 16s. 6d., Liverpool.

#### NEWCASTLE AND THE TYNE DISTRICT.

The pig-iron trade of this locality has been firm in tone this week, and prices are slightly advanced, say 3d. to 4½d. per ton, the present price of No. 3 Cleveland pig being 46s. 6d. to 46s. 7½d. per ton, delivered in the Tyne, as against 46s. 3d. last week, whilst for No. 4 forge quality the quotation is 1s. less than that of No. 3. Exports are to a satisfactory extent, and the home demand is on the increase. Steel also is in good request, with prices firm. In finished iron a steady business is being done on about former terms. Ship-plates are sold at 67 to 67½ 2s. 6d., delivered in the Tyne; angle iron makes 66 7½ 6d., and bars 66 5s. 6d. 7½ 6d. per ton, less the usual 2½ per cent., whilst boiler plates fetch 68 per ton. Red ore from Bilbao is shipped at that place at 7s. per ton, and the freight to the Tyne remains about 9s. 3d. per ton. Great activity continues in the iron shipbuilding trade of the Tyne and Wear so far as the construction of vessels is concerned, but new orders, although more frequently in the market than was the case a few months ago, are by no means plentiful; still, most of our building firms have contracts secured—most of them having been entered into in the early part of this year—that will keep their yards in full operation until next spring. There is some apprehension in the minds of shipowning men that steamers are being built in greater number than is required by the carrying trade, so that a lull in the shipbuilding operations of our coast may not be far off. Engines manufacturers are extremely busy, on marine work particularly; the extensions carried out at some of the works, and the near completion of the new works that are being fitted up at Wallsend by the North-Eastern Marine Engineering Company will give employment to a largely increased number of hands, should the trade continue as prosperous as it has been since the revival of trade set in. All the other branches of the iron industry that are mainly dependent on the shipbuilding and engine making business, such as boiler makers, ironfounders, bolt and rivet makers, &c., are naturally as full of work as they need be, and a great deal of nightwork and overtime is requisite to get orders executed. In the coal trade there is but little change since our last. Steam coals of the best quality are rather easier to buy, the loading turns at most of the collieries having become shortened, partly by detention of tonnage from rough weather; but the price is still quoted 9s. 6d. per ton, less 2½ per cent., this however, being 3d. to 6d. per ton less than the real selling value. Gas, manufacturing, and smithy coals are in good request at 6s. 3d. to 7s. per ton, whilst households are dull of sale. Coke goes away freely at 13s. 6d. to 14s. 6d. per ton, f.o.b., less 2½ per cent., whilst blast-furnace sorts make 10s. to 10s. 6d. at the ovens. Chemicals are still rising in price; soda ash sells at 18d., less 7½ per cent., soda crystals at 22 17s., and bleaching powder 42s. 6d., net. Rouencliff is in better demand at 4s. 6d. to 4s. 9d. per ton. Fireclay goods are unchanged in value or demand. Cement steady, with good inquiries both for home purposes and for export.

**NEWPORT.**—The business of the port during the week has been of a satisfactory character, and there are still signs of a steady improvement as regards our local industries. No transactions of any note have taken place in pig iron, which remains very firm at the prices quoted in our last week's report. The iron-ore market is not quite so firm, although large quantities are still going rapidly into consumption. Rubio is quoted at 15s. c.i.f., and Campanil Somorostro at 15s. 3d. c.i.f. The manufactured iron trade continues active, but not much fresh business has been done, as manufacturers have good orders in hand. We do not expect any large sales will take place for a few weeks, unless at an advanced figure. The steelworks are well employed, and for steel rails there is still a brisk demand. Prices remain firm at 45 10s. to 46 per ton free on rail at works, according to section. If anything, there is a slight upward tendency in the prices of tinplates. I.C. cokes are quoted at 16s. 6d. to 17s. per box, and charcoal at 19s. to 21s., delivered at Liverpool. The improvement in this branch is very gradual. As will be seen by the figures given below shippers of steam coal have again had a very busy time of it and prices are easily maintained. The general opinion is that when the winter demand sets in we shall see an advance in prices. House-coal is in fairly good request, and, considering the season, is selling at a high figure. There is no abatement in the brisk inquiry for small coal, and fancy prices are being obtained. There is not much being done in pitwood, and prices are barely maintained. The small arrivals, however, which we have to record this week may give a firmer tone to the market. In the freight market there are a fair number of orders, and quotations are generally speaking firm. At Tredgar on Saturday last a trial was made at steel rail making and everything appears to have given satisfaction. The coal clearances for the week give a total of 31,706 tons, as compared with our last return of 29,944 tons. Of iron, &c., 3033 tons were despatched to the following places:—New York, 2200 tons; Santos, 623 tons; and Paraiba, 210 tons. Thirty tons of coke also left the port. The imports comprised 5940 tons of iron ore from Bilbao, 3750 tons from other directions, and 820 tons of pitwood.

**NORTH STAFFORDSHIRE.**—There continues to be a fairly steady demand for most descriptions of finished iron. Specifications from home merchants show a slight falling off this week, but this is more than counterbalanced by orders from shipping houses, the export branch of the trade being brisk just now. The merchant mills are, as a rule, making full time, and there is some improvement in the demand for hoops. Business in plates is, however, very quiet, and some difficulty is experienced in keeping the mills going as long as four turns per week. There is a good sale of sectional iron, such as is used in shipbuilding and large engineering works, most of the mills in this branch being well employed, with a prospect of the present rate of working being kept up for some time. Prices of finished iron are well maintained, but no attempt is being made at present to increase them, the quotations of the last two or three months remaining in force. Puddled bars find a ready market, and the forges are working full time. Pig-iron and ironstone are in less demand, and rates for the better qualities

of ironstone show a little falling off. Furnace mine is still quoted at from 8s. 6d., but puddled mine has dropped 3d. a ton, and now fetches from 10s. 9d. The supply of coal is much in excess of demand for all descriptions, and prices are unaltered. An intended agitation for an increase of wages is rumoured, but it is difficult to see what chance of raising wages the present condition of trade can allow.

**SHEFFIELD.**—Business in the town in the ordinary old staple trades is acknowledged to be dull. Whether it be that large buyers are away on their summer vacations is not known, but it is certain that the lines which are coming in, either for home or foreign delivery are light. The houses engaged in the country trade are as slack as the shipping firms. Beyond a few inquiries for the Spanish South American markets, there is nothing to indicate a present resuscitation of trade. It will not be until the opening week of September, and the latter end of it, that any genuine revival of business will take place. This was the case last year. The cutlery and steel trades were last year dull in August, but September brought about an improvement. The same rule appears likely to prevail this year. We note that bone and horn are coming down in price, after an unexampled run of high rates, but ivory of best quality is very scarce and dearer. It appears that produce is coming in slowly from the West Coast of Africa, and shipments of Egyptian ivory have almost stopped. File manufacturers are short of orders, and edge tool houses are only doing a comparatively light trade, though several of the American houses are busy. In the Bessemer department, prices are low, and only a slack trade is noticeable at present; but next month there is certain to be an alteration. Ship-plates are in exceedingly stiff request, and the boiler-plate shops are also doing well. In regard to the armour-plate department it need scarcely be repeated that there is work in hand to last for a couple of years to come. Composite plates are those most enquired for, but "linings" form no insignificant portions of the orders to hand. There is an improvement in the engineering trade. We hear of few houses of note being unable to keep their shops in full work. In every other branch merchants are reporting little coming in. At the rolling mills, also—which are a fair index of the condition of trade—proprietors state that business is dull. The autumn trade will, however, be fair, if on no other account than the influx of American lines.

**SHROPSHIRE.**—The local iron trade in all departments is marked by positive inactivity. The demand for manufactured iron of the best qualities cannot be said to have fallen off, but there is absolutely no improvement, and prices continue at exactly the same level. In the pig-iron branch the same state of things is reported by the leading smelters. Neither in demand or price is there any material change. The various contracts in the hands of the different firms are being moved off satisfactorily, but fresh enquiries do not come to hand, nor are they anticipated just at present. The coal trade of the district, considering the season, is in a fairly satisfactory condition.

**SOUTH STAFFORDSHIRE.**—Indian business is checked by the war, since merchants are reluctant to consign goods "at war risk." But Australia and New Zealand continue valuable customers for all classes of hardware. The Cape trade is not what it should be, but from some parts of South America a satisfactory demand is experienced for cheap wares. The naval authorities and the India office are just now sending important enquiries for cultivating and edge tools into this district, direct and through merchants. Early delivery is specified as to all the orders. The enquiries from the Admiralty embrace best cast steel spades and shovels, best cast steel hammers of varied description and size, chisels, brace drills, clippers, cleavers, axes, &c. Nearly 3000 hammers are needed, over 3000 chisels, and 3000 spades and shovels. Much of the work, it is expected will come into this district. Local manufacturers have also tendered to the India Department for 6000 picks of a weight varying from 5 lb. to 7 lb. each. Brass cabinet lockmakers report a good trade with the Antipodes in desk, till, and straight and cut cupboard locks, and India is an important market too. In London much competition is experienced from the German and French makers. Builders black ironmongery is in fair sale, but orders are for irregular lots and prices are much cut up. Patent iron hinges have of late been in big demand for export. Manufactured iron continues in good demand, particularly sheets and hoops. Singles are 48 5s., and doubles 49. Plates are 48 2s. 6d., as a minimum. Hoops 46 10s. to 47.

**SWANSEA.**—The improvement in the iron and steel trades is still well maintained. All descriptions of steam-coal are in good demand, and prices are firm, especially for through and through steam. Steam tonnage is plentiful, and freights firm, with the exception of Bayports; these show a somewhat downward tendency. 30,192 tons have been cleared, including 6890 tons of mineral. The anthracite colliery proprietors have just met the men's representatives at Brynamman, and agreed that the wages shall be henceforth advanced or reduced at the end of each period of four months by addition or reduction of 2½ per cent. upon the standard wage-rate, the standard f.o.b. prices being fixed at between 7s. 8d. and 8s. This is virtually an enactment of the South Wales and Monmouthshire sliding-scale agreement. It now remains for the executive to adopt such steps as will effectually prevent any underselling or departure from the terms of the agreement. The sliding scale agreement for the house-coal is working well, despite the feared disaffection. The failure of Mr. Thomas Joseph, colliery proprietor, Rhondda Valley, has created commotion. Owing to the heavy liabilities (about £150,000) large assets are realisable. The men (700) have agreed to work on at the Rhondda collieries upon stipulated conditions. With reference to the tinplate trade, prospects continue to brighten. In a few days the appliances at the new dock will be brought into practical use. Satisfaction is felt at the information that a movement is on foot for the establishment of an association of railway shareholders on the lines of the council of foreign bondholders. The promoters are encouraged by the report of the Select Committee of the House of Commons on railway rates and fares to believe that such an association as that proposed would have a *locus standi* before the Railway Commissioners in all matters affecting the general interests of the shareholders.

**WEST CUMBERLAND.**—The aspect of the iron trade in this district has not been materially changed during the week. The demand from all parts is very fully main-

tained, and it is evident that although only two months intervenes before the shipping trade is closed to a great extent for the season, buyers are anything but satisfied with the purchases already made, and are placing new orders on a large scale. The demand for Bessemer iron is very well maintained, inasmuch as steelmakers in the district and throughout this and other countries have very large demands to meet in the immediate future. The forge iron trade also occupies a very satisfactory position, and it is noteworthy that the demand for this metal is considerably augmented by makers engaged in the tinplate as well as in the general trades. There is a very heavy yield of metal from the works in the district; but, despite this, makers have a difficulty in keeping up to their delivery engagements, which are very extensive, and the heavy traffic passing over the local railways and the extensive shipments of metal from local ports are evidences of the activity which rules throughout the district. Prices are very steady at 59s. for No. 1, 58s. for No. 2, at 57s. 6d. for No. 3, at works, net, but in most cases higher prices are being asked. Steelmakers are very busy, and the demand is strong. Iron ore is in full demand at 14s. to 16s. per ton at mines. Coal and coke, brisk, at steadily improving prices.

## THE CONTINENTAL IRON AND COAL TRADE.

**BELGIUM.**—The Belgian iron market continues to improve from week to week. Orders are becoming more numerous and important and iron is disposed of readily at the enhanced prices. Belgian works have their order-books filled for several months ahead, and it appears almost certain that the advance which usually takes effect in spring will this time be reached without the customary previous depression.

**BRUSSELS, WEDNESDAY EVENING.**—There was not a large attendance at the Bourse des Métaux to-day, because of the opening of the Belgian hunting season. Nevertheless, prospects are very good; and prices, though now only generally maintained, are likely to rise again in a short time. The following are the latest official quotations per 1000 kilogrammes, with those of the past week:—

	Aug. 23. Francs.	Aug. 30. Francs.
Belgian foundry pig .. ..	75 ..	75
Belgian forge pig .. ..	65 ..	65
Luxemburg foundry pig .. ..	57 ..	57.50
English foundry pig .. ..	60 ..	65
Bars, No. 1 .. ..	137.50 ..	137.50
Joists .. ..	145 ..	145
Angle iron .. ..	150—155 ..	150
Railroad and T-iron .. ..	145—150 ..	145—150
Ordinary plates .. ..	190 ..	190
Boiler plates .. ..	210 ..	210
Sheets .. ..	290 ..	290
Steel rails .. ..	160 ..	160
Tires .. ..	235 ..	235
Axles .. ..	245 ..	245

A firmer tendency prevails in the coal market, owing to the reduced stocks in several districts of the country, and to the total absence of stocks in the Borinage, whence great quantities are continually being sent to France. It is to be expected that, if the beginning of next winter proves cold, our coal markets will be greatly strengthened during the whole season. Meanwhile, we note a rise in the price of large coal. The quotations for coal per ton are:—

	August 23. Francs.	August 30. Francs.
House coal .. ..	16—18 ..	16—18
Large coal .. ..	17—20 ..	16—19
Unscreened coal .. ..	11.50—15 ..	11.50—14.50
Small steam coal .. ..	10—11 ..	10—11
Small coking coal .. ..	11 ..	11
Coke .. ..	18 ..	18
Ditto half washed .. ..	21 ..	21

**FRANCE.**—The French customs returns for the first seven months of this year show that the imports of pig-iron were 15,212 tons, against 162,722 tons in 1881; of manufactured iron, 74,857 tons, against 47,518 tons last year; and of steel, 20,738 tons, against 11,758 tons in 1881; total, 258,807 tons, against 221,998 tons during the corresponding seven months of 1881. The total metallurgical exports during the first seven months of this year were 58,691 tons. The tables below give the imports and exports of iron ore during the corresponding periods of 1882, 1881, and 1880:—

	Imports.		
	1882. Tons.	1881. Tons.	1880. Tons.
Belgium .. ..	67,828 ..	63,895 ..	61,605
Germany .. ..	222,029 ..	167,861 ..	164,897
Spain .. ..	288,421 ..	249,140 ..	181,579
Italy .. ..	56,126 ..	81,662 ..	68,651
Algeria .. ..	195,677 ..	166,955 ..	187,388
Other countries .. ..	6,865 ..	4,891 ..	2,274
Totals .. ..	836,946 ..	734,404 ..	666,394
	Exports.		
	1882. Tons.	1881. Tons.	1880. Tons.
Belgium .. ..	34,933 ..	11,626 ..	28,576
Germany .. ..	23,273 ..	19,349 ..	22,949
Other countries .. ..	6,767 ..	14,425 ..	12,123
Totals .. ..	64,973 ..	45,400 ..	63,828

There is no perceptible change to note in the French iron market. In the Meurthe-et-Moselle, the period for the renewal of contracts for forge pig is approaching, and, from particulars which have come to hand, it would appear that they will be concluded at about 70 fr. per ton. This would



of 2 fr. below the present ruling price, which is 72 fr. The following is a list of furnaces in the Longwy district:—

Names of Works.	Proprietors.	In Blast.	Constructing.
Mont-St-Martin	D'Huart, Raty et Cie	5	0
Gorcy	Labbe	1	0
Longwy-Bas	De Sain ignon et Cie	2	0
Chiers	Maigret et Cie	0	1
Rehon	Hovine et Cie	3	0
Cons la Grandville	Marquis de Lamberty	1	0
La Sauvage	Raty et Cie	1	0
Moulaine	D'Huart, Raty et Cie	1	0
Saulnes	Raty et Cie	2	1
Hussigny	Braconier et Cie	1	1
Villerupt-Micheville	Ferry, Currique et Cie	2	0
Villerupt-Châtillon	Châtillon Commentry	0	2
Mines de Villerupt	Société belge	0	1
Totals		19	6

There is no blast-furnace idle. In the Haute-Marne, the position of most descriptions of finished iron is good. There are not many current sales, but there are, on the other hand, numerous inquiries for deliveries in 1883. Coke iron is quoted at 210 fr., mixed iron at 230 fr. Nail-rod No. 18 obtains 280 fr. at works. At Paris an important sale of old material (7215 tons) was held on August 26 by the Compagnie du Chemin de fer du Nord. The highest offer for old rails was 126 fr. 75 c., and for iron fish-plates 127 fr. 50 c. These high prices have caused no surprise, for it has long been known that, with pig-iron at its present high rates, old material will be readily bought by forges. Quotations at Paris are still 200 fr. per ton for merchant bars and 210 fr. for plating sections. In the Nord there has also been no change. Prices are firm, work is abundant, and there is a steady demand. New works are being rapidly erected. The following are still the ruling quotations:—

	Aug. 23.	Aug. 30.
Merchant bars ..	190-195	190-195
Plating iron ..	200-205	200-205
Angle iron ..	200-205	200-205
Joists ..	190-195	190-195
Heavy plates ..	220-225	220-225
Ordinary plates ..	250	250
Boiler plates ..	280	280

GERMANY.—With the exception that puddling pig is beginning to be quoted in Westphalia at 67 marks, there has been no change in the German iron market, which continues to preserve its previous favourable tendency. Amongst the new tenders may be mentioned one for over 10,000 tons of steel rails and iron permanent way fixings for the Bromberg Railway. The latest official quotations at Dortmund for iron and steel, per 1000 kilogrammes at works (English descriptions per ton at port of shipment), are:—

	Aug. 21.	Aug. 28.
White-grained puddling pig ..	64-66	64-66
Spiegel-eisen ..	76-78	76-78
German foundry pig No. 1 ..	76	76
German foundry pig No. 2 ..	72	72
German foundry pig No. 3 ..	65	65
German Bessemer pig ..	72	72
English foundry pig No. 3 ..	44-45	44-45
English Bessemer hematite pig ..	58	58
Luxemburg pig ..	47	47
Bar-iron ..	145	145
Flat-grained iron ..	170	170
Angle-iron ..	150	150
Joists ..	150	150
Boiler-plates ..	220	220
Boiler-plates No. 2 ..	205-210	205-210
Fine Siegen plates ..	195	195
Fine-grained plates ..	250	250
Charcoal plates ..	280	280
Low Moor plates ..	310	310
Bessemer steel rails ..	160-166	160-166
Bessemer steel rails (defective) ..	135	135
Bessemer steel pit rails ..	135-143	135-143
Iron pit rails ..	135	135

The German coal market continues active. There is a good enquiry for English coals at Stettin, but prices have not changed. In Westphalia, the following are the latest quotations per 100 cwt. at the pit's mouth or at coke ovens:—

	Aug. 21.	Aug. 28.
Best coal (Stückkohle) ..	38-43	38-43
Cobbles ..	36-40	36-40
Large washed nuts ..	37-40	37-40
Washed smith's coal ..	30-33	30-33
Screened coking coal ..	26-28	26-28
Inferior coal ..	15-20	15-20
Gas coal ..	30-37	30-37
Mixed coal ..	30-32	30-32
Prime coal ..	58-68	58-68
Pateut coke ..	68-78	68-78
Small coke ..	42-45	42-45

SWEDEN.—Of the Swedish iron brands imported into England for steel manufacture, that of Dannemora is generally considered the best, and nearly the entire make of this company, about 1000 tons a year, is exported to England, whence it is returned to Sweden in the shape of so-called best English cast steel, surgical instruments, and other articles of fine manufacture. The cause of the latter anomalous circumstances is that, through a larger out-turn at the works in England, and by the greater skill of the English mechanic, these articles can be made there and imported into Sweden cheaper than if manufactured in the latter country. Lately, however, attempts have been made at some of the Swedish manufactories, as, for instance, Osterby Works, to produce such cast steel from Dannemora iron only at a price which would compete with the English, and naturally of better quality than the latter, which at most contains 50 per cent. of best Swedish iron. The Söderfors Company have also lately made railway hoops, tires, and springs of this material at their rolling mills at Elfkälar, capable of turning out from 150 to 200 tons of such articles a year, and with which they have already supplied the State as well as private railways in Sweden. Of other things now rolled at these works are steel springs for

coaches, said to be superior to forged ones, which have never before been manufactured in the country, for the production of which modern machinery has been imported from America. The Dannemora iron is still made by the old-fashioned Walloon process, which method seems to be preferred in Sweden for the making of the few material for crucible cast steel.

There is at present little activity in the Swedish iron-market, and the prices paid for certain lots sold cannot be considered as showing the tendency of the market. There is but little demand from America, and buyers are only offering prices impossible to accept. The good harvest expected in America may possibly soon influence the market. The demand from other countries has been very limited, but this is, in Sweden, chiefly attributed to political complications. For small lots of forged iron 6 kr. 75 öre per cwt. has been paid, but it would no doubt be difficult to obtain this price for any larger quantity. Rolled iron is in somewhat greater request and more difficult to obtain, and may consequently be quoted a little higher. A shipment of about 500 tons of pig-iron of better brands was last week sold at 3 kr. 25 öre per cwt. f.o.b. Gothenburg.

## THE AMERICAN IRON TRADE.

AMERICAN pig-iron is scarce, cannot be extensively obtained for prompt delivery, is firmly held, and the tendency of quotations is upward. Scotch pig is offered freely, to arrive next month, in anticipation of low freights. Short sales are being made on the basis of the expected concessions in freight, and hence the market is dull and weak. There have been 500 tons of Summerlee sold on private terms, to arrive, besides which, the total sales of Scotch for the week will probably not aggregate 1000 tons. Scrap iron at Pittsburgh is reported firmer, in anticipation of more mills resuming operations. Advances from Philadelphia and other iron centres agree that there is more inquiry for all grades of iron than there is a disposition on the part of consumers to do business. The late meeting of manufacturers at Pittsburgh was thoroughly representative. The action taken was not made public except in so far as was explained by the secretary, who said that the position of the operators as antagonists to signing the scale was reaffirmed. The action of the mills which have succeeded in utilising non-union labour was likewise endorsed.—Bradstreet's (August 19).

## SCOTCH PIG-IRON QUOTATIONS.

(From the Glasgow Herald.)

	Th.	Fri.	Sat.	Mon.	Tu.	Wed.
Gartsherrie (in yard) ..	25	25	25	25	25	25
Coltness (at quay) ..	26	26	26	26	26	26
Langloan ..	25	25	25	25	25	25
Glengarnock ..	25	24	24	24	24	24
Carnbroe ..	25	24	24	24	24	24
Summerlee ..	25	25	25	25	25	25
Eglinton (at quay) ..	23	23	23	23	23	23
Shotts ..	26	25	25	25	25	25
Calder ..	—	—	—	—	—	—
Carron ..	24	24	24	24	24	24
Dalmellington ..	24	24	24	24	24	24
Kinnell ..	—	—	—	—	—	—

## NEW PATENTS.

ALL the patents are placed alphabetically, with the official numbers attached. The new applications range from No. 4011 to No. 4111, being the entries from August 22 to August 28, 1882.

### NEW APPLICATIONS.

- Ammonia and Bone Black.—A communication.—E. P. Alexander, 36, Southampton Buildings, Middlesex. [4057]
- Apparatus for Impregnating Mineral Substances with Bituminous Products.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4071]
- Apparatus for Printing.—W. C. Haig, Manchester. [4039]
- Apparatus for Retaining Heat, &c.—J. Cavaragna, Manchester, Lancs. [4051]
- Apparatus for Spinning, &c., Worsted.—H. Niswonger, Bradford, Yorks. [4056]
- Apparatus for use on Railways.—C. H. Lea, Staffs. [4015]
- Apparatus for Winding Coils of Wire upon Armatures of Dynamo Electric Machines.—W. B. Espeut, Jamaica, West Indies. [4036]
- Arc Electric Lamps.—P. R. Allen, Belvedere Road, Lambeth, Surrey. [4064]
- Balloons.—J. A. Fisher, 101, Queen Victoria Street, and G. G. Spencer, 14, Rinecroft Street, Holloway. [4028]
- Big Boiling Matter.—A communication.—F. Wirth, Frankfurt on the Main, Germany. [4048]
- Bottle Stoppers.—J. Lippman, Berlin, Prussia, Germany. [4024]
- Breaking Coal.—C. G. Robinson, Barnsley, Yorks. [4050]
- Cans for Holding Oil, &c.—J. S. Marriage, Bell Street, Reigate, Surrey. [4082]
- Carburetted Illuminating Gas.—C. Croant, Eastcheap, London. [4133]
- Clogs.—G. Glover, Liverpool, Lancs. [4075]
- Combination Arms.—R. Howard, Southampton. [4018]
- Commutators for Magneto Electric Machines.—H. B. Lewis, Bartholomew Lane, and W. G. Smythe, Haymarket, Middlesex. [4049]
- Construction of Wheels.—J. Fry, Stephen Street, St. Marylebone, Middlesex. [4027]
- Cranes.—A. Grafton, 11, Cannon Street, London. [4027]
- Dredging.—A communication.—E. P. Alexander, 36, Southampton Buildings, Middlesex. [4027]
- Drilling Machines, &c.—J. Ruffie, Kirby Street, Hatten Garden, Middlesex. [4022]
- Dynamo Electric Machines.—A communication.—H. H. Lake, Southampton Buildings, London. [4111]
- Electric Arc Lamps.—J. K. D. Mochnais, Halifax, Yorks. [4046]
- Electric Bell and Automatic Alarm Apparatus.—A communication.—P. M. Foxice, Southampton Buildings, London. [4073]
- Electric Lamps.—G. S. Sneli, 45, Tudor Road, Hackney, Middlesex. [4065]
- Electric Measuring Apparatus.—S. H. Emmens, Argyll Street, Middlesex. [4080]
- Engine or Motor Machines Having for Object the more Perfect Utilisation of the Heat or Energy Stored in the Aeriform or Gaseous Media used for Actuating the said Machines.—T. Charlton, and J. Wright, to, Cornhill, Middlesex. [4055]
- Exhausting Air from Stacks.—W. Haigh, Skipton in Craven, Yorks. [4021]
- Facilitating the Starting of Horse Tram Cars.—A communication.—J. E. Walsh, Halifax, Yorks. [4066]

- Fastenings for Connecting Buttons, &c., to Gloves, &c.—W. B. Espeut, 20, Cambridge Street, Hyde Park, Middlesex. [4013]
- Filtering Apparatus.—J. F. C. Karsch, and W. Oldham, both of 24, Long Acre, Middlesex. [4072]
- Filters.—E. Perrett, Victoria Chambers, Westminster. [4028]
- Firearms.—F. B. W. Roberts, and B. T. Moore, both of 11, Queen Victoria Street, Middlesex. [4010]
- Friction Couplings for Shafts, &c.—A communication.—F. G. Glaser, Berlin, Prussia. [4081]
- Furnaces.—J. Robinson, and T. Robinson, both of Widnes, Lancashire. [4011]
- Gas Burners.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4026]
- Gas Fires.—A communication.—A. J. Boulle, 323, High Holborn, Middlesex. [4059]
- Gas Furnaces.—A communication.—G. D. Abel, 23, Southampton Buildings, Middlesex. [4054]
- Gas Lamps.—F. H. Wenham, Warbeck Road, Shepherd's Bush, London. [4109]
- Gas Stoves.—J. F. and G. E. Wright, both of Birmingham, Warwick. [4077]
- Generation, &c., of Electricity.—J. S. Williams, Riverston New Ferry, U. S. A. [4034]
- Glass Bottles.—T. Pyke, South Shields, Durham. [4032]
- Guiding Fishing Nets and Lures.—H. Davies, Aberdeen, North Britain. [4085]
- Hammerless and other Guns.—W. Anson, 221, Bordesley Green, Aston, Warwick. [4089]
- Harvesting Machines.—J. Howard, and B. T. Bousfield, both of Bedford. [4001]
- Heating Apparatus.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4031]
- Heating Baths of Dwelling Houses.—D. Jones, 1, Dunluce Street, Walton, Liverpool, Lancs. [4074]
- Hydrocarbon Furnaces.—J. Mundell, and W. J. Gordon, both of Philadelphia, Pennsylvania. [4014]
- Knitting Machines.—P. Beveridge-Standing, Goad, Bath, Wiltshire. [4103]
- Lace Boots and Shoes.—A. O. Andrews, Birmingham, Warwick. [4058]
- Lamp and Oil Feeder Combined.—W. E. Gillmore, Deptford Kent. [4147]
- Lids for Provision Cans.—A communication.—H. J. Hadden, Kensington, Middlesex. [4021]
- Lighting of Railway Trains by Electricity.—A communication.—H. E. Newton, 66, Chancery Lane, Middlesex. [4087]
- Looms for Weaving.—J. Dawson, Lavoisier, Maine, U. S. [4105]
- Looms for Weaving.—J. Williams, and H. Barnes, both of Burnley, Lancs. [4070]
- Machinery, &c., for Preserving Meat.—W. H. Northall, New Cross, London. [4051]
- Machinery for Painting, &c., Flat and Irregular Surfaces.—H. H. & Co., Toys, Philadelphia, U. S. A. [4050]
- Machinery for Making Moulds for Casting Nails.—S. Williams, Aston, Warwick. [4143]
- Machines for Preparing Cotton, &c.—W. Lord, Tadmorden, 11 Yorks. [4141]
- Manufacture of Horseshoe Nails.—W. J. Bingham, Sheffield, Yorks. [4100]
- Manufacture of Hydrate of Glucose from Sugar.—A communication.—H. J. Hadden, Kensington, Middlesex. [4017]
- Manufacture of Starch, &c., from Maize.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4024]
- Mats.—J. Madden, 98, Borough High Street, Surrey. [4023]
- Mechanical Stokers.—J. Proctor, Burnley, Lancs. [4040]
- Metal Cans.—J. A. Lloyd, Bush Lane, Cannon Street, London. [4035]
- Moulding Tobacco into Packets.—H. Clark, Shoreham, Middlesex. [4058]
- Opening Bottles.—D. Cote, Swindon, Wilts. [4083]
- Phantom Gig.—H. Lloyd, Liverpool, Lancs. [4052]
- Piston Lubricators.—A communication.—H. J. Hadden, Kensington, Middlesex. [4016]
- Ploughs.—W. Sweetman, Div., Norfolk. [4101]
- Polishing Tin Plate.—B. Williams, Canton, Cardiff, Glamorgan. [4018]
- Portable Folding Boats.—L. W. Jeff, Piccadilly, London. [4134]
- Preparation of Porous Siliceous Materials for Filtering Acids, &c.—C. F. Claus, Mark Lane, London. [4106]
- Printing Ink, &c.—C. F. Claus, Mark Lane, London. [4106]
- Railway and other Carriages.—W. J. Bennett, Church Street, Chelsea, and C. H. Rother, Fulham Park Gardens, Middlesex. [4186]
- Railway Carriage Doors.—J. Wallis, 30, King Street, Cheapside, London. [4012]
- Regenerative Furnaces.—C. A. W. Schon, Hamburg, Germany. [4064]
- Regulating Flow of Liquids.—J. C. Stevenson, 11, Layland Street, Liverpool, Lancs. [4088]
- Revolving Paper Cutting Machines.—A communication.—P. Jensen, 11, Chancery Lane, Middlesex. [4067]
- Roller Mills for Grinding Flour.—T. A. Adamson, Belfast, Antrim. [4020]
- Rotary Engines and Pumps.—W. B. Espeut, Jamaica, West Indies. [4076]
- Rowlocks.—S. S. Haselard, St. Sampson's, Cornwall. [4022]
- Safety Guard for Chaff Cutting Machines.—B. Rigby, jun., Liverpool, Lancs. [4022]
- Secondary Batteries for the Accumulation of Electricity.—L. H. Somers, Brussels, Belgium. [4099]
- Sewing Machines.—A communication.—H. J. Hadden, Kensington, Middlesex. [4052]
- Signalling Apparatus for Protection of Property, &c.—H. Duggins, Auckland Road, and A. Gluck, Southwood Road, Upton, Middlesex. [4045]
- Skates.—C. G. Beddoe, Lambeth Road, Surrey. [4026]
- Sleeper Chairs for Railways.—J. M. Blair, Glasgow, Lanarkshire. [4051]
- Spring Hinges for Swing Doors.—E. Barnes, Angelsea Street, Mile End, Middlesex. [4078]
- Steel for Corsets, &c.—J. S. W. Whitehead, Halifax, Yorks. [4042]
- Steel Wire as used in Pianofortes.—J. R. Gibson, and J. S. Baple, both of 61, St. Paul's Road, Camden Road, and A. Squire, 6, Wrotham Road, Camden Town, Middlesex. [4050]
- Stoppers for Bottles, &c.—A communication.—H. J. Hadden, Kensington, Middlesex. [4037]
- Telephone Receiving Apparatus.—R. and M. Theiler, both of 80, Canonbury Road, Islington, Middlesex. [4044]
- Telephonic Apparatus.—G. L. Anders, Queen Victoria Street, London. [4110]
- Umbrella Mountings.—A communication.—A. C. Henderson, 6, Southampton Buildings, Middlesex. [4095]
- White Pigments, &c.—C. F. Claus, Mark Lane, London. [4107]
- Wind Motors.—H. Ludlow, Hannover, Prussia. [4071]
- Wood Mortising Machines.—A communication.—J. H. Johnson, 47, Lincoln's Inn Fields, Middlesex. [4040]
- Working Gear and Appliances used in Electric Lighting.—K. W. Hedges, 25, Queen Anne's Gate, Westminster. [4025]

## ABSTRACTS OF SPECIFICATIONS RELATING TO METALS

PUBLISHED DURING THE WEEK ENDING AUGUST 26, 1882 (Prepared by PHILIP M. JUSTICE, 53, Chancery Lane, W.C.)

**Horse Shoes.**—25 (1882).—J. Buckham and G. Jackson.—The shoe is constructed with bevelled calks. At a little distance behind the toe calk, square headed studs are screwed, the heads being also bevelled, and between these and the toe piece, a tapered tongue is driven in. The heel calks are similarly fitted with a tapered tongue with a hammer. When not required, the sharpened tongues may be removed.

**Horse Shoes.**—73 (1882).—J. Vernon.—The metal shoe is recessed on its under side to receive pads of rubber. The ends of these pads are shaped so as to fit under projecting parts of the metal shoe, and having been sprung into their recesses, are secured in place by transverse bars or keepers of metal provided with studs fitting into sockets in the metal shoe, locking pins passing through both shoe and studs. The rubber pad may be vulcanised, or a strip of steel inserted in it in order to stiffen it. A further recess is also formed in the shoe, in which short tufts of bristles are embedded in order to afford a better foothold for the animal.



**ANDREW AND JAMES STEWART,**  
CLYDE TUBE WORKS, GLASGOW AND COATBRIDGE.  
OFFICES, 41 OSWALD STREET, GLASGOW.

MANUFACTURERS OF LAP-WELDED IRON

**Boiler Tubes**

LOCOMOTIVE IRON AND STEEL TUBES.

Boring Tubes and Lining Tubes screwed with flush joints. Tubes for Field Boilers & all other descriptions of Tubing.  
WROUGHT IRON WELDED TUBES & FITTINGS.

**B M. RENTON,**

Iron and Steel Merchant, Savile Street, Sheffield,  
IS A CASH BUYER OF

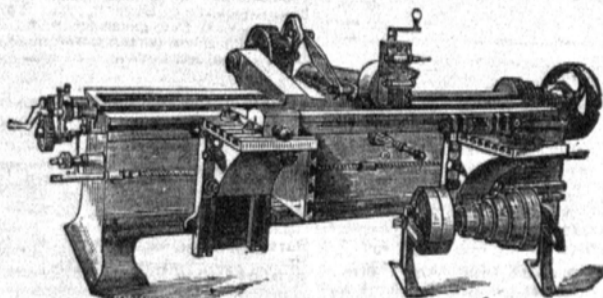
Old Steel Rails, Old Leaf Spring Steel, Old Steel Tyres, Old Steel Tools, Old Files, and any other sort of Steel and Iron Scrap in small or large quantities. Railway Companies, Colliery Proprietors, Ironmongers and others, are requested to send quantities and lowest cash price.

**JAMES FRASER, ELLAND ROAD, LEEDS.**

SUCCESSOR TO THE LATE

G. E. ILLINGWORTH.

ALL CLASSES  
OF  
ENGINEERS'  
TOOLS



OF THE BEST  
QUALITY  
AND  
WORKMANSHIP.

SEND DIRECT FOR CATALOGUE.

**JOSEPH PARKIN,**  
IRON AND STEEL MERCHANT, SHEFFIELD.  
Importer of Spiegeleisen, Russian and Swedish Iron.

**OLD STEEL RAILS.**  
A large stock always on hand of the following Materials:—Double-sawn Rail-Ends of all sections, Old Steel Tyres (whole and broken), Old Railway Springs, Bessemer Blooms and Billets, Plating Bars and ordinary Bessemer Bars, for all purposes; Cut Bessemer Scrap, Spring Ends, &c., for crucible melting. Also large quantities of Bessemer Scrap Rail Ends, Bloom Ends, &c. for (Martin-Siemens) re-melting kept in stock at various Ports for shipment.

**STEEL FOR TOOLS**

ALSO FOR

**CONTRACTORS' MINING AND RAILWAY PURPOSES.**

Double Shear, Spring, Sheet and Blister.  
FILES, SAWS, CAST STEEL HAMMERS AND TOOLS.

**GREGORY AND BRAMALL,**

SHEFFIELD: SOHO STEEL AND FILE WORKS.  
LONDON: ALEXANDER BROS., 7, DRAPERS' GARDENS, E.C.  
BIRMINGHAM: FARLEY & UNDERHILL, 58, NEW STREET.

**MANCHESTER WIRE WORKS,**

NEAR VICTORIA STATION, MANCHESTER,  
(ESTABLISHED 1790).

**JOHN STANIAR & CO.,**

Manufacturers by Steam Power of all kinds of Wire for

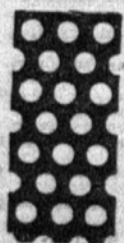
RICE & FLOUR MILLS, RICE & FLOUR MILL MACHINERY.

Extra Treble Strong Wire for

LEAD AND COPPER MINES,

Jigger Bottoms, Cylinder Covers, woven any width. Extra Strong Riddles and Sieves, and Strong Perforated Zinc and Copper.

Shipping Orders Executed with the Greatest Despatch.



**FINE ARTS & INDUSTRIAL EXHIBITION.**

Technical School, Bradford.

GRAND ANNEX.

**THWAITES BROTHERS**

EXHIBIT

MACHINERY IN MOTION.

IMPROVED STEAM HAMMERS.

ROOT'S PATENT BLOWERS & EXHAUSTERS,  
ENGINES AND AIR COMPRESSORS.

LARGEST STOCK OF STEAM HAMMERS IN THE WORLD.

Price Lists Post Free.

**JAMES EADIE & SONS,**

CLYDESDALE TUBE WORKS,

RUTHERGLEN, near GLASGOW.

ESTABLISHED 1832.



LAP WELDED IRON BOILER TUBES.  
LOCOMOTIVE TUBES WITH COPPER ENDS.  
GAS STEAM & GALVANISED TUBES.  
STEEL TUBES.

**ASBESTOS.**

WILLIAM HOLLYWOOD,

REGISTERED 15, MARGARET ST.  
HIGH JOHN ST. GLASGOW.

NONE GENUINE.



WITHOUT THIS

Inventor and Sole Manufacturer of Asbestos Putty, for Steam and other Joints.  
Asbestos Jointing Mill-Boards, in Sheets and Washers, any thickness. All kinds of Crude and Manufactured Asbestos kept in Stock.

AGENTS IN LONDON—  
W. H. WILCOX & CO.,  
36, Southwark Street London, E.C.

TRADE MARK

**HENRY WIGGIN AND CO.,**

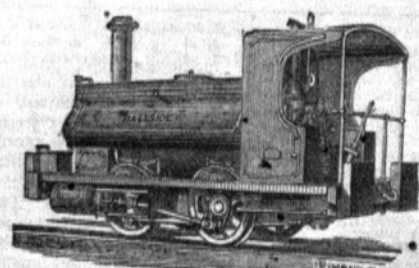
(LATE EVANS AND ATKIN.)

NICKEL AND COBALT REFINERS,  
BIRMINGHAM.

Manufacturers of their  
PATENT MALLEABLE NICKEL & COBALT  
SHEETS AND ANODES.

**GRANT, RITCHIE & CO.,**

Engineers, Ironfounders and Boiler Makers.  
KILMARNOCK.



Locomotives, 8 tons inch cylinders, always in stock or in progress  
Also Manufacturers of Winding Pumping, Blowing, Rolling Mill and Air Compressing Engines of all sizes. Underground Hauling Machinery. Guibal Fans. Blast Furnace and Bessemer Steel Works Plant.



**Cartridge Cases.**—551 (1888).—*T. R. Bayliss*. This has reference to large cartridges used with machine guns and artillery. From a sheet of rolled brass or copper, circular discs are cut out. The marginal portions of these are thinned by turning or otherwise. The cups are then made tubular by a series of drawing processes. The tube thus obtained has an excess of metal near the enclosed end, which may be turned off in a lathe.

## NEW COMPANIES.

**TIN, LIMITED.**—This company proposes to adopt an unregistered agreement of 17th inst., between Hy. Johnson, of Tasmania, and the subscribers, concerning tin ore in Tasmania. The company was registered on the 10th inst., with a capital of £10,000, in £1 shares.

THE current rates for coal and iron are :—

Newport Newcastle Cardiff or Sunderland, Swansea.		Newport Newcastle Cardiff or Sunderland, Swansea.	
s.	d.	s.	d.
Alexandria	13 0	Montevideo	23 6
Alicante	12 0	Montreal	11 0
Ancona	20 0	Messina	12 6
Aden	13 0	Muscat	11 0
Athens	13 0	New York	11 0
Batoum	10 0	New Orleans	11 0
Bombay	20 0	Naples	12 6
Bahia	19 0	Odessa	11 0
Barbadoes	14 0	Oporto	9 6
Barcelona	10 6	Penang	19 0
Brindisi	11 0	Pernambuco	19 6
Buenos Ayres	20 0	Palermo	12 6
Bermuda	13 0	Panama	23 0
Bussorah	11 0	Para	19 0
Calcutta	17 0	Padang	11 0
Callao	21 0	Port-au-Prince	12 0
Cape Good Hope	21 0	Porto Rico	11 0
Cape de Verda	13 0	Reunion	11 6
Cadix	10 0	Rio Grande del Sud	27 0
Cagliari	12 0	Rio Janeiro	21 0
Cartagena	11 0	Rosario	30 0
Cardenas	11 0	Seychelles	11 0
Cienfuegos	11 0	Singapore	18 6
Coccoloba	11 0	Saigon	11 0
Civilta Vecchia	13 0	Shanghai	11 0
Colombo	19 0	San Sebastian	11 0
Colon	28 6	San Francisco	11 0
Constantinople	11 0	St. Catherine's	14 0
Corfu	12 0	St. Paul de Loand	32 0
Demerara	18 6	St. Thomas	19 0
Fayal	11 0	St. Jago de Cuba	14 0
Fiume	11 0	St. Lucia	14 0
Galle	10 6	Santos	21 0
Genoa	11 0	Savona	12 6
Gibraltar	9 0	Seville	11 0
Gwata	16 0	Smyrna	13 0
Havana	16 0	Suez	13 0
Hong Kong	11 0	Sydney	13 6
Hioho	11 0	Sierra Leone	20 0
Iquique	21 0	Sebastopol	11 0
Jamaica	12 6	Taganrog	11 0
Java	20 0	Tarragona	14 0
Kertch	11 0	Tenerife	14 0
Kurrachee	10 0	Tientsin	11 0
Lisbon	12 0	Trieste	12 0
Malta	11 0	Trincmalce	14 0
Malaga	11 0	Union	14 0
Madeira	12 0	Valencia	11 0
Madras	11 0	Valparaiso	21 0
Maranham	20 0	Venice	14 6
Marthinque	14 6	Yokohama	25 0
Mauritius	21 0	Zanzibar	24 9
Marsilles	15 6		

[FOR THE PRESENT AND PAST WEEK.]

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

(August 31, 1882.)

## METALS AND ORES.

	AUGUST 24.		AUGUST 31.	
	6 s.	6 s.	6 s.	6 s.
CUTTER (per ton)—	67 5/8	67 5/8	67 5/8	67 5/8
Chili, for 50 per cent.	72 1/2	72 1/2	72 1/2	72 1/2
Wallaroo.	71 0/0	71 0/0	71 0/0	71 0/0
Hurra Hurra.	71 0/0	71 0/0	71 0/0	71 0/0
English Lough.	70 0/0	70 0/0	70 0/0	70 0/0
English Ingots, best.	71 0/0	71 0/0	71 0/0	71 0/0
Specs. smelting and red.	70 0/0	70 0/0	70 0/0	70 0/0
Bottoms.	8 0/0	8 0/0	8 0/0	8 0/0
Ore per unit.	—	—	—	—
PHOSPHOR BRONZE				
Special Bearing Metal (p.in)	115 0/0	115 0/0	115 0/0	115 0/0
Other alloys (per ton)	12 0/0	12 0/0	12 0/0	12 0/0
TIN (per ton)—				
Strait (Cash).	101 17/6	101 17/6	101 17/6	101 17/6
For B.M.	—	—	—	—
Billiton.	—	—	—	—
Banca.	—	—	—	—
English Ingots.	105 0/0	105 0/0	105 0/0	105 0/0
Do. Bars.	107 0/0	107 0/0	107 0/0	107 0/0
Do. Refined.	108 0/0	108 0/0	108 0/0	108 0/0
Australian.	101 17/6	101 17/6	101 17/6	101 17/6

TIN PLATES, per box, I.C.	£	s.	£	s.	£	s.	£	s.
coke L.O.B. London.....	0	17/0	0	18/0	0	16/6	0	17/6
IX. do.....	0	23/0	0	24/0	0	21/6	0	22/6
I.C. charcoal.....	0	30/0	0	28/0	0	30/0	0	28/6
I.X. do.....	0	25/0	0	27/0	0	25/0	0	27/0
Red lead.....	16	10/-	—	—	10	10/-	—	—
White.....	21	10/-	—	—	21	10/-	—	—
Patent shot.....	17	10/-	18	0/-	17	10/-	18	0/-
Zinc (per ton)—from No. 5 Gauge.	19	15/-	—	—	19	15/-	—	—
Sheets, rolled.....	19	15/-	—	—	19	15/-	—	—
Lead (per ton).....	19	15/-	—	—	19	15/-	—	—
Soft English pig.....	14	5/-	14	15/-	14	5/-	14	10/-
Do. W.B. do.....	—	—	—	—	—	—	—	—
Spanish soft.....	14	2/6	—	—	14	2/6	—	—
Do. with silver.....	—	—	—	—	—	—	—	—
SPELTER (per ton).....	—	—	—	—	—	—	—	—
Silesian, com.....	17	10/-	—	—	17	10/-	—	—
Rhenish.....	—	—	—	—	—	—	—	—
English.....	—	—	—	—	—	—	—	—
QUICKSILVER, bot.....	6	0/-	—	—	6	0/-	—	—
ANTIMONY ore (per ton).....	—	—	—	—	—	—	—	—
Australian.....	—	—	—	—	—	—	—	—
Spanish.....	—	—	—	—	—	—	—	—
French Star.....	5	0/-	55	0/-	5	0/-	55	0/-
Regular.....	—	—	—	—	—	—	—	—
Crude (per cwt.).....	1	14/-	—	—	1	14/-	—	—
NICKEL (per lb.).....	0	3/3	—	—	0	3/3	—	—
BRASS (per lb.).....	0	0/8	—	—	0	0/8	—	—
Sheets, 48 x 24.....	0	0/8	—	—	0	0/8	—	—
Tubes.....	0	0/11	0	1/-	0	0/11	0	1/-
Wire.....	0	0/8 1/2	—	—	0	0/8 1/2	—	—
Yellow metal.....	0	0/6	0	0/6	0	0/6	0	0/6
ABRISTOS (per lb.).....	0	0/3	0	0/6	0	0/3	0	0/6
PLUMBAGO (per cwt.).....	1	2/8	1	5/-	1	2/-	1	5/-
Ceylon lump.....	0	10/-	0	14/-	0	10/-	0	14/-
Do. chip.....	0	10/-	0	12/-	0	10/-	0	12/-
Do. dust.....	1	2/-	—	—	1	2/-	—	—
East Hartlepool.....	1	4/-	—	—	1	4/-	—	—
Lambton.....	1	4/-	—	—	1	4/-	—	—
Tees.....	1	2/-	—	—	1	2/-	—	—
Hartley.....	1	4/-	—	—	1	4/-	—	—
Hetton.....	1	3/-	—	—	1	3/-	—	—
Hawthorn.....	1	3/-	—	—	1	3/-	—	—
Tunstall.....	—	—	—	—	—	—	—	—

## OILS, CHEMICALS, &amp;c.

	AUGUST 24.		AUGUST 31.	
	£ s.	d.	£ s.	d.
Oils (per ton) —				
Olive, Galloli .....	—	—	—	—
Do. Gioja .....	—	—	—	—
Do. Levant .....	37 10/	38 0/	36 0/	37 0/
Do. Seville .....	—	—	—	—
Do. Corfu .....	—	—	—	—
Seal, pale .....	35 0/	35 0/	35 0/	35 0/
Sperm head .....	74 0/	75 0/	74 0/	75 0/
Cod .....	31 10/	32 10/	31 10/	32 10/
E.I. Fish .....	—	—	—	—
Rape, English, brown .....	29 0/	29 5/	29 0/	30 0/
Do. refined .....	—	—	—	—
Foreign Refined .....	—	—	—	—
Ground nut and Gingelly .....	—	—	—	—
Madra .....	—	—	—	—
Palm oil, fine .....	35 0/	35 10/	35 0/	35 10/
Palm nut oil .....	—	—	—	—
Linseed oil .....	23 17/6	23 5/	23 10/	23 17/
Col. onseed (per ton) .....	—	—	—	—
Crude .....	22 15/	27 0/	22 15/	26 0/
Refined .....	20 0/	20 15/	20 10/	20 15/
Hull .....	25 15/	—	25 15/	—
Lard, English .....	62 0/	64 0/	60 0/	61 0/
Cocoa nut, Ceylon .....	35 10/	35 0/	35 10/	36 0/
Do. Ceylon pipes .....	29 5/	30 0/	29 5/	29 15/
Sydney .....	—	—	—	—
OIL CAKE (per ton) —				
Linseed, India .....	8 10/	8 10/	8 5/	8 10/
American barrels .....	8 12 6	8 15/	8 12 6	8 15/
Do. bags .....	—	—	—	—
Marseilles .....	8 5/	—	8 5/	—
Rapeseed .....	5 12 6	6 0/	5 12 6	6 0/
Cocoa nut .....	5 15/	5 17/6	5 15/	5 17/6
TALLOW, P.V.C. old (per cwt.) .....	0 53 6	—	0 53 6	—
S. American, Beel .....	—	—	—	—
N. American .....	—	—	—	—
Australian Beel (fine) (per cwt.) .....	0 42	0 43 6	0 42	0 43 6
Do. Sheep .....	0 44 6	0 45 1	0 44 6	0 45 3
PETROLEUM OIL (per gal.) .....	1 59 16	0 58	0 58 1	0 58 3
Refined coal oil .....	—	—	—	—
Naphtha .....	0 0 6	0 7 8	0 0 6	0 7 8
TURPENTINE (per cwt.) .....	—	—	—	—
French Spirits .....	—	—	—	—
American do .....	—	—	—	—
WATER (per ton) —				
Davis' Stairs .....	800/	900/	800/	900/
Arctic .....	800/	900/	800/	900/
BRIMSTONE (per ton) —				
Rough grs. ....	—	—	—	—
Roll .....	—	—	6 15/	—
Lein, (per lb.) .....	10 15/	12 10/	10 15/	12 10/
Acetic .....	0 19/	0 26/	0 19/	0 26/
Second quality (per gal.) .....	—	—	—	—
Citric (per lb.) .....	—	1 11/	—	1 11/
Uric acid, (per cwt.) .....	0 4 6	0 7 6	0 4 6	0 7 6
Nordhausen 50 per cent. ....	0 45/	0 50/	0 45/	0 50/
Nitro .....	0 0 3	0 0 4	0 0 3	0 0 4
Sulphur, white .....	0 6 3	0 6/	0 6 3	0 6/
Do. Brown .....	—	—	—	—
Tartaric Crystals .....	0 0 3	0 0 1	0 0 3	0 0 1
Do. Powdered .....	0 1 8	0 1 7	0 1 8	0 1 7
MONIA —				
Carbonate, per lb. ....	0 0 6 1	0 0 6 2	0 0 6 1	0 0 6 2
Sulphate, Best White (per ton) .....	20 5/	21 0/	20 5/	21 0/
Mercuric White Lump (per cwt.) .....	0 24 6	0 25/	0 24 6	0 25/
Powdered do .....	0 10 5	0 10 0	0 10 0	0 10 0
Leaching powder 35 L .....	0 2 6	0 3/	0 2 6	0 3/
OFFERS, &c., Eng. horses (ton) .....	0 60/	0 63/	0 60/	0 63/
PORTLAND CEMENT —				
1st quality in casks co lb. gross, including casks, f.o.b., Thames, per cask .....	0 0/	—	0 0/	—
Do. in sacks, 20 lb. net (per ton) .....	2 0/	—	2 0/	—
Sacks extra, 1/6 each .....	—	—	—	—
Portland White Paint (per cwt.) .....	1 12/	—	1 12/	—
Do. Torbay Paint, Br wn .....	0 30/	—	0 30/	—
Do. Red .....	0 34/	—	0 34/	—
AD, Sugar, Eng., white .....	0 33 0	0 36 0	0 33 0	0 36 0
Red (per cwt.) .....	0 16 6	0 17 0	0 16 6	0 17 0
White, ground .....	0 21 6	0 21 6	0 21 6	0 21 6
CHARGE (per cwt.) .....	0 17/	0 17/6	0 17/	0 17 6
THIE —				
Acetate, Brown .....	—	—	—	—
Distilled .....	12 5/	12 10/	12 5/	12 10/
Bichromate (lb.) .....	0 0 5 8	6 0/	0 0 5 8	0 6/
Chlorate (per lb.) .....	0 0 5 8	—	0 0 5 8	—
ss, Red (lb.) .....	1 10/	—	1 10/	—
Do. Yel. lb. ....	0 10/	0 10/	0 10/	0 10/
Sulphate (per ton) .....	8 1/	9 10/	8 1/	9 10/
ngt. refined, kg. ....	—	—	—	—
Do. barrels .....	0 26/	0 27 6	0 26/	0 27 6
Do. Bengal .....	0 27 0	0 27/	0 27/	0 27/
Do. A, Acetate (per cwt.) .....	0 26/	1 10/	0 26/	1 10/
Do. carbonate .....	0 0 6	—	0 0 6	—
Do. auste 60 to 62 ..	9 0/	11 0/	9 0/	11 0/
Do. crystals grw. hts. ex ship (prtn) .....	3 2 6	3 6 3	3 2 6	3 6 3
Do. litrate .....	11 3/	11 6/	11 3/	11 6/

PREPARED BY

MESSRS. BOLLING & LOWE.

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

## STAFFORDSHIRE

STAFFORDSHIRE.		Tyres to 4 cwt. ....		£	s.	d.
List Brands at Works. Per Ton.		4 cwt. to 5 ½ cwt. 2½	0	0	0	0
BARS—		5 ½ cwt. and over	20	0	0	0
½ in. to 3 in. rounds	.....	5 cwt. to 6 cwt. ....	20	0	0	0
and squares .....	£7 10 0	6 cwt. and over .....	25	0	0	0
1 in. to 6 in. flats .....	7 10 0					
Rounds and Squares.						
3½ in., 10s. per ton extra.						
4 in., 20s.	"					
4½ in., 40s.	"					
5 in., 50s.	"					
Rounds only.						
5 in., 70s.	"					
1 in., 70s.	"					
6 in., 110s.	"					
7 in., 130s.	"					
Round and Squares,						
7-16 in., 10s.	"					
1 in., 20s.	"					
5-16 in., 30s.	"					
1 in., 40s.	"					
3-16 in., 70s.	"					
HOOPS—						
1 in. to 6 in. wide by						
usual gage .....	£8 0 0					
½ in. wide up to 20 w. g., 20s.						
per ton extra.						
1 in. wide up to 20 w. g., 40s.						
per ton extra.						
1 in. wide up to 20 w. g., 80s.						
per ton extra.						
1 in. wide up to 20 w. g., 120s.,						
per ton extra.						

## CASTINGS

(f.o.b. Shipping Port)

SOCKET PIPES (for gas or water) —					
	£ s. d.		£ s. d.		
1½ to 2 in....	5	0	0	to	6
2 to 3 in....	5	0	0	to	5 18 0
3 to 4 in....	5	6	0	to	5 12 6
4 to 5 in....	5	0	0	to	5 10 0
5 to 6 in....	4 17	6	0	to	5 7 6
Chairs .....	4 15	0	0	to	5 0 0
Girders .....	4 15	0	0	to	8 0 0
SCRAP —					
Old rails, D.N.K.	3	10	0	to	3 15 0
Do. flange	3	0	0	to	3 5 0
Engineers heavy scrap	2 18	0	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 0 0	to	8 0 0	
5	...	7 10 0	to	8 10 0	
6	...	8 0 0	to	8 0 0	

STAFFORDSHIRE, MID-

Ordinary Brands (at Works)

Ordinary Brands (at Works).			
Bars	£ s. d.	£ s. d.	
Hoops	6 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, 30s. to 40s. "			
Treble best, 40s. to 50s. "			
CLEVELAND AND NORTH OF ENGLAND BRANDS (at Works).			
Bars	£ s. d.	£ s. d.	
Ship Plates to	6 2 6	to 6 5 6	
8 cwt.	6 15 0	to 7 0 0	
Angles	6 10 0	to 6 5 0	
Best, 10s. per ton extra.			
Best, best, 30s. "			
Treble best, 50s. "			

SCOTCH (at Glasgow).

	6	s.	d.
bars NB crown	7	0	0

Hoops .....	7	10	0
Ship Plates .....	8	0	0
Boiler .....	8	0	0
Angles .....	7	10	0
Best, 10s. per ton extra.			
Best, best, 30. "			
Treblebest 30s. "			
WELSH (Newport and Cardiff).			
	£	s.	d.
Bars .....	5	10	0
Plates .....	7	0	0
Best, 10s. per ton extra.			

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

are £ s. d. £ s. d.  
5 12 0 to 0 10

Hoops .....	6	10	0	to	7	10	0
Plates .....	7	10	0	to	8	10	0
Sheets .....	8	0	0	to	10	0	0
Angles .....	6	0	0	to	7	10	0
Nail rods .....	6	10	0	to	7	0	0
<b>IRON ROLLED GIRDER—</b>							
Narrow flanges..	6	0	0	to	7	10	0
Wide flanges ..	6	10	0	to	8	0	0
<b>STEEL ROLLED GIRDER, ANGLES</b>							
<b>AND CHANNELS at proportionate</b>							
<b>differences.</b>							

**BEST YORKSHIRE**

(at Works).

To 12 cwt.....	6	s.	d.	
32 to 5 cwt.....	20	0	0	C
5 cwt. and upwards.....	20	0	0	
BOILER PLATES—	0	0	0	G
To 22 cwt.....	22	0	0	
22 to 3 cwt.....	23	0	0	22
3 to 32 cwt.....	25	0	0	22
32 to 4 cwt.....	27	0	0	22
4 to 5 cwt.....	30	0	0	22
5 to 6 cwt.....	33	0	0	22
6 to 7 cwt.....	36	0	0	22
7 cwt. and over.....	39	0	0	22
Plates over 6 feet to 8 feet wide, 40s. per ton extra.				22
Sheets.....	24	0	0	22
Angles and Tees.....	24	0	0	22

## STEEL (at Works)

Siemens-Martin or Bessemer.

Plates	2	10	6	10	6	10	6	10
Sheets	10	10	10	10	10	10	10	10
Bars	9	10	10	10	10	10	10	10
Angles	9	10	10	10	10	10	10	10
Tees	10	10	10	10	10	10	10	10
Spring Stl.	10	10	10	10	10	10	10	10
Cast Steel or								
Tools	40	0	0	0	60	0	0	0

**GALVANISED IRON  
ROOFING SHEETS**  
(at Liverpool).

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

**Gauges** 16, 18, and 20, £14 os. to  
£15 os. 0.

22 and 24 gauge, £15 0 to £16 0  
26 gauge, £17 10 to £18 10s.  
28 gauge, £19 10s. to £20 10s.  
Sheets 8 to 9 feet long, 20, per ton  
extra.

Sheets 9 to 10 feet long, 40s. per  
ton extra.

Sheets 10 to 11 feet long, 60s. per  
ton extra.

Sheets 11 to 12 feet long 80s. 2s



# PATENT ROLLED SHAFTING

1/4 inch dia. to 7 inch dia.

No Turning.  
No Labour.  
No Waste.  
Single Shafts supplied.  
Increased 20 per cent. in torsional strength.  
" 33 per cent. in flexional "

By Royal Letters Patent.



The Kirkstall Forge Co., Leeds,  
PATENTEES AND SOLE MAKERS

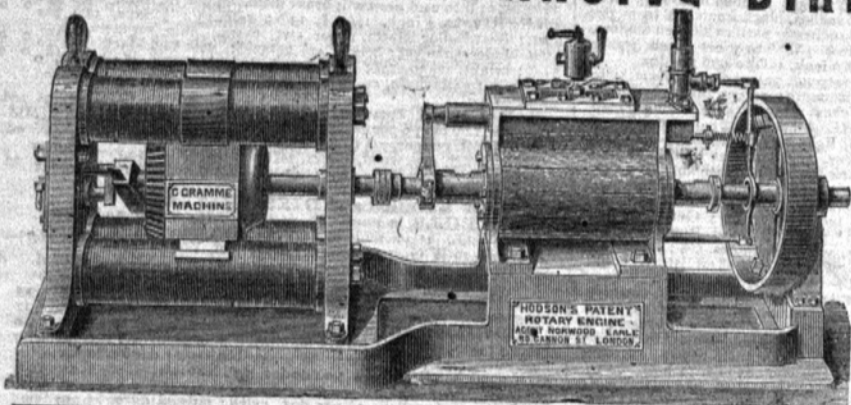
IRON AND STEEL BARS AND  
FORGINGS OF ALL KINDS.

## BUTLER'S PATENT FRACTIONAL COUPLING



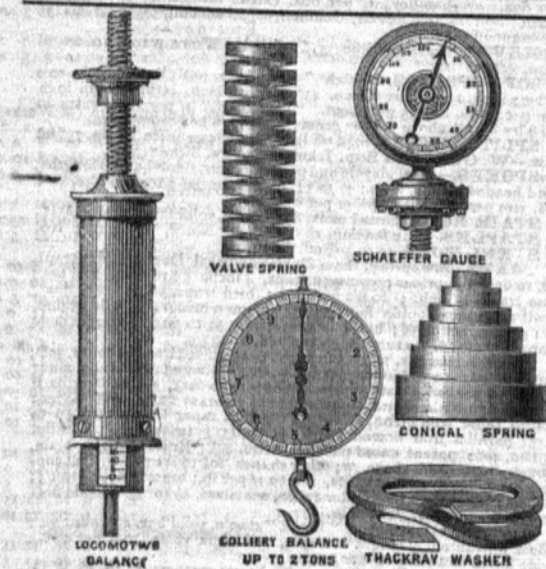
No Keybeds.  
No Bolts nor Projections.  
No Swells required.  
Adapts itself to slight irregularities in dial  
Concentric.  
Cheapest, Simplest, most effective.

## ELECTRIC EXHIBITION, CRYSTAL PALACE, 1882. HODSON'S PATENT HIGH-SPEED EXPANSIVE DIRECT-ACTING ROTARY ENGINE AN ESTABLISHED SUCCESS.



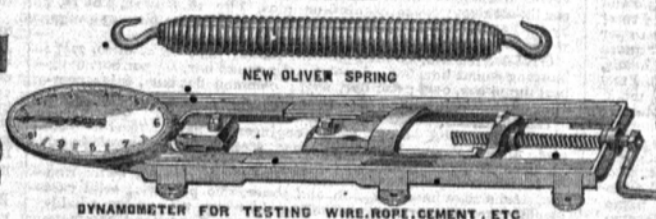
CAN BE SEEN WORKING AT 1,500 REVOLUTIONS PER MINUTE,  
AND DRIVING VARIOUS DYNAMO ELECTRIC MACHINES.

FOR PARTICULARS, APPLY TO  
STAND No. 18, WESTERN CORRIDOR, CRYSTAL PALACE,  
TO  
MR. NORWOOD EARLE, 80, CANNON STREET, LONDON,  
OR TO THE MANUFACTURERS,  
**THE THAMES IRONWORKS AND  
SHIPBUILDING CO., Ltd.,  
BLACKWALL.**

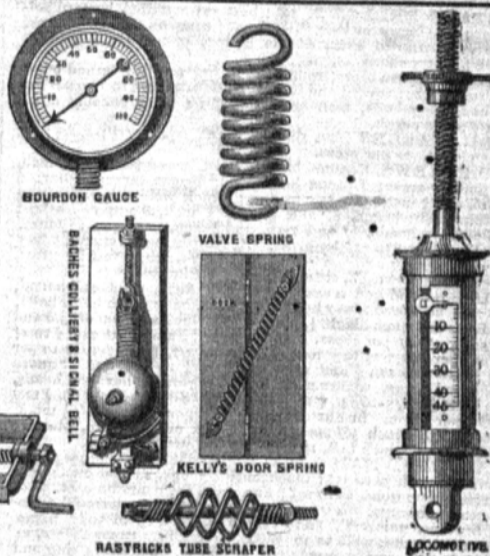


## GEORGE SALTER & Co., West Bromwich Manufacturers of SPRING BALANCES, BOURDON'S, SCHAEFFER'S, & SILVESTER'S PRESSURE GAUGES DYNAMOMETERS

For TESTING WIRE, ROPE, CLOTH, CEMENT, &c.  
Colliery Signal Bells, Rastrick's Tube Scrapers,  
THACKRAY'S SPRING WASHERS,  
Conical, Spiral and all kinds of Coiled Springs.  
MADE TO ORDER.



GOODS SUPPLIED THROUGH MERCHANTS AND FACTORS.



**BUSINESS CARDS.**  
**CHILD BROTHERS,**  
Falcon Works.  
SMETHWICK, NEAR BIRMINGHAM.  
Manufacturers of all kinds of En-  
gineers', Machinists', Carriage and  
Coach  
BOLTS AND NUTS;  
Set Screws: Patent Pointed Coach Screws,  
Patent Boiler Ship Tank and Girder Rivets,  
Anvils, Vices, Washers, &c.  
GENERAL SMITHS.

**SPENCER & BOOTH'S,**  
GENERAL BRASS FOUNDERS, &c.,  
MANUFACTURERS OF  
RAILWAY WAGON & COLLIERY BRASSES  
OF EVERY DESCRIPTION.  
HEAVY MACHINE BRASSES FOR ENGI-  
NEERS, &c.,  
OF UNSURPASSED QUALITY,  
ALSO  
ALL KINDS OF CASTINGS IN BRASS AND  
OTHER ALLOYS, at low rates.  
PORTLAND STREET BRASS WORKS, NORTHGATE,  
HALIFAX.

**CAPPER, PASS AND SON, BRISTOL,**  
ARE BUYERS OF  
LEAD, ASHES SULPHATE OF LEAD, LEAD SLAGS,  
ANTIMONIAL LEAD, COPPER MATTE, TIN ASHES, &c.  
and DROSS or ORES containing  
COPPER, LEAD, AND ANTIMONY.  
**S. MOULTON & CO.,**  
KINGSTON INDIA-RUBBER MILLS,  
BRADFORD, WILTSHIRE.

Manufacturers of their Patent Steel Embedded and other India-  
rubber Springs for Locomotives, Railway Carriages and Trucks,  
India-Rubber Valves, Sheet Packing, Washer Rings, Hose Pipes,  
and Tubing, Machine Banding, Waterproof Garments, Blankets,  
Sheeting, Elastic Hot Water Beds, Cushions, Patent "Moss" Ink-  
ing Rollers for Printers, Truss Bands, and Umbilical Cones, &c.,  
**STEPHENS AND EBSWORTH,**  
BILBAO, SPAIN,  
IRON ORE MERCHANTS.  
Agents for the purchase and sale of Steel Rails,  
Bessemer and other Pig Iron, Coal, Coke, &c.  
Steamship and General Commission Agents.  
From Mr. Stephens' long residence in Bilbao, now  
twenty years, as managing partner of Blast-Furnaces, Iron  
Works and Iron Mines, he is the better able to select such  
iron ores and fuel as are best suited for use in iron and steel-  
making establishments. He is further open to act as con-  
sulting engineer in connection with the laying out of Iron  
and Steel-making establishments in this country.

**THE GARNKIRK FIRE CLAY CO.**  
GARNKIRK WORKS, NEAR GLASGOW.  
OFFICE: 243, BUCHANAN STREET, GLASGOW.  
Manufacturers of  
FIRE BRICKS and BLOCKS for the highest heats for Iron blast-  
furnace, forge, rolling, puddling and steel furnaces, pottery bottle  
and flint glass furnaces, copper, calcining, roasting, and refining  
furnaces, chemical works, coke ovens, boiler seat blocks, locomotive  
bricks, &c.  
Special Bricks made for Siemens Patent Rege-  
nerative Gas Furnace. Registered Trade Mark,  
"GARNKIRK."

**JOSEPH WOOLLEY,**  
Allestree Carriage Works,  
DERBY,  
Manufacturer of Carts, Wagons, Trillies, Drays, Dobbin Car and  
Wheelbarrows, and every description of Railway Contractors' Plant.  
Drawings and Estimates on Application.

**THE LANGLEY MILL**  
Engineering Wheel & Wagon Co., Limited,  
Railway Wagon Builders & Repairers.  
MILLWRIGHTS, IRON AND BRASS FOUNDERS, Manu-  
facturers of Solid Wrought-iron Locomotive Engine, Carriage and  
Wagon WHEELS, CRANKS, AXLES, SHAFTS, and every  
description of SMITHS' WORK, PIT CAGES.  
**METAL TUBBING.**  
ALL KINDS OF COLLIERY CASTINGS, AND EVERY  
VARIETY OF  
CRUCIBLE STEEL CASTINGS,  
LANGLEY MILL, near NOTTINGHAM.



# PRICES CURRENT OF MANUFACTURED GOODS

## BIRMINGHAM AND DISTRICT.

\* This List being compiled exclusively for the pages of IRON, all rights of reproduction are reserved. 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.

Trade generally in the hardware industries of this neighbourhood is fairly maintained, and the demand for iron shows no diminutions. Prices, however, are still very low, and no alteration of any moment have been made, but manufacturers seem to look for an improvement as the autumn comes on. Colonial advances are not quite so favourable, large stocks on the other side having a tendency to keep down the prices.

### ABRIDGED LIST.

**AMERICAN WIRE HOBS.** 1 lb. 4/6; 1 1/2 lb. 5/6; 2 lb. 6/6; 3 lb. 7/6; 4 lb. 8/6; 5 lb. 9/6; 6 lb. 10/6; 7 lb. 11/6; 8 lb. 12/6; 9 lb. 13/6; 10 lb. 14/6; 11 lb. 15/6; 12 lb. 16/6; 13 lb. 17/6; 14 lb. 18/6; 15 lb. 19/6; 16 lb. 20/6; 17 lb. 21/6; 18 lb. 22/6; 19 lb. 23/6; 20 lb. 24/6; 21 lb. 25/6; 22 lb. 26/6; 23 lb. 27/6; 24 lb. 28/6; 25 lb. 29/6; 26 lb. 30/6; 27 lb. 31/6; 28 lb. 32/6; 29 lb. 33/6; 30 lb. 34/6; 31 lb. 35/6; 32 lb. 36/6; 33 lb. 37/6; 34 lb. 38/6; 35 lb. 39/6; 36 lb. 40/6; 37 lb. 41/6; 38 lb. 42/6; 39 lb. 43/6; 40 lb. 44/6; 41 lb. 45/6; 42 lb. 46/6; 43 lb. 47/6; 44 lb. 48/6; 45 lb. 49/6; 46 lb. 50/6; 47 lb. 51/6; 48 lb. 52/6; 49 lb. 53/6; 50 lb. 54/6; 51 lb. 55/6; 52 lb. 56/6; 53 lb. 57/6; 54 lb. 58/6; 55 lb. 59/6; 56 lb. 60/6; 57 lb. 61/6; 58 lb. 62/6; 59 lb. 63/6; 60 lb. 64/6; 61 lb. 65/6; 62 lb. 66/6; 63 lb. 67/6; 64 lb. 68/6; 65 lb. 69/6; 66 lb. 70/6; 67 lb. 71/6; 68 lb. 72/6; 69 lb. 73/6; 70 lb. 74/6; 71 lb. 75/6; 72 lb. 76/6; 73 lb. 77/6; 74 lb. 78/6; 75 lb. 79/6; 76 lb. 80/6; 77 lb. 81/6; 78 lb. 82/6; 79 lb. 83/6; 80 lb. 84/6; 81 lb. 85/6; 82 lb. 86/6; 83 lb. 87/6; 84 lb. 88/6; 85 lb. 89/6; 86 lb. 90/6; 87 lb. 91/6; 88 lb. 92/6; 89 lb. 93/6; 90 lb. 94/6; 91 lb. 95/6; 92 lb. 96/6; 93 lb. 97/6; 94 lb. 98/6; 95 lb. 99/6; 96 lb. 100/6; 97 lb. 101/6; 98 lb. 102/6; 99 lb. 103/6; 100 lb. 104/6; 101 lb. 105/6; 102 lb. 106/6; 103 lb. 107/6; 104 lb. 108/6; 105 lb. 109/6; 106 lb. 110/6; 107 lb. 111/6; 108 lb. 112/6; 109 lb. 113/6; 110 lb. 114/6; 111 lb. 115/6; 112 lb. 116/6; 113 lb. 117/6; 114 lb. 118/6; 115 lb. 119/6; 116 lb. 120/6; 117 lb. 121/6; 118 lb. 122/6; 119 lb. 123/6; 120 lb. 124/6; 121 lb. 125/6; 122 lb. 126/6; 123 lb. 127/6; 124 lb. 128/6; 125 lb. 129/6; 126 lb. 130/6; 127 lb. 131/6; 128 lb. 132/6; 129 lb. 133/6; 130 lb. 134/6; 131 lb. 135/6; 132 lb. 136/6; 133 lb. 137/6; 134 lb. 138/6; 135 lb. 139/6; 136 lb. 140/6; 137 lb. 141/6; 138 lb. 142/6; 139 lb. 143/6; 140 lb. 144/6; 141 lb. 145/6; 142 lb. 146/6; 143 lb. 147/6; 144 lb. 148/6; 145 lb. 149/6; 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## IRON.

No. 504.

LONDON, FRIDAY, SEPTEMBER 8, 1882.

## THE HISTORY OF THE IRON AND STEEL TRADES OF THE UNITED STATES.

No. II.

THE history of the manufacture of iron in the United States divides itself almost naturally into two periods. The first commenced with the early attempts of the colonists as described in our previous notice of Mr. Swank's interesting narrative of the development of the industry in America, and continued down to about the year 1840, when the second era began. The former may be styled the charcoal period and the latter the coal period; for although the use of charcoal is by no means discontinued in the manufacture of pig-iron at the present time, yet it was the form of fuel exclusively employed down to the time mentioned, while now only about a seventh part of the pig-iron produced by the States is made from it. It would not be right, however, to suppose that even yet the manufacture of pig-iron with charcoal is decaying; on the contrary, it is a fact that there is more charcoal pig-iron made now than at any previous time; but the use of coal and coke in the blast-furnace has added to the powers of production so greatly that the make of charcoal iron is thrown quite into the shade. A natural consequence of the introduction of mineral fuel is to be observed in the manner in which the manufacture of charcoal iron has been affected. Whilst it has been almost driven off the field in localities which are favourably situated as regards coal; it has settled and developed in other districts where, prior to 1840, there was little or no iron industry. A sufficient explanation of this vitality is to be found in the abundant supply of timber possessed by the United States. To the same reason is, no doubt, to be attributed the loss of the period when coal was regularly used as an adjunct to the manufacture of pig-iron, for long after the smelting of the ore by means of coal or coke had become established in Great Britain, and was, indeed, the principal method of producing pig-iron, the United States continued to depend entirely upon the use of charcoal. The extensive forests of the New World afforded ample supplies of the latter, and it doubtless continues to be the cheapest fuel in many districts even at the present day. By the rapid destruction of the forests of England our ironmasters were, no doubt, forced to turn their attention to other agents than charcoal at an earlier date than they might otherwise have done; but Mr. Swank is in error in leading one to infer that with the close of the eighteenth century the manufacture of charcoal pig-iron had practically ceased in Great Britain. It is true that it had dwindled to comparatively small proportions, since out of 125,079 tons, the total output of the furnaces of Great Britain in the year 1796, the quantity of charcoal pig-iron was only 3780 tons; but even now the manufacture has not quite disappeared from amongst us. So late as the year 1868 a furnace for use with charcoal was erected in Hampshire, and has continued in operation since, with a few intervals, according to the supply of that fuel. The owners of this furnace possess others in Argyleshire, Cumberland, and Lancashire, the two situated in the last named county producing, it is estimated, from 1400 tons to 1500 tons of charcoal pig-iron per annum.

It is not a little curious, and we cannot find any sufficient explanation of the fact, that the early attempts of the Americans to use coal in their blast furnaces were principally made with anthracite. In fact, down to the year 1874 there was more pig-iron manufactured with anthracite than with bituminous coal or coke. Latterly, however, the preference manifested for the former kind of fuel has been transferred to the latter. In 1854, there were 339,435 tons of pig-iron of 2000 lb. each, made with anthracite, and only 54,485 tons with bituminous coal or coke; while in 1880, 1,807,651 tons were made with the former, and 1,950,205 tons with the latter varieties of fuel. It is singular, too, that the iron manufacturers in the States were so slow to adopt the use of bituminous coal, seeing that they had before them the example of the successful employment of it in the blast-furnaces of the United Kingdom. About 1840, the ironmakers in America commenced to use both anthracite and bituminous fuel, but the use of coke did not come rapidly into favour, it being the year 1850 before it began to exercise an appreciable influence upon the manufacture of pig-iron; and it was some six years later before the employment of raw bituminous coal became anything like general. But, as early as 1846, Pennsylvania and New Jersey had forty-two furnaces using anthracite coal, with an annual capacity of 122,720 tons; while in 1856

there were 121 anthracite furnaces throughout the country. The greater measure of attention which was paid at first to smelting by means of anthracite may perhaps have been due to the success which attended the employment of the hot-blast. The Americans do not claim to have invented this improvement, but they assert that it was first applied by them to the smelting of ore with anthracite fuel. In 1828, Neilson invented the hot-blast, and its utility and economy were so speedily recognised by the Scotch ironmasters, that by 1835 it had been adopted at every ironworks in Scotland with the exception of one. But Mr. Swank claims that the fuel used was bituminous, and that it was not until 1836 that the hot blast was used in Great Britain in connection with anthracite; while in 1833 a Lutheran clergyman of New York had a patent granted to him for the employment of anthracite in smelting iron, one of the peculiarities of which was that the use of heated air was mentioned as preferable. Before, some twenty years previous, the value of anthracite as a fuel in any way had been quite unknown, and it was to a mere accident that its introduction was due. An enterprising colonel brought nine waggon-loads to Philadelphia, two of which he managed to sell, the rest he had to give away, and all the thanks he got for his pains was to be thought an impostor for attempting to palm off stones as fuel. However, one of the parties who purchased some of the coal, while trying it in his furnace, accidentally closed the doors, and discovered by this means that it made an excellent fuel. The value of anthracite in the blast furnace was no sooner discovered than, as we have seen, it was rapidly adopted in the manufacture of pig-iron; while bituminous coal and coke, although coming less speedily into vogue, have now become more extensively employed.

The iron and steel trades of the United States have benefited in an equal manner with those of other countries, by the very greatly extended demand created for iron of all sorts by the rapid development of the railway system. The adoption of coal and coke in smelting the ores in the blast-furnaces, and the consequently increased production procured, although coincident with the commencement of that demand, does not appear to have been in any way caused by it; for according to Mr. Swank, "early in 1844 there were still no facilities in America for the manufacture of heavy iron rails to supply the wants of the 4185 miles of American railroad which existed at the beginning of that year, and of a few hundred additional miles which were then projected." This is to be explained partly by the fact that up to the year 1842 the railmakers of the United States had been unprotected by any fiscal restrictions on the importation of railway material. After the passage of the Tariff Act of that year "American capitalists began to think about making heavy rails." The beginnings of railroads in the United States were very similar to the early essays made in this country to facilitate communication. The first of which we read were constructed for the purpose of hauling stone and coal over, and were laid with wooden rails. These primitive tramways appear to have been made use of for the first time about the year 1807. The initial step taken to improve them was to protect the wooden rails with strips of iron nailed along the exposed surfaces. The rails, which were laid upon the Mohawk and Hudson Railroad, and upon the Charleston and Hamburg Railroad, which latter the Americans claim to have been the longest line in the world at the time of its completion in 1833—it was 135 miles in length—were of this description. The first heavy rails rolled in America were made in the course of the year 1844, and were of the Bridge pattern; the rolling of T rails, the flange type now so universally adopted throughout the States, was commenced in the following year; and thereafter the erection of suitable mills became more general, but the trade passed under a cloud in 1850, when, out of fifteen rail mills in the country, all but two were stopped, owing to foreign competition. The Americans lay claim to the flange rail, as an invention of Robert L. Stevens, who was president of the Camden and Amboy Railroad in 1830. In that year he issued invitations to tender for the supply of from 500 to 600 tons of iron rails of this description. From the drawing accompanying his letter, it would appear that the rail varied very slightly from the more modern patterns of this type, the most apparent difference being that in Mr. Stevens' rail the head was much wider than it is now made, whilst the bearing surface was quite flat. There was another peculiarity, which, however, was not carried into effect. At every 2 feet along the flange it was intended to have projections of a semicircular shape, with a view to giving the rail a broader foundation where it rested on the sleepers, but this idea was abandoned. Mr. Stevens had considerable difficulty in finding a works that would undertake the rolling of his pattern; but, after various unsuccessful inquiries in this country, the Guests of the Dowlais Ironworks made some experiments upon it, and finally succeeded in rolling it, although at first much trouble was experienced by the twisted and distorted shapes in which the rails came out of the rolls. The rest of Mr. Swank's interesting history of the rise of the iron trade of the

United States, embracing the introduction of the manufacture of steel, and a record of some of the most noteworthy achievements in American works, we must leave to be dealt with on a subsequent occasion.

## IRON TRADE SUMMARY.

THE position of the English iron market is better than it was when we last wrote. The pig-iron markets were somewhat unsettled at the end of last week, but they have since recovered their general steadiness. Prices have been, on the whole, but little affected, the healthy and encouraging position of the iron trade, as evidenced by the Northern shipping returns for last month, having counteracted the effect of the feeling produced by the approaching termination of the agreement restricting the production of pig-iron in Scotland and Cleveland. It may be possible, after all, that some arrangement restricting the output will be come to, as negotiations to that effect are stated to have been again commenced. The tone of the market on Tuesday at Middlesbrough was decidedly better, and makers remained firm at their quotations, 44s. 6d. per ton of No. 3, f.o.b. Merchants sold at 44s. to 44s. 3d. for prompt and forward delivery. The Glasgow warrant market has somewhat recovered from its depression, partly owing to the prospect of an agreement, but principally, we believe, to the satisfactory demand for iron for local consumption. Warrants closed Wednesday for buyers at 50s. 1d. cash, and 50s. 3d. a month, sellers near—figures which are a trifle higher than those ruling the previous Wednesday. Scotch makers are well supplied with orders, and maintain their prices at a comparatively higher level than warrants. On the Tyne, quotations for pig-iron have receded quite 3d. per ton. In Lancashire, prices of local pig remain very firm, at 46s. per ton, less 2½ per cent., delivery equal to Manchester. The Midland pig-iron markets are unchanged. The hematite iron market has also been slightly affected by the influence which has dominated in Glasgow and Middlesbrough. Some second-hand parcels have changed hands at rather lower rates; makers, however, are firm in their quotations, and they are justified in this attitude by the strong foreign demand, which is especially heavy from the Continent. Prices remain at 59s. for No. 1, 58s. for No. 2, and 57s. for No. 3, net per ton, f.o.b. west coast ports or on trucks at furnaces. In the Forest of Dean, local pig-iron sells at 60s. The manufactured iron market appears not to have suffered through the late movement in the pig-iron market. On the contrary, the finished iron trade seems to have rather improved, for manufacturers are reported well supplied with contracts, and want better prices. Good orders have been taken at Middlesbrough this week at £6 15s. for ship plates; while angles are at £6, all less 2½ per cent. Shipbuilders are still good customers. In Scotland finished iron works are all busy. Prices are well maintained, especially for ship and boiler plates. In the Tyne district a steady business is passing, mostly with shipbuilders; but the extreme rates of last week have relaxed to a slight extent, and prices are now £6 17s. 6d. for ship plates, £7 17s. 6d. for boiler plates, £6 7s. 6d. for angles, and £6 5s. for bars, delivered in the Tyne, and less 2½ per cent. In Lancashire, manufacturers are firm on the basis of about £6 7s. 6d. per ton for bars, delivered at Manchester or Liverpool. The tinplate market is not over active, but fairer prices are realised, coke-makes selling from 16s. 9d. to 17s. per box, charcoal-makes from 19s. to 20s. In the hardware market prices are hardly so firm as might be desired by manufacturers. Our Sheffield correspondent writes to the effect that business is again reviving, after a lull extending over the greater part of two months, and that there are indications of a good autumn trade. Heavy lines are being received for ship and boiler plates. There are some good contracts in the market for steel rails, both on home and continental account. The steel rail market generally is steady. The prospects of the shipbuilding trade are good. Engineering establishments are kept well engaged. Foundries are doing better lately, and forges are busy. In West Yorkshire, however, those engaged on best Yorkshire iron are still working only four days a week. In the coal market, the improvement of previous weeks continues, and a large trade is being done for home consumption. Shipments are also fairly heavy for this time of year. Values are improving, especially for domestic fuel. Prices have again risen in the London coal market. There is some probability that the movement on the part of the National Miners' Union for an advance of wages which is contemplated will be successful. There seems to be a tendency on the part of colliery proprietors in most districts to meet the propositions of the men in an amicable spirit.

The iron markets of the Continent continue active. The Belgian market is again gaining in firmness, after a slight depression. Makers are so well provided with work that they need not trouble themselves to obtain fresh orders before the spring. Pig-iron, still very scarce, is maintained at the advanced rates. Great activity prevails in finished iron; en-



## FARCOT'S VENTILATOR.

(For description, see page 206.)

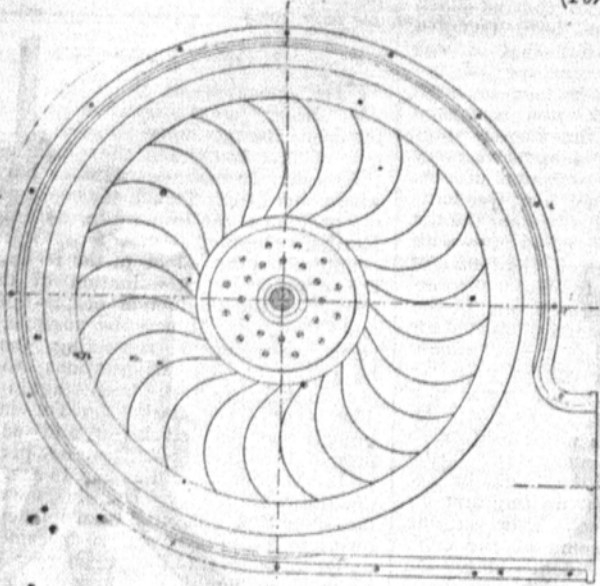


FIG. 1.

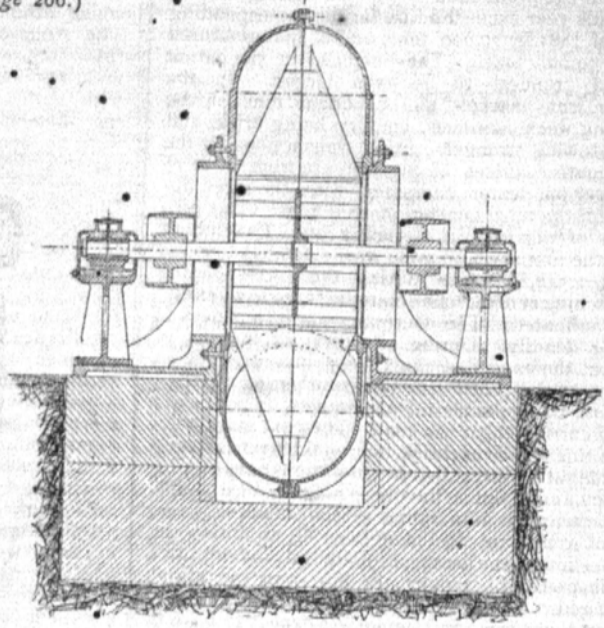


FIG. 2.

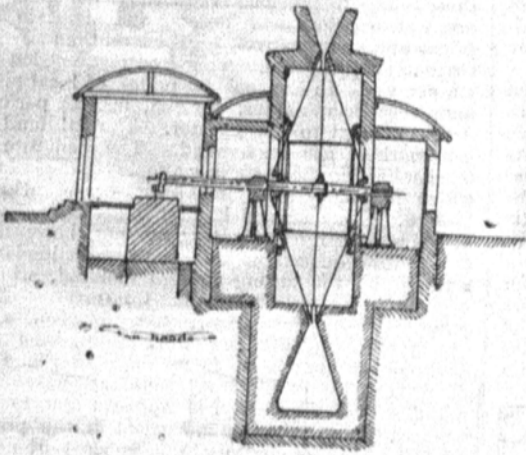


FIG. 3.

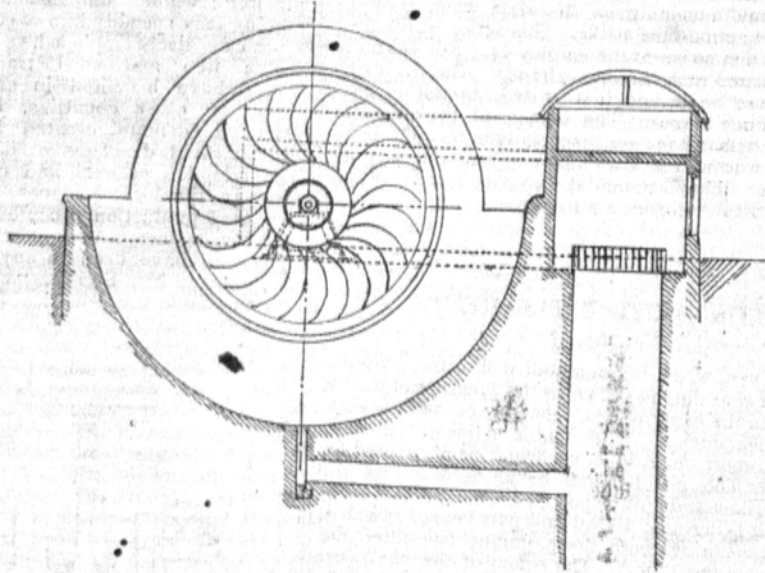


FIG. 4.

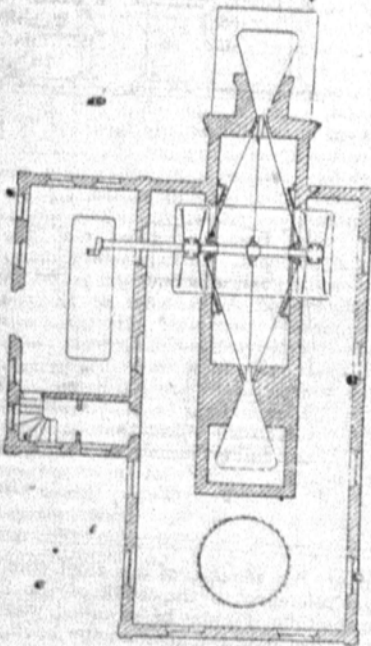


FIG. 5.

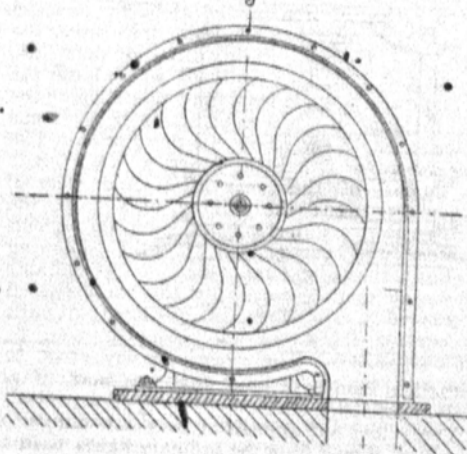


FIG. 6.

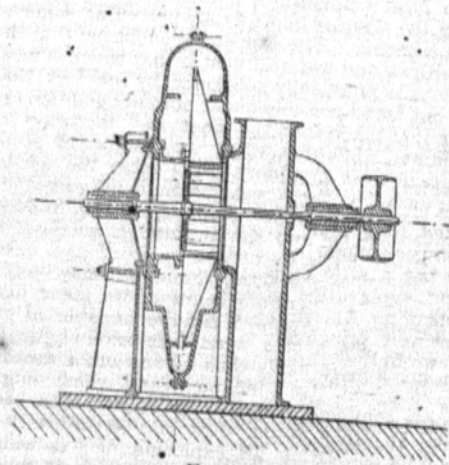
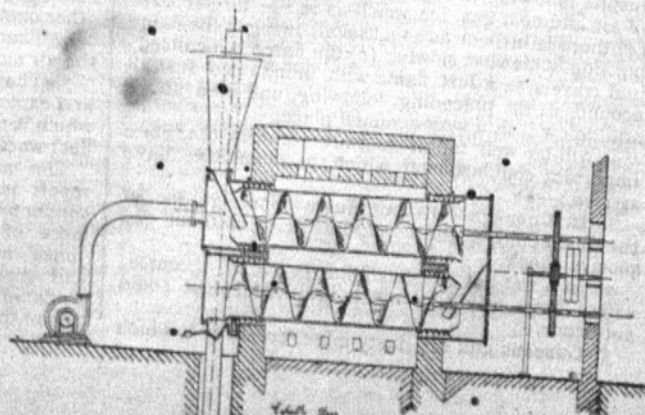
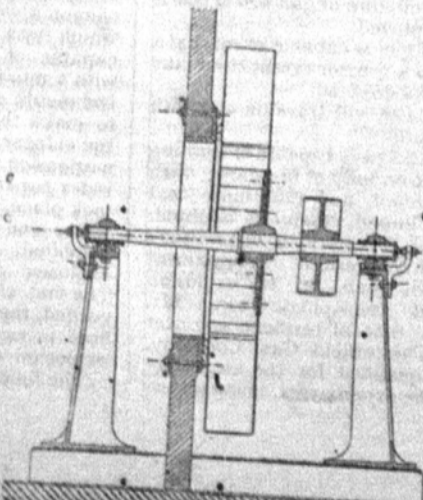


FIG. 7.





quiries are very numerous, especially for special sections and plates. A steady business is being done in the French market, at firm prices. The returns published by the Administration des Mines show that the production of pig-iron during the first half of this year exceeded that for the corresponding period of 1881 by 70,000 tons, and of manufactured iron by 39,000 tons. The increase in the output of steel promises to be even larger. In the German iron market the confident tone of the preceding week continues, enquiry being brisk, and prices growing stronger. In all transactions for the fourth quarter, prices of pig-iron are from 2 to 2½ marks per ton dearer, compared with the rates obtained for the third quarter of this year. The production of pig-iron in Germany and Luxemburg during the first seven months was 1,600,853 tons, as against 1,548,868 tons during the corresponding seven months of 1881. The manufactured iron market is very animated. The German export business is growing steadily. During the first six months of this year, the export of machinery increased by 40 per cent. as compared with the same period of 1881; of boilers, by 20 per cent.; locomotives, 33 per cent.; railway carriages, 50 per cent. The coal markets of the Continent are very brisk, household fuel beginning to participate in the activity. Quotations have a rising tendency, and advances have been made in Westphalia. The American iron market is without much change. Sales of American pig have been light during the past week, and the prospect of an advance in price has disappeared. Stocks are low, and quotations unchanged. There is no improvement in the market for Scotch pig-iron, and importers expect to have to make concessions for September delivery on account of the decline in freights. The Pittsburgh iron strikers held a meeting on Monday, when they resolved to continue the strike. This action of the men has been a surprise to the employers. Several mills have resumed with non-union hands. But the strike is becoming weak, and, it is stated, cannot be protracted much longer. The idleness of the mills has caused a demand for iron, especially by the petroleum interest, who have sent an agent to England for tank materials. They accumulate 40,000 barrels of oil daily without facilities for storage.

#### COAL DUST EXPERIMENTS.

##### No. II.

THE very weak inflammability of some varieties of coal dust is shown by the presence of double flames in the experimental tube, as well as by several other phenomena. The double flames, the committee report, may, in cross firing, be accounted for thus:—"The pistol flame, being fired across the tube, strikes and splits upon the side of the tube, part of it firing dust above, and part below, and then the current brings both these flames one after the other down the tube." The colour of the coal dust flame was dark red, which heightened into an orange tint when gas was admitted. The experiments, as might be expected, prove that any coal dust, under certain conditions, may be ignited; however, these conditions are frequently such as can never occur in any mine. This is particularly the case with reference to high temperatures obtained by drying and heating the samples immediately preceding some of the experiments. The expected conclusion that the finest, driest, and warmest dust is that which is most dangerous is practically confirmed by the fact that it was not found possible under normal conditions to inflame that taken from the floor and roadways of dusty mines, while that which was swept off props and bars in close proximity to the other did ignite. Again, dust from the screens at the bank was found to be highly inflammable; perhaps, indeed, more so than that pounded and sieved through muslin. It would appear that a dust flame by itself can never be of an explosive character, although it may be of a very serious character on account of its great heat and after effects. Again, it is quite capable of extending the effects of a small explosion of gas, by which, much more likely than by any other means, it may have been itself inflamed, and which might have been confined to narrow limits, had dust been absent. In other words, dust may certainly be a medium for converting an explosion of gas which would otherwise be trifling into one which is much more serious. The effect of inflaming a mixture of coal dust and pure air is widely different to the results following the ignition of an explosive mixture of air and coal gas, inasmuch as in the former case (a) there is little or no concussion, owing to the flame burning somewhat slowly; (b) the flame is localised, and travels as a dust flame with uninflamed dust all around it, i.e. preceding, following, and even above and below it in a very confined place.

It will be well for us to state seriatim the more important conclusions to which the committee have arrived:—

1. In a non-gaseous but dusty mine, ignition of the dust could, at the worst, only burn, without explosive shock.
2. In a wet but gaseous mine, in which, of course, safety lamps would be in use, ignition of dust could not occur.
3. Gaseous and dry dusty mines are those to which

the practical danger of coal dust is almost, if not entirely, confined.

4. There does not appear to be much danger of the ignition of dust from the ordinary lights used by workmen; but that the sudden flash and great volume of even a small explosive mixture of gas will ignite a coal dust cloud has been proved.

5. That an explosion of gas is capable of raising a cloud of dust in a mine to a greater extent than any other occurrence cannot be doubted.

6. That the coal dust flame will travel in and with the air current has been proved.

7. That such coal dust flame is capable of igniting and exploding any pocket or body of fire damp with which it may come in contact, and that more coal dust would thus become ignited, cannot be doubted.

The addendum of the Chesterfield committee's report is an account of the results of experiment conducted by Mr. C. G. Jones, on the explosive force of coal gas and atmospheric air. Mr. Jones' appointment, i.e. that of resident engineer and manager of the Chesterfield Gas Company, rendered him eminently qualified for the examination of the subject, and the experiments, being under-

## THE DUAL ENGINE.

By MESSRS. MACKENZIE AND VIVIAN.

(For description, see page 207.)

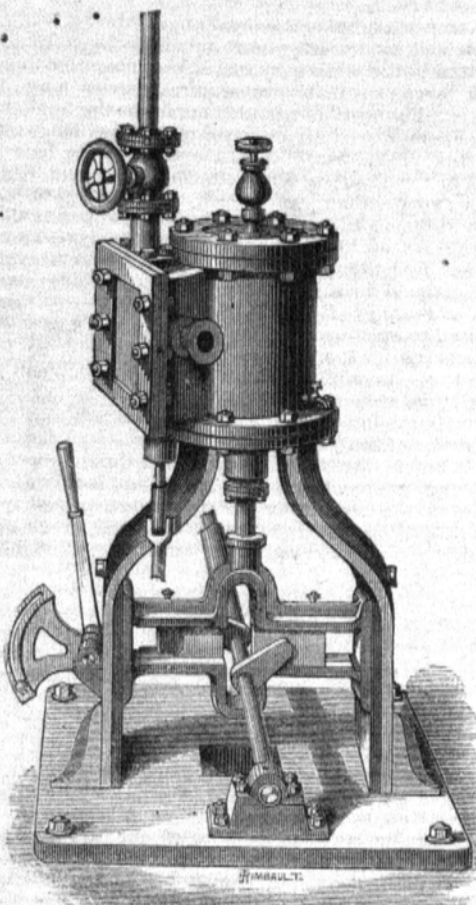


FIG. 1.

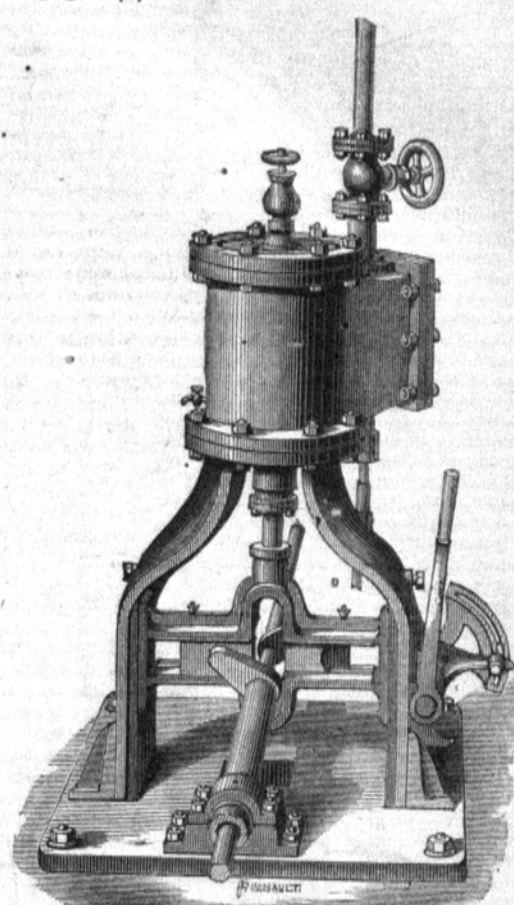


FIG. 2.

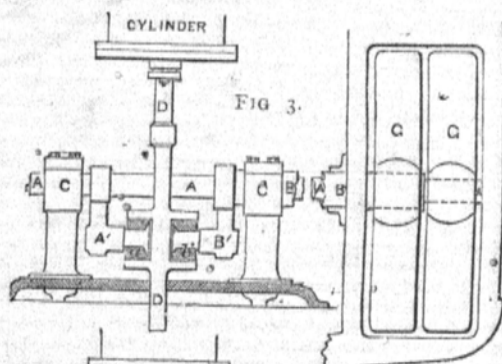


FIG. 3.

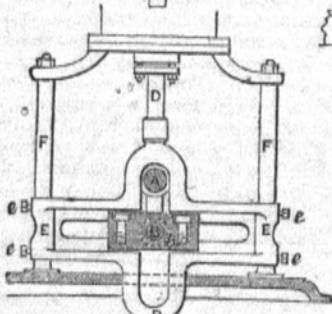


FIG. 4.

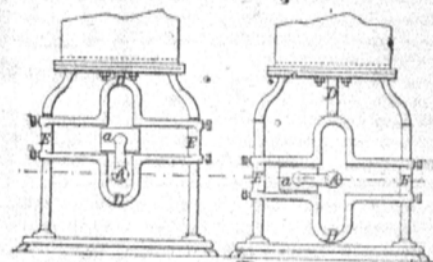


FIG. 5.

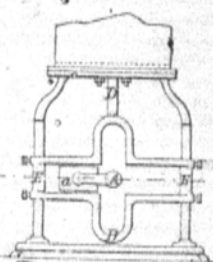


FIG. 6.

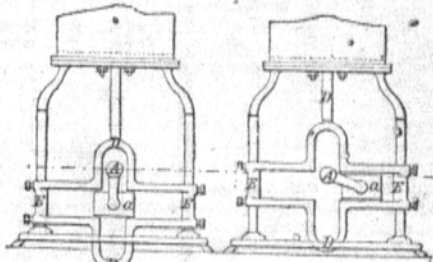


FIG. 7.

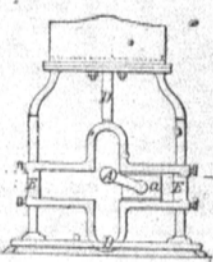


FIG. 8.

taken at the request of the chief committee, had special reference to the work of the latter. The explosion tube, if it may be so called, was a cast-iron cannon 3 feet long, 4 inches diameter, having a capacity of 267·84 inches. It was, of course, isolated from the gasholder by stop-cocks. To the mouth of this cannon a weighted and movable clapper was fixed, which was suspended on a horizontal axis, and capable of moving on the slightest impulse, and with a minimum of friction. The clapper covered the mouth of the cannon, and was fitted with means to make the whole water-tight; a continuation of the clapper, which was of wood, above the point of suspension, carried a lead pencil pressing against an index paper, the pencil in this way, when explosion took place, described an arc of a circle on the paper, whose sine was of course a function of the energy exhibited. The cannon was filled with the required explosive mixture by the displacement of water. The first charge in each case was fired and disregarded, the pencil was then adjusted, and charges fired in rapid succession, and a diagram of each explosion was taken.

The following are Mr. Jones' results:—1 part of



gas to 3 of air, or 1 in 4, inflames, does not explode, but burns quietly away. 1 part in 5 of air is distinctly explosive, and so on up to 1 in 7, or 14.28 per cent. of gas to 85.72 per cent. of air, which gave the maximum result. 1 in 7.5 has less explosive energy than the last-named proportion, but the difference is not great. All proportions up to 1 in 15, or 6.6 of gas to 93.3 per cent. of air, are explosive. Less than 6 per cent. of gas has no explosive properties; but any higher proportion is decidedly dangerous. We need hardly point out that these results are only exact for the particular gas used by Mr. Jones, and that the most explosive mixture for any gas can be easily calculated when its composition is known; they are, however, probably approximately correct for any ordinary lighting gas, since the variation in composition of coal gases as now made is not very considerable.

Mr. Jones' results of experiments on safety lamps in gaseous mixtures will find much importance among colliery men. The experiments were conducted in a suitable air-tight chamber with four glass windows, through which observations could be made. A lighted Davy lamp was used, and the following observations were made. One per cent. of gas gave no indication of its presence. A slightly increased brilliancy was observed, due, as was subsequently shown, to the oxygen of the air and not to the gas. Eventually the flame was extinguished. Two per cent. of gas gave similar results. Three per cent. of gas caused a very slight elongation of the flame, with increased brilliancy. With four per cent. the flame was elongated, and materially increased in brilliancy, and was very sensitive; the indications in this case were unmistakable. Five per cent. elongated the flame considerably, and formed the characteristic blue cap of pit gas. Six per cent. gave intensified results; the gas burning inside the lamp gave no sign of extinction. No flame was observed outside the gauze. A portion of this mixture was exploded in the cannon, and showed considerable force.

It is not, of course, in our province to discuss the appendix of the committee's report, among which we find Professor Abel's very remarkable experiments on the effect of non-combustible powders on the ignition of gaseous mixtures. This subject will receive at the hands of the Royal Commission on Accidents in Mines the further investigation which it demands, and we feel sure that the very careful and comprehensive work of the Chesterfield committee will be of much value to the Royal Commission who are now engaged in experimentation on allied subjects.

#### BREECHLOADING ORDNANCE.

THE United States Government having appointed a committee on heavy ordnance and projectiles on the 16th May, 1881, the Board reported, on the 18th May, 1882, the result of its labours. From this report it appears about ninety different proposals for gun-construction and projectiles have been rejected for various reasons assigned, and that the following plans have been recommended for trial, viz.: Kennedy's spiral drill point projectile, Paulding, Kemble and Co.'s plans of gun-construction consisting of a cast iron case, jacketed and hooped with steel (but objection is taken to their proposal to line the gun with a wrought-iron tube). Seabury's, Hotchkiss', Butler's, Mann's, and Woodbridge's projectiles are recommended for competitive trial; Russell's design for a loading apparatus; Woodbridge's, and Schultz's wire-bound guns; Hunt's all-steel gun; and Chief-engineer George Quick's breech-loading mechanism. The report is signed by General Getty, who was president; General Tower, Colonel of Engineers; Colonel Mendenhall, of the Artillery; Lieut-Colonel Buffington, of the Ordnance; and Major Parker. In view of the foregoing, a brief description of the Quick breechloading mechanism which has been recommended for trial, may prove interesting.

This breech mechanism consists essentially of a breech-screw (similar to the French breech-screw, except in the important fact that no part of the screw-thread is cut away) fitting into a sliding block of steel, called the sliding-carriage. The sliding-carriage is provided with lands and grooves on its upper and lower sides, and is fitted into a recess or slideway, formed at the rear of the powder chamber, at right angles to the bore and horizontally in a line with the trunnions. The front end of the breech-screw, next the powder chamber, is fitted with an expanding obturator or gas-check, which closes the rear of the chamber gas-tight, on the gun being fired. On the rear end of the breech-screw a lever is secured, by which the breech-screw can be moved, and at a convenient distance, on an arm of the lever, projecting pin or stud is fitted, which, at one portion of the revolution of the lever engages in a slot or guide formed on the rear face of the breech of the gun. By this means the lever is employed, firstly, to move the breech-screw through a small arc of a revolution, to withdraw the gas-check from the powder-chamber; and, secondly, by the continued motion of the same, lever the stud or pin, by bearing against the slot in the breech of the gun, which acts as a fulcrum, forces the breech-screw,

with its sliding carriage, on one side, so that the gun can be loaded. The reverse motion of the lever brings the sliding carriage and the breech-screw in line with the powder chamber, and the breech-screw is screwed up by the continued movement of the lever. Thus only one lever, and only one motion, is required to open the breech for loading, and only one motion is required to close the breech ready for the gun to be fired.

In very heavy guns the lever on the breech-screw is replaced by a tooth wheel, acted on by a pinion mounted in the sliding carriage, the pinion having a crank lever, so that any required power may be attained, but provision is also made for the application of compressed air or hydraulic power for working this mechanism. A self-acting safety bolt is fitted to the lever, which bolt covers the vent at all times except when the breech-screw is perfectly screwed up, so that premature firing is impossible; for the act of unscrewing the breech-screw shuts the bolt over the vent or firing gear. The advantages claimed for this method of breech-loading are that, as there is only one motion of a single lever required to open or close the breech, instead of three motions (as in the French gun), that it will be far more rapid in action, that mistake or accident in working it, even on a dark night in a rolling sea, will be quite impossible. It is also claimed that the inner tube of the gun is relieved of that longitudinal strain which caused the failure of the Italian 100-ton gun and many others, and that the longitudinal strain on the exterior or jacket will not exceed two tons to five tons per square inch of metal, when the powder-pressure is twenty-five tons per square inch in the chamber.

It is almost impossible to over-estimate the value of rapidity of loading, for in an engagement in smooth water at short range, rapidity of fire would be of great importance. How slow the firing is with muzzle-loading guns has been recently proved at Alexandria; the question, therefore, arises as a matter of economy, whether these guns should not be converted into rapidly working breechloaders on the system proposed. No doubt such guns would be inferior to guns built of all steel, and specially designed as breechloaders, having a bore of thirty calibres in length; but as none of our present warships could carry these very long guns without expensive alterations, the conversion of the muzzle-loaders would be by far the cheapest and best plan to adopt, as it could be so very easily and quickly effected, and little or no change would be required in our stores of ammunition which have accumulated during the last ten or twelve years. We may add that two models of the English 38-ton muzzle-loading gun converted into breechloaders on Mr. Quick's system are exhibited in the department of marine engineering at the North-East Coast Exhibition, Tynemouth.

#### A GAS-DRIVEN REFRIGERATOR.

COLD produced by the compression and subsequent expansion of air is now, and for some time past has been in extensive use for bringing frozen meat from the Antipodes, and for carrying the same across the Atlantic, the first machine for this purpose having been constructed by the Bell-Coleman Mechanical Refrigeration Company, of London and Glasgow. These machines are driven by steam cylinders, which form a portion of the machine, the steam being supplied in the usual way by steam boilers. Another way of driving these machines has been used in practice, viz., connecting them by means of a pulley or belt, with shafting put in motion by steam or gas engines. These methods, however, are not suited for refrigeration on a small scale, such as for hotels, and the fish, poultry, or meat stores of dealers, so that the possibility of constructing some simple arrangement by which the machine can be set in motion by means of a gas motor, without the intervention of gearing, has been the subject of much consideration by the above firm, and Mr. Coleman has recently taken out a patent by which the object has been successfully accomplished, by combining cylinders for the compression and expansion of air, together with a gas motor cylinder on one bedplate. The gas cylinder adopted is the Otto. Messrs. Crossley Brothers having co-operated with Mr. Coleman in bringing out this self-contained direct-acting apparatus. The first of these machines has been put down on the premises of Messrs. G. F. Brooke and Co., of Old Leadenhall Market, where we had an opportunity of inspecting its working on Wednesday last. Messrs. Brooke have recently had new premises constructed in the market, in which a suitable place has been found for placing the refrigerator, and connecting it with a chamber of 3000 cubic feet capacity, the walls being insulated so as to prevent the external heat penetrating into the chamber. The machine runs at a speed of about 140 to 160 revolutions per minute, discharging air at about 40 deg. below zero in a constant current at the rate of about 5000 cubic feet per hour. This quantity of cold air is first sent into a portion of the chamber, divided off so as to form a freezing department in which game or fowls can be frozen for transmission to Paris or other foreign

parts. The rest of the chamber is kept at about 40 deg. by the machine working twelve hours a day. If the machine is kept working longer the whole chamber can be kept at about freezing-point. The arrangements for cooling and drying the compressed air are placed in the bedplate, so that the machine is remarkably neat and compact, and stands in a space of about 12 feet long and 4 feet wide. The results of the working on Wednesday were in every respect satisfactory, and point to the usefulness of the machine wherever refrigeration on a comparatively small scale is desired.

#### OCCASIONAL NOTES.

##### TELEGRAPHIC COMMUNICATION IN AMERICA.

AS in the Old World, telegraphic communication, both submarine and overland, is extending at a marvellous rate in America. One of the latest additions to the great network covering and encircling that part of the New World is the gigantic undertaking of the Central and South American Telegraph Company. The Central American States, the remotest parts of South America, and the Straits of Magellan and Cape Horn will soon be joined to the telegraph networks of the United States and Canada. The ocean cable to be completed during this month on the west coast of the American Continent, with transverse connecting wires across it—down south as far as Valparaiso and east to Buenos Ayres—will introduce a new era on the other side of the Atlantic. The connections of the undertaking within the domain described amount to about 20,000 miles.

##### VILLAGE TELEGRAPHS.

A suggestion is made by a correspondent, who asks that before our popular Postmaster-General parts with some of his increasing surplus by conceding sixpenny telegrams, the claim of dwellers in villages be heard—the claim of those persons, namely, who have to add to their shilling's worth one to two or more shillings before they get their message delivered. The telephone may be made to accomplish this, and also become an enormous feeder to the telegraphic system. In the case of the telephone, no training as formerly to the needle or A B C instrument, would be needed. Any existing keeper of a post-office with ordinary quickness of hearing would do the work. Wires might therefore be put up from telegraphic centres to a belt of village post-offices, either with or without a guarantee for business by inhabitants. The telephone has removed the operating difficulty, and that of delivery would only be on a par with hundreds of existing offices where the service is only occasional. Let the Postmaster-General act upon this suggestion, and he would confer a benefit upon villagers which would be greatly appreciated.

##### BLASTING WORK IN THE DANUBE.

The construction of the railway bridge across the Danube at Peterwardein involves a large amount of blasting in the bed of the river, which operations are now being carried out under the direction of Major Lauer, and at the expense of the contractors for the bridge, the Fives-Lille Company. The rock upon which part of the fortress of Peterwardein is built descends pretty steeply into the Danube. One of the piers of the bridge will have its foundation on this rocky slope, and it has been found necessary to level the rock for a length of 65 feet and a breadth of 26 feet, in order to be able to lower with the requisite precision the caisson for the pier foundation. As the rock to be removed is 23 feet below zero and at the present level of the Danube about 40 feet below water, and as the current is running at a speed of 10½ feet per second, some idea may be formed of the difficulties of the blasting work to be done. The method employed by Major Lauer is consequently well suited to the operations needed; but as even with that method considerable difficulties arise, it has been found necessary, in this case, to construct, in the first place, a guide-rod of a length of 65 feet, which should resist the strong current to such an extent as to permit of the several dynamite charges being sunk with the greatest accuracy. After several experiments, a guide-rod has now been constructed which meets the requirements of the case, and enabled the workers to begin blasting operations on August 21. As upwards of 10,000 cubic feet of rock have to be removed, the work of blasting will probably last about forty days, and thus an opportunity will be offered for testing Major Lauer's method on a large scale.

##### RAILWAY AND CONTRACTS ENQUIRY OFFICE.

Who has not experienced the difficulty of obtaining exact information at a railway station, whether it be as to times of departure or arrival of trains, the correspondence of one train with another, or the cost of a certain journey? And happy is he who has not been misled by incorrect information. The late Minister of Public Works in Belgium conferred a great boon upon business men, and also private individuals, in that country, by inaugurating in Brussels a "Bureau des Renseignements"—an intelligence office. Here precise and gratuitous information may be obtained as to times, fares, and correspondence of trains, and the rates of



carriage of goods, both national and international. Moreover, the particulars are not given in a perfunctory manner. There is an evident disposition on the part of the officials to help an enquirer; and, if they are unable to give any desired information, they do their best to obtain it. At a branch of the same office, particulars may be obtained, and specifications consulted, of all government contracts, and also those of foreign countries, as furnished by the various consuls. The Germans have lately adopted this system by founding an "Informations-Bureau" at Berlin, where the tariffs of the different railway companies may also be obtained. On account of the success attending the Brussels office, and its great public convenience, branches are shortly to be established in the chief industrial centres of the Belgian kingdom. As Englishmen are found to make great use of the facilities afforded, we will add that the Brussels office is at 16, Rue de l'Orangerie. Another arrangement for public convenience, devised by the late Minister of Public Works, has been discontinued through want of appreciation by the public. This was a provision, at the principal railway stations, for packing up train parcels with the services of an employé, in return for a small fixed charge.

#### HAMBURG AND THE ZOLLVEREIN.

An interesting account is given in a recently published official report of the negotiations for the incorporation of that ancient free state with the Zollverein or German Customs Union. Subject to certain conditions regarding the sum, equivalent to two millions sterling, which is to be contributed by the imperial government towards the cost of the incorporation, the treaty, as finally settled, will come into force at some date to be appointed, not later than October 1, 1888. The freedom which has so long been the pride of the Hamburgers will, we learn, be in the main preserved; nor can the right of the district to remain a free port be withdrawn or lessened without the consent of the Hamburg folk. Within these extensive limits, including the islands in the river opposite the town, the movement of ships and merchandise will be free from all customs control, and the unlimited establishment of industrial manufactories will be allowed. As heretofore, the docks of Cuxhaven remain outside the limits of the German customs. The Niederlage, however, is to be closed; whilst another clause provides that those establishments which are situated in the future customs territory, and which cannot, on account of their present position, be transferred to the free district, shall be permitted for some time longer to manufacture their articles as before and under the most advantageous conditions which can be granted to enable them to compete with foreign rivalry. These establishments are, it appears, of some importance, including, as they do, spirit refineries, guano works working for export, rice mills, slaughter-houses for export, dockyards, and certain sugar refineries. It is stipulated that the regulations of the union are to be revised in such a manner that the trade and commerce of Hamburg shall only be burdened with such formalities as are unavoidably necessary for fiscal purposes.

#### PROOF AGAINST FIRE AND LOOTERS.

The Milner's Safe Company have taken a step which is deserving of praise. We learn that they have sent out lately to Alexandria special representatives, one a practical engineer, for the purpose of rendering assistance, gratis, to the large number of those bankers, merchants, and tradesmen possessing Milner's safes, sufferers by the late disasters there, who were at a loss to know how to have their safes opened, after being removed from the burning ruins, or from their pillaged houses, battered and wedged by the infuriated mob in the deplorable events of last July. The *Egyptian Gazette*, in commenting upon the step taken by the firm, says:—"The readiness and promptitude with which this invaluable assistance has been rendered, involving, too, an enormous amount of labour and expense, meets with admiration on all sides. The compensation Messrs. Milners have for this zeal and outlay is the satisfaction to learn the good condition in which the valuable contents of the great majority of their fire-resisting safes have been found, notwithstanding their having endured such extraordinary tests as so unprecedented a conflagration as that which destroyed a large part of Alexandria, and their remaining for several weeks subsequently buried in the ruins of the hot lime-stone of which the houses were built, an ordeal it was believed no safe could resist. On the other hand, the perfect immunity from being broken open of those burglar-resisting or strong holdfast safes of the same firm, which have been so savagely attacked but have nevertheless defied all the diabolical efforts of the looters, is an additional gratification to Messrs. Milners." There is no need for us to add anything further; but we may put on record the following rather amusing incident, which sufficiently illustrates the great resistance of those safes. One of the safes, the property of the Lighthouses and Outports Administrations, containing a large sum of money, was severely attacked during the pillage, the handles having been broken off and attempts made to pick the lock. Subsequently the carpenter and some men from H.M.S. *Helicon* were told off to open it; but, although some hours were employed in working on it, it resisted so completely that it had eventually to be blown open by gun cotton. This occurred of course before the arrival of the representatives of Messrs. Milners.

#### THE POLYTECHNIC INSTITUTE.

THE Young Men's Christian Institute, which, as our readers are probably aware, has transferred its headquarters to the building formerly well known to most of us as the Polytechnic, has just issued the syllabus of the evening classes in science, art, technical and general subjects, for the session 1882-83. The programme includes, amongst other practical subjects, pattern making, metal turning, and lathe work, sanitary engineering, electrical engineering, mechanical engineering, metal plate pattern cutting, and metal plate work, practical mensuration, theoretical mechanics, applied mechanics, machine construction and drawing, chemistry, &c. The classes will commence on Monday, October 2, when the opening lecture, on "The Technical Education of Artisans," will be delivered by Mr. Paul N. Hasluck, the well known author of *Lathe Work*, &c. The importance of providing technical instruction for apprentices, artisans, &c., has now been fully recognised, and we are glad to see the efforts being made in that direction. The Polytechnic Institute—the object of which is to reach those classes in London which have hitherto been so much neglected—although established some time, has up to the present been without a suitable abode. We trust that by the acquisition of the well known building in Regent Street, which has been entirely remodelled interiorly and fitted up for the purpose it is now destined to serve, that want will be supplied. Further particulars, we may add, are to be obtained on application to the Secretary, Polytechnic Institute, 309, Regent Street, W.

#### SUBMARINE TELEGRAPHY.

ONE of the main difficulties attending the connecting of submarine telegraph cables to lightships or floating stations is to counteract the influence of the swinging of the vessel by either wind or tide, or veering away in heavy weather. This difficulty appears to be met in an invention by Messrs. Cockshott and Goodman, of East Greenwich, which has just been brought under our notice. For this purpose there is placed near the ordinary windlass a tube of metal carried in fore and aft frames, and through which is passed the anchor chain, which is then continued through the centre of a Boxer's patent rotating hawse pipe and thence to the anchor or mushroom mooring. Near the end of the chain-tube is a flanged drum running freely on the tube, on the fore end of which is a flanged boss, the periphery of which is embraced by a friction band, adjustable by means of screws. On the end of the drum next to this friction band is fixed a projecting stud which when in contact with the projections on the friction band rotates the drum. The rotary hawse pipe in the fore part of the vessel has in its centre the hole through which the anchor chain passes, and at one side of the hole a smaller one is arranged through which the telegraph cable is made to pass from a sunk weight through a sheave over the drum round which the telegraph cable is wound and secured. By this arrangement the telegraph cable can readily be paid out automatically at any time the anchor chain is veered away. In order to take in the telegraph cable as the anchor chain is shortened there is a bevel-wheel on the central part of the hollow shaft, the wheel being driven by hand or steam power. The attendant, by actuating this wheel, rotates the hollow shaft by its friction band in contact with the stud in the end of the drum and so winds up the slack telegraph cable. In order to prevent the anchor chain fouling and entangling with the telegraph cable, the rotating hawse pipe is actuated by means of a lever inserted in one of a series of mortises on its circumference or by screw bevel or spur gear. This will necessarily transfer the fouling or entanglement to the inside of the vessel, and in order to obviate this, after the ship has swung by wind and tide the bight of the telegraph cable is stoppered and removed quickly from the snatch block, passed under the drum, and replaced again in the snatch block and the stopper removed. This operation can be repeated as often as may be necessary.

In order to retain the perfect electrical connection between the telegraph cable and the instruments on board, there is an adjustable metal insulated contact stud or ring, which is always in metallic contact with another metal insulated ring on the after flange of the cable drum, round which the telegraph cable is wound, and from this metal insulated stud or ring the insulated leading wire is taken and connected to the instrument in the operator's room on board, thus making the electrical circuit complete at all times. On the circumference of the hollow shaft there is a ratchet into which a vertical pawl gears. In order to prevent any damage to the telegraph cable by its contact with the ground on which it lies occurring through the currents, or wash of the sea, or the swinging of the vessel, a heavy weight is used, and through this weight is passed the telegraph cable. On the top of this weight is a recess in which is a sunk eye, for the purpose of attaching a removable chain when lowering it in its position on the ground. On the side of the weight, near its bottom, is another sunk eye in a similar recess, to which is shackled a permanent chain, the purpose of which is to facilitate the raising of it to the surface when desirable, such chain lying on the ground so as to be readily grappelled when necessary. On such occasions a chain can be placed through the top sunk eye, and when the weight is lowered to the ground can be readily drawn through placing the weight again in its original position. In view of the importance of establishing electrical communication at sea, we commend this invention to the notice of our authorities in the hope that it may be practically tested, and if found meritorious—as it appears to be—that it may be adopted both in the interests of humanity and commerce.

#### THE MINERS' CONFERENCE.

THE conference was continued at Manchester on Thursday, last week, Mr. Burt, M.P., again presiding. Resolutions were passed in favour of overmen deputies and firemen being subject to government examination before appointment, and in favour of the appointment of a minister of miners. The next question for consideration was as to the power to prosecute for infringements of mining regulations. The president said it was important they should limit the number of questions which they entered on their parliamentary programme. He must confess that he did not regard this as a vital question, because, as they knew, their power was increasing, and he thought that by their united efforts they could get the Home Secretary to take the initiative in any prosecution they might desire to institute. Whether they would get convictions or not was another question altogether. They seldom got convictions, but that was not a matter which he could see his way to altering at present. He did not see that it was absolutely necessary that they should make any change in the present system. After considerable discussion, however, the following resolution was adopted (an amendment deferring the subject receiving only six votes):—"That, instead of the power to prosecute as directed by the Mines Act being exclusively in the hands of the mines inspector or secretary of state, that power be granted to a common informer." Subsequent resolutions related to danger-signals and working-plans. It was unanimously resolved—"That, when a fatal accident occurred, no alteration ought to be made to the place where each accident does occur until visited by the inspector of mines, unless such non-interference should tend to either increase or continue a danger or impede the working of the mine." A motion was next made—"That section 50, clause 7, in the Coal Mines Act, 1872, ought to be amended by the addition of the following:—"This not to disqualify men from acting as jurors who work in other mines owned by the same owner as the mines in which the accident happened." An amendment in favour of the postponement of the question was proposed. After considerable discussion, the conference divided, when the motion was carried by a large majority. Mr. Charles R. Vincent was then heard by the conference in support of the establishment of an orphanage in connection with the mining world, such as he formerly succeeded in establishing in connection with the railway servants. This subject was remitted to the business committee. The two next resolutions were—"That, in the opinion of this conference, there should be inserted in any new Mines Act a clause giving the relatives of deceased persons, whose lives had been lost in or about mines, the power to be represented at coroners' inquests to elicit evidence from witnesses to show the cause of the death of such deceased person or persons." "That it is the opinion of this conference that every colliery should be examined by a government inspector not less than once every six months, and that in order to carry out this the conference insists upon the appointment of practical miners as sub-inspectors." Resolutions were also passed relative to ambulances at collieries and the appointment of a check weighman by the pitmen.—The following motions were likewise adopted:—"That persons entering mines where safety lamps are used be examined as to their competency to use lamps." "That where a mine exceeds a mile from the shaft at least one more shaft be put down." "That the ventilation in every pit in the United Kingdom be measured in every working district, and the number of feet of wind recorded on the pit bank before the workmen go into the pit." Mr. Parrott (Yorkshire) moved—"That we urge upon the Home Office the necessity of finding means to test the principle of bringing into use the new system of getting coal with lime." The resolution was carried. The president, speaking of the Employers' Liability Act, said the conference would recognise the fact that any attempt to reopen this question would be certain to encounter considerable opposition. There was an indisposition on the part of Parliament to open the question, and but for the fact that employers had brought pressure to bear upon their workmen to advise them to contract themselves out of the Act he should have been no party to reopening the subject. Mr. B. Pickard proposed a resolution that the conference should do its best to support Mr. Burt and Mr. Broadhurst in their efforts to pass the Employers' Amendment Liability Act next session. The resolution was agreed to. Resolutions were passed on a variety of other subjects, including the following:—"The provision of danger signals to make known such atmospheric changes as may affect the working of mines; the provision of ambulances for colliers at mines; the examination of strangers entering mines; the sinking of extra shafts; the measurement of air, the provision of safety catches and hooks at collieries, and the carrying out of the act with reference to the deduction of coal for dirt."

On Friday the Conference was principally occupied with two subjects—the first being that of national organisation, and a long discussion ended in the adoption of the following motion:—"That a national organisation of all the mining districts of Great Britain is of the greatest importance and necessity; and having in view the efficient rules of the present Miners' National Union, and knowing that these rules are at all times open for amendment and application to objects not therein stated, we would recommend all districts outside the National Union to affiliate themselves to it, and thereby promote the passing of the legislative measures and afford mutual aid and advice in the labour question." In introducing the wages question, the president, Mr. Burt, M.P., drew attention to an attempt made by a former conference to secure a meeting between national deputations of the owners and miners to consider the best means of raising wages, which all must admit were at best lower than they should be, and in many districts were far from being adequate to meet the necessities of the people employed in and about the mines. He was very sorry to say this request was, however, refused by the coal-owners. If that meeting had taken place, he felt it would have been very beneficial to all concerned in the coal trade, and he hoped that before long the employers would see their way clear to grant the request. Mr. B. Pickard moved—"That having regard to the lowliness of wages in and about the coal mines, we express ourselves in favour of an advance towards the same."



to further discussion at this conference." The motion was seconded and carried.

On Saturday the conference met for the last time, to decide the remaining questions on the programme. Mr. Burt, M.P., president of the Miners' National Union, again presided, and there was a full attendance of delegates, the subject under discussion being the wages question, and the advisableness of resorting to a general strike to enforce a demand for increased remuneration. In opening the proceedings, the president called the attention of the conference to the important nature of the business under consideration, and said before they resumed the discussion on the wages question he wished to inform the conference that since the adjournment a meeting of the central board had been held at which a discussion had taken place on the best means of increasing the usefulness of the union. A resolution was come to that the central board would be willing to send two of their members to any district which had a desire to hear any information concerning the rules and operations of the National Union. The board had further decided that this should be done at the expense of the National Union, and not at that of the districts. Among the mining population the result would be one of great benefit. The districts visited would now remain without any excuse if they did not become acquainted with the operations of the Union. The conference proceeded with the adjourned debate on the various proposals laid before the delegates for securing an advance of wages. The president said there were two propositions before the conference. One of them favoured a general stoppage of work if the demand for an advance of wages was not complied with by the miners; the other proposed to proceed rather by a limitation of output and a regulation of the work. The general necessity for an advance of wages was believed in by them all. It would facilitate the business of the conference, if, in the first place, they discussed one of these propositions, and either affirmed or rejected it, and in the case of its being affirmed, then proceed to formulate the means by which they thought it should be carried out. The meeting adopted the president's suggestion. Mr. Pickard, vice president of the Miners' National Union, proposed, "That in the opinion of this conference the time has come when the miners of the United Kingdom should demand an advance of wages, and that no effort be spared to obtain the same by the 1st October next; and further that, if the same cannot be obtained without, there should be a general stand of all miners throughout the United Kingdom." Mr. Parrott, of the Yorkshire Miners' Association, seconded the motion. This motion was the one which the Yorkshire district had put on the programme of the conference. The Durham delegate moved an amendment in favour of regulating labour and reducing the output. A long and animated discussion took place, in which it was evident that the general feeling of the meeting was in favour of the original motion. The motion was carried by Mr. Pickard was adopted. The conference then proceeded to discuss the means for enforcing the demand, and a long discussion took place. Some of the delegates spoke in favour of a general rule which would be alike for all the collieries throughout the country, while others of the delegates favoured the proposal to leave each district perfect freedom of action in deciding upon the best means. Eventually the following resolution, moved by the Northumberland Delegate (Mr. Wright) was agreed to:—"That the best means of carrying out the resolution seeking for an advance of wages will be to leave each district to make its own claim in its own form." Mr. Wilson, of Durham, moved a resolution in favour of political associations being formed among the miners, with a view of affording support to their Parliamentary candidates. Mr. Trotter of the Durham Colliery Mechanics' Association, seconded the motion and it was adopted.

A meeting of the central board has during the conference had under final consideration the question of erecting a statue of the late Mr. Alexander Macdonald, M.P., who for a long time was president of the National Union. The meeting had before it the selection of a sculptor and other matters, and it was decided to entrust the work to Messrs. Whitehead and Sons, of London, whose tender was accordingly accepted. The statue, which will be in marble, will be erected in front of the Miners' Hall, Durham, and the cost will be defrayed by a general subscription among the miners of the country. Most of the required money has already been subscribed.

The conference closed with a hearty vote of thanks to Mr. Burt, M.P., for presiding.

#### FARCOT'S VENTILATOR.

In a previous number we described and illustrated the Farcot dynamometer,\* remarking that, in turning his attention to the improvement of pressure and exhaust fans, M. E. D. Farcot, of 221, Rue Lafayette, Paris, had discovered defects in existing dynamometers, which led him to devise that bearing his name. As an interesting example of the action and reaction of cause and effect, we may now mention that it was in consequence of the exceedingly accurate readings afforded by his dynamometer of the power absorbed by various fans and centrifugal pumps that M. Farcot has been enabled to arrive at the improved type of fan, which we now describe and illustrate. We will first, however, mention some interesting facts connected with the history of the improvements. Early in 1880 it became necessary to replace one of the two large fans for supplying the blast to the machine forge at Creusot by another of higher duty, so as to obtain a greater pressure of air, while at the same time utilising the existing engine of 20 horse-power nominal. The fan, which was found insufficient, absorbed a considerable amount of motive power and made a great deal of noise in working. It was 4 feet in diameter,

and consisted of six blades enclosed between two discs revolving with them. The casing was eccentric with respect to the axis of rotation, and the nozzle had a sectional area of 5 square feet 116 square inches. This fan supplied the blast to

4 furnaces with pipes of 200 mm. = 7 7/8 inches diameter  
2 large fires " " 70 mm. = 2 7/8 " "  
8 medium fires " " 60 mm. = 2 1/2 " "  
8 small fires " " 40 mm. = 1 1/2 " "

forming together a sectional area of about 1 square foot 116 square inches. The air channel, built of brick, was 656 feet long and 3 square feet in sectional area. As this was cracked in several places, through the vibration caused by the steam hammers, the leakage of air increased the volume required of the fan. In the month of May, M. Farcot received instructions to supply a new fan to be driven from the engine by two fly-wheel pulleys of nearly 10 feet diameter, and capable of furnishing a blast of 4 1/2 inches pressure, to be increased, if necessary, to 6 1/2 inches pressure. The total sectional area of the tuyeres was given as 1 square foot 88 square inches; but special mention was made that they were never all open together. The new fan, 4 feet 11 inches in diameter, and having a nozzle of 14 inches diameter, representing a sectional area of 1 square foot 11 square inches, was erected at the end of September. It made no noise in working, but was quite inadequate to the requirements of the forge, besides absorbing more power than the old one, although having a smaller outlet orifice. A power of 33.66 horses was required to obtain a pressure of 4 1/2 inches of water when all the tuyeres were wide open, while the old one only required 28.6 horse-power under the same conditions. The old fan was accordingly restored, and gave much better results than before, on the sharp curve connecting it with the air-channel being suppressed. On renewed observations being made with the dynamometer, the true cause of failure was discovered. The former trials had been made upon exhaust fans, with their exit orifices open to the air; it was now found that pressure fans should not be tested in the same manner, but that the nozzle should be put in communication with a reservoir of air compressed to the normal pressure required. Successive modifications made in the fan, in consequence of this discovery, permitted of obtaining the duty of 70 and 80 per cent, which had previously been obtained with exhaust fans; and more than one practical application confirmed the results. A fan of 2 feet 9 inches diameter, put down in a mill where the former ventilator was found insufficient, gave immediate relief to the engine, while at the same time affording a considerably greater pressure of blast.

The information thus obtained permitted of designing a new fan for Creusot, with a capacity three times that of the former. It was erected at the end of 1881, with a diameter of 1 m. 95 = 6 feet 4 1/2 inches; and the sectional area of nozzle was equal to 3 square feet 33 square inches for an effective discharge to the fires of half that quantity. This fan is shown in side view at fig. 1, and in transverse vertical section at fig. 2, of the illustrations on page 202. Its chief characteristic is the series of doubly curved blades enclosed between conical discs of thin sheet iron. The blades are not continued quite up to the periphery of the discs, as is usual in fans of this type; but their length is calculated so as to form, at the periphery of the discs, an annular chamber connecting all the channels formed by the blades. The sectional area of the annular aperture at the periphery of the discs is regulated so as to be only half that at the periphery of the blades. As the air drawn along by the blades cannot escape freely under the influence of the centrifugal force, it causes a compression in the annular reservoir which equalises the pressure at all the points in the circumference of the fan. This pressure is distributed by a series of elementary zones, the pressure of which gradually increases, owing to the centrifugal force, from the centre to the circumference. One of the effects of this system is to cause an absolutely uniform discharge at all the points of the outer circumference. As the blades do not reach to the outside of the revolving discs, they do not cause the vibrations noticed in other ventilators, and which produce the usual hum that is so disagreeable. Another important advantage of this system of fan is that it revolves in the casing without that resistance met with in fans, the blades of which reach the outside of the revolving discs. There is in these latter a difference between the pressure in front and behind the blades, which causes eddies and back pressure, thus increasing the resistance to rotation. The special form of double curve given to the blades permits of taking the air without shock, and of discharging it at an angle more inclined than the radius in the direction of rotation. It thus happens that the centrifugal force obtained is greater than that corresponding to the speed of rotation at the end of the blades, which is a great gain in practice. In September last, some trials were carried out by the Creusot officials for comparing the duty of the new fan with that of the old, when it was found that, with the same pressure of blast, viz., 4 1/2 inches, the engine only made 55 revolutions instead of 60, and only developed 17 horse-power, when all the tuyeres were open at once, affording a total sectional area of 16.50 square decimetres = 1 square foot 112 square inches, without reckoning the leakage before mentioned. In order to obtain the required pressure of 4 1/2 inches of water, it was found sufficient to run the engine at 57 revolutions for 422 of the fan, with 21 horse-power indicated. In order to obtain the same pressure with the old fan, under the same conditions, it was necessary to run the engine at 62 revolutions for 715 of the fan, developing 28.6 indicated horse-power instead of 21. When running at 60 revolutions of the engine, and 444 of the fan, thus absorbing 26.2 indicated horse-power, the pressure rose to 5 1/2 inches of water. A fresh official test was made on September 15, with all the tuyeres wide open, and the engine running at 67 revolutions for 439 of the fan, absorbing 34 indicated horse-power, when the pressure rose to 6 1/2 inches of water.

With the tuyeres more or less closed, according to the requirements of the fires, the engine was run at 72 revolutions for 518 of the fan, developing 31.49 indicated horse-power, when the pressure reached 8 1/2 inches. The fan ran noiselessly, and the belts kept on the pulleys, whereas with the old ventilator running at this speed, the belts were constantly coming off. The result of the test was that the fan was accepted by Schneider et Cie, who certified that it saved 266 per cent. of the motive power formerly employed; and they ordered a second fan on the same principle for supplying the foundry blast at a pressure of 15 1/2 inches of water, to be driven by a 60 horse-power engine.

Kind of Fan.	Number of Revolutions.	Pressure at Exit.	Inlet Lower.	Space's.	
				Ft.	Pl.
Farcot No. 2 (accepted)	55	407	4 1/2	17	137 140
" "	72	518	8 1/2	34.39	174 185
" "	5	422	4 1/2	21	141 149
Creusot	61	705	4 1/2	28.62	236 140
Farcot No. 2	60	444	5 1/2	26.20	149 151
" "	67	439	6 1/2	34	146 162
Farcot No. 1 (removed)	72	643	4 1/2	33.56	212 140

The above table summarises the results obtained at Creusot with the three fans, viz., that already existing the Farcot which was removed and that which replaced it. The first two results were recorded with the tuyeres more or less open, according to requirements, and the rest with all wide open, corresponding to a sectional area of 1 square foot 116 square inches. This table shows the importance of fixing upon suitable dimensions, as well as on a good type of fan, for obtaining a blast of given pressure with a minimum of motive power. It also confirms what the dynamometer had before pointed out, viz., that the second fan, which was too small for its work, having a sectional area of nozzle less by one-third than that corresponding to the required volumes absorbed 33.66 horse-power; while the new one, three times more powerful, and with a nozzle of double the sectional area corresponding to the required volume, only absorbed, 21 horse-power to do the same work, thus effecting a saving of 12.66 horse-power, or 36 per cent. As compared with the previously existing fan, with a sectional area of nozzle almost double that corresponding to the required volume, and requiring 28.6 horse-power to drive, there is a saving of 7.6 horse-power, or 26 per cent. It is also highly instructive to compare the speeds at the circumference of the fan with those of the air at exit, corresponding to the pressures at the nozzle, as recorded in the table. It will be seen that the pressure obtained with the new fan was equal to, or rather greater, than that corresponding to the speed at the circumference, while with the other fans there were considerable differences—a loss of 98 feet in one case and of 78 feet in the other. The reason of this is evident, demonstrating that large fans with a sectional area of nozzle less than that corresponding to the volume required may be safely recommended. If the capacity of a fan is greater than that required, the speed of escape of the air at the nozzle and in the channel is reduced to a minimum. But when, on the other hand, the fan is too small, the speed of exit is at the maximum; and a loss of power occurs through friction and eddies, which greatly diminishes the useful effect. In applying this system of fan to the ventilation of mines, it is necessary to modify the form of the casing, while preserving the principle of an equalising annular reservoir. Fig. 3 shows a vertical transverse section; fig. 4, a side elevation; and fig. 5, a plan of a fan designed to extract 3531 cubic feet of air per second, with a diminution of pressure of 3.15 inches, from a colliery at Cardiff. The "diverging" case permits of reducing the speed of exit of the air to from 6 to 10 feet per second, if desired. Figs. 6 and 7 show vertical sections, at right angles to each other, of an exhaust fan supplied to the Compagnie Générale des Voitures, Paris, to serve as a grain elevator, the height to which the grain is raised being 92 feet. By coupling two fans together, a pressure or vacuum of as much as 50 inches of water has been obtained, with 70 per cent. of useful effect and very satisfactory working. The same principle has also been applied, with similar success, to centrifugal pumps, small sizes of which, 6 1/2 inches in diameter, giving a useful effect of 72 per cent., have raised water to a height of 20 metres. In this way it has been possible to demonstrate, with the aid of the dynamometer, that the theory of centrifugal pumps is the same as that of fans. Fig. 8 shows a front view, and fig. 9 a vertical cross section, of a reaction aspirator, without casing, for various industrial applications where large quantities of tolerably pure air are to be displaced with slight pressure or vacuum. It is not, however, suitable to cases where the air is charged with dust or with matters likely to adhere to the blades. With aspirators drawing from one side only, the installation is very simple. Fig. 10 shows a vertical longitudinal section of a drying apparatus devised and constructed by M. Farcot. Its principle consists in causing the substance to be dried to circulate in a contrary direction to that of the hot air. It consists of a horizontal cylinder of iron plate, in the interior of which is fixed a helix, also of the same metal. Its revolution causes the substance introduced by the hopper at one end, to pass along until it is discharged at the other, the motion constantly exposing a fresh surface to the action of the air. If desired, several of these appliances may be fitted up, one over the other, so as to work together.

A recent report of the chief engineer of the Humboldt Maschinenbau-Actien-Gesellschaft (Kalk am Rhein), as to a fan of 1.95 metre diameter put down by M. Farcot, states that at 800 revolutions a minute the pressure of air was equal to 15 1/2 inches of water, the exit orifice being 11 1/2 inches in diameter, or 108 1/2 square inches sectional area, with 31 indicated horse-power. The speed was 262 feet; and the volume 148 cubic feet, giving a useful effect of 0.725. M. B. Brunon ironmaster, Rive-de-Gier, states that, with a speed of 380 revolutions, he obtains a pressure of nearly 4 inches, which is quite satisfactory. M. A. Piat, who has put up a pressure fan of 1 metre diameter at his new foundry at Paris, says that it revolves more slowly than that which it has replaced, absorbs less power, gives a greater pressure, and makes no noise. M. Farcot has just sent a fan 1.75 metre diameter to the Société John Cocke-rill, Seraing, and others to the Baume and Mercier foundries.

\*See Iron of March 25, 1881, p. 201.



## THE DUAL ENGINE.

IN our reports of the exhibits at the Naval and Submarine Engineering Exhibition, held in April last, we referred to the dual engine of Messrs. Mackenzie and Vivian, and which was exhibited by Mr. Mackenzie, of No. 4, Great St. Helen's, London. We now place before our readers full particulars of this remarkable engine, which we also illustrate in the engravings on page 203. Figs. 1 and 2 represent respectively a back and front view of this engine as applied to the purposes of screw propulsion. The fly wheel and reversing gear have been removed in order to show the knal crosshead. The idea, however, of driving two propellers (right and left handed) on concentric shafts in opposite directions is no new one, having been patented by Mr. (afterwards Sir F. P.) Smith very shortly after his single screw. He must, therefore, early have seen how effective is the arrangement for securing all the power from angular rotating surfaces, and various have been the modifications adopted and the gear employed to get the reverse motions. But as gear (cogwheels or other) is not admissible for rapid speed, especially in marine engines, no progress has been made in the direction indicated by the common sense of the reputed inventor of the screw propeller, and it is only now, after seven years of experiments on the part of Messrs. Mackenzie and Vivian, that attention is called to the employment of a direct-acting dual engine to give uniform opposite rotation to right and left handed propellers on concentric (male and female) shafts. Messrs. Mackenzie and Vivian's looped crosshead or bifurcated piston-rod for obtaining concentric rotary motion without cogwheel or belt gearing, though difficult to describe without seeing the engine in action, will be understood from our illustrations, which explain the motion of the drag or slot-block around the shaft. This is done with as much facility as in the ordinary slotted crosshead used for pumps, &c., where space for a connecting rod is not available, but with the novel and unique feature that instead of the block actuating a crank-pin at the extremity of a shaft, it may be thrown around it at any desired or convenient point, thus enabling two concentric rotary motions to be obtained without gear, from a single initial rectilinear one. Figures 3 and 4 are illustrative of the double, or dual, looped crosshead, to secure uniform concentric motion in opposite directions. The following are the letters of reference, and the various parts they represent:—AA, male or inner shaft; BB, female or outer shaft; A', male crank-pin; B', female crank-pin; a, male crank slot block; b, female crank slot block (both made in halves); CC, thrust blocks; DD, bifurcated piston-rod, or looped and slotted crosshead; EE, slide attached to DD working on; FF, guides supporting cylinders; G, set screws for slides; and GG, propellers right and left-handed, keyed conically on each shaft.

When concentric rotary motion is required, but not at uniform speed, the male or inner shaft may be driven by ordinary connecting rod, and the female or outer shaft by a single looped crosshead, as shown in figs. 5 to 8; but where uniform rotary speed is necessary, either in one or opposite directions, the dual looped crosshead, or bifurcated piston-rod, as shown in figs. 1, 2, 3 and 4, is used; and though most of the experiments made during the past seven years have been for marine propulsion where speed and straight course is necessary by the employment of right and left handed screws rotating in opposite directions, there are many other uses to which the plan may be applied, as pumping (two diverse screws in a chamber lifting water, mud, or gravel, where no valves could be employed), for laying cord or wire uniformly in opposite directions over telegraphic cable, crushing and grinding mills, &c., without cumbersome and noisy cog or belt gear, and at increased speed if required, and specially for the de Meritens type of electrical machine.

The dual engine has, we are informed, been in use for five years in a launch 43 feet long, driving her at speeds up to 15 miles an hour, with marked economy in fuel, owing to the slow rate of piston travel. It is also applied, and has been successfully working, in the *Dua*, an iron 50-ton yacht. Other advantages claimed besides increased speed on a given consumption of fuel, are the perfect steering and non-liability of the vessel to sheer to one side or other when suddenly stopped and the engines reversed, the rudder being affected by the direct throw (or drag when backing) of the water in line with the keel, instead of an oblique direction, as with single screws.

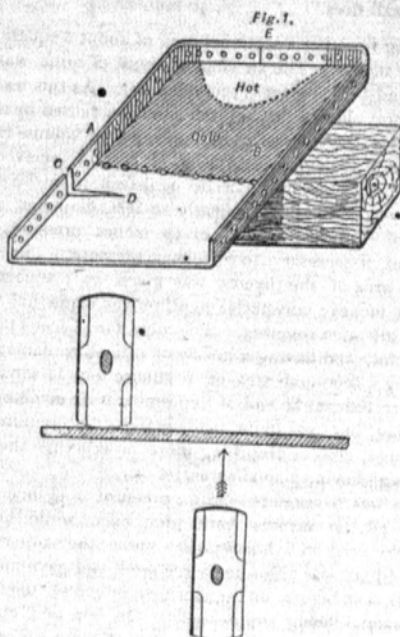
## ON CRACKS AND ANNEALING OF STEEL.\*

By Mr. A. C. KIRK.

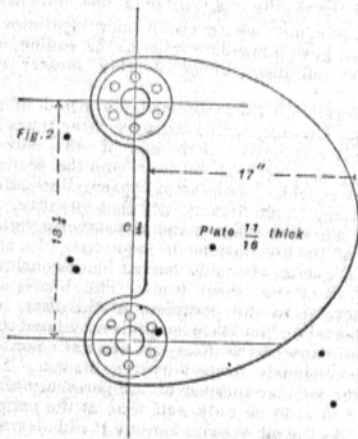
IT is well known that occasionally steel plates have been cracked in a way very mysterious and unaccountable, and the general cause to which it has been attributed was want of annealing, or that process done badly. But, whichever was the way, it has been commonly assumed that the cause is the existence of unequal strains in the plate produced by unequal cooling. To confine this mystery to narrower limits, and elucidate the question of annealing, is the object of this short paper. About the middle of June, last year, I had my first experience of these cracks, that it has ever been my good or bad luck to have happened actually in my own practice. The plate (a back tube plate) had been flanged at the smith's fire, heated all over in the furnace, straightened up, and allowed to cool in the usual way. The centres of the tube holes were marked off for boring, and two men were deepening the centres for the boring machine with a flogging hammer and punch, when the plate cracked, as shown at C D in the appended sketch, fig. 1, from which you will see that when it cracked, the plate opened at C, showing that there was a strain at that point on the plate. The plate simply cracked, and was not in the least reduced in thickness on either side of the crack, showing that no extension previous to fracture took place, in this respect agreeing with all the best information I have been able to collect of similar fractures, which have occurred elsewhere. With regard to such cracks it has long been my opinion that it is hard to see how a material which can stretch 25 per

cent. under a strain without fracture can break with no extension at all. This is confirmed by many things we see often: notably so in steel rivets shrinking and never breaking, flanged boiler fronts, with holes flanged in them, which have been heated and worked piecemeal, and which I have never found to crack, though tumbled freely about before they were put in the furnace and straightened; virtually annealed.

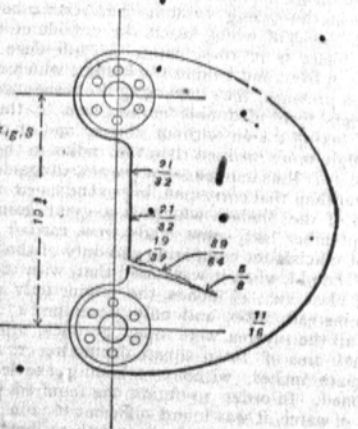
From this we may deduce that, when such fractures occur, there is a presumption that there has been from the be-



ginning—from the ingot state, probably—a line of weakness, along which the fracture takes place. As this seemed worth testing, I set about it as follows:—I had the plate drilled across at the line A B, shown on fig. 1. The remainder of the plate I had heated in the furnace all over to a bright red, removed, and laid outside, as in fig. 1, and cold water and wet cloths applied to the shaded part marked "cold" till it was quite cold. At this time the unshaded part, marked "hot," was hot enough to just set fire to straw. The whole plate was now cooled as quickly



as possible. Thus, I think, I succeeded in putting the upper part of the plate in tension to the utmost degree possible by unequal cooling, and if steel must break when that is done, it ought to have cracked in the flange marked "hot." Lying on a block of wood, I had it struck six times over various parts of its surface by full blows of a 28 lb. hammer, which produced no effect. I then had a 28 lb. hammer held up against the flange at one side and struck four times with another, the only result being to bend the flange slightly. The same thing was repeated in the middle of the



flange, at the "hot" end, with the same result. I then had the flange at hot end at E, fig. 1, nicked deeply on edge and both sides with a rod chisel and 28 lb. hammer, after which the plate was struck six blows on the surface without fracture. After that the flange was held up on one side of the nick by the same hammer and struck four times on the other side, without starting a fracture. I then had it next supported on two blocks under the steam-hammer, about six inches apart, and bent the part between these three inches, still without producing a fracture.

Thus, sound steel put intentionally into the greatest state of tension possible, by unequal cooling, does not crack, and cannot be cracked. I have heard the proposition stated, I believe, in this room, by an eminent steel maker, that contraction tears a plate, the fracture then commencing at the edge and gradually extending into the plate, and that thus, you could not expect to have extension as in a simultaneous fracture right across a piece of steel. I now lay before you the result of having a piece of steel plate torn in this way, and the result will completely dispel any such illusion. The plate I prepared was of mild steel, shaped as in appended sketch, Fig. 2, with the object of tearing it by direct tensile strain. The results obtained were quite in accordance with my expectations, the thicknesses decreasing in all directions towards the place of fracture, but more especially along the edge of the plate, and of the fracture, as will be seen on reference to appended sketch, Fig. 3. The plate stretched between centres 1½ inches when rupture took place under a load of 80 tons. The action of stress throughout the material is distinctly marked in clearly defined lines, by the cracking of the surface skin or scale. The experiment was carried out at Lloyd's testing house, and owing to the arrangements in their chain cable testing machine, one end only could be fixed to the machine head, while the other had to be fastened by a shackle to a cable end. This I take it, proves that the tearing theory—which, I confess, I never could comprehend—is no explanation; and, further, that such cracks are simply due to lines of weakness in the steel, which annealing, will not cure, although it may easily, as I showed in the discussion of the steel of the *Livadia*, boilers (*Trans. Inst. Nav. Arch.* vol. xxii, page 25), do harm; and that the best thing is a certain amount of rough treatment (even if done intentionally, as a test), and if that cracks a plate, the plate is to be thankfully rejected. I hold that I have succeeded in proving that these mysterious cracks in steel are not produced in the working of the steel after it is rolled, and where the germ exists cannot be prevented from showing themselves by annealing; the only test being some rough usage and knocking about. It remains for the steel maker to assign a cause for these fracture lines, and provide a remedy. After all, we have much fewer defects in steel than we had in iron, although, it is true, they are of a different kind.

## THE DEVELOPMENT OF THE LIGHTING POWER OF COAL GAS; WITH NOTES ON STREET AND INTERIOR LIGHTING.\*

By Mr. GEORGE BRAY.

THE electric light, whatever may be its ultimate effect on gas interests, has served the purpose of rousing the attention of those engaged in the gas industry to the possibilities of their position, and appears to have inspired them with a general determination, not only to maintain their present posts of advantage, but to make, with vigorous steps, further advancement. That this progress may be substantial, it is necessary that it should be based upon sound principles, and if, in the past, wrong lines have been followed, it will, of course, be of advantage to all connected with gas, and likewise to the general community, that a new departure should be taken in the right direction. In this paper, it will be my endeavour to show, that with regard to the development of the lighting power of coal gas, a wrong theory has universally obtained, and to enunciate, in its place, a correct one. In doing this, publicity will be given to a matter, intimately associated with the success of my business, which has hitherto been kept to myself; but the time has come when correct information on a question of so much importance should be made known for the benefit of the industry with which we are all connected.

The prevailing theory has been that in order to develop its utmost lighting power, gas must be consumed at the minimum of pressure at the point of ignition. Instances of the promulgation of this theory abound in papers read before the several gas and other influential associations, and in evidence given in courts of law and before parliamentary committees; and, as full accounts of these have been published in our trade and other journals, there is no necessity to give quotations in proof of its prevalence. But I am confronted with this initial difficulty, that the amount of pressure meant by the "minimum of pressure" has never been defined; but a general idea of what is understood by it may be gathered from such quotations as, the gas should be consumed "without pressure," at the "lowest possible pressure," and "pressure at the point of ignition decreases illuminating power." The theory, as thus expressed, has been applied to flat-flame and Argand burners alike, and the above forms of expression have been repeated as if they were axiomatic. In dealing with this theory, I shall endeavour to show:—

- (1) That the leading functions performed by pressure in Argand and flat-flame burners are opposed to each other, and that consequently no theory based upon the identical operation of pressure in both classes of burners, can be a guide for the development of their lighting power.
- (2) That the successive developments of the lighting power of neither class of burners have been accomplished under the condition of a minimum of pressure.
- (3) That, as the lighting power of gas per foot consumed is increased by flat-flame burners, there is, all other things being equal, an increase of pressure.

And in the fourth place I shall lay down what I consider the right principle, applicable to both classes of burners, for the development of their lighting power.

To prove my first proposition as to the diverse functions performed by pressure in the two classes of burners, and its consequent unreliability as a guide, let us consider its operation when a flat-flame burner is used. In this burner pressure has to perform the essential duties of spreading and giving stability to the flame, and of keeping up the temperature by accelerating combustion, all of which it does by ejecting the gas into the atmosphere, at a considerable speed. On the other hand, in the Argand

\* Read at the twenty-third session of the Institution of Naval Architects, March 1882.

\* Read before the North British Association of Gas Managers at Edinburgh, July 1882.



TABLE I.  
EXTRACTED FROM BRITISH ASSOCIATION OF SCIENCE TESTS, 1878.  
(GAS 26 CANDLES.)

Kind of Burner.	At 0.4 Inch Pressure at Point of Ignition.			At 0.9 Inch Pressure at Point of Ignition.		
	Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.	Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.
"Regulator" union jet No. 0	1.00	2.72	13.6	1.50	3.13	10.4
" " " No. 1	1.15	3.75	16.3	1.80	4.30	11.9
" " " No. 2	1.50	5.03	18.7	2.30	7.25	15.8
" " " No. 3	1.80	7.97	22.1	2.75	10.11	18.4
" " " No. 4	2.40	11.26	23.4	3.60	15.21	21.1
" " " No. 5	2.60	12.76	24.5	4.35	20.49	23.4
" " " No. 6	3.15	15.95	25.3	4.95	25.42	25.7
" " " No. 7	3.80	20.07	26.4	6.05	32.75	27.1
" " " No. 8	4.70	24.76	26.3	7.10	40.63	28.6

TABLE II.  
EXTRACTED FROM BRITISH ASSOCIATION OF SCIENCE TESTS, 1880.  
(GAS 16 CANDLES.)

Kind of Burner.	At 0.5 Inch Pressure at Point of Ignition.			At 0.6 Inch Pressure at Point of Ignition.			At 0.9 Inch Pressure at Point of Ignition.		
	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.
"Special" slit union No. 4	3.2	8.0	12.5	4.8	13.6	14.2	6.4	17.8	13.9
" " " No. 5	3.2	8.2	12.8	5.1	14.2	13.9	7.0	19.5	13.9
" " " No. 6	3.5	8.8	12.6	5.7	16.0	14.0	7.8	21.6	13.8
" " " No. 7	3.9	10.6	13.6	6.4	18.4	14.4	8.8	26.0	14.8
" " " No. 9	4.8	13.2	13.8	7.9	25.2	15.9	10.8	34.5	16.0

TABLE III.  
(GAS 16 CANDLES.)

Kind of Burner.	At 0.4 Inch Pressure at Point of Ignition.			At 0.9 Inch Pressure at Point of Ignition.			At 1.3 Inch Pressure at Point of Ignition.		
	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.	Cubic Feet of Gas per Hour.	Illuminating Power.	Illuminating Power per 5 Cubic Feet of Gas.
Market, batwing	5.8	17.8	15.3	9.8	32.2	15.6	13.6	45.0	16.5
" " " " "	6.2	19.3	15.0	10.3	33.5	16.2	14.1	48.0	17.0

Note.—The pressures in the original tables are higher than those here stated, but the stuffing in the burners reduces the pressures at the point of ignition to, as nearly as possible, those given above.

burner, pressure does not spread and give stability to the flame, nor accelerate combustion. Apply a light to the Argand burner, when divested of its chimney, and there is a dull and rolling flame; the pressure being insufficient to give it brilliancy and stability; put on the chimney, and without any change of pressure, the rapidly upward moving column of air make the flame bright, luminous, and steady. Thus in the case of the Argand burner the rapidly moving columns of air perform the functions which in the flat-flame are effected by the rapid flow of the gas. Now, let us notice another opposite effect of pressure on the two flames, which is, as we shall see hereafter, vital in its import. Apply a light to each of the burners when only a small quantity of gas is turned on. Gradually turn on more gas and you will see that as the pressure increases the flat-flame is thinned, whilst the Argand flame is thickened. In view of these different effects produced by pressure in the two classes of flames, I submit that no theory based on pressure can be a guide for the development of their lighting power.

We will now consider my second proposition, that the developments of the lighting power of neither class of burners have been accomplished under the condition of a minimum of pressure. Let us light a flat-flame burner which will yield its best result with a consumption of say 5 feet of gas per hour. Now with the lowest possible pressure of gas, there is only a small speck of blue flame at the tip of the burner; of course it would be absurd to say that this burner is now yielding its greatest amount of light for gas consumed; but if the minimum of pressure theory were sound, such would be the case. If, however, this be not the minimum meant by those who advanced the theory, we will turn on more pressure until the burner is consuming say 2½ feet of gas per hour; now is this the minimum of pressure at which the burner yields its highest lighting power for gas consumed? The reply, of course, is no. Then let us put on more pressure, until a consumption of 5 feet per hour is reached, and that being the pressure at which the burner yields the greatest amount of light for gas consumed, and seeing that we have been gradually increasing the pressure from the lowest possible, up to the present point, would it not be as reasonable to say, that this burner yields its best result at a maximum as at a minimum of pressure? Again let us test the minimum of pressure theory with an Argand burner. We will take a five-foot Argand. In this case let us observe the results when the burner is consuming the quantity of gas per hour for which it is constructed, viz., 5 feet. With this consumption it will yield, say 16 candles of light. Now, if the pressure be diminished, that is, if we leave the maximum pressure at which the burner is designed to work, and go in the direction of the minimum

of pressure, shall we increase the lighting power for gas consumed? Certainly not; for, lower the pressure until the burner is consuming 2½ feet per hour, and the light yielded, instead of being 16 candles per 5 feet of gas, is only 10; lower the pressure further, and the lighting power for gas consumed is still further reduced. Thus showing that simply lowering the pressure in the Argand does not increase the lighting power, as it would do if the minimum of pressure theory were correct. But it may be said, that if the pressure could be lowered, and the burner still made to pass its 5 feet per hour, then the lighting power might be increased. I reply that the holes for the emission of the gas even in the best Argand burners could be so enlarged that the requisite quantity could be passed at one quarter the lowest pressure now employed; yet this is not done. And I venture to say, that Argand burners are not constructed, and never have been, in accordance with the minimum of pressure theory.

My third proposition, that as the lighting power of gas per foot consumed is increased, by flat-flame burners, there is, all other things being equal, an increase of pressure, is illustrated by the accompanying tables of tests made at the instance of the British Association for the Advancement of Science. It will be observed in Table I. that the best result for gas consumed by No. 2 union-jet is at 4.10ths pressure, which yields 18.7 candles with 5 feet of 26 candle gas. But when Nos. 6, 7, and 8 are reached, 4.10ths pressure ceases to yield the best result; a pressure of 9.10ths takes the first place, and a development of 28.6 candles for 5 feet of gas is yielded. An examination of Tables II. and III, which contain tests with 16 candle gas, will further illustrate my proposition, and without submitting these as conclusively proving my proposition, I put them forward as strong evidence in its favour, and feel sure that the more it is tested by further experiments, the more firmly will its correctness be established.

The above considerations, I maintain, prove that whatever the principle may be by which the lighting power of coal-gas is developed, the minimum of pressure theory, instead of embodying it, is wholly unsound and misleading. Let me now direct your attention to the principle which I hold to be correct. It is the one in accordance with which all my improvements in the lighting power of burners for several years have been effected; and notably the improvements effected in slit burners in 1879, whereby I increased the lighting power of 16-candle gas by 2.2 candles; and, further, all former improvements are explainable on this principle. My theory is, that to develop the lighting power of coal-gas the thickness of the flame must be adjusted to the quality of gas to be consumed; that for every quality of gas there is a thickness of flame which will yield the greatest

amount of light for gas consumed; and that the thickness required lessens as the lighting power of the gas increases.

For the production of the requisite thickness of flame, the primary agent is the burner. But, as will have been gathered from the remarks on my first proposition, pressure of gas is also an important agent in producing the requisite thickness of flame, though no modification of pressure will remedy an initial defect in a burner. Guided by the thickness of flame principle in the construction of burners, and taking advantage of the thinning of flat flames, and the thickening of Argand flames by pressure, it is possible to make burners consuming an equal quantity of gas to yield their highest lighting power with materially different pressures. As will be seen from Table III. flat-flame burners may be made to yield their best results with a high pressure at the point of ignition (which gives a firm flame), when required. In the Argand burner the requisite thickness of flame may be, and is obtained in several ways, viz., by using different diameters and numbers of holes for the emission of the gas; by varying the distance of the holes from each other; by increasing or diminishing the size of the air inlets or of the chimney, thereby varying the speeds of the air columns, the lateral pressures of which exert an important influence on the thickness of the Argand flame. Take a five-foot Argand burner, retain the chimney and all the other parts unaltered, and reduce the consumption to one-half, and, as before stated, the amount of light yielded is reduced to less than one-third. How is it that with one-half the consumption there is less than one-third of the lighting power? This is due to the lessened power of the gas to resist the lateral pressure of the upward moving columns of air, consequently the flame is thinned, and its oxidation too rapidly effected. This result with the Argand may be altered, and the lighting power, for gas consumed, brought up to nearly eight candles, by the simple experiment of lessening the thinning power of the air columns by obstructing the air passages at the top of the chimney. In the flat-flame burner the requisite thickness of flame may be obtained in several ways; but as the particular mode of doing this would be more appreciated by gas burner manufacturers than by an audience of gas managers, I need not mention it here, further than to say that the broad principle on which to work, is to adjust the width of the slit in batwing and slit union burners, and to adjust the holes in the union-jet burner so as to yield the requisite thickness of flame. Without entering into full particulars concerning the union-jet burner, I may state in passing that there are difficulties connected with it when used for gas say below 20-candle power, which interfere with the development of its lighting power, particularly in the smaller sizes. The larger sizes of union-jets, and all the sizes of slit burners present fewer practical difficulties, and they can be manipulated to give their highest or a medium lighting power as may be deemed best for the circumstances in which they are to be used. The principal circumstances to be considered are the amount of smoke that can be tolerated, and the atmospheric conditions—whether steady or agitated.

Having worked on this principle for some years, I was prepared, when the electric light challenged attention in Paris, at the exhibition of 1878, to meet it by an extension of the principle to flat-flame burners of larger lighting power. The diameters of slit burners then existing would not admit of a further development of their lighting power for gas consumed, as their gas consuming capacity could only be increased by further widening the slit, which in the case of the larger sizes, was already too wide, and yielded too thick a flame for developing the lighting power of the gas. In order, therefore, to make burners of greatly enlarged capacity with a suitable width of slit, I had to construct burners with greatly enlarged diameters, across the top of which it was possible to cut a slit of the required width, whilst giving the burner the capacity to pass the increased quantity of gas. The lighting power of flat-flame burners was thus increased from 14.8 candles—the highest result previously recorded, calculated to 5 feet of 16-candle gas—to 17 candles. All my improvements in burners for canal gas have been effected on the same principle. Before the discovery of this principle, there were many instances of improvements in the lighting power of burners, both in my own experience and that of others, which could be cited as illustrations of it. My first experiments with gas burners in 1864 illustrate it in a striking manner. They were conducted with a small union-jet burner, and I found that by placing a piece of wire across the broad part of the flame, close to the burner, its lighting power was increased. In order to obtain this improvement in a practical form, I fixed a small piece of thin metal between the holes of the small union jet burner, and this had the desired effect. But I found that the ratio of increase of light gradually lessened as the sizes of the burners increased, until sizes were reached in which the piece of metal either ceased to afford any advantage or became a disadvantage. That is to say, in the smaller sizes of burners, where the flame was much too thin to develop the lighting power of the gas, the piece of metal increased its thickness; but when applied to those sizes of burners in which the flame was thick enough for the quality of gas, the advantage of the flame-thickening piece of metal disappeared. Thus, without then knowing anything of the principle enunciated, I was actually putting it into effect. This mode of increasing the lighting power of burners was afterwards patented by another person, and since then it has been frequently revived as a novelty. Another example is furnished in my double-flame burner, which gave the increased light in a more acceptable and striking manner than by placing the wire or the strip of metal in the flame. This burner, as you may be aware, consists of two small burners whose flames are brought together, so that they join immediately above the top of the burner. The result of this combination of the two thin flames is a large increase of light, owing to the thickening of the flame and the consequent retardation of combustion. At the time I patented this burner, viz., in 1865, I was under the impression that it was a novelty, but afterwards found, to my consternation as a young inventor, that it had been anticipated. I ceased to manufacture it, on account of its many practical defects, foremost amongst which are its smokiness and looseness of flame when used below 8.10ths of pressure. Notwithstanding its history and its defects, people continue to patent this burner, and, some of them, by means of experimental tricks, well known to most gas managers, but



Unfortunately, not to their customers, palm it upon the public as a new invention, and as superior to all other burners. A further illustration of the operation of this principle, is afforded by the enlargement of the holes of the Argand burner, which was done some years ago, whereby the flame was thickened, and, consequently, as I hold, the lighting power increased. But this increase of lighting power was attributed to the diminished pressure at the point of ignition, which would obviously take place. Hence, apparently, arose the theory applied indiscriminately to Argand and flat-flame burners, that to develop the lighting power of gas to the utmost advantage it must be consumed at the lowest possible pressure.

Having thus set forth the principle on which, as I maintain, all developments of the lighting power of coal-gas have been, and must continue to be made, let us pass on to the consideration of the use of the improved burners. Their increased capacity and improved lighting power per foot of gas were attended by disadvantages arising from increased unsteadiness, and tendency to smoke. For many purposes these would have been fatal objections. To overcome the unsteadiness, I determined, for street lighting, to support the flames by a regulated vertically-moving column of air, similar to that employed in the Argand burner, but necessarily of much larger area; and this was obtained by the mode of top and bottom ventilation, with which you will all be acquainted in my street lanterns. But this column of air whilst steadying the flames, unduly thickened their edges on the under side, and gave them a tendency to smoke, to overcome which I placed a wing or projection immediately under each edge. But I came to the conclusion that the most efficient means for lessening the smoky tendency, increasing the brilliancy and controlling the lighting power of the flames, would be to group them as shown in fig. 3, in such a way that they would heat each other. This grouping of the flames had the further advantage that it enabled the number of the burners to be multiplied to any extent required to compete with the fabulously stated power of the electric lights on their own sensational lines. Another advantage obtained by so grouping the flames, is that it disperses, to a great extent, the shadows produced by the ribs of the lantern, by rendering a large portion of the flames visible on each side of each rib. By these means the use of large and improved flat-flame burners was rendered not only possible but highly advantageous. It will have been gathered from what has already been stated that I had full confidence that the flat-flame system of lighting was the proper one by which to advance gas interests. It may therefore not be out of place that I should here briefly state for future guidance the advantages which the flat-flame burner possesses over any burner on the Argand principle. In the course of experiments with the latter burner, with the object of improving its lighting power, I became convinced that, for the trying conditions of everyday use, it was unsuitable by reason, of its sensitiveness, to variations of pressure—its tendency to smoke with the slightest addition to the maximum quantity of gas it is constructed to consume—its rapidly diminishing yield of light for gas consumed, when burning less than its full quantity—the necessity for the use of a chimney—the rapidly diminishing yield of light by the dirtying of the chimney, and because the chimney becomes semi-opaque by use when it does not happen to break. In addition to all these defects, there is, when it has to burn gas of a high quality, the objection that it yields, even on the photometer, less light than the flat-flame burner. These defects, I felt sure, would all be developed to the utmost, when Argand burners were used for street lighting, and must be fatal to the system. History has confirmed this opinion. Another defect of the Argand burner is its lack of top and bottom light, as compared with the flat-flame burner. It has been stated before a committee of the House of Commons, and in papers read before Gas Managers' Associations, that the Argand burner yields a light in all directions alike, which means that the side light shown on the photometer is the measure of its lighting power in all directions. A more inaccurate statement is scarcely conceivable. The error of that assertion can be easily ascertained by placing an Argand burner against a whitened wall, when it will be seen how much more powerful is the lateral than the top and bottom light. Had space permitted, I would have given you an account of an unique experiment, proving that the total all round light yielded by a flat-flame burner with 5 feet of gas, is at least equal to that yielded by an Argand with the same consumption. Want of space also compels me to defer, until another occasion, dealing with the many important considerations arising out of the principles I have been discussing.

#### PRACTICAL SUGGESTIONS FOR STREET LIGHTING.

We will now pass on to the consideration of some of the conditions to be fulfilled in order to secure effective street lighting. It is an essential feature that there should be an even distribution of light over the whole of the roadway. There should be no brightly lighted spots, with intervening patches of comparative darkness, for, in addition to their objectionable appearance, streets so lighted are unsafe, as both foot passengers and drivers of vehicles have their eyes so dazzled in passing over the excessively illuminated spots into the darkness immediately beyond, that an element of danger is introduced into the streets. I also hold that the illumination of the upper parts of buildings, especially those that have balconies and similar projections, is necessary, in order to afford security to property, by giving the police the power of watching the upper as well as the ground floors. In this age of advancing taste, those interested in the progress of gas lighting cannot afford to lose sight of that which is pleasing to the eye. To put the upper parts of buildings in darkness is to throw away one of the most effective applications of gas lighting. It is true that some of the structures in our principal streets do not call for much admiration, but when we consider the splendid lines of buildings in most of the large towns of the United Kingdom, of which Princes Street, Edinburgh, affords so conspicuous an example, I think you will agree with me that to throw those imposing facades into darkness would be an act of unqualified vandalism. But there is the further and very important advantage that the illumination of the buildings materially assists, by reflection, in distributing the light over the roadway. The bright and cheerful appearance of streets

so lighted contrasts most favourably with those whose buildings are left in darkness, as the latter present overhead the oppressive appearance of a dark vault. To attain the objects just mentioned, the light must be carefully manipulated. In my opinion the only portion of the light which could be regarded as wasted, if allowed to pass away, is that which passes vertically upward. The best way to deal with the upward vertical rays is to utilise them by means of a flat porcelain or other reflector, placed in the roof of the lantern, for the purpose of clearing the base of the pillar from shadows. The whole, or a large portion of the upward oblique rays should be allowed to pass through the roof and sides of the lantern and reach the buildings; in order to admit of this the portion of the lantern roof, not covered inside by the reflector, must be made of clear or of white glass, and not of any opaque substance. Another important point is that the flames should be well below the waist of the lantern, so that when white glass tops are used, some of the oblique rays may pass upward to the buildings through the clear side panes. If the flames be placed too high in the lantern, a too great concentration of the downward reflected rays takes place immediately around the base of the pillar. The pillars usually employed in our streets averaging from 9 feet to 10 feet in height, are too low to admit of an equable diffusion of light, and this defect is made more patent by the introduction of lanterns of large lighting power. For lanterns up to 100 candle power, the columns should not be less than 10 feet high, 12 feet would be better, but the public would probably object to the innovation. Lanterns of 80-candle power, placed on columns 12 feet high, light broad thoroughfares in an equable manner, and such an elevation would ultimately be accepted as an improvement. For wide open spaces, lanterns up to 1100-candle power are now advantageously employed. These should be placed on columns from 16 feet to 24 feet high, according to their power. For lanterns of 400-candle power and upward, enamelled iron, or porcelain tops are suitable, as the great height of the lanterns from the ground, and their distance from the buildings render clear or white glass tops unnecessary, and risk of breakage of top panes, which at that height cannot readily be replaced, is entirely avoided. In these lanterns a flash jet must be used, as they are out of the reach of the pole of the lamplighter. The modern demand for greatly improved lighting in the streets considerably increased the expenditure on gas, but this was soon materially lessened by the introduction of the "double service" arrangement, which enables the consumption of gas to be reduced to that of an ordinary street lamp, when the necessity for a strong light has ceased. This gives an advantage to gas lighting with which electric light companies have nothing to compare. It is well known that when there is more electric light than lighting authorities like to pay for, there is no middle course, and the lights must be extinguished.

#### INTERIOR LIGHTING.

Though great improvements have been made during recent years in interior gas fittings, our great difficulty still lies with the makers and fitters of gas-lighting apparatus. They, as formerly, seek to gratify the taste of their customers in design, clearly, in most cases, without the knowledge requisite to guide them to the construction of fittings adapted to apply gas with efficiency and economy. How to get these well-intentioned people to study the present phase of gas-lighting is a problem which I cannot here attempt to solve, but much can be done by gas managers exerting their influence against the use of unsuitable fittings. There is now the greater necessity for this because our electric light friends are attacking us in our most vital part. They have had the acuteness to detect and to play upon our most telling defects, viz.: the heating and vitiation of the atmosphere. This is a legitimate form of attack, and it touches a weakness on our side which the public eagerly magnify. But if it can be shown that the defects named are not inherent in the system, and that gas apparatus can also be made a valuable ventilating agent, then an advantage will be secured for gas with which the electric light has nothing to compare. For the purpose of combining ventilation with gas lighting, ventilating chandeliers

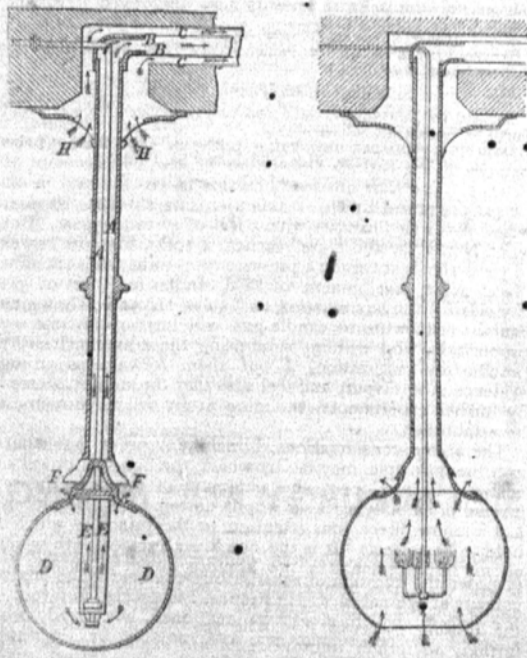


FIG. 1.

FIG. 2.

have been designed from time to time, but, so far as I am aware, these have always been employed in connection with the Argand burner, the defects of which have already been

pointed out. To remove the disadvantages of the system owing to the use of the Argand burner, which disadvantages I consider have prevented its more general introduction, I determined to remove that burner and to try and adapt the system to flat-flames. In this attempt my highest expectations have been realised. For the introduction of the Argand ventilating chandelier, which has been in use for several years, I believe we are indebted to Mr. Benham. Its object is not to allow the heated products of combustion to pass into the atmosphere of the room, but to convey them direct from the burners into a chimney, or into the outer air. His apparatus is shown in section in fig. 1. A ventilating shaft A A, suspended from the ceiling, and turned by an elbow into the horizontal tube B B passes between the ceiling of the room and the floor of the upper chamber into the chimney. The upper part of this shaft is surrounded by an outer tube C C which also opens into the chimney. To the bottom of the suspended shaft is attached the large globe D D and inside this globe is placed the Argand burner E. The air for supporting combustion is admitted at the openings F F, descends between the sides of the globe and the burner, and then ascends the chimney of the burner. The products of combustion enter the ventilating shaft A A, and are thereby conducted into the chimney of the room. The outer tube C C is intended to ventilate the upper part of the room. When the burner is lighted, the air in this outer tube is warmed by the heated air and gases passing through the inner shaft, and a draught is thereby induced into the chimney of the room. The air of the room passes through the openings H H to supply the place of the rarefied air, and it, in its turn, is conducted into the chimney. In this way the room is kept free from the products of combustion and its air effectively, but imperceptibly renewed. I have before stated it was to remove the objections connected with this system that I determined to try to adapt it for flat-flames, and for two years I have had such a modified form in successful operation in my own dining-room and have supplied them to some of my friends. A section of this is shown in fig. 2. The alterations I have made are in the globe, the burners, and the diameter of the ventilating shaft.

These were made to secure the steadiness and brilliancy of the flames whilst ensuring that the products of combustion should pass up the shaft and not into the room. For the latter purpose, it is necessary, when flat-flame burners are employed, to use a shaft with a greater diameter than when the Argand burner is used, as the chimney of this burner conducts all the products of combustion directly into the ventilating shaft, whereas with flat-flames, whilst the products of combustion naturally keep to and ascend up the centre of the globe they are mixed with a large quantity of air which necessitates a wider shaft. The interior diameter should not be less than two inches; but the usual sizes when the Argand burner is used are only from 1½ inches to 1½ inches. From the bend the horizontal part of the tube should be 3 inches in diameter to afford a free flow for the outgoing products. The burners are arranged in clusters on the principal I introduced into street lanterns. To secure the steadiness of the flames I arrange for a column of air having a diameter considerably greater than that of the flames, to pass through the globe, by making in a 12-inch globe a hole at the bottom 7 inches wide; and a suitable speed of air is obtained by making the top outlet of the globe of the same diameter, as the bottom opening. The conical bottom of the shaft is 5 inches in diameter. These dimensions produce a column of air which is adapted to the flames when they are placed in or near the centre of the globe. It will be perceived that a much greater quantity of air is admitted at the bottom of the globe than can pass up the ventilating shaft; the portion of the air which does not come in contact with the flames passes through the annular space between the top of the globe and the bottom of the ventilating shaft, whilst the products of combustion and the air brought into contact with the flames are caught by the conical bottom of the shaft, up which they pass into the chimney. As to the efficiency of this apparatus, I can state that it leaves scarcely anything to be desired. The whiteness and steadiness of the flames are so remarkable, that people who are not familiar with the capabilities of gas, and who deemed that so admirable a result could only be yielded by the electric light, have frequently mistaken it for the new illuminant. The wide opening at the bottom of the globe allows the light to pass downward, and the ground glass globe, which I use in preference to either clear or opal glass, diffuses the light over the whole of the room, in a manner which cannot be equalled by the ordinary chandelier with all its light obstructing paraphernalia. This improvement I have not attempted to secure by patent, nor have I time to enter upon the manufacture of the chandelier, but I shall be glad to give every assistance to manufacturers who may choose to take it up on their own account. I have pleasure in giving a public description of it, for I am sure that its general adoption, in place of the common chandeliers, would greatly promote gas interests.

This paper has assumed larger proportions than I originally intended, and had I written it before sending the title to the secretary, the latter part would probably have given place to a more detailed exposition of the theory of the development of the lighting power of coal gas. But, under any circumstances, this last field is too wide to be covered within the desirable compass of a paper to be discussed at this meeting, and I must defer the fuller consideration of many of the points touched upon and their practical outgrowths until another occasion. For the present my object has only been to open the subject, I have been assertive rather than argumentative in places; but I have endeavoured to suggest lines on which experiments may be made, so that the correctness or otherwise of the theory may be demonstrated by any person who chooses to go into the subject. And I trust that what has been said will help to quicken the attention of those concerned in gas affairs and stimulate further inquiry and experiment.

Note.—Since reading this paper I have become aware that flat-flame burners have been employed by other persons in connection with a ventilating chandelier, but the burners and the globe are not arranged on the principles described above, and in these and other particulars that apparatus differs to an extent which I regard as vital from the one which I have constructed.



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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 Editor does not hold himself responsible for opinions expressed by correspondents.]

## THE SUPPLY OF TRAMWAY ENGINES.

To the Editor of IRON.

SIR,—Noticing in your issue of August 25 an article on the supply of tramway engines, in which the Wilkinson engine is alluded to as consuming 21 lb. of coke per mile run, according to a statement given in a "descriptive circular," would you kindly allow us to state that we have never issued such a circular; whatever has appeared in print to that effect has done so without our sanction. However, we may say that the engines now working on the Wigan and Penrith line of tramways (a line of curves and gradients of 1 in 16 and 1 in 20 from end to end) are working with considerably less fuel per mile than as stated above, and if the line were anything like a fairly level one, the consumption would be still further reduced. We do not claim superior economy with our boiler, but we claim so many other advantages that we find them far outweigh the disadvantage of burning a little extra fuel; and in proof of what we assert, we beg to point to the fact that we have engines working on the above heavy and severe line of tramways that have run continuously thirteen thousand miles without any renewals or repairs of the working parts, save re-turning the wheel tires, which fact, in the annals of steam traction on tramways, is unparalleled. We note the remarks about the engines on the Batley, Dewsbury and Birstal Tramway, but we have strong reasons to believe that engines made by the same firm for the North Staffordshire Tramways, Stoke-on-Trent, have given a very different result, as far as pounds, shillings, and pence, wear and tear, and durability are concerned; consequently that company have, after careful examination of the merits of our engine as a whole machine, given an order for the building of a number of them, their fuel burning propensities notwithstanding.—We are, &c.,

WM. WILKINSON AND CO.

Holme House Foundry, Wigan.

September 1, 1882.

Our correspondents will please note that the remarks in our article, to which they take exception, are quoted from a contemporary.—Ed.]

## SCIENCE AND ART.

**SOUTH KENSINGTON MUSEUM.**—Visitors during the week ending September 2, 1882:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum, 12,800; Mercantile Marine, Building Materials, and other Collections, 6,477. On Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. to 6 p.m., Museum, 20,500; Mercantile Marine, Building Materials, and other Collections, 707; total, 22,034. Average of corresponding week in former years, 20,385. Total from the opening of the Museum, 21,296,343.

**TECHNICAL EDUCATION AT NOTTINGHAM.**—An important movement is taking place among the manufacturers and machine makers of Nottingham to promote the establishment of a first-class technical school in connection with the University College in that town. A nucleus fund for this purpose has been provided by the Drapers' Company in a grant of £300 per year for five years, with an additional £200 in the first year for the purchase of apparatus. This grant is, however, subject to certain conditions, and is also to some extent dependent on the amount of local enterprise which is displayed. The company, after mature consideration, and upon the report of Mr. Magnus, the director of the City and Guilds' Technical Institute, who, with certain members of the Drapers' Company, visited Nottingham to make inquiries, resolved to make the grant through the institute, and the instruction provided by it is to enable students, artisans, and others to present themselves for the institute examination in mechanical engineering. A course of instruction in practical mechanics is to be given by a professor of physics and mechanics in the evening, and the services of a skilled fitter are to be obtained to act under the professor in the practical explanation of the tools and machinery used in lace and hosiery manufacture. The local committee are now arranging for the setting apart of portions of the college for this special purpose.

**THE INSTITUTE OF PATENT AGENTS.**—The Institute of Patent Agents was incorporated under the Limited Liability Companies Acts 1862 to 1880, on August 12, the word "Limited" being omitted by licence of the Board of Trade. According to the Memorandum of Association, the objects for which the institute is established, are: (a) 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. (b) To frame and establish rules for the observance of Patent Agents in all matters appertaining to their professional practice. (c) 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. (d) To raise and obtain moneys by subscriptions, donations, or otherwise for expenditure in accomplishing the objects of the association, and to expend such moneys when raised in accomplishing such objects. (e) The doing all such other lawful things as are incidental or conducive to the attainment of the above objects or any of them. The affairs of the institute are to be managed by a council (chosen from Fellows only), assisted by officers to be appointed according to certain regulations. The first council is composed as follows:—President, Mr. J. H. Johnson; Vice-President, Mr. J. Inray, M.A. Council, Messrs. C. D. Abel, W. Brookes, W. Carmichael, St. J. V. Day, A. V. Newton, G. Shaw, W. Speuce, W. L. Wise. When we take into consideration the value of the interests that are constantly entrusted to Patent Agents, we cannot think that the institute has been established too soon, and we can only hope that by judicious administration the institute will prosper and become sufficiently powerful to prevent incompetent, and often dishonest, persons from practising as Patent Agents to the serious detriment of the inventor of patentee who falls into their hands.

## MEETINGS FOR THE WEEK.

TUESDAY, SEPTEMBER 12.

HEREFORD MUSICAL FESTIVAL.—1.15 p.m. Mendelssohn's "Elijah." 8 p.m. Concert in Shire Hall.  
ROYAL HORTICULTURAL SOCIETY.—3 p.m.  
STAFFORDSHIRE AGRICULTURAL SOCIETY SHOW.—Lichfield, also Poultry Show (two days.)

WEDNESDAY, SEPTEMBER 13.

SOCIETY OF ENGINEERS.—Visit to the Dockyard, Guntery and Torpedo Vessels, Portsmouth.  
HEREFORD MUSICAL FESTIVAL.—11.30 a.m. Handel's "Judas Maccabeus," &c. 8 p.m. Mendelssohn's "St. Paul."

THURSDAY, SEPTEMBER 14.

HEREFORD MUSICAL FESTIVAL.—11.30 a.m. Dr. Garrett's "Shulamite," &c. 8 p.m. Concert in Shire Hall.  
WIRRAL AND BIRKENHEAD AGRICULTURAL SOCIETY SHOW.—(Three days.)

FRIDAY, SEPTEMBER 15.

BUCKHUNTING BEGINS.  
HEREFORD MUSICAL FESTIVAL.—11.30 a.m. Handel's "Messiah," 8 p.m. Chamber Concert.  
EXHIBITION OF LEATHER MANUFACTURES AT THE AGRICULTURAL HALL.—To be opened by the Lord Mayor. Noon.

SATURDAY, SEPTEMBER 16.

ZOOLOGICAL SOCIETY, 4 p.m.

## METALLURGY AND MINING.

**NICKEL VERSUS BRONZE.**—The committee appointed to consider the question of substituting a nickel for the bronze coinage at present in use in France, has decided in favour of the project, which, it may be mentioned, has already been adopted by other countries and notably by Germany, Belgium, and Switzerland. The work thus thrown upon the mints of Paris and Bordeaux will be gigantic, it being estimated that there are 500,000,000 francs' worth of bronze coins in circulation, but the necessary appliances are already in hand, and the work will be rapidly proceeded with.

**OBTAINING COAL BY THE LIME PROCESS.**—At the monthly meeting of the South Staffordshire Institute of Mining Engineers held at Dudley, on Tuesday, Mr. Lapworth, of the Cannock Chase Colliery, gave some account of the lime process of getting coal which had been carried out that day. He showed that the cartridges brought down a block of forty tons within an hour, and that the only slack produced would be made in breaking up the coal for loading purposes. He considered the experiments eminently satisfactory, although he was not prepared to give an opinion as to the relative cost of blasting with powder, or wedging.

**MANGANESE DEPOSITS IN TRANSCAUCASIA.**—At a recent séance of the Belgian Geological Society an interesting letter was read from M. J. Reuleaux, giving an abstract of a paper by Mouchketoff, Professor of Geology at the St. Petersburg School of Mines, on the deposits of manganese in Transcaucasia. It appears that the centre of the mining district is Tchiatoura, distant about 26 miles from the village of Kvirile, on the river of the same name, and a station on the Poti-Tiflis railway, 78 miles from Poti. Kvirile is 492 feet above the level of the Black Sea; and Tchiatoura 700 feet higher still, so that the incline is downwards all the way, and therefore favourable for transport. The chalk strata are overlain by a series, comparatively thin, of tertiary measures, in the lower portion of which the manganese ore is chiefly found. It forms a series of thin and almost horizontal beds, with a dip of two or three degrees to the north-east. The ore occurs in compact masses, strata of ore alternating with layers of manganeseiferous clay and talcy clay. These strata overlie the limestone of the upper chalk formations on the banks of the Kvirile. Analyses made at the St. Petersburg laboratory show that the ore contains from 85 to 94 per cent. of binoxide of manganese, and from 1 to 2½ per cent. of protoxide, which corresponds to from 55 to 61 per cent. of metallic manganese.

**BORING OPERATIONS WITH BOART.**—A correspondent writes:—"In the course of some boring operations which have recently been carried on by the Government of the Cape of Good Hope in the search for coal, it occurred to the geologist in charge to make trial of native boart in lieu of the Brazilian carbonado, which had, until then, been employed. The experiment proved a complete success. The last six crowns used were of 3 inches diameter, set with boart. It was found that these bored through 1100 feet of sandstone and shale, part of it exceedingly hard, being indurated by contact with intrusive rock. The average boring per crown was therefore 183 feet, and the last crown is nearly as good as new. Of the above six crowns, one bored through 322 feet 7 inches and was still usable, while another bored through 350 feet. In precisely the same class of country, eight crowns supplied from London and set with carbonado, bored only 30 feet each. The boring effected with the latter cost at the rate of 27s. 6d. per foot, while the work done with boart, in the same class of rock, cost less than 2s. per foot bored. The advantage in the use of boart is increased by the fact that, owing to the greater depth bored by a single crown, there is less delay caused by the resetting of the stones. Great care is, however, necessary in the selection of boart for the purpose, as a very large percentage of the ordinary boart of commerce is unsuitable."

**PETROLEUM WELLS IN RUSSIA.**—The petroleum wells of Baku, on the Caspian Sea, form the subject of a report from the Vice-Consul at Batoum, on the Black Sea. The increasing importance of these wells has led to a project being set on foot for connecting Baku and Batoum by means of pipes, thus avoiding the difficulties and dangers of the railway transport of the oil. At Batoum the petroleum will be pumped into tank steamers, and when the arrangements are complete and in working order, the consul says:—"Very sanguine expectations are entertained as to the possibility of successfully competing with the American petroleum imported to Europe." Mr. Peacock gives the following description of the Baku petroleum territory:—"The total area of the Baku petroleum region, taking its extreme points of surface oil, gas wells, &c., is not less than 1200 square miles. Its elevation above the level of the Caspian Sea varies greatly. The Caspian is 86 feet below the level of the ocean. The general aspect of this region is that of a barren desert, deprived of water and vegetation, chequered here and there with dried up salt lakes, natural outflows, and pools of oil, gas wells, and exhausted mud volcanoes. Even on the surface of the Caspian natural outflows of petroleum and gas may be seen at certain places. The boring operations are mostly carried out on the peninsula of Aspheron, where the potential productiveness is considered to be much greater than that of American petroleum regions. Comparing the results achieved in the two countries on the one side and the average depth and total number of wells on the other, it may be justly stated that the natural petroleum riches of Baku, as far as our knowledge goes, have no parallel in the world. The lands are partly purchased and partly held by lease. The former comprise 680 desetines, or 1836 acres, sold by the Crown to different parties by public auction for the sum of Rs.2,980,307, or above £300,000 at the rate of exchange in 1872, when the sale took place. For certain plots as much as £3500 per acre has been paid. The yearly rent for leased Crown land is only Rs.10 per desetine, or about 7s. 6d. per acre. These lands were supposed to be worthless at the time, but the contrary has been proved since, and they now form a subject of wild speculation among the numerous moneyless leaseholders very detrimental to legitimate business. A tract of the most valuable petroleum land, with an area of 270 acres, has been granted to a certain number of high officials as a token of imperial favour. In 1873 the number of wells sunk by way of drilling was 17. The total number now is above 375. The average depth of borings is 350 feet; the deepest well, 637 feet; with a diameter of 10 inches to 14 inches. The number of unproductive wells from natural causes is comparatively small; but a great many wells are abandoned for want of means or skill to continue the boring, or still more frequently on account of the extremely low price of crude petroleum. Flowing wells, yielding from 2000 to 4000 barrels (eight poods or forty gallons to the barrel) daily, and pumping wells yielding from 300 to 600 barrels daily are of common occurrence. The total quantity produced in 1873 was 500,000 barrels, and in 1881 this rose to between 3,000,000 and 4,000,000, besides immense quantities of crude petroleum, which was wasted at the place of



production for want of adequate means of tankage and transportation. The export of the different petroleum products from Baku by sea amounted to 2,946,000 barrels in 1881, against 1,702,200 in 1879."

## ELECTRICITY AND TELEGRAPHY.

**ELECTRIC LIGHTING AT EASTBOURNE.**—The local board of Eastbourne having entered into a contract for the lighting of the principal thoroughfares by electricity, the sea front was on Saturday last illuminated by the new light.

**AN ELECTRIC RAILWAY IN SWITZERLAND.**—An arrangement has just been concluded on behalf of a syndicate of English capitalists, and Mr. Theodore Turrettini, acting for the local government, for the construction, on the Edison system, of an electric railway from St. Julien, in Savoy, to Geneva, about sixteen miles.

**THE JABLOCHKOFF ELECTRIC LIGHT COMPANY.**—This company have taken large premises on the Albert Embankment to be used as a manufactory for their carbon candles and warehouse, and as a lighting centre. They are also about to erect a building on the Victoria Embankment for the purpose of more effectually carrying out the contract with the Metropolitan Board of Works.

**THE AQUARIUM WINTER ELECTRICAL EXHIBITION.**—In addition to the prizes to be given at the forthcoming exhibition at the Aquarium, a £50 prize is to be awarded for the best electro motor for stationary work, or for tram-car work—(a) absorbing  $\frac{1}{2}$  horse-power, (b) absorbing  $2\frac{1}{2}$  horse-power, (c) absorbing 5 horse-power. The effective value of the receptors economical for the transmission of power will be the chief point of contest, that is to say, if 1 horse-power is put in by strap indication at one end, the strap indication of the work done at the other end will be measured, and the comparison thus made.

**THE ELECTRIC LIGHT IN THE BRITISH MUSEUM.**—The reading-room of the British Museum is now provided with four new Siemens lamps, which are adjusted so as to give equal light over the whole room. These will be in operation every evening from September 1 until April 1 next, so that the room can be kept open until 8 p.m. Outside the museum are two new Swan lamps, and there are the usual number of lamps within the hall and in the out offices. It may also be mentioned that reference books have taken the place of periodicals on the front gallery of the reading-room, so that they may be more readily attainable.

**INSULATION OF ELECTRICAL CONDUCTORS.**—At the meeting, on the 14th August, of the Paris Academy of Science, M. Geoffroy drew the attention of members to a new method of insulating electrical conductors, some improvement in this respect having been rendered necessary by the numerous accidents which have occurred through imperfect insulation. M. Geoffroy prevents all danger of ignition from the wires, by winding asbestos thread round them, and then covering them with lead. Experiments made with wires thus insulated have been made by M. H. Lippmann, demonstrating that they may be completely volatilised without transmitting a spark.

**ELECTRICITY IN FRENCH LIGHTHOUSES.**—A recent law of the French Legislature authorised the application of the electric light in no fewer than forty-two important lighthouses on the coasts of France. The total expense of this change is estimated at about £320,000 sterling. But it appears that the transformation will be rather slow, and will hardly be completed in less than eight to ten years. A sum equal to £6000 sterling has already been voted towards the undertaking, and the Minister of Public Works is about to demand a new vote equal to £28,000 for the continuance of the work in 1883. The operations will commence with the light of Cape Griznez and at other points familiar to English travellers in crossing the Channel.

**A NEW TELEPHONE.**—It is known to be advantageous to utilise both poles of a magnet in the telephone. How should the wire be placed, relatively to the magnet, to give the best effect? is an important question. M. d'Arsonval has lately become convinced by experiment that in the two-pole telephones (as those of Gower, Siemens, Ader, &c.), the really active part of the wire is that lodged between the magnetic poles. The rest of the wire may be regarded as mere useless resistance. The point, then, is to have the whole coil between the poles. M. d'Arsonval, accordingly, makes a telephone with a bent bar magnet, one pole of which terminates in a short cylindrical piece, with a coil round it, while the other terminates in a ring piece, surrounding the coil. These two poles are in the same plane and very near the plate. The complete instrument is very light, yet it is said to transmit the voice with extreme distinctness and with such force that, if a trumpet mouthpiece be added, one can easily hear throughout a room.

**AN ELECTRIC GAS-LIGHTER.**—A new gas-lighter upon electric principles has been invented by Mr. Clarke, and promises to be of considerable use to the public generally. It consists of a chloride of silver battery, the chloride being applied to the silver plate under pressure. The wire of the induction coil, instead of being of copper, is of iron wire wound over a bobbin with interlayers of cotton thread, in place of the usual copper wire insulated with silk or cotton. This layer of wire is then covered with paper saturated in paraffin to produce more perfect insulation. The condenser is composed of discs of tinfoil and paraffined paper. The whole is enclosed in an ebonite handle about a foot in length; and from this a brass tube to any extent is run, carrying the positive and negative wires. The current from the battery induces a secondary current in the induction coil, which passes to the points, and by the pressure of a button contacts made to complete the circuit, producing the spark which ignites the gas. This lighter is being manufactured by Messrs. Stodge and Co., of 48, Osnaburgh Street, Regent's Park, and its great feature is its safety, for it is stated that the spark will not ignite anything beyond coal-gas, the vapour of benzoline and ether thus affording a safeguard against fire. It is said that as many as 40,000 lights are obtainable from each apparatus.

## RAILWAYS & TRAMWAYS.

**THE ST. GOTTHARD RAILWAY.**—As the company have sought, and obtained, the sanction of the Swiss federal authorities for laying down a second line of rails through the St. Gotthard tunnel, it is evident that the development of the traffic must have been much more rapid than was originally expected.

**A UNIFORM GAUGE ON RAILWAYS.**—An international conference is to be held in Switzerland to discuss the question of a uniform gauge for continental railways in order that trains may proceed from one country to another without the necessity of changing the carriages. The Federal Council proposes that the conference shall take place at Berne, on September 16. Germany, France, Italy, and Austro-Hungary have already agreed to adopt a uniform system.

**CANADIAN RAILWAYS.**—The Canadian Pacific Railway is now laid for a distance of 350 miles from Winnipeg. Telegraph construction is being pushed on concurrently with the work of the railway. Two hundred miles of rail have been constructed during the last three months. It is announced officially that the Thunder Bay section of the railway will not be opened for traffic this year. The line is laid for the entire distance, but along Section A some parts of the railway are not considered safe for use at the present time.

**CENTRAL ASIAN RAILWAYS.**—A report by Herr von Schultz has been recently laid before the Imperial Russian Geographical Society on a survey made, by order of General Suive, along the proposed south-eastward extension of the Orenburg Railway, and the result is to show that the best line is by way of the valley of the Ilek, across the southern part of the Mugodjar Hills to Tsetse-bash Bay, on the north-western shores of Lake Aral. Another party at the same time starting from Kara-Turgai and Kazalensk, and working across the Kara-Kum desert to the north-west examined the country east of the Great Barsuk sands; but this was found far less favourable than the Tsetse-bash line, which is better populated, has more water, and a better supply of materials requisite for the construction of a railway; it is only 480 miles in length, terminating at Tsetse-bash Bay, which makes a good harbour, while from the Sea of Aral the rivers Oxus and Jaxartes are navigable for the distance of 1600 and 1300 miles respectively.

**HE CAME FROM THE WEST.**—The other day a railroad agent was engaged in posting railroad schedules at Astor with his little hatchet, and seeing a darkey looking at the posters, the following dialogue took place:—"I say, boss, is dis de circus what Mister Astor is goin' to bring down heah?" "Not exactly. I am the advance agent of a great enterprise. This is not a circus in the ordinary acceptance of term, but a straight line, and our only quadruped is the iron horse." "Jes so, boss, jes so. I don't prezaekly understand what you say, although I know what you mean. Is dis a straight circus?" "No, it is a railroad." "Oh! A railroad! What is going to run, boss?" "It is already running. It is opening up the great West, and converting its dreary wastes into a busy mart of trades." "Its doin' dat, is it? Well I declar!" The tacks were hammered while the agent whistled "Hannah at the Window." The darkey scratched his head and searched for an idea. "I say, boss, is dat all true about de West?" "It is, and I would advise you to go West yourself and grow up with the country." "Yer can't fool me, boss, fer I came from the West myself to work on dese railroads." "What part of the West?" "From West Florida."—*Jacksonville (Fla.) Times.*

**EXHIBITION OF RAILWAY APPLIANCES.**—As we stated in IRON of August 25, an exhibition of models of improved railway-wagon couplings and appliances is to be held at Darlington, on October 3 and the four following days. The exhibition, which has the approval of the Board of Trade, is being promoted by the Amalgamated Society of Railway Servants, the object in view being the better protection of the lives of those engaged in the work of coupling and uncoupling railway vehicles. It is estimated that 14,000 men are regularly engaged in this kind of work, and of this number 206 have been killed and 101 injured in the five years ending with 1880. The risk incurred is said to arise mainly from the use of link or chain couplings, and the necessity of men placing themselves between the vehicles and passing over the rails in attaching or detaching waggons. The promoters of the exhibition desire to show that the use of improved couplings will materially reduce the risk of accidents. Inventors of improved railway couplings are invited to co-operate with the society by sending models of their inventions to the exhibition. Notice of the nature of any intended exhibits must be given before September 25 to the Secretary of the Amalgamated Society of Railway Servants, Mr. F. W. Evans, 306, City Road, E.C., London, or to the honorary secretaries of the Local Committee, and all articles sent to the exhibition must reach Darlington not later than Friday, September 29.

**RAILWAY CONSTRUCTION IN MEXICO.**—The work of railway is being pushed in Mexico. We learn that the superintendent of the Sinaloa and Durango Railway has received orders to continue at once work on the said line from Culiacan to Durango. Since railways commenced to be built in Mexico, the importations from the United States to that country have increased 51 per cent. Since August 21 of last year 31 vessels have sailed from New York, San Francisco, and Southampton, bound for the port of Manzanillo, Mexico, and laden with railroad material for the Mexican National Construction Company. Mr. Jackson, the new superintendent of the Morelos Railroad has gone over the line several times, and is commencing to introduce a number of important reforms. The railway line from Mexico to Leon was inaugurated on August 28. A new section of eight kilometers has been finished on the Sonora and Durango Railway, making a total of 85 kilometers completed so far. The horse railway from Chalchicomula to the station of Dolores, on the Vera Cruz line, was opened on September 5th. The legislature of Tamaulipas has approved the plans presented for the construction of the Nuevo Laredo street-railway lines. The National Railway Company's telegraph line has reached Monterey. The Tuxpam Street Railway Company have petitioned the Vera Cruz legislature, asking for exemption from payment of all duties on their material.

## NAVAL ARCHITECTURE.

### LAUNCHES.

#### ENGLISH.

**Benbrack.**—On September 1, the screw-steamer *Benbrack*, of 2,047 gross tonnage, was taken out for a six hours trial trip in Liverpool Bay, and proved exceedingly satisfactory to those interested. About three months ago, when this steamer was handed over to the engineers to be refitted with new engines, etc., she was a four-masted vessel, with the engines right aft, and required 400 tons of ballast on board to keep her upright. As she appeared on her trial trip, she is a schooner-rigged steamer, with funnel amidships, 600 tons of water-ballast on board, and clean swept holds. The speed and consumption with the old engines were relatively 7 knots and 24 tons a day, with the new engines it was 10 knots on 17 tons. The steamer returned to the river after her six hours' trial, during which the engines were run at full speed, without heated bearings or priming, and anchored off Egremont.

**Constance.**—On August 31, this iron steam paddle trawler was launched by Mr. J. T. Eltringham, Stone Quay, South Shields. The boat has been built to the order of Messrs. W. H. Shawcross and Co., Scarborough, and is of the following dimensions, namely:—Length, 90 feet; breadth, 18 feet; depth, 9½ feet. The engines, which will be of 40 horse power nominal, will be built by Messrs. Baird and Barnsley, North Shields, and are upon the jet condensing side-lever principle.

**Fannie.**—On September 2, Messrs. W. Gray and Co. launched this screw-steamer from their West Hartlepool yard, of the following dimensions, viz:—Total length, 257½ feet; breadth, 35½ feet; depth of hold, 19 feet. She has been built to the order of Messrs. C. Neilsen and Son, of West Hartlepool. She will carry 2350 tons, and is intended for the Indian trade. Her engines, of 140 horse-power, will be supplied by Messrs. Blair and Co., of Stockton-on-Tees.

**Henrietta.**—On September 2, Messrs. Rayton, Dixon and Co. launched from the Cleveland Dockyard, Middlesbrough, this iron paddle steamer. Her dimensions are:—Length over all, 97 feet; breadth, 18 feet 9 inches, and depth of hold, 8 feet 9 inches. She will be fitted with Grasshopper side lever engines of 40 nominal horse-power, by Messrs. Kincard and Co., of Greenock. This vessel has been built to the order of Captain Blacklin, of West Hartlepool, and is specially arranged as a tender for Dutch Government purposes in Java.

**Karawacca.**—On August 31, there was launched from the shipbuilding yard of Messrs. Hodgson and Soulsby, this iron steamer. She is schooner-rigged, of about 1415 gross tons, and 990 net. Her dimensions are as follows:—Length, 250 feet; breadth, 35 feet; depth, 17 feet 6 inches. She was built to the order of Messrs. Harrold Brothers, London. She has compound inverted double-acting self-condensing engines, 140 horse-power, 32 and 60—39, built by Messrs. Blair and Co., Stockton-on-Tees.

**Norseman.**—On August 31, this screw steamship, built to the order of the British and North Atlantic Steam Navigation Company (Limited), was launched from Messrs. Laird Brothers' Works, Birkenhead. The steamer is of iron on the longitudinal bracket plan, and has three decks and awning deck, and a most complete water ballast arrangement for 770 tons. Her dimensions are:—Length, 390 feet; beam, 43 feet 6 inches; depth, 35 feet 3 inches, with a gross tonnage of about 4000 tons. She will be fitted with inverted cylinder compound engines of 2500 indicated horse power.

**Rhymney.**—On September 2, there was launched from the shipbuilding yard of Kisch, Boulds, and Co., Pallion, Sunderland, a screw-steamer of the following dimensions:—240 feet by 34 feet by 17 feet. She is built to the order of Messrs. Morel, Brothers, and Co., Cardiff, has been specially designed to carry a large cargo on a light draught of water. The engines, by Messrs. W. Doxford and Sons, are of the compound, direct-acting, surface-condensing type, of 150 horse-power nominal.

**Saltwich.**—On August 31, there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson and Sons, North Sands, Sunderland, this vessel of the following dimensions, viz:—Length, 260 feet; breadth, 36 feet; depth, 18 feet 8 inches. She has engines by Mr. John Dickinson, of Sunderland, 150 horse-power. She has a deadweight capacity of about 2300 tons. The steamer has been built to the order of Messrs. J. H. Barry and Co., of Whitby.

**Waterloo.**—On August 31, there was launched from the shipbuilding yard of Messrs. John Readhead and Co., West Docks, South Shields, this screw-steamer, built to the order of Mr. W. D. C. Balls, of Tynemouth. The vessel measures 255 feet in length between perpendiculars, 36 feet beam, 17½ feet depth of hold. Her engines, built by Messrs. Readhead, will be of 140 horse-power nominal, the cylinders being 30 inches and 57 inches in diameter, and the stroke of the piston 36 inches, the pressure on the boilers being 80 lb. to the square inch. The deadweight carrying capacity of the vessel is 2100 tons.

There has been launched from the yard of Messrs. Palmers' Shipbuilding and Iron Company, at Jarrow, an iron screw-steamer of the following dimensions:—Length, 286 feet; breadth, 37 feet; depth of hold from top of water-ballast-tank to upper deck, 23 feet 2 inches. The vessel has been built for the Steamship Carlisle Company (Limited).

#### SCOTCH.

**Albany.**—On August 30, at Linthouse, Glasgow, Messrs. Alex. Stephen and Sons launched for Messrs. John Warrack and Co., Leith, this iron screw-steamer, of about 2200 tons. The engines, which are also by Messrs. Stephen, are of the compound surface-condensing type, and have cylinders 38 inches and 68 diameter, by 46 inches stroke, with ample boilers adapted for a working pressure of 85 lb.

**Ballaarat.**—On August 31, Messrs. Caird and Co., shipbuilders, Greenock, launched from their yard, for the Peninsular and Oriental Steamship Company, this steel screw-steamer, of about 5000 tons gross, and of the following dimensions:—Length, 420 feet; breadth, 43 feet; and depth, 36 feet. The steamer will be supplied with engines



1000 indicated horse-power by the builders, with cylinders of 56 and 100 inches diameter, and 66 inches stroke.

**Ballina.**—On September 1, Messrs. A. and J. Inglis, shipbuilders, Pointhouse, launched this screw steamer, a vessel of 2600 tons. The new vessel, which will be fitted with engines of 2000 horse-power, is of the following dimensions:—Length, 313 feet; breadth, 38 feet; depth, 26 feet. She has been built to the order of Messrs. Gray, Dawes, and Co., London, for the Queensland trade.

**Cumbræ.**—On August 31, this screw-steamer of 500 tons, built and engined by Messrs. W. Simons and Co., was launched complete from their works at Renfrew. She is fitted with compound engines of 70 horse-power, and is the last of four steamers constructed by this firm for the Clyde Lighthouses Trust, and named respectively *Toward*, *Clyde*, *Clach*, *Cumbræ*.

**Ecclfechan.**—On August 30, Messrs. Robert Duncan and Co. launched at Port Glasgow this four-masted ship for the Village Line of Mr. Thomas C. Guthrie, Glasgow. She is of the following dimensions: Length over all, 307 feet; breadth, 42 feet; depth of hold, 23 9/12 feet, with a registered tonnage of 2100 tons.

**Hanrot.**—On August 31, Messrs. William Denny, Brothers launched from Leven Shipyard, Dumbarton, this steel screw-steamer, of about 2,000 tons gross measurement, or the Union Steamship Company of New Zealand. The dimensions of the *Hanrot* 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.

**Helenslea.**—On August 29, there was launched from the shipbuilding-yard of Messrs. Alexander Stephen and Sons, of Dundee, this steel barque. Her dimensions are as follows:—Length, 243 feet; breadth, 35 feet 2 inches; depth of hold, 21 feet 6 inches; and gross tonnage, 1,355 tons. She is owned by her builders.

**Skulda.**—On September 2, Messrs. S. and H. Morton and Co., shipbuilders, Leith, launched from their yard this iron screw-steamer of the following dimensions:—Length, 325 feet; breadth of beam, 32 feet 9 inches; depth, 16 feet; her gross tonnage being 1150. The steamer, which has been built to the order of Messrs. T. Salvesen and Co., Grangemouth, is intended for the general Baltic trade. She will be supplied with 120 horse-power surface-condensing engines.

**Sumatra.**—On August 30, this steamer was launched from the shipbuilding-yard of Messrs. John Elder and Co., Govan, for the Stoomvaart Maatschappij Nederland. The principal dimensions of the vessel are:—Length between perpendiculars, 325 feet; breadth, 37 feet; depth moulded, 27 feet; gross tonnage, about 2600. The engines are of the usual compound inverted cylinder type, with high pressure cylinder 38 inches diameter, low pressure 70 inches by 4 feet stroke. The steam is supplied by two double-ended cylindrical boilers, at a pressure of 80 lb.; and the engines will work up to 2000 indicated horse-power. The vessel is the sister ship to the *Prinses Wilhelmina*, launched for the same company on August 1.

On August 28, Mr. John M. Adam launched from his yard at Govan a steam-launch of the following dimensions:—Length, 60 feet; breadth, 11 feet; depth, 5 feet; tonnage about 25 tons. The new vessel, which will have accommodation for 100 passengers, has been built to the order of Mr. Laughton, advocate, Isle of Man.

#### IRISH.

**Ards.**—On August 20, there was launched from the shipbuilding yard of M. Ilwaine and Lewis, Belfast, an iron screw-steamer of about 100 tons measurement. This steamer was built for the purpose of trading between Irish, English, and Scotch ports, but more particularly for the coal trade between Donaghadee and the English coal ports, in connection with the County Down Railway Company.

**Paxie.**—On August 31, there was launched from the iron shipbuilding and engine works of Messrs. M. Ilwaine and Lewis, Abercorn Basin, Belfast, this steam barge built to the order of Messrs. James Fairclough and Sons, Warrington, and intended for the grain trade between Liverpool and Warrington. The *Paxie* is 70 feet long, 16 feet 7 inches broad, and 8 feet 10 inches deep, with a carrying capacity of 80 tons. She is fitted with high pressure engines, with two 48-inch cylinders, having 14 inch stroke.

#### FOREIGN.

**Qexander.**—On August 24, this steamer was launched from the yard of the Gothenburg Engineering Works. Her dimensions are:—Length, 155 feet; breadth, 25 feet; draught of water, with a cargo of 500 tons deadweight, 14 feet. The engines, which are compound, and of 50 horse-power, will give her a speed of nine knots per hour. She is a sister vessel to the *Olof*, recently launched from this yard, and is built to the order of M. F. Haussou, of Gothenburg.

**Dur.**—On August 25, this iron screw-steamer was launched from Brodin's yard at Gelfe, Sweden. Her dimensions are:—Length between perpendiculars, 200 feet; width, 29 feet; depth in the hold, 19 feet. The hull is built of English iron, with the exception of the keel and stem, for which Swedish iron has been used. She is rigged as a schooner, without yards on the foremast, and fitted with engines of 80 horse-power, made at Motala, which propel her, when loaded, at the rate of eight knots per hour. Her carrying capacity is, while drawing 15 feet of water, about 1000 tons, and she is built for the carrying trade for account of M. O. A. Brodin.

#### TRIAL TRIPS.

**Cedric.**—On September 2, this screw-steamer, built by Messrs. Murdoch and Murray, and engined by Messrs. Muir & Houston, Glasgow, 2000 tons N. M., left Port Glasgow for her trial trip. She is built to the order of Messrs. George Hood and Co., Glasgow, specially for the Black Sea trade. She ran the measured mile at an average speed of 12 miles per hour, which was considered highly creditable to both builders and engineers.

**Hermes.**—On August 30, this new steamer, which has been built to the order of Messrs. R. P. Houston & Co., Liverpool, was taken out for her trial trip as far as the North-West Lightship, and the result of her preliminary run

was satisfactory. The *Hermes* was built at Whiteinch, Glasgow, by Messrs. Aitken and Mansel, and is 305 feet long, has 40 feet breadth of beam, and 22 feet depth of hold. She has been fitted with engines by Messrs. Jones and Sons, of St. George's Engine Works, Liverpool, and the ship has been constructed to carry 3,200 tons deadweight, with 20 feet draught. She has two large boilers and eight furnaces, and is expected to travel at a speed of 10 knots an hour.

**Kong Ring.**—This steamer, built at the Kockum Engineering Works, Malmö, went on her trial trip on August 29. The vessel is 223 feet long, and 30 feet broad, with engines of 650 horse-power, and loads about 1000 tons. The trial was in every respect a satisfactory one, and she will at once take up her route between Christiania and Hambury. She belongs to the Søndensfjeldske Norske Dampskibsselskab of Christiania.

**Pavonia.**—On September 2, this vessel, the latest addition to the fleet of the Cunard Company, made her trial trip. The *Pavonia* has been built by Messrs. J. and G. Thompson, and is a vessel of 5587 tons gross register, her dimensions being:—Length, 445 feet; breadth, 46 3/4; depth, moulded, 36 5/8. This ship, although not quite so large as the *Servia*, possesses internal fittings which render her equally commodious and without doubt she will prove herself as great a favourite as her larger predecessor. She is capable of carrying a deadweight of 5200 tons. At her trial, the engines of this ship developed 4600 indicated horse-power. They are of the two-cylinder inverted vertical type, the cylinders being 53 inches and 92 inches in diameter, and 5 feet 6 inches stroke. They have built crankshafts by Vicars, the whole the tunnel shafting of the s.s. *Mersey* iron. She has steam and hydraulic starting gear by Brown Brothers, of Edinburgh. Steam is supplied by circular steel boilers, 15 feet in diameter, working at 90 lb. pressure, and having Fox's patent corrugated furnaces. This ship, as well as her sister, the *Cephalonia*, is in many respects a new departure in the policy of the Cunard Company, and there is probably no other ship in any of the passenger lines which carries within several hundreds of tons of deadweight of what this ship will carry, and yet she attained the high speed of 14 1/2 knots.

**THE "DANDALO."**—The trial of the artillery of the Italian ironclad *Dandolo* is stated to have been a complete success. The towers revolved in 40 seconds. The cannons were fired with a charge of 160 kilogrammes, others with 220 kilogrammes, and finally two cannons at the same moment with each a charge of 230 kilogrammes.

**NEW IRONCLADS FOR SWEDEN.**—A Commission, which has been considering the requirements of the Swedish navy, has advised the government not to build ironclads of an expensive type, but has recommended a scheme by which the country, with an expenditure of about £100,000 a year, will at the end of fifteen years possess eight ironclad vessels of the second-class, somewhat of the *Thunderer* type, twenty large and fourteen small torpedo boats, besides ten ironclad gunboats.

**DISASTERS AT SEA.**—There were fifteen British and foreign actual shipwrecks reported during the past week, making a total of 945 for the present year, or a decrease of 182 as compared with the corresponding period of last year. British-owned vessels numbered 7. Three were steamers (all British), with an aggregate tonnage of 1252 tons. Total tonnage lost for the week, 6088 tons. Number of lives lost, 9. Three vessels were wrecked off the coast of the United Kingdom, two being British and one German owned. 300 tons of timber were lost, also 403 tons of coals and 300 tons of general goods.

**THE TYNEMOUTH NAVAL EXHIBITION.**—The North-east Coast Exhibition of Naval Architecture, Marine Engineering, Fishery, Life-saving, and Coast Lighting Apparatus, Electric and other Patent Lights, was formally opened at the Aquarium, Tynemouth, on Wednesday, by Lord Ravensworth, who, in declaring the exhibition open, pointed out the national importance of the exhibition, which included projects to minimise dangers at sea with the greatest security for life and property. The speaker dwelt at length on the value of life-boats and life brigades, and referred to the important pier works at the entrance to the Tyne, which would tend to render the entrances safer.

**AMERICA AND THE FISHERIES EXHIBITION.**—The United States government are building at Wilmington, Del., an iron steam-ship, which will cost nearly 200,000 dollars, especially constructed for the Fish Commission to gather and preserve sea fish. The vessel will be sent to this country with millions of specimens of small fish and sea bugs, to be exhibited at the great fish exposition in May next. She is to be christened the *Albatross*. She is 200 feet long, 27 feet 6 inches beam, 15 feet 9 inches depth of hold, and 1 of 800 tons burthen. She will be supplied with a deep sea dredge with eight or ten miles of wire rope, for the purpose of dredging up specimens of animal life from below the surface of the ocean. The ship is being built at Pusey, Jones and Company's yards, and will be launched in about four months. The *Albatross* will be under the direction of United States Fish Commissioner Baird.

**NEW IRONCLAD.**—A new armourclad, for which the blocks have been some time in readiness, is about to be laid down forthwith at Portsmouth. She will be of the kind known as the "Admiral" type, and may be regarded to some extent as an answering move on the part of the Admiralty to the gigantic shipbuilding projects of the Italian Government. While the *Rodney* and the *Howe* exhibit certain improvements upon the design of the *Collingwood*, the *Camperdown*, the name of the new ship, will in her turn display various modifications upon the design of the *Rodney* and *Howe*. She will differ from the latter in being 5 feet longer, having 400 tons greater displacement, and carrying stronger barbettes. Her dimensions will be as follows:—Length, 330 feet; extreme breadth, 68 feet 6 inches; mean draught, 26 feet 9 inches; and displacement, 10,000 tons. She will be propelled by twin screws, the engines being contracted to develop with the use of forced draught 9800 horses. It may be useful to contrast with these data the measurements of the *Dulio*, which are:—Length, 341 feet; breadth, 64 feet 9 inches; displacement, 10,434 tons; indicated horse-power, 7500. While, therefore, the displacement of the English ship is slightly less than the *Dulio*, her engine-power is considerably greater, and is estimated to give her, in spite of her broader beam, a speed of 16 knots, or two knots an hour more than the Italian turret ship.

She will be armoured to the depth of five feet below the water-line, and will be protected by a belt rising 2 feet 6 inches above the water-line. Her armour will consist of compound plates of the following thicknesses:—One the side, 18 inches; bulkheads, 16 inches; barbettes (normal), 14 inches and 12 inches; conning tower, 12 inches and 9 inches; and screw bulkheads, 6 inches. She will differ from all existing vessels, either armoured or unarmoured, in having vertical ventilating tubes extending from the flying deck to the lower deck. These tubes will be armoured to the thickness of 12 inches. She will be also protected by an armoured deck 3 inches thick over the belt, and 2 1/2 inches thick below the water-line at the ends, while the protection under the base of the barbettes will be 3 inches. Her armament is at present arranged to consist of four 63-ton B.L.R. guns, and six 6-inch B.L.R. guns, besides a complement of boat and machine guns and Whitehead torpedoes. Her bankers are to hold 900 tons of coal, and her ship's company is intended to comprise 430 officers and men. The *Camperdown* will be a sister ship of the *Benbow*, the contract for which has just been accepted by Messrs. Palmer Brothers, of the Tyne.

**A NEW PORT FOR LONDON.**—On Monday next the South Eastern Railway Company will open up a new sea and railway route, which is expected to be largely used for continental and transatlantic traffic, alike for passengers and for merchandise. This new means of communication has been obtained by the company acquiring the line of the Hundred of Hoo Railway Company, who obtained their act two years ago. The new line leaves the North Kent system about three miles below Gravesend, and reaches the banks of the Medway at Port Victoria, as the new port has been called, a point nearly opposite to Queenborough in the deep-water channel of the river. The advantages claimed for the new line and the docks which it is intended shall form part of the completed scheme, are that it shall at once give facilities for loading and unloading the largest sea-going vessels, in any state of the tide, at a point within 50 minutes by rail of London, and without any of the delays which necessarily result from navigating the tortuous and crowded waterway of the Thames between Gravesend and the docks; with the additional prospect when the new pier is built of having the means of accommodation, for loading and unloading purposes, vessels in 27 feet of water at low water in ordinary spring tides. The pier, which has already been completed, is 450 feet in length by 50 feet wide, and has, close in, a depth of 22 feet at low water. The main pier, which will be commenced immediately, will be built in the stream about 100 yards distant from the present structure, and will have a length of 600 feet and a width of 60 feet. The trains will run directly on to the pier over lines laid on cylinders and latticed girders, and will discharge passengers and cargo directly into the vessels moored alongside. By this means much of the inconvenience to passengers and delay in the transit of merchandise, now existing not only in the port of London but elsewhere, will be avoided, and it is expected that the commercial advantages afforded by ocean steamers of the largest tonnage combined with rapid railway communication between London and all the parts of the world will be attained. The company have secured some 500 acres of ground in the neighbourhood of the port, on which it is intended to construct docks capable of accommodating the largest ships afloat, and which will be further utilised in such other ways as may be necessary for the success of the undertaking. One great advantage of the scheme will be that, the railway now having communication with Woolwich Arsenal, a heavy train of military stores can be discharged on shipboard within a few hours of quitting Her Majesty's storehouses. The line and the existing pier have been constructed by Mr. Francis Brady, engineer of the South-Eastern Company, under whose superintendence the entire works will be completed.

## ARMS, ARMOUR, AND EXPLOSIVES.

**FOREIGN ORDERS FOR NORDENFELT GUNS.**—The Brazilian government have, it is stated, ordered during the last week, for immediate delivery, fifty Nordenfelt (English Admiralty pattern) machine guns, ten five-barrel rifle-calibre mitrailleurs, and five six-pounder rapid-firing shell guns, of 14-inch calibre. The Japanese government and the Spanish government have each also ordered ten Nordenfelt (English Admiralty pattern) machine guns. Ammunition has in each case to be supplied, the orders exceeding together a quarter of a million rounds.

**PANCLASTITE.**—This is the name given to a new explosive substance discovered by M. A. Turpin, and with which some experiments have lately been carried out at Cherbourg. It is composed of two liquids which are perfectly harmless separately, but which constitute, on being mixed together, an explosive which is said to exert more destructive effects than any yet discovered, while at the same time it is not so easily exploded. Holes were bored in some rocks at Cherbourg exposed at low water and charged, some with dynamite and others with panclastite, in order to compare the results, and the effects produced by the new explosive are stated to have been invariably greater, although only half the quantity was used.

## OBITUARY.

**ROLL.**—The death is announced of Mr. Peter Roll, who for some years served as a director of the Commercial Dock Company, and who was also a past master of the Drapers' Company. He served as Deputy-Lieutenant for the county of Middlesex, and was created an Italian count in 1872. For many years he was connected with the Thames Ironworks Company, in the course of which he took a leading part in the construction of the *Warrior*, the first English ironclad man-of-war.

**HARVEY.**—We regret having to announce the death of Captain John Harvey, R.N., the co-inventor with his nephew, Commander Frederick Harvey, R.N., of the



Harvey torpedo. He died on Sunday last at Sandwich, Kent, at the ripe age of 89, and was buried yesterday (Thursday) at Folkestone. Captain Harvey was for many years a member of the Institution of Naval Architects. He was a grandson of the Captain J. Harvey, R.N., who was killed while in command of the *Brunswick* in Lord Howe's action on the celebrated 1st of June.

**PERRIER.**—Colonel Ferdinand Perrier, a distinguished Swiss engineer, soldier, and littérateur, died at Freiburg last week in his 73rd year. He came of a fighting family; many of his ancestors were soldiers of fortune, and his father, Dominique Perrier, commanded the 4th Swiss Regiment in the service of France under the First Empire. Ferdinand was, however, destined by his parents for the Church, and they placed him at an early age in the Jesuit College at Freiburg. But, preferring the career of a soldier to that of a priest, he left college and obtained a commission in one of the Swiss regiments of the King of the Two Sicilies. After a few years spent at Naples, he exchanged the quiet life of a garrison town for active service in the field. In 1838, he went to Egypt, obtained an appointment on the staff of the Egyptian Army, and as aide-de-camp to Soliman Pasha took part in the campaigns of 1838, 1839, and 1840. After the defeat of Soliman he resigned his commission and wrote his book, *La Syrie sous le Gouvernement de Mehemet Ali*. Returning once more to his native country, Colonel Perrier, after studying two years at Freiburg in Breisgau and Carlsruhe, obtained the diploma of civil engineer, and commenced the active duties of his new profession in the Swiss Freiburg. He was an active politician, engineer of ponts-et-chaussées, a frequent contributor to the press, and an active collaborator of the *Gazette de Lausanne*. The best known of his books are *Souvenirs pittoresques de la Gruyère*, *Nouveaux Souvenirs de Freiburg*, *La Gruyère*, and his work on Syria. He was also an elegant Latin scholar, and so thorough a master of Church Latin that he once, by way of joke, published in a local paper some apparently medieval documents purporting to be of ecclesiastical origin which deceived both priests and antiquaries.

## GENERAL NOTES.

**L. STERNE AND CO., LIMITED.**—We understand that the firm of Thomson, Sterne and Co., Limited, who recently acquired large works at Hollinwood, Manchester, has, at a recent meeting of the shareholders, resolved to increase the capital of the company, and to alter its designation to "L. Sterne and Co., Limited."

**TONNAGE RATES.**—An important meeting of owners of blast furnaces and representatives of firms smelting iron in North Lincolnshire, was held, on Thursday at Barnsley, in reference to the rates charged for conveyance of coke, iron, &c., to and from South Yorkshire and north of England. Most of the large firms interested in the iron trade around Fordingham attended, although the meeting was a private one. It transpired that the object desired is a revision of the tonnage rates.

**THE JOHNSTON HARVESTER CO.'S FACTORY DESTROYED BY FIRE.**—We regret to learn that the works of the above company at Brockport, N.Y., have recently been totally destroyed by fire. Had this happened at any other time of the year the loss might have been very serious, both to the agricultural world and to the company. The construction of a much larger factory—twice the size, has been begun. It will be finished early in December, so that these useful machines will be turned out almost as early as usual for the next harvest.

**ENGLISH IRON IN GERMANY.**—According to a statement in the German press, on account of the low rates of freight from the United Kingdom to Hamburg by steamer, and the facility which the railways in Germany afford for the transport of imported iron, the Berlin purchasers for manufacturing purposes can get the English article at a price which competes successfully with the products of native industry. The first cost of iron at the works in Germany seems to be about 25 per cent. above the value of Scotch iron sold at Glasgow. The railway carriage to Berlin costs nearly as much as the freight, duty, and railway carriage on the imported article. Hence the supposed advantages of the protective policy are lost. The matter is being brought before the Imperial Government of Germany with a view of obtaining such concessions in the railway rates of carriage of iron as would do something towards assisting the position of the German iron industry, and thus swelling the traffic receipts of the various lines interested. As an instance of the extent to which our iron is used in Germany, it is stated that the lamp posts in Berlin are made of English metal. So much the better for the Berliners looked at properly.—*Builder*.

**THE TRIESTE NAVAL EXHIBITION.**—The exhibition which has been opened at Trieste contains a good display of naval architecture, from the smallest boat up to the large roracles of the Austrian navy. Some of the models are in sections. The models of merchant steamers built by the Austrian Lloyd's, and of sailing vessels built by other establishments, are in accordance with the most recent improvements as regards hull, sails, and rigging. Not so the roracles, which are mostly obsolete models, and cannot for a moment be compared to the powerful modern ships of the British navy. For recent improvements in steam engines, &c., the visitor must go to one of the above-named establishments. Among conspicuous articles exhibited are apparatus for ghthouses, compasses, steering appliances, chronometers, noys of different shapes, iron chains and anchors, coils made of Manilla, Italian, and Hungarian hemp, from the smallest to the largest size, fishing nets, sail cloths of every ind, sample of wood used in the construction of ships, among which is the Austrian oak, one of the finest in the world. There is also no end of marine charts published by the hydrographic establishment at Pola belonging to the government, plans (raised in relief) of the Bouhe di Cattaro, the Nurenta River, and its projected rectification, which give one a fair idea of those mountainous districts, and of almost every small part, creek, or hole on the coast of Istria and Dalmatia. The buildings contain also a fine collection of fish and aquatic birds.

**EXHIBITION OF DOMESTIC LABOUR SAVING APPLIANCES.**—The second annual exhibition of domestic appliances held at the Agricultural Hall closed yesterday. The exhibits on view were of a somewhat miscellaneous character, including appliances for lighting, warming, cooking, ventilating, cleaning, washing, and sewing. In the departments comprised under the three first named headings extensive collections of apparatus, in which gas is used as the heating power, were shown. There was a large display of their cooking ranges by the Wilson Engineering Company, and the Eagle Range and Foundry Company. Sewing, washing, wringing, knife cleaning, and other labour saving machines were also shown in large numbers. Among the most interesting things in the collection were Griscom's electric motors and automatic batteries. These are intended to work sewing and other machines which need little power. Some vertical feed sewing machines, manufactured by the company of that name (noticed in IRON of July 28) were samples of an American novelty specially adapted for fancy work, the trouble of "tacking" being avoided by means of this invention. Deverill's patent irrigator was another novelty. It consists of a movable frame bearing several cocks, each able to discharge in any direction either a cloud of spray, a stream of water, or a shower. The knitting machines exhibited by Messrs. Renick, Kemsley, and Co., and by Messrs. Biernatzki and Co., as well as the buttonhole machines of the former firm, were worthy of notice. Messrs. R. Boyle and Sons showed a large number of their ventilators. There was a good collection of furniture, and also of garden requisites. Although there were no startling novelties in the exhibition, it was a very good one from a domestic point of view. Householders will learn much from visits to such exhibitions.

**GHEENT INDUSTRIAL EXHIBITION.**—A small, but highly valuable exhibition from an artistic point of view, was opened at the Casino, Ghent, on 28th August, and will be continued until the 16th October. The nucleus of the display is formed by the works sent in to compete for prizes offered by the Chambre Syndicale des Arts Industriels de Gand, including the following:—3. Design for a street lamp-post with one lantern. All the full size competitive drawings, in isometrical projection, showed great taste. The first prize, a diploma, a silver medal and £4, was awarded to M. Charles Gassée, Brussels; and the second, to M. Raemackers, of Schaerbeek, near the same city. 8. Design, full size, of gas girandole for a church of the thirteenth century. No prize awarded. In the second series (works executed) the furniture (price £48) and decoration of the office of a manager of works tempted many competitors. The first prize was awarded, "with special compliment," to M. De Coninck, Ghent, and M. Masson, Brussels; the second prize not being awarded. 20. For a sledge, price £64, the first prize, a diploma, silver-gilt medal and £20 was awarded to Mr. Pulinx de Geyter, Ghent; the second prize to M. A. Despret, of the same city; a very honourable mention to M. D'Ieteren, of Brussels, not competing; and an honourable mention to M. Eichberger, Ghent, for his patented improvements. Besides the objects sent in for the special competitions, the five classes, of building, furniture, metal-work, textile industry, and various industries, were well filled. M. Vandermersch, of Brussels, showed several articles coated by electro-metallurgy with 0.04 inch of pure nickel. With the bath, generally used, of the double sulphate of nickel and ammonia, it is impossible to deposit more than from a hundredth to two-hundredth parts of the above thickness. If more be attempted, the whole will peel off; consequently, with wear and cleaning, the metal underneath is soon exposed. M. G. Schoonyans, assistant manager of the Brussels Mint, exhibited, for the first time, a variety of gaseliers, which he has begun to manufacture strictly in accordance with the design furnished, instead of a hundred at a time, all of the same pattern. M. L. Wuyts, "art smith," Antwerp, contributed the figures 1883 decorated with foliage, and also an oak tree and a fuschia, with their roots, all beaten out of iron by the hammer. M. J. B. Fondu, of Vilvorde, has sent a cabinet fitted with all kinds of railway carriage door and other fastenings, and also twelve different locks operated each by its own key, and yet all capable of being opened by one master key. M. Landois shows a large collection of door and window fastenings in different styles; and the Brussels Compagnie des Bronzes exhibit some capital busts. Ancient ironwork is well represented in the retrospective collection by arms, coffers, skets, locks and hinges, &c. The manufacturing city of Ghent is easily reached by the Great Eastern Company's first-class steamers running between Harwich and Antwerp, and then a short railway journey through the Pays de Waes.

**THE IRON INDUSTRY OF INDIA.**—It is officially intimated that the Government of India have for some time past had under their special consideration the importance of developing the iron industry in India. In Assam, Kuch Behar, Burmah, and the Kumaon ranges the prospects are promising to a greater or less extent. In Lower Bengal, the Ranigunj district, Sonthalia, and Chutia Nagpur; in the central provinces, Sumbalpur and Chanda; in Central India, the ranges near Gwalior, and in the Punjab numerous localities are found to be specially endowed with all the requisites for successful production. In recalling these facts and inviting the consideration of capitalists the Viceregal Government state that in quality the ores are mostly found to be extremely pure, and, where the proportion of impurities is large, recently invented processes have moved all obstacles to their successful elimination. It appears, therefore, that India possesses the means of supplying all her wants in respect of cast iron, wrought iron and steel, and the supply could be produced remuneratively on a strictly commercial basis. Nothing appears to be necessary in order to attract private enterprise to so eligible an opening except the collection and diffusion of sufficient information and the grant of such facilities as the State may legitimately and reasonably afford to a young and growing industry. The Indian Government point out, however, that private enterprise in this matter must evidently be on a large scale, and not confined to one locality alone. The distances in India are so great and the railway system now so extended that the cost of conveying material to the spot where it is needed is an important factor in every calculation. It has been proved that unless works were established in four different localities the cost of sending old rails and tires to be worked up afresh would exceed that of obtaining new ones from

England. Towards the development of the industry in the Ranigunj district, the attention of the Government has in the first instance been directed, in consequence of the fact that a private company was established a few years ago, but after a short time it fell into difficulties. After carefully investigating the causes of failure the Government of India came to the conclusion that the only way in which the works could be at any early date placed in the hands of experienced persons having an adequate command of capital was by an intermediate purchase on the part of the State. The Bengal Ironworks have, therefore, been purchased for the sum of 430,761 rupees, and the Viceroy now announces that his Council will be ready to transfer them for the sum, together with any further indispensable outlay, to any parties who may establish satisfactorily that they are in possession of sufficient skill and resources, and who are prepared to carry on the manufacture of iron and steel upon a scale commensurate with the probable needs of that portion of British India which is within a reasonable distance of the works. The Governor-General in Council will be further prepared to enter into an engagement for ten years at fixed prices to be agreed upon.

## THE HOME IRON AND COAL TRADE.

### BARNESLEY AND SOUTH YORKSHIRE.

The house-coal trade continues to improve, and a larger tonnage is sent by rail to London, and the south. The advance of the prices of coal in London, coupled with certain alarming statements respecting the collieries being underhanded and the supplies of coal are much exaggerated. So far as this district is concerned, there is no difficulty in obtaining supplies, and considerably more coal could be raised if it was required. All the coal-owners agree that prices for a long time have been very low, and a meeting was held last week in order to try to come to some understanding respecting an advance at the pits, which for a long time has been most desirable. The Silkestone and Barnsley house-coal pits have been of late much better off for orders for house-coal. Steam qualities are in fair request, and most of the largest thick seam pits are sending a good tonnage to Hull and Grimsby. There is a very even demand for small coal and slack for the manufacturing districts, and rather better prices are being obtained owing to the large demand for coke-making purposes. There is no falling off to note in connection with the coke trade, and the large business passing with North Lincolnshire. It is satisfactory to be able at length to state that the North Gawber Hall Colliery, which has been standing idle for over twelve months will shortly be restarted. A number of men have been engaged during the week putting the surface and underground workings in order. The colliery deserves more than a passing notice, having been floated as a limited company with a capital of £100,000, all of which money, together with a large debenture fund being entirely lost. The colliery when in full work could raise from 1200 to 1500 tons per day. The new lessees are Messrs. Fountain and Burnley, who own Darton Hall and other collieries in the immediate district. The finished-iron trade does not appear to have undergone much material change since our last notice. The works at Manton and Elsecar are fairly off for orders for merchant iron of various descriptions. There is rather a better business doing at the foundries, whilst fully an average output of pig-iron is being made at the various furnaces in blast. The Yorkshire steel and iron works at Penistone continue busy.

### BARROW-IN-FURNESS AND NORTH LANCASHIRE.

There is still a very steady tone in the iron trade of this district, and makers are very well employed in all departments. There is a full inquiry from all quarters, but an increase is noted from the continent, buyers from this source being especially desirous of closing with orders before makers enter into engagements, which will more than fill their books for the year. No change in prices can be noted, but those who are favourably situated for orders—and there is scarcely a maker in the district who is not—are asking full prices. In one or two instances sales of second-hand parcels are noted at rather smaller rates; but, on the other hand, heavy consignments have been cleared at full value, representing an average of about 58s. 6d. per ton, net, at works, for average Bessemer qualities. The output of the works is very steadily maintained, but there is no prospect of an increase, although delivery engagements are already very heavy. In the steel trade there is nothing new to report, the mills being very fully employed, and makers being in receipt of a considerable number of inquiries. The ship-building trade is stronger, as large contracts have been booked, and others are on the point of being accepted. It is reasonable to hope in this branch of business there is a very brisk future. The minor industries of the district are very well employed. Railway rolling stock has been largely ordered. Iron ore remains firm at about 14s. 10d. 14s. 6d. per ton, net, at the mines. Coal and coke stronger. Ship-ping well employed in all departments.

**CARDIFF.**—The dispute at the Landore Steel Works is occasioned by a desire on the part of the company to reduce the wages of the hammermen from 25 to 33 per cent. The men are willing to concede 15 per cent., but will not budge from that reduction. First-class hammermen earn from £5 10s. to £6 per week, while metalmen earn about £3 10s. The company have found out that they are paying more than other people, and that they cannot compete in the markets of the world, and maintain their high reputation for the make of steel. The entire wages paid at the Landore Works are about £3000 per week, which gives an average of £2 each to 1500 men. It is expected that the hammermen at the old works will be the first to concede, and return to work. The wages of the men are abnormally high, compared with other trades in this district. A few parcels of iron have been sent away during the week, amounting to 2478 tons. Iron ore is not coming in so freely, only 1870 tons from Bilbao having arrived during the week. The amount shipped from Bilbao for the first seven months of this year to this country have been 2,225,777 tons. Campanil Somorrostro is still quoted at 15s. 3d. c.i.f., good



Rubio 15s. c.i.f.; Cartagena manganese ores maintain their firmness. As regards tinplates, although merchants in London and Liverpool give but gloomy accounts, the works which are open here are fairly busy. Prices now nearly touch paying point. Good coke-mades are from 16s. 6d. to 17s. per box, and charcoal-mades from 19s. 6d. to 20s. The spelter and zinc works of South Wales are tolerably active. There is no retrogression in the activity of the steam coal trade, and prices are hardening. The amount sent away during the week has been 117,032 tons, with 1970 tons of patent fuel. Good colliery screened is quoted at 11s. per ton. A return just published shows that 22,207,176 tons of coal were raised in 1881 in South Wales and Monmouthshire, being about one-seventh of that raised by the entire country. The Great Western carried away 8,764,023 tons, the Taff Vale 7,278,617 tons, the London and North Western 1,114,112 tons, the Midland 680,007 tons. There are 289 collieries in Glamorganshire alone, and fresh discoveries are being made. Within the past few days a six-foot and a nine-foot seam have been struck in Llynvi Valley, which will probably employ from 800 to 1000 colliers.

**CARMARTHENSHIRE.**—The demand for pig-iron is good and it is thought prices are likely to rise, but the strike in Glamorganshire at the steel works will tend to equalise this. Although the London tinplate market is reported quiet, nearly all the works in the district are busy, and orders are stated to be not scarce. Several works at Llanelly complain much of the local rating (against which appeals are pending), but this can only affect such as are working at a very narrow margin of profit. The number of boxes sent to Liverpool in the past week is quite up to average. Relations between masters and men are satisfactory. The anthracite trade appears to be slowly but surely recovering. At the meeting of the shareholders of the Barry Port and Gwendraeth Valley Railway last week, the directors stated that there was an increase of £340 in the revenue. The cause of this satisfactory result is attributed to the increased demand for anthracite coal. For bituminous &c. coal prices continue low. Advertisements are out for contracts to make the long-talked-of line from the Rhondda Valley to Swansea; and, with a thorough rate, it is not unlikely that this line (or even the prospect of its being made) may keep down prices.

**CLEVELAND.**—The excellent character of last month's returns of the ironmasters, and the improvement in tone and prices at Glasgow, imparted a better feeling to the iron-market at Middlesbrough on Tuesday; and this was increased when it was reported that there was after all a possibility of some arrangement being made with the Scotch ironmasters by which any material increase in the production of both districts will be prevented. The ironmasters at their usual meeting before the market discussed the restriction question, and had communications before them which justify them in hoping that such an arrangement will be come to, and that without delay. The Cleveland ironmasters, as announced in our last report, were unanimously in favour of continuing the restriction, and all the Scotch combination except the Messrs. Baird were of a similar way of thinking. It is now stated that another firm, not previously in the combination, is willing to take the place of the Messrs. Baird, and thus things will be pretty much as they were, and some arrangement will doubtless be come to within the next few days. The tone of the market on Tuesday was more cheerful, and consumers appeared to be more prepared to enter into negotiations for purchasing, in fact, a good number of enquiries were received, and merchants were decidedly firmer in their quotations. Some were asking 44s., and others 44s. 3d. per ton for prompt f.o.b. deliveries of No. 3 G.M.B., and as buyers offered 44s. freely, a good amount of business was transacted at from 44s. to 44s. 1½d. per ton—figures which a few makers outside the combination took also. Those, however, connected with the combination, and who are the large majority, would not take less than 44s. 6d. per ton for prompt, and no one will sell forward until the restriction question is settled. The warrant trade is very dull, even offers to sell at 43s. 9d. per ton are made. The inquiries for pig-iron from abroad continue to be numerous, and shipments this month are likely to be good again, though they have only been about the average during the last few days. For the week ending Tuesday, September 5, they were 20,570 tons, and the total for September up to Tuesday night was 14,150 tons. The stock in Messrs. Connal's stores has declined 1700 tons since the former Tuesday, the quantity held being 115,881 tons. The finished iron trade has also improved, and manufacturers are well supplied with contracts, and want better prices. Some good orders have been taken during the last few days at £6 15s., less 2½ per cent. discount for ship-plates, and there is now a larger enquiry for this description of iron than there has been for a long time past. Angles are £6, less 2½ per cent. for large lots, and 2s. 6d. per ton more for small parcels, while common bars needed £6 5s., and best £8, both less 2½ per cent. Hematite iron is rather quieter, and Nos. 1, 2, and 3 are quoted at 56s. per ton, f.e.b. west ports. There is less inquiry for steel rails, which are quoted at £5 7s. 6d. per ton. Cleveland ore is quoted at from 4s. 6d. to 4s. 8d. per ton, and Spanish Bilbao 17s., and Campanil Somorostro 17s. 6d. per ton delivered Tees. Coalmasters are doing better, and receive many inquiries. It is thought that at the end of this month house coal will be advanced 1s. per ton. Coke is in good demand, and realises 12s. to 12s. 6d. per ton delivered at Middlesbrough. In the chemical trade business is stronger, particular in Epsom salt and oxalic acid. Numerous inquiries have been received from the leading chemical firms respecting the salt workings at Middlesbrough. The Cleveland ironmasters' returns for August were issued on Monday, and show that at the end of the month there were 120 furnaces blowing, being the same as at the end of July. Eighty-one furnaces are making Cleveland iron, which is one more than in July. There are thirty-nine making hematite, basic, &c., against forty at the expiration of the previous month. The output of Cleveland iron has been 147,878 tons, and of other kinds, 76,940 tons, the total being 224,767 tons, or 2526 tons less than July, the falling off being in the output of hematite. Stocks have decreased 21,842 tons, the total amount at the end of the month being 309,494 tons, as against 331,336 tons on the 31st July. The agreement for restricting the make, which came into operation on October 1, 1881, and

expires on the 30th inst., has been attended with a reduction in stocks to the extent of 124,917 tons. The shipments in the past month, as we reported last week, were exceptionally heavy.

**DERBYSHIRE.**—The most important event in connection with the iron and coal trade of this district is the start which has been made in connection with the construction of new works at Workington, in order to enable the Dronfield Works to be removed. It is expected that a population of 2000 persons will follow the new works. About £14,000 will, it is said, be required to remove the plant from Dronfield, whilst the addition to the existing works at Workington will, it is expected, entail an outlay of from £40,000 to £50,000. The general tone of the iron trade has of late improved, and more orders are on hand than was the case a short time ago. The foundries are also better off for work, and are turning out a fair share of work and orders. The coal trade shows some further improvement, but many of the pits are by no means fully employed. The miners in this part of the country seem to take but little interest in the threatened general strike. There is more coal sent by rail to London and the south, as well as to other markets. Steam coal is not so much enquired for, and there is only a moderate demand for small coal and slack.

**DURHAM.**—The pig-iron trade has been somewhat better this week. It is now stated that the Scotch trade is likely to change its mind in that respect, and as the matter is pending, things are inclined to be stiffer. The better feeling is also in a large measure due to the heavy shipments which have been going on, as also the reduction of stocks of about 22,000 tons. Shipments of pig-iron were the heaviest last month of any month since September, 1879, when the great American "boom" appeared. The demand was chiefly on foreign account, there being 58,000 tons sent to foreign ports, and under 38,000 coastwise. The quotations of makers are still based on 44s. No. 3, and those of merchants on 44s. to 44s. 3d., and these rates are very firmly maintained. The manufactured iron trade has been very steady as a rule. Some more inquiries have been coming forward, and manufacturers' hands have been pretty full. Bar manufacturers who were slack have been receiving more inquiry, and their rates are rather firmer. The shipbuilding trade keeps up a good demand for iron, and the prospects of this branch are good. The foundries are lately doing rather better, though the prices keep rather low. The figures for cast iron chairs is £3 2s. 6d. to £3 7s. 6d. The forge works are busy. The engineering works are also well employed, though the railway establishments are more employed on repairing than in the building of new locomotives. The prices of manufactured iron have been about—angles, £6 to £6 2s. 6d.; bars, common, £6 5s.; best ditto, £6 15s.; best best, £7 15s. to £8; iron rails, £5 5s. to £5 10s.; ship plates, £6 15s. to £7; boiler plates £7 15s. to £8, less 2½ per cent.; puddled bars, £4 2s. 6d., net. The ironworkers have given notice of a 7½ per cent. advance in wages from the 1st of November, when Sir J. W. Pease's award terminates. As the iron manufacturers have also given notice of a reduction from the same date, there is considerable divergence of views between the two sides, which an arbitrator will probably have some difficulty in adjusting. The action of the miners at the Manchester Conference in deciding to go in for a general advance of wages has not had much effect upon the local coal trade, where a sliding scale arrangement exists, which it is believed the men will carry out, unless considerable outside pressure be brought to bear upon them. The Durham household coal trade has been pretty steady, showing some improvement on the whole. It is thought that some advance may take place next month in the prices. The manufacturing coal trade has been firm, with a good steady demand. Steam coals are weaker, and the best are offered at 9s. per ton. Gas coals in good request. Coke firm.

**EAST WORCESTERSHIRE.**—We can report the local pig-iron market as steady, and that crude iron keeps in good request. The output of the number of furnaces in blast throughout South Staffordshire and East Worcestershire is fully absorbed by the current demand, stocks of pigs receiving very little augmentation. Current quotations are, for all-mine, hot-air, pig-iron, £3 7s. 6d. to £3 10s. per ton; part mine, £2 10s. and £2 12s. 6d.; common iron, £2 to £2 2s. 6d. The reported resolution of the Scotch ironmasters not to renew the agreement with the Cleveland makers in regard to a restriction in the manufacture of pigs to the extent of 12½ per cent. of the furnaces in blast, although such decision points perhaps to a speedy relighting of more furnaces in the north, and the consequent replenishing of the pig-iron market, has not appreciably affected the firmness of prices here. On the contrary, the decision is held to point to the belief of the Scotch ironmasters that the market in pig-iron generally is equal to that much addition to the output involved in the resolution referred to. The tone of the finished iron trade continues to be satisfactory; but, in some departments, a slight falling off of actual demand may be reported. Marked bars are quoted at £7 10s., with the customary 12s. 6d. extra for Lord Dudley's brand. Plates continue in good request, the bridge and girder departments being very busy just now in the execution of some important contracts. Sheets (singles) are quoted at from £8 5s. to £8 10s.; doubles, £9; and trebles, £10 to £10 10s. The healthy aspect of trade generally is already beginning to cause speculation as to the course of events at the next quarterly meetings of the trade, when some important developments are deemed probable. The industries in the East Worcestershire district are now without fear of immediate or prospective labour complications arising to disturb the settled tenor of business, a satisfactory state of things which, it is to be hoped, may long continue. Ironstone is in firm quotation, with fair sales. Oolite is also in good request. Coke is plentiful. Coal keeps slightly better, as compared with the demand of a fortnight or three weeks ago. The leading list rates are based upon 10s. per ton for furnace coal, east of Dudley; 8s. for steam (or locomotive) coal; and 5s. 4s. 6d., and 4s. for best and ordinary slack respectively. An inferior quality of fine fuel is, however, readily obtainable from some collieries at much less rates than these; and in large coal, also, the foregoing prices are "squeezed" for large quantities. The question of Insurance. Provident Societies still exercises the minds of the local miners and their delegates; but the attention of the

men recently has been chiefly centred on the Miners' Conference at Manchester.

**FOREST OF DEAN.**—The crude iron trade does not show revival, notwithstanding that stocks are low and immaterial. Last month's clearances at Cinderford were, approximately, 1500 tons, and since the beginning of September business here has been steady. Quotations are practically the same as stated in a recent notice, best brands fetching 60s. in the yards. In manufactured iron the prospects are a little more hopeful, and at the district tinplate industries a steady business is being done at late prices. Iron ore is not in any very active request, on the contrary, the large importations of Spanish ores to other districts materially interfere with the prospects and position of the Forest. Quotations for best classes of local mineral at the pit banks may be stated at 12s. per ton, and inferior ores of 25 to 30 per cent. metallic iron, 7s. The coal trade is showing elasticity. Prices are, however, unaltered, best classes of domestic fuel at the pits fetching from 8s. to 9s. per ton, and rubbles 7s. 6d. Steam-coals range from 3s. 6d. to 5s., and engine fuel from 2s. 6d. to 3s. 6d. Last month's shipments at Lydney-on-Severn were 25,287 tons, which is the highest for the year, and was only once surpassed during 1881. A good deal of interest is directed to the decision of the miners' representatives at Manchester last week on the subject of applying for an advance of wages. In the Forest there is a great deal of uneasiness because of the wage question, and any rupture elsewhere would tend to strengthen the demand here. At the Bilson and Crump Meadow Collieries the employees have this week been conceded a 5 per cent. advance.

**GLASGOW.**—The warrant market has now somewhat recovered from the depression which set in when it became known that the Scotch ironmasters were not going to renew the agreement with their Middlesbrough competitors to restrict the production of iron, and it is now reported that fresh negotiations are likely to be entered into between the two parties, which may result in some understanding being come to not to increase the production in either district whilst the stocks remain so heavy. Some of the ironmasters here are said to be anxious that some scheme with this object in view should be carried out. In the meantime there is a decidedly satisfactory demand for iron both for local consumption and shipment, and the prospects of trade for the autumn are satisfactory. There has been a slight lull in the American orders, but Canada continues a good customer. On Thursday business was done from 49s. 6d. to 49s. 11d. cash and 49s. 8d. to 50s. 1½d. a month; next day the heavy selling of two or three firms knocked the price down from 49s. 10d. cash, and 50s. a month to 49s. 3d. cash and 49s. 6d. a month. On Monday the market recovered from 49s. 5d. cash, and 49s. 7½d. a month to 50s. cash and 50s. 2½d. a month. On Tuesday the price was somewhat steadier at 49s. 11½d. to 50s. 3d. cash. On Wednesday sales took place from 50s. 3½d. cash and 50s. 6d. a month to 50s. cash and 50s. 3d. a month. Closing buyers buyers 50s. 1d. cash, and 50s. 3½d. a month. Sellers near. Makers are well supplied with orders, and maintain their prices at a comparatively higher level than warrants. There are now 109 furnaces in blast, against 118 at this time last year. The shipments of pig-iron from Scotland last week were foreign, 13,155 tons; coastwise, 2921 tons; total, 16,076 tons, against 13,795 tons in the corresponding period of last year. The increase in the shipments for this year now amounts to 52,347 tons. The imports of Middlesbrough pig-iron into Grangemouth last week were 4205 tons against 6505 tons in the similar period of last year. The total decrease in imports for this year is now 52,011 tons. The stock of pig-iron in Connal and Co.'s store is now 629,355 tons, being a decrease for the week of 635 tons. The works in the manufactured iron trade are all busy, and will be so for some time to come. Prices are well maintained, especially for ship and boiler plates. Shipbuilders, engineers, and ironfounders are as busy as ever they were, and the local consumption of pig-iron is at present very heavy. This week about 10,000 tons of Spanish iron ore have arrived in the Clyde. Prices show no change. A large trade is doing in coals both for home use and for shipment. The colliers are again beginning to agitate for higher wages, though present prices are rather low to be able to afford any advance.

**LANCASHIRE.**—Makers, both in the pig and finished iron trades of this district, are kept busy, working on with contracts in hand; but of actually new business there is very little stirring, and there is scarcely anything doing to actually list the market, so far as values are concerned. A slight easing down is, however, apparent, and although it cannot be said that actually lower prices are ruling, there is little doubt that anything like good offers at under-current rates which have a better chance of being accepted now than was the case a week or so back. Of Lancashire pig-iron good deliveries are still being made from the local works, and the total sales for the year up to the present are in excess of those of last year; but there has been a marked falling off in the new orders coming in during the past two or three weeks. For delivery equal to Manchester the quoted prices remain very firm at 46s., less 2½, for both forge and foundry qualities. Odd sales of distinct brands are still being made at full rates, but except where makers are really not offering iron, prices are certainly easier. For delivery equal to Manchester, Lincolnshire iron could be bought at 47s. to 48s., and Derbyshire at 48s. to 49s., less 2½ per cent. In the finished iron trade the home demand cannot be said to be good, and second-hand lots are to be bought in the market at under makers' prices; but for shipment there is a very fair demand, and manufacturers, who are kept fully going with orders in hand, are firm on the basis of about £6 7s. 6d. per ton for bars delivered equal to Manchester or Liverpool. The engineering branches of trade are also kept well engaged, and there is a fair amount of new work still coming in. There is, however, a falling off in the activity recently experienced, and inquiries for workmen are not so numerous as they were. Any improvement in the coal trade, which is naturally to be expected at this season of the year, is only developing itself very slowly, and as yet no advance in prices has been possible. There is certainly more doing in the better classes of round coal for house fire purposes, and the pits are getting on to about five days a week, but this represents to the full extent any improvement at present experienced in the market. In common classes of round coal for iron making and steam



purposes there is no change to notice. Burgy meets only with a very slow sale, and slack, although prices in some cases are rather stiffer, is generally more plentiful in the market. Shipping has not been quite so active, and both at Liverpool and Garston very low prices are still ruling. At the pit mouth the average prices are about as under:—Best coal 8s. to 8s. 6d.; seconds, 6s. to 7s.; common round coal, 5s. to 5s. 6d.; burgy, 4s. to 4s. 6d.; good slack 3s. 6d. to 3s. 9d.; and common sorts, 2s. 9d. to 3s. 3d. per ton.

**LEEDS AND WEST YORKSHIRE.**—The best Yorkshire iron forges, with one or two exceptions, are working four days a week. There is a better demand for railway axles, and the stocks of tires on hand are being drawn upon very considerably. In consequence of the latter circumstance, there is a good deal more doing in one or two forge departments, in order to be prepared for what may hereafter arise. The home railway companies have been making inquiries, and it seems most likely that, in order to meet their winter traffic, some of the companies, both in the north and the Midlands, will give out orders very shortly for tires to a considerable extent. A good deal of the machinery in some of the forges is engaged in the production of special uses, such as are required for general engineering work, and in connection with one or two large contracts for bridge construction. With respect to the common iron manufacture there is nothing new to report. Merchant's find business rather quieter than they did a month since, and on the whole prices are weaker, because warehouse stocks are rather heavy in consequence of purchases made at the turn of the quarter in the expectation that prices had then decidedly taken an advancing turn. Locomotive builders continue to be steadily employed. There is no more active branch of the trade at this moment than boiler-making; more than one firm in the business is working night and day. As to the West Yorkshire coal trade, there is no change with respect to either the export or the home demand; the former keeps steady, but nothing beyond that.

**LIVERPOOL.**—The market just keeps steady and no more. Orders are not large, but in fair number, and prices seem to be maintained by makers. Pig-iron does not show much life, and the fluctuations caused by the numerous reports as to the action of the Glasgow and Middlesbrough makers creates considerable uncertainty in buyers' minds. Tinplates are rather slow of sale at the moment, and the supply seems ever equal to the demand. Stocks work off but slowly, and the output, despite the fewer number of mills, is large. Sellers do not seem able to get buyers beyond 16s. per box for prime cokes, and at this price, or 2s. less for waste, many thousand boxes can readily be had. American orders for sheet iron continue to come across, but not much else, although there has been some inquiry this week, probably emanating from those who foresee an export from this side during the autumn to counterbalance the large imports of wheat, which the extremely bad weather for our own harvest is considered likely to cause. Sheet iron is still the spoilt child of the moment, and makers have things pretty much their own way, although they do not find it possible or advisable to drive figures up beyond the point reached a few weeks ago. Hoops show an increasing demand, partly on Indian and partly on American account for baling purposes, with a fair general demand as well. Ship-plates and angles are not in favour, although the prices of the latter, as compared with that of plates, is disproportionately low. Home buying of finished is rather slack, and prospects are not quite so good in this line just at present. Ship-builders are said to have enough work to carry them over the winter, but they do not seem to be buying any more material now; what new vessels have been recently placed have chiefly been either sailing ships or steel steamers.

**LONDON.**—The metal market here is quieter for consumption. The more speculative metals show signs of improvement. Iron.—We notice some violent fluctuations in pig-iron, from 51s to 49s. 3d., and up again to 50s. 11d. closing. In manufactured, makers are well employed, although low rates are ruling. Copper.—Strong. Chili bars, 68 5/8, cash. Tin: After a relapse to 99 for no reason whatever, we note a smart reaction to 105, closing easier, 104 1/2. English ingots, 108. Lead.—Quiet. Soft Spanish, 14 1/2. Tinplates.—Easier. Cokes, Liverpool, 16s. 3d. and 17s.

**NEWCASTLE AND THE TYNE DISTRICT.**—The pig-iron trade here is rather quiet, but steady withal. Influenced in a great measure by the failure of the negotiations between the ironmasters of Scotland and the North of England for a continuation of the restriction of make, prices have receded quite 3d. per ton since last week, the current rate for Cleveland No. 3 delivered here being 46s. 3d. per ton, and for No. 4 forge quality, 45s. 3d. In manufactured iron we have a steady business passing, mostly in the supply of shipbuilders' requirements; but the extreme rates quoted last week have relaxed to a slight extent, although it cannot be said that the market is weaker. Ship-plates are realising 66 1/2 to 67s. 6d.; angle-iron, 66 1/2 to 67s. 6d.; boiler-plates, 67 1/2 to 68s. 6d.; and bars, 66 1/2 to 67s. 6d., delivered to the Tyne, and less 2 1/2 per cent. commission. All the rolling mills in this neighbourhood are in full work, and have extensive contracts on hand for the most part. A moderate business is being done in the import of iron ores from Spain; the price of Bilbao red ore, shipped, is 7s. per ton, and the freight to the Tyne, 9s. 3d. Shipbuilders are all extremely brisk as far as regards present work, but new orders and inquiries are little heard of. Indeed, there is but too much cause to fear that iron steamers are being produced too rapidly, and one indication is pointed out by the people who hold this opinion, viz., that notwithstanding the withdrawal of a very considerable tonnage from the ordinary carrying trade by the exigencies of our operations in Egypt, freights are no higher, but, on the contrary, are lower in some directions. There is every prospect of a heavier tonnage of new steamers being launched in the Tyne this year than has ever been known in one year before. Engine manufacturers are still as busy as it is possible for them to be; and some good is expected to result from the North-East Coast Exhibition, in the way of bringing more orders to our district. We have no change to note in any of the minor iron industries. The coal trade is, on the whole, in a prosperous condition, but Northumberland steam coals are weaker, the best of the export trade being drawing to a close for the year. They have settled down

again to the old price of 9s. per ton, less 2 1/2 per cent. Gas coals are being shipped very freely for all parts, and the demand for London is very great, so that prices are extremely stiff at 6s. 6d. to 7s. per ton, and manufacturing and smithy sorts rate about the same, with a strong demand. Households are improving in value to a slight extent. Coke goes off readily, foundry sorts bring 14s. to 14s. 6d. per ton, 10 b., and blast furnace descriptions 10s. 6d. per ton at the ovens. Chemicals are steady, and have an upward tendency; soda ash, 11 1/2 d. net, and soda crystals, 2 1/2 1/2. For cement there is a good sale at full prices. Firebricks are rather less asked for, and the less known brands are easier to buy.

**NEWPORT.**—The improvement in the iron and steel trades is still maintained; the demand from all parts is kept up, and orders on a large scale are being placed in the neighbourhood. There is little or no change to report in pig-iron, which remains firm at 50s. 6d. to 55s. for Middlesbrough foundry pigs, and 49s. to 50s. for other qualities delivered ex ship at Newport. The arrival of iron ore from Bilbao during the week have again been very large, and prices remain the same as quoted in our last, viz., Rubio, 15s. per ton; c.i.f., and Campanil Somorrostro, 15s. 3d. per ton, c.i.f. Not much ore is going to stock, which is a proof of the activity at the works. Manufacturers of finished iron have now little cause for complaint, as they are well supplied with orders at fairly remunerative prices. Buyers who for some time have been withholding their orders in the hopes of getting better terms are now anxious to place their specifications, fearing a rise. The demand for steel is very great and the quantities turned out from the neighbouring works show a marked increase of production. Tinplates are quoted at the same figures as last week, and the reports from America are still very satisfactory. It is the opinion of many well able to judge that manufacturers are better off now than they would be if plates went up suddenly to a high figure. Undoubtedly, if this were the case, we should soon have several of the works now idle, restarting, and the result be that the supply would again exceed the demand. Although the shipments of steam coal during the week have been considerably below the average, prices remain very firm, and shippers refuse to make the slightest concession, knowing the lull in the shipments is only of a temporary character. Small coal is still in good inquiry, and prices are stiffening. There is no change to report in pitwood, but we may mention that not a single cargo has arrived during the week. The coal clearances, foreign, amounted to 12,799 tons, and coastwise, 18,688 tons, against our last returns of 31,706 tons foreign and 17,067 tons coastwise. Of iron, &c., 1283 tons were despatched to the following places:—Lisbon, 1200 tons, and New Orleans, 83 tons. The imports comprised 15,559 tons of iron ore from Bilbao and 5920 tons from other places. 8572 standards of deals also came to hand from Archangel.

**NORTH STAFFORDSHIRE.**—There is no alteration of importance in the condition of the iron and coal trades of this district. The home market is steady, but is not animated, although fairly healthy. The continued depression in the weather causes some anxiety as to the harvest, on which a good deal of winter business depends. The export trade, however, is fairly active. Some good orders for merchant classes have been received from the United States, and few heavy consignments of sections are being made to India. Nothing is doing with Russia, formerly an excellent customer. Business with Australia and the Cape is quiet. As to the trade generally, there is a good demand for bars and heavy sections, but orders for plates have fallen off, and hoops are not quite so much wanted. Prices all round are very firm, if anything firmer than for some weeks, but crown bars are still quoted at from 66 to 67s. The pig-iron and ironstone markets are in fair condition, the demand being steady, if not particularly active. Prices are upheld on the quotations last given. There is a good sale of puddled bars. No change is noticed in the coal trade, which keeps dull, with very low rates.

**SHEFFIELD.**—After a lull which has extended over the greater part of two months, business is again reviving. There are now indications of a good autumn trade. In the first place ironmasters are receiving heavy lines for ship and boiler-plates, and two of the leading Sheffield houses have orders on hand which will keep them fully employed in the plate and sheet departments until next spring. Most of the leading firms engaged in the heavy iron trades are now busy, and before long we may have to report on further accessions of orders. That this marked revival would occur, was noted in IRON three weeks ago. The removal of the business of Messrs. Wilson, Cammell and Co. from Driffield to Workington is a principal topic in local circles, and it is ascribable only to the conduct of the railway companies, who, when they own local lines, where they can charge their own rates, place heavy tariffs on their customers' consignments. A large proportion of trade has been lost to this district through this removal. Some good contracts are in the market for steel rails, both on home and continental account (principally Italy). Where, however, the goods have to be shipped, the coast houses get the lines. Where home requirements have to be regarded, the Sheffield makers hold their own. Foreign orders are the heaviest, and therefore the more regarded by rail manufacturers. The fact is, that excepting for best rails for home use, there is little demand for local made steel rails. The railway tariffs, on incoming raw material and out-going finished rails, have practically driven the trade from the locality. In reference to the cutlery departments, it may be noted that the Spanish-South American markets are again reviving, heavy fresh specifications coming in. Several of the Sheffield cutlery firms with a trade to Valparaiso, Lima, &c., are in receipt of good orders. The trade has for ten years past been cut up by the French houses, but as the result of special efforts on the part of local houses, a considerable portion of the business has been regained. Advances from the West Coast of Africa are reassuring, and within a couple of months very heavy shipments will be made for the coast trade. On Monday the heavy mail from Sydney (with advices from the South Sea Island markets) ran in, and her reports, as noted by manufacturers here, indicate a continuance of good trade with the Australasian settlements, which are being rapidly developed. No other alterations in trade are sufficiently significant to require notice.

**SHROPSHIRE.**—There is at last something like a

movement in the finished iron trade of the district, although it is not of a very decided character. Still manufacturers report that the enquiries for best qualities of finished iron during the past week have been certainly more numerous than of late, and specifications have also come to hand with greater freedom. Prices continue without change. There is no decided change in the local pig-iron trade. Balances of orders on the books of the leading firms are being worked off, and the enquiries for next quarter will, it is expected, shortly be forthcoming.

**SOUTH STAFFORDSHIRE.**—The circumstance that the war seems likely to prove a longer affair than was at first anticipated is viewed by manufacturers with dissatisfaction this week, since it means continued interruption with the Indian and Levant trade. Nevertheless, cultivating tools, especially hoes, are going in good quantities to the Empire. Manufacturers, however, complain of the leanness of the business. Australia is ordering water fittings and other brassfoundry in fairly encouraging quantities. The home demand for plumbers' brasswork is bad. Chandeliers and gasfitter makers are beginning to lay themselves out for the coming season, although it is not believed that the demand will be large. The Colonies, once important markets for these goods, are now largely supplying their own necessities. Brass lock furniture keeps the leading makers busy on home and export account. But prices favour buyers, and on common furniture the discount has been increased 2 1/2 per cent., making it now 70 per cent. Wrought iron odd work makers are busy, and so, too, are the shipping tackle firms. Galvanisers keep very well employed, and prices are steady. Galvanised sheets of 24 w.g., in bundles, are 64 1/2 to 65 1/2 at outports, and 26 w.g., 66 1/2 to 67 1/2. Marked bar makers announce that competition from the second-class houses, whose price is 67 and thereabouts, as against 67 1/2 to 68 1/2, quoted by "the list" houses, is active. Common bar makers are well on at 66 1/2 to 67. The demand for hoops is good at 66 1/2 to 67. Black sheets are about 68 1/2 to 69 1/2 for singles. Native pigs are dull at 39s. to 42s. 6d. for cinder sorts, and 52s. 6d. to 57s. 6d. for part mine qualities. Messrs. E. T. Wright and Sons, of the Monmoor Ironworks, Wolverhampton, have just secured the three years' contract for supplying the Admiralty with boiler plates. The same firm also got the contract three years ago and none of the deliveries which they have made under it have been returned.

**WEST CUMBERLAND.**—There is no improvement to note in the condition of the iron trade of this district; but makers are very well employed in all departments, and there is a stronger enquiry from certain districts to which large supplies of hematite iron are usually sent. America and the continent are very good customers, and are likely to remain so during the remainder of the year. The furnaces are pretty nearly all in blast, and the output is therefore large. The demand for Bessemer qualities by steel makers in the neighbourhood and elsewhere is quite up to recent averages, and as there is a steady growth in the steel trade and in the facilities for producing this metal, it is expected for a long time to come there will need to be a very heavy production of Bessemer metal. A fair tonnage of forge iron is being produced at the different works in the district, and the demand for this is only second in importance to that of Bessemer. The value of No. 1 Bessemer stands at about 59s., and No. 3 forge 57s. In some instances it is said that sales have been effected at prices a trifle lower than this, but the general business of the district is maintained at the quotations given above. A steady tone characterises the steel trade, and it is noticeable that the mills are fully employed night and day (Sundays excepted), both in the rail department and at the mills where merchant qualities are produced. There is no change to note in the value of iron ore, but a good demand is experienced, and the mines are busily employed. A good shipping trade is being done.

#### 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 last week. The shipments were:—

The shipments were:—					
Week ending	1882.	1881.	1880.	1879.	1878.
	Tons.	Tons.	Tons.	Tons.	Tons.
Jan. 7 ..	3,389	6,182	6,689	6,069	6,085
14 ..	5,767	6,677	12,288	6,291	5,538
21 ..	7,742	4,608	7,566	6,331	6,170
28 ..	8,041	8,936	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	8,311	7,836
March 4 ..	12,600	9,900	19,968	13,919	6,816
11 ..	13,287	8,261	23,985	10,743	8,062
18 ..	17,544	7,893	20,987	11,107	7,728
25 ..	12,375	12,262	23,598	9,463	11,499
April 1 ..	10,107	10,421	15,822	15,653	7,445
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	10,270	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	11,030	11,415	10,742
27 ..	9,769	11,943	12,810	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	7,410
8 ..	10,474	13,850	10,158	5,619	7,151
15 ..	13,136	11,118	10,728	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	8,491
Sept. 2 ..	10,076	13,795	15,522	11,795	9,918
Totals	425,545	373,269	486,242	335,354	268,602



## 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 August of 1882 and the previous four years:—

WEEKLY SHIPMENTS.					
Week ending	1882.	1881.	1880.	1879.	1878.
Tons.	Tons.	Tons.	Tons.	Tons.	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	20,390	18,835	—	—
22 ..	16,400	19,244	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 ..	27,803	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 ..	22,301	20,933	15,734	—	—
12 ..	21,199	15,982	17,051	—	—
19 ..	20,002	17,980	18,387	—	—
26 ..	18,864	21,923	14,067	—	—
Sept. 2 ..	20,536	15,027	20,609	—	—
Totals ..	607,625	607,735	645,009	—	—
MONTHLY SHIPMENTS.					
Jan. 31 ..	71,458	47,890	78,941	39,751	47,932
Feb. 28 ..	60,893	58,370	71,573	57,458	51,607
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	81,820	71,456	74,043
June 30 ..	68,373	91,577	82,186	60,808	68,808
July 31 ..	71,311	87,580	82,306	61,825	78,642
Aug. 31 ..	95,861	84,901	72,665	61,499	73,275
Totals ..	607,047	606,559	641,893	491,152	525,039

## THE CONTINENTAL IRON AND COAL TRADE.

**AUSTRIA.**—The important contract of 26,000 tons of steel rails for the Galizische Transversalbahn has been divided between the Witkowitz Eisenwerke and the Erzherzoglich Albrecht'sche Industrie-Verwaltung, at the price of 115 florins per ton, f.o.b. Witkowitz and Trzinetz, delivery to extend over 1882 and 1883. The Witkowitz establishment has also obtained the order for the whole of the iron bridge material required for the above new railway, about 4000 tons, the price being fixed at 240 florins per ton at works.

**BELGIUM.**—There is no change to record in the general tendency of the Belgian iron market, the former firmness continuing. All the works are fully employed; orders are coming in very steadily; but there has been as yet no desire to advance prices, as the present rates, which are by no means too high, appear to give general satisfaction. Pig-iron is held at the same price as last week. English foundry pig is steady at 65 fr., while Belgian foundry pig is scarce, and wanted at 75 fr. At Athus, sales are effected at 62 fr. 50 c. Blast furnaces are engaged up to the end of the year. Forge pig is also without change. Small quantities are treated at 60 fr. at Charleroi. There is likewise no alteration in finished iron. Bars 0. 1 are steady at 135 fr. and 157 fr. 50 c. There is an active demand for joists, especially from England. Between 2000 and 3000 tons have been sold. Quotations range from 145 fr. to 150 fr. For angle iron, the price is 150 fr. and 155 fr. The inquiry for plates is very animated. At Liège, as well as at Charleroi, best brands are not treated under 190 fr. Boiler plates are in much request at 210 fr. Rolling mills are very busy on fine plates, which fetch, on the average, 280 fr.

**BRUSSELS, WEDNESDAY EVENING.**—There was a very large attendance to day at the Bourse des Métaux, and, as may readily be supposed, the conversation turned principally on last week's resolution of the Scottish ironmasters. The effect of this resolution on the continental markets has not lasted long, the English statistics of the pig-iron market having greatly improved at the end of last month. As for the Belgian market, the tendency is firm again, after a very slight depression, in consequence of the above mentioned events. Our last official quotations per 1000 kilogrammes, are as follows:—

	Aug. 30.	Sept. 6.
Belgian foundry pig ..	France.	France.
Belgian foundry pig ..	75	75
Luxemburg foundry pig ..	65	65
English foundry pig ..	57.50	57.50
Bars, No. 1 ..	65	65
Angle iron ..	137.50	137.50
Boiler plates ..	145	145
Ordinary plates ..	150	150
Oil plates ..	175-150	145-150
Steel rails ..	145-150	145-150
Cast iron ..	190	190
Cast steel ..	210	210
Cast iron ..	290	290
Cast steel ..	260	260
Cast iron ..	235	235
Cast steel ..	245	245

With respect to the coal market, there are still bright prospects on account of the continual exhaustion of stocks and the coming winter season. But there has been no further rise this week in prices, except those of coke. Large coal is much in request, on account of the demand for that kind of fuel in France. The last quotations are:—

	Aug. 30.	Sept. 6.
House coal ..	France.	France.
Large coal ..	16-18	16-18
Unscreened coal ..	16-19	16-19
Small steam coal ..	11.50-15	11.50-14.10
Small coking coal ..	10-11	10-11
Coke ..	11	11
Ditto half washed ..	18	19
	21	21

**FRANCE.**—The surveys for the proposed Canal du Nord, which, if carried out to the extent proposed, will connect Paris with Dunkirk, are to be pushed forward with the utmost possible speed. As the construction of the canal will be of very great importance to the departments through which it is to pass, it may be interesting to recapitulate a few particulars, which we take from a contemporary, with reference to the new canal. As long ago as 1878, the French government were authorised to execute the necessary work for giving the Seine a depth of 10 feet between Rouen and Paris. English coal, which is already delivered in considerable quantities upon the Parisian markets, would, on such a depth of water being obtained between Rouen and Paris, reach the French capital more easily, and could be sold upon the Parisian markets at some reduction in price. The prospect of this state of things occasions some uneasiness among the colliery proprietors of the Nord and the Pas-de-Calais, who naturally wish to secure a large share of the coal supply of Paris. After consideration of all the facts, the parties interested came to the conclusion that, in order to augment the outlets of the coal mines of the Nord with the Pas de Calais, it is indispensable to unite those departments of Paris by a direct canal. Paris in fact, now communicates with the northern frontier of France by a number of waterways which have become inadequate to meet the requirements of modern commerce. The movement of commodities is effected upon these streams in a sluggish fashion and under relatively costly conditions. The Northern of France Railway cannot supply the deficiencies of the existing navigations, and the result is that Paris, the great industrial centre of France, is obliged to apply to England for half the coal which it consumes. The proposed canal would be of obvious utility for the conveyance of heavy goods, which naturally seem intended to travel by water rather than by railway. Two routes for the proposed great canal came under consideration, and an enquiry having been opened as to the relative merits of these routes, the commission of enquiry pronounced almost unanimously in favour of a direct canal *via* Arleux, Péronne, Ham, and Noyon. The commission further advocated the doubling of the sluices, and proposed that the width of the canal should be carried from 35 feet 8 inches to 56 feet 8 inches. The commission, in short, adopted the proposal for a direct canal of large dimensions. The effect of the proposed doubling of the sluices and increasing the width of the canal will be to carry the estimated cost from £3,320,000 to £4,200,000. The expense of maintaining and working the canal is estimated at £36,000 per annum. The annual charge for interest at 4 per cent. per annum upon the capital which will have to be expended will be £168,000; and, accordingly, to clear its expenses, the canal will have to earn somewhere about £204,000 per annum. Should the canal of the Nord be carried out, it will bridge the distance between Dunkirk and Paris by 68½ miles. The district to the east of France accommodated by the new canal from the Oise to the Aisne will also benefit to some extent, as it will abridge the distance between it and Paris by about 63 miles. Finally, direct navigation between the Mediterranean and the North Sea will also be reduced by the proposed new canal to 715½ miles, or about the length of the present railway route from the north to the south of France. A reduction of the distance over which coal will have to be conveyed will necessarily involve also a reduction of transport dues, and it is estimated that upon coal forwarded from Anzin to Paris, for example, the average saving will be about 1s. 7½ p. ton. As the consumption of the department of the Seine now exceeds 3,000,000 tons of coal per annum, of which more than half is imported from abroad, the annual saving secured by the district accommodated by the proposed canal would obviously be very considerable.

The French Administration des Mines has published statistics of the production of iron and steel in France during the first six months of this year. They show that the output during that time was greater by 83,124 tons than for the last six months of 1881, divided as follows:—47,676 tons for pig-iron, 19,070 tons for manufactured iron, and 15,578 tons for steel. If we compare the figures of the corresponding half-years of 1881 and 1882, the increase is still greater. It was 79,000 tons for pig-iron, and 32,000 tons for finished iron, or a total of 111,000 tons, without including steel, the production of which will also turn out to be much greater for the last half-year. The following are the exact figures:—

	First Half-year, 1882.	Second Half-year, 1881.
Forge pig—	Tons.	Tons.
Coke ..	789,350	732,810
Charcoal ..	22,733	21,461
Mixed ..	5,745	8,952
Totals ..	817,828	763,223
Foundry pig—		
Coke ..	173,660	185,013
Charcoal ..	4,100	4,583
Mixed ..	15,207	10,300
Totals ..	192,967	199,896
Total production—		
Coke pig ..	963,010	917,823
Charcoal pig ..	26,833	26,044
Mixed pig ..	20,952	19,252
Grand totals ..	1,010,795	963,119

	First Half-year, 1882.	Second Half-year, 1881.
	Tons.	Tons.
Manufactured iron—		
Iron rails ..	15,183	13,279
Merchant bars and special iron, puddled ..	383,431	368,840
Charcoal iron ..	13,785	13,007
Iron produced from scrap ..	41,779	35,166
Puddled plates ..	69,396	70,322
Charcoal plates ..	9,076	8,719
Plates produced from scrap ..	6,554	9,901
Total production—		
Bars ..	438,995	417,013
Rails ..	15,183	13,279
Plates ..	85,026	88,942
Grand totals ..	539,204	519,234
Cast Bessemer or Martin steel—		
Rails ..	161,687	151,984
Bars, &c. ..	37,256	30,329
Plates ..	9,422	6,310
Various descriptions of steel—		
Puddled and forged ..	9,195	8,274
Cemented ..	1,418	1,497
Hearth steel ..	4,478	3,484
Grand totals ..	223,456	207,838

There is no material change in the French iron market. A steady business is being done, at firm prices. The principal event during the past week in the pig-iron market of the Meurthe-et-Moselle has been the renewal of most of the various contracts for the supply of forge pig which are on the point of expiring. It is said that in the district of Longwy no less than 80,000 tons have been contracted for within the last week, one forge in the Nord taking no less than 20,000 tons. Without knowing the actual conditions, it is difficult to state at what price the iron has been contracted for, but it is the general belief that it is about 70 fr. per ton. Sales of foundry pig continue also frequent, and the prices at which No. 3 is held are 84 fr. for prompt and 82 fr. for future deliveries. Stocks are very low. There were several errors in the list of furnaces in the Longwy district, and which now append a corrected one:—

Names of Works.	Proprietors.	Furnaces. In Blast.	Con-structing.	Cold.
Mont-St-Martin et Pricuré	Société des Acieries de Longwy	5	—	1
Moulaire	Société des Acieries de Longwy	1	—	—
Rehon	Société de la Providence	3	—	—
Saulnes	Gustave Raty et Cie	3	—	—
Senelle	D'Huart Frères	1	—	—
Longwy-Bas	D'Saintignon et Cie	2	—	—
Micheville	Ferry Curicque et Cie	2	—	—
Villerupt et Claire	Ste. Chatillon-Commen-try	0	2	—
Villerupt	Ménart et Cie	0	1	—
Gorcy	Société métallurgique de Gorcy	2	—	—
Hussigny	Société lorraine industrielle	1	1	—
Jaco Corbeau	Société de la Chiers	0	2	—
Joet	De Wendel et Cie	2	2	—
Cons la Grandville	Marquis de Lamberg-tye	1	—	—
Totals ..		23	8	1

In the Haute-Marne, great activity prevails, and the market is very firm. Rolled coke iron sells easily at 210 fr., mixed qualities at 230 fr., charcoal puddled iron at 240 fr. to 245 fr., nailed at 280 fr. to 290 fr. At Paris, there is a steady sale, and current quotations to consumers are still 200 fr. for merchant bars, 210 fr. for plating sections, and 260 fr. for ordinary heavy plates. In the Nord, a good many sales have lately been effected; delivery to extend up to March and even June of 1883. This latter term has been difficult to obtain, for most manufacturers decline to bind themselves for longer than six months. The following are the ruling quotations:—

	Aug. 30.	Sept. 6.
	France.	France.
Merchant bars ..	190-195	190-195
Plating iron ..	200-205	200-205
Angle iron ..	200-205	200-205
Joists ..	190-195	190-195
Heavy plates ..	220-225	220-225
Ordinary plates ..	250	250
Boiler plates ..	280	280

**GERMANY.**—Statistics just issued show that the production of pig-iron in Germany and Luxemburg during the first seven months of this year was considerably above that of the corresponding period of 1881. It was in July 267,133 tons, against 215,148 tons in the same month of 1881; and for the seven months 1,600,853 tons, against 1,548,868 tons in 1881. The German export business is growing steadily. During the first six months of this year, the export of machinery increased by 40 per cent. as compared with the same period of 1881; of boilers, by 20 per cent.; locomotives, 36 per cent.; railway carriages, 50 per cent. In the German iron market the confident tone of the preceding week continues, enquiry being brisk, and prices growing stronger. In Westphalia, in all transactions for the fourth quarter, prices of pig-iron are from 2 to 2½ marks per ton dearer compared with the rates obtained for the third quarter of this year. Transactions are recorded in Luxemburg pig at 50 fr. for the last three months of this year. Puddling pig is also maintaining its price for all fresh contracts, and it is several marks next quarter. German foundry pig cannot be had under 60 marks. Bessemer pig is favourably influenced by the firm tone in the English Bessemer market. English metal of that description is now quoted on the Rhine 58-60 marks. Spiegeleisen is firm. There is a very large demand for all descriptions of finished iron. Great activity con-



tinues in most of the collateral departments of the iron trade.

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

	Aug. 28.	Sept. 4.
White-grained puddling pig ..	64-66	64-66
Spiegelisen ..	76-78	76-78
German foundry pig No. 1 ..	76	76
German foundry pig No. 2 ..	72	72
German foundry pig No. 3 ..	65	66
German Bessemer pig ..	72	72
English foundry pig No. 3 ..	44-45	44-45
English Bessemer hematite pig ..	58	58-60
Luxemburg pig ..	47	47
Bar-iron ..	145	145
Fine-grained iron ..	170	170
Angle-iron ..	150	150
Joists ..	150	150
Boiler-plates ..	220	220
Boiler-plates No. 2 ..	205-210	205-210
Fine Siegen plates ..	195	195-200
Fine-grained plates ..	250	250
Charcoal plates ..	280	280
Low Moor plates ..	310	310
Bessemer steel rails ..	160-166	160-166
Bessemer steel rails (defective) ..	135	135
Bessemer steel pit rails ..	135-143	135-143
Iron pit rails ..	135	135

The tendency in the Silesian iron market is still very favourable. The works projected and partly constructing, by some Silesian establishments in Poland will, it is stated, have a beneficial effect upon the pig iron market. The Upper Silesian market would then, it is thought, be relieved of about 15,000 tons, the amount of stocks at furnaces. Puddling pig is steady, and is quoted at stations nearest to furnaces at 65 to 66 marks per 1000 kilogrammes. The weekly production averages about 7500 tons. There is an active enquiry for rolled iron, while puddled iron is rather quieter. Rolled iron is steady, and paid with 137½ to 140 marks at mills. Sheet iron is selling well, coke plates at 190 to 192½ marks, black plates at 215 marks.

In the German coal market, besides an active enquiry for steam, gas, and coking coal, there is a brisker business doing in house fuel. Coke is also selling largely. A Dortmund quotations per 100 cwt. at the pit's mouth or at coke ovens are as follows:—

	Aug. 28.	Sept. 4.
Best coal (Stückkohle) ..	38-43	40-45
Cobbles ..	36-40	36-40
Large washed nuts ..	37½-40	37½-40
Washed smith's coal ..	30-33	30-33
Screened coking coal ..	26-28	26-28
Inferior coal ..	15-20	20
Gas coal ..	36-37	36-37
Mixed coal ..	30-32	30-33
Prime coke ..	58-68	60-68
Pateut coke ..	68-78	68-78
Small coke ..	42-45	42-45

# SCOTCH PIG-IRON QUOTATIONS.

(From the Glasgow Herald.)

	Th.	Fri.	Sat.	Mon.	Tu.	Wed.
Gartsherrie (in yard) ..	25½	25½	25½	25½	25½	25½
Coltness (at quay) ..	26	26	26	26	26	26
Langloan ..	25½	25½	25½	25½	25½	25½
Glenarnock ..	24½	24½	24½	24½	24½	24½
Carnbroe ..	24	24	24	24	24	24
Summerlee ..	25½	25½	25½	25½	25½	25½
Eglinton (at quay) ..	23½	23½	23½	23½	23½	23½
Shotts ..	25½	25½	25½	25½	25½	25½
Calder ..	24	24	24	24	24	24
Carron ..	24	24	24	24	24	24
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. 4112 to No. 4210, being the entries from August 29 to Sept. 4, 1882.

## NEW APPLICATIONS.

- Apparatus for Hanging Electric and other Lamps, &c.—A communication.—A. M. Clark, 53, Chancery Lane, Middlesex. [4149]
- Apparatus for Producing High Vacuum.—J. Jamieson, Akenhead Hill, Newcastle-upon-Tyne. [4181]
- Apparatus for Shipping Coal, &c. in Bulk.—P. J. Messent, Tynemouth, Northumberland. [4182]
- Power of Combustion from Gas or Oil.—H. Defty, 34, Gold Blow Road, New Cross, London, S.E. [4190]
- Apparatus to Facilitate the Impregnation of Air with Antiseptic Matters.—J. Mayer, Great Portland Street, Middlesex. [4160]
- Appliances for Securing Heads of Brooms to their Handles.—W. J. Sage, 77, Lorrimer Road, Watworth, Surrey. [4115]
- Automatic Nipper for Wire Rope.—J. C. Spence, 28, Harrow Road, and B. G. Nichol, Leazes Terrace, both of Newcastle-upon-Tyne. [4114]
- Axle Blocks for Carriages.—R. Palmer, Manchester, Lancashire. [4202]
- Bakers' Ovens.—A communication.—H. J. Haddon, Kensington, Middlesex. [4190]
- Baths.—A communication.—W. M. Brown, Southampton Buildings, Middlesex. [4112]
- Brough Loading Small Arms.—E. James, Birmingham, Warwick. [4187]
- Carbon for use in Arc or Incandescent Electric Lamps, &c.—H. J. Marshall, Linslade, Buckinghamshire. [4108]
- Carbonizing Air for Gas for Heating or Illuminating Purposes.—H. Defty, Gold Blow Road, New Cross, London, S.E. [4201]
- Carpet Fastener.—A communication.—E. Edwards, 40, Southampton Buildings, Middlesex. [4153]
- Chime Clocks, &c.—H. Robert, St. John Street Road, Clerkenwell, and H. F. Gouvenon, Theobald's Road, Middlesex. [4154]
- Construction of Apparatus for Actuating Railway Signals.—R. Evans, Denham Road, Kilburn, and H. J. Bennett, Pembroke Road, Kilburn, Middlesex. [4208]
- Construction of Cask or Barrel.—S. T. Thomas, Wolverhampton, Staffs. [4118]

- Construction of Hopper and other Dredgers.—W. R. Kinschley, Greenwich, Kent, and 2, Westminster Chambers, Middlesex. [4189]
- Construction of Ships.—A communication.—O. D. Abel, 28, Southampton Buildings, Middlesex. [4173]
- Construction of Voltaic Batteries.—L. Hartmann, Middleton Square, Middlesex. [4186]
- Coupling Presses, &c.—A communication.—H. J. Haddon, Kensington, Middlesex. [4205]
- Couplings for Railway Waggon, &c.—S. Keeton, Lenton, Nottingham. [4151]
- Covering the Contents of Railway Trucks, &c.—A communication.—H. S. King, Cornhill, London. [4194]
- Cutting, Pleating, and Sewing the Linings of Hats.—A communication.—W. H. Beck, 139, Cannon Street, London. [4193]
- Deodorising and Disinfecting Apparatus.—G. Nobes, 27, Dudley Grove, Harrow Road, Paddington, Middlesex. [4128]
- Discharging Bilge Water from the Holds of Vessels.—A communication.—A. M. Clark, 53, Chancery Lane, Middlesex. [4190]
- Diving Apparatus, &c.—E. Easthope, Wolverhampton, Staffordshire. [4143]
- Door Locks.—A communication.—H. J. Haddon, Kensington, Middlesex. [4142]
- Drying all Kinds of Waste or other Animal Matter.—F. Johnston, Brookly, Chemical Works, Bow Common Lane, Middlesex. [4203]
- Electric Controller and Indicator for Clocks, &c.—T. Wright, Malta. [4127]
- Electric Hydraulic Meter for the Measurement of Electric Currents.—R. Hammond, and L. Goldenberg, both of 110, Cannon Street, London. [4192]
- Electric Lighting.—T. T. Smith, Circus Place, Finsbury, London. [4162]
- Evaporation of Liquids, &c.—Adalbert, Podewills, Munich. [4155]
- Extracting Juice or Liquid from Sugar Cane.—A communication.—H. H. Gerson, Manchester, Lancs. [4146]
- Fasteners for Scythas.—A communication.—A. J. Boul, 323, High Holborn, Middlesex, and 6, Lord Street, Liverpool, Lancashire. [4121]
- File for Holding Papers, &c.—A communication.—P. Lawrence, Farrington Street, London. [4191]
- Filters.—A communication.—A. M. Clark, 53, Chancery Lane, Middlesex. [4193]
- Filters.—M. Richards, Brierley Hill, Staffs. [4193]
- Fish Bolts for Railway Fastenings, &c.—A. M. Tippet, Barrow-in-Furness, Lancs. [4177]
- Flanging Holes in Metal Plates.—A. Kirk, Glasgow, Lanark. [4137]
- Frames of Bags, &c.—V. Hupke, Offenbach-on-the-Main, Germany. [4172]
- Galvanic Batteries.—E. B. Burr, Walthamstow, and W. F. Scott, the Crown Chemical Works, Stratford, Essex. [4198]
- Galvanic Batteries.—S. H. Emmeus, Argill Street, Middlesex. [4147]
- Generating, &c., Electrical Energy.—P. de Villiers, Lancaster Road, Middlesex. [4148]
- Hair Restorer.—A communication.—E. Edmonds, 203, Strand, Middlesex. [4191]
- Handles for Bicycles, &c.—G. S. Kelsey, 13, Temple Street, Birmingham, Warwick. [4200]
- Hot Water Apparatus in Dwelling Houses.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4195]
- Indicator for Gas, &c.—J. Finney, Manchester, Lancs. [4130]
- Instantaneous Boat Discharge Apparatus.—C. Mace, and J. B. Brewster, both of Sunderland, Durham. [4167]
- Introducing into the Earth Manures in a Gaseous form.—A communication.—L. A. Greth, 30, Finsbury Pavement, Middlesex. [4150]
- Letting off Motion for Weaving Looms.—A communication.—B. G. Swann, Burgess Hill, Sussex, and 11, Arundel Street, Middlesex. [4132]
- Machine for Washing Lawn-Tennis Balls, &c.—A. S. Openshaw, Birmingham, Warwick. [4117]
- Machinery for Pressing Woollen and other Fabrics.—J. D. and W. Kenton, both of Leeds, Yorks. [4139]
- Machines for Spinning Flax, &c.—J. S. Cory, and J. McArthur, both of Leeds, Yorks. [4146]
- Magic Lantern Lamps.—Newton, Fleet Street, London. [4192]
- Manufacture of Boxes from Paper, &c.—A communication.—H. J. Haddon, Kensington, Middlesex. [4130]
- Manufacture of Carbon for Incandescent Electric Lamps.—J. Jamieson, Akenhead Hill, Newcastle-upon-Tyne. [4181]
- Manufacture of Caustic Potash and Soda.—A communication.—H. L. Wise, 7, Whitehall Place, Westminster. [4144]
- Manufacture of Metallic Boxes.—S. Rosse, Brighton, Surrey. [4124]
- Manufacture of Paper Bags.—T. Coates, Carlisle, and N. Chandler, Hedsor, Staffs. [4195]
- Manufacture of Silicate of Zinc, &c.—C. F. Claus, Mark Lane, Middlesex. [4131]
- Marine and Fluvial Structures.—A communication.—J. G. Tongue, 34, Southampton Buildings, Middlesex. [4145]
- Means of Warming the Air Before Inhaling, &c.—S. A. Darier-Gide, Geneva, Switzerland. [4206]
- Measuring Electric Currents.—A. L. Laneff, Wilmington Square, Middlesex. [4196]
- Metal Fencing.—W. B. Foreman, Wolverhampton, Staffs. [4184]
- Metal Waggon, &c.—A. H. Wallis, Basingstoke, Hants. [4204]
- Meters for Water, &c.—J. Rethie, Kirby Street, Hatten Garden, Middlesex. [4174]
- Paddlewheels.—P. M. Crause, 27, Upperton Gardens, Eastbourne, Sussex. [4169]
- Pencil Cases.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4195]
- Preparing Wool, &c.—I. Bailey, Keighley, Yorks. [4133]
- Printing machines.—W. S. Hope, 3, Elliott's Row, Southwark, Surrey. [4176]
- Propelling Ships or Vessels.—G. F. Harrington, Northwood House, Ryde, Isle of Wight. [4119]
- Railway Vehicles.—A communication.—W. L. Wise, 7, Whitehall Place, Westminster. [4145]
- Reciprocating Pistons for Fluid Pressure Engines, &c.—A communication.—H. J. Haddon, Kensington, Middlesex. [4141]
- Recording Votes.—J. Lazenby, Barnaby, Yorks. [4196]
- Recovering Tin Snuff, &c., to Extract the Metal Therefrom.—J. J. Loy, Heston, and S. P. Stephens, Siltney, both of Cornwall. [4196]
- Roasting Coffee.—W. T. Sugg, Vincent Street, Westminster. [4128]
- Rocking Chairs.—J. Hopwood, Salford, Lancs. [4170]
- Safety Couplings for Railway Waggon, &c.—G. R. Snowden, B. aford, Yorks. [4171]
- Safety Stirrups.—A communication.—A. J. Boul, 323, High Holborn, Middlesex, and 6, Lord Street, Liverpool, Lancs. [4122]
- Secondary or Storage Batteries.—D. G. Pitt-Greald, Heston, Surrey, and T. J. Jones, Princes Street, Hanover Square, Middlesex. [4178]
- Self-acting Tea or Coffee Urn, Heating Jacket, and Feed-Keyle Combined.—R. W. Raphael, Balmore, Ballymore, Antrim, Ireland. [4120]
- Sewing and Trimming Knit Goods, &c.—A communication.—J. H. Johnson, 37, Warwick's Inn Fields, Middlesex. [4113]
- Sewing Machines.—J. Warwick, Manchester, Lancs. [4107]
- Speed-Accelerating Driving Mechanism.—A communication.—W. R. Lake, Southampton Buildings, Middlesex. [4195]
- Spinning Frames for Spinning Jute, &c.—A communication.—S. J. V. Day, 115, Saint Vincent Street, Glasgow, Lanarkshire. [4134]
- Steam Engines.—A. W. Pattie, and G. W. Robertson, both of Glasgow, Lanark. [4190]
- Steam Pumps.—F. Spencer, Metropolitan Chambers, New Broad Street, London. [4145]
- Steering Gear.—J. Grantroth, Greenock, Renfrew. [4157]
- Stoppers for Bottles, &c.—N. Thompson, Brookly, New York, U. S. A. [4185]
- Supply of Ink to Pens.—G. R. Hughes, 2, Elm Row, Hampstead, and T. Cartwright, 6, Rudall Crescent, Hampstead, Middlesex. [4152]
- Telephonic Apparatus.—A communication.—J. H. Johnson, 37, Warwick's Inn Fields, Middlesex. [4113]
- Telephonic Instruments.—J. D. Husbands, Queen Victoria Street, London. [4150]
- Treatment of Materials to be used in the Manufacture of Paper.—G. O. McAlum, Newcastle-upon-Tyne. [4116]

- Tricycles, &c.—W. J. Lloyd, Harborne, Staffs. [4187]
- Valve Motions and Cylinders of Steam Engines.—A. C. Kirk, Lanark, North Britain. [4135]
- Ventilators for Railway Carriages, &c.—A communication.—R. H. Brandon, 1, Rue Lafayette, Paris, France. [4179]
- Working of Hydraulic Lifts, &c.—J. M. Day, W. R. Green, H. O. Walker, and R. Carey, all of Palmouth Road, Great Dover Street, Surrey. [4164]

## ABSTRACTS OF SPECIFICATIONS RELATING TO METALS

PUBLISHED DURING THE WEEK ENDING SEPT. 2, 1882.  
(Prepared by PHILIP M. JUSTICE, 53, Chancery Lane, W.C.)

**Corrugated Tubes.**—210 (1882).—S. Fox.—This relates to improvements on Patent No. 2530 of 1877, which describes a machine or apparatus for the manufacture of corrugated tubes and plates. Such corrugating being effected by rolls and guide rolls. The present improvement has reference to the mode of mounting the upper roll. Instead of the opening bearing for the journal at the end of said top roll, the journal is supported in a pair of specially arranged housings, and the middle and other end journals of the roll are carried in a sliding headstock capable of being moved endwise upon a fixed foundation plate. Another part of the invention relates to the use of hydraulic and compound toggle mechanism, by which the bottom roll is caused to approach the upper roll during the operation of corrugating a tube, and to recede therefrom after the corrugation is effected, for such a distance as to permit that part of the tube in contact with the periphery of the top roll to leave the same such a distance as to allow of the free withdrawal of the said top roll endwise when the corrugated tube may be lifted away from between the two housings.

**Stereotype Plates.**—303 (1882).—T. Smoler and W. Ward. Final Specification not filed.—In order to dispense with the burr, and ingate on the sides of stereotype plates, and to avoid the necessity of dressing the edges after casting, a recess is formed round the inner edges of the chases on three sides of the form, so that this part is only shoulder high, and the paper mache matrix thus arranged comes off with a raised edge round three sides. The ingate is removed by notching with a knife and breaking it off.

**Purification of Lead.**—308 (1882).—Cory communicated by P. Negris and E. Rizo. Provisional Protection only.—A jet of steam is injected into the bath of lead on its coming out of the reducing furnace. As the copper becomes eliminated, the oxides form an oily layer over the bath. In order to clear this off, alkaline ashes are added to the bath.

**Blast Furnace Gases.**—410 (1882).—G. Chapman. Provisional Protection only.—In order to separate oil or tar from blast-furnace gases, the gas is caused to pass through a chamber having a number of discs or screens kept constantly wetted with water. Said discs or screens have perforations through which the gases must pass.

**Blast Furnaces.**—416 (1882).—J. Cliff, and J. H. Dames.—In order to facilitate the charging of blast furnaces, a series of plates are placed opposite the openings in such a position as to receive the charge as it leaves the barrow and distribute it equally to the furnace. The plates are preferably of circular form.

**White Lead.**—1300\* (1877).—J. G. Martin.—Precipitated white lead is produced from litharge or lead oxide, or directly from metallic lead. When operating upon the last, the lead is caused to fall in a melted state upon a rapidly revolving cylinder kept cool by water circulating within it. The metallic lead so divided, is spread upon racks one above the other, over and through which a solution of acetate of lead in water is caused to flow, white lead being precipitated from the solution by the action of carbonic acid gas. The white lead is then separated by passing through a filter press, and is washed by forcing water through it.

**Oxide of Lead.**—2278 (1881).—Lark, communicated by G. T. Lewis.—Lead fumes are subjected to the action of carbonate of soda, or caustic soda, the resulting carbonate of lead, or hydrated oxide of lead, being subsequently heated in a furnace. The lead fumes containing sulphuret of lead are purified by the addition of bleaching powder before or during the treatment with carbonate of soda, or caustic soda.

## NEW COMPANIES.

**ABERDUNA LEAD MINES COMPANY, LIMITED.**—On the 25th ult., this company was registered with a capital of £37,500, in 25,000 shares of £1 10s. each to purchase from Mr John Hartlett, liquidator of the Denbighshire Consolidated Mines Company, Limited, the leases and assets of that company, situate at Llanerch, and to purchase other properties in the counties of Denbigh and Flint.

**ALLEN AND BURNHOUSE GILL MINING COMPANY, LIMITED.**—This company proposes to acquire and work the Allen and Burnhouse Gill Mine, situate in the township of Ridley, county of Northumberland. It was registered on the 25th ult., with a capital of £10,000 in 8000 shares of £1 5s. each.

**BORLAND PATENT INJECTOR COMPANY, LIMITED.**—This company proposes to acquire and work the United States patent No. 255,029, Chester, for improvements in injectors for steam engines. It was registered on the 25th ult., with a capital of £6000 in £50 shares.

**ELASTIC LOCK-SEWING MACHINE COMPANY, LIMITED.**—This company proposes to work the letters patent No. 4594, dated 13th November, 1878 granted to Wm. Fairweather for improvements in sewing machines. It was registered on the 25th ult., with a capital of £2000, in £5 shares.

**GOLD AMALGAMATING COMPANY, LIMITED.**—Incorporated on the 25th ult., with a capital of £150,000, in £10 shares, to purchase and work the letters patent, dated 22nd August, 1881, granted to Thomas Allison Readwin, for ore grinding and amalgamating machines, and a 50 to acquire from T. A. Readwin and Al. x. Hawthorn, a secret process for the treatment of auriferous and other ores. This company will also purchase from Edmund Thomas Bruff the business carried on by the Greenwich Ore Reduction Company, Limited.

**JARROW CEMENT COMPANY, LIMITED.**—For carrying on the business of cement manufacturers this company was registered on the 25th ult., with a capital of £30,000, in £10 shares.

**LANEFOOT COAL COMPANY, LIMITED.**—Registered on the 25th ult., with a capital of £1000, in £10 shares, to purchase for £630 the leases and assets of the Lanefoot Colliery Company, Lanefoot, near Littleborough, in the county of Lancaster.

**MINERAL PROPERTIES ASSOCIATION, LIMITED.**—On the 25th ult., this association was registered, with a capital of £2000, in £5 shares, to carry on the usual business of a mining, smelting, and refining company.

**NITRATE RAILWAYS COMPANY, LIMITED.**—This company was registered on the 24th ult., with a capital of £1,200,000, in £100 shares, to carry out an agreement of the 24th ult., with John Manuel Montero, of Lima, for the purchase of the shares of the National Nitrate Railways Company, of Peru, consisting of 6000 nominative shares of £100 each, and 5000 shares to bearer of £100 each, all fully paid.

**PRITTS SMELTING COMPANY, LIMITED.**—On the 29th ult., this company was registered with a capital of £6000, in £10 shares, to acquire and work patents for crushing, smelting, reduction or amalgamation of ores, pyrites and mineral substances.

**ROSS HILL GOLD COMPANY, LIMITED.**—This company was registered on the 24th ult., with a capital of £75,000, in £100 shares, to acquire the gold mines and reefs, situate on Ross-Hill, at Spitz Kopp, in the Transvaal, South Africa.

**S. H. BECKLES AND COMPANY, LIMITED.**—This is the conversion to a company of the business of Messrs. S. H. Beckles and Co., of 6 and 8 Lime Street Square, chemical manufacturers and dealers. It was registered on the 25th ult., with a capital of £20,000, in £5 shares.

**STAFFORDSHIRE STEEL AND INgot IRON COMPANY, LIMITED.**—Registered on the 25th ult., with a capital of £70,000, in £10 shares, to carry on business as steel converters and steel and iron manufacturers.

**VICTORIA COAL AND COKE COMPANY, LIMITED.**—This company proposes to take over the collieries, works, properties and effects of Robert Hudson and Co., Limited. It was registered on the 25th ult., with a capital of £100,000, in £10 shares.



# PRICES CURRENT OF MANUFACTURED GOODS

## BIRMINGHAM AND DISTRICT.

This List being compiled exclusively for the pages of IRON, all rights of reproduction are reserved. The quotations given are manufacturer's average prices, dependent, of course, on terms of payment as well as the quality and quantity of good 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.

Sept. 6.

Prices of iron are apparently very firm, but for manufactured hardware generally they are still extremely low and unsatisfactory. Galvanised hollow ware is especially so, and the makers are endeavouring to form a combination amongst themselves to do away with the existing competition. Advances from abroad are not quite so favourable, with the exception, perhaps, of edge tools, which are in fair request, and the home demand is reported not quite so brisk.

### ABRIDGED LIST.

**AMERICAN WIRE ROBS,** 1 lb., 4/6; 1 1/2 lb., 5/6; 2 lb., 6/6; 3 lb., 7/6; 4 lb., 8/6; 5 lb., 9/6; 6 lb., 10/6; 7 lb., 11/6; 8 lb., 12/6; 9 lb., 13/6; 10 lb., 14/6; 11 lb., 15/6; 12 lb., 16/6; 13 lb., 17/6; 14 lb., 18/6; 15 lb., 19/6; 16 lb., 20/6; 17 lb., 21/6; 18 lb., 22/6; 19 lb., 23/6; 20 lb., 24/6; 21 lb., 25/6; 22 lb., 26/6; 23 lb., 27/6; 24 lb., 28/6; 25 lb., 29/6; 26 lb., 30/6; 27 lb., 31/6; 28 lb., 32/6; 29 lb., 33/6; 30 lb., 34/6; 31 lb., 35/6; 32 lb., 36/6; 33 lb., 37/6; 34 lb., 38/6; 35 lb., 39/6; 36 lb., 40/6; 37 lb., 41/6; 38 lb., 42/6; 39 lb., 43/6; 40 lb., 44/6; 41 lb., 45/6; 42 lb., 46/6; 43 lb., 47/6; 44 lb., 48/6; 45 lb., 49/6; 46 lb., 50/6; 47 lb., 51/6; 48 lb., 52/6; 49 lb., 53/6; 50 lb., 54/6; 51 lb., 55/6; 52 lb., 56/6; 53 lb., 57/6; 54 lb., 58/6; 55 lb., 59/6; 56 lb., 60/6; 57 lb., 61/6; 58 lb., 62/6; 59 lb., 63/6; 60 lb., 64/6; 61 lb., 65/6; 62 lb., 66/6; 63 lb., 67/6; 64 lb., 68/6; 65 lb., 69/6; 66 lb., 70/6; 67 lb., 71/6; 68 lb., 72/6; 69 lb., 73/6; 70 lb., 74/6; 71 lb., 75/6; 72 lb., 76/6; 73 lb., 77/6; 74 lb., 78/6; 75 lb., 79/6; 76 lb., 80/6; 77 lb., 81/6; 78 lb., 82/6; 79 lb., 83/6; 80 lb., 84/6; 81 lb., 85/6; 82 lb., 86/6; 83 lb., 87/6; 84 lb., 88/6; 85 lb., 89/6; 86 lb., 90/6; 87 lb., 91/6; 88 lb., 92/6; 89 lb., 93/6; 90 lb., 94/6; 91 lb., 95/6; 92 lb., 96/6; 93 lb., 97/6; 94 lb., 98/6; 95 lb., 99/6; 96 lb., 100/6; 97 lb., 101/6; 98 lb., 102/6; 99 lb., 103/6; 100 lb., 104/6; 101 lb., 105/6; 102 lb., 106/6; 103 lb., 107/6; 104 lb., 108/6; 105 lb., 109/6; 106 lb., 110/6; 107 lb., 111/6; 108 lb., 112/6; 109 lb., 113/6; 110 lb., 114/6; 111 lb., 115/6; 112 lb., 116/6; 113 lb., 117/6; 114 lb., 118/6; 115 lb., 119/6; 116 lb., 120/6; 117 lb., 121/6; 118 lb., 122/6; 119 lb., 123/6; 120 lb., 124/6; 121 lb., 125/6; 122 lb., 126/6; 123 lb., 127/6; 124 lb., 128/6; 125 lb., 129/6; 126 lb., 130/6; 127 lb., 131/6; 128 lb., 132/6; 129 lb., 133/6; 130 lb., 134/6; 131 lb., 135/6; 132 lb., 136/6; 133 lb., 137/6; 134 lb., 138/6; 135 lb., 139/6; 136 lb., 140/6; 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641 lb., 645/6; 642 lb., 646/6; 643 lb., 647/6; 644 lb., 648/6; 645 lb., 649/6; 646 lb., 650/6; 647 lb., 651/6; 648 lb., 652/6; 649 lb., 653/6; 650 lb., 654/6; 651 lb., 655/6; 652 lb., 656/6; 653 lb., 657/6; 654 lb., 658/6; 655 lb., 659/6; 656 lb., 660/6; 657 lb., 661/6; 658 lb., 662/6; 659 lb., 663/6; 660 lb., 664/6; 661 lb., 665/6; 662 lb., 666/6; 663 lb., 667/6; 664 lb., 668/6; 665 lb., 669/6; 666 lb., 670/6; 667 lb., 671/6; 668 lb., 672/6; 669 lb., 673/6; 670 lb., 674/6; 671 lb., 675/6; 672 lb., 676/6; 673 lb., 677/6; 674 lb., 678/6; 675 lb., 679/6; 676 lb., 680/6; 677 lb., 681/6; 678 lb., 682/6; 679 lb., 683/6; 680 lb., 684/6; 681 lb., 685/6; 682 lb., 686/6; 683 lb., 687/6; 684 lb., 688/6; 685 lb., 689/6; 686 lb., 690/6; 687 lb., 691/6; 688 lb., 692/6; 689 lb., 693/6; 690 lb., 694/6; 691 lb., 695/6; 692 lb., 696/6; 693 lb., 697/6; 694 lb., 698/6; 695 lb., 699/6; 696 lb., 700/6; 697 lb., 701/6; 698 lb., 702/6; 699 lb., 703/6; 700 lb., 704/6; 701 lb., 705/6; 702 lb., 706/6; 703 lb., 707/6; 704 lb., 708/6; 705 lb., 709/6; 706 lb., 710/6; 707 lb., 711/6; 708 lb., 712/6; 709 lb., 713/6; 710 lb., 714/6; 711 lb., 715/6; 712 lb., 716/6; 713 lb., 717/6; 714 lb., 718/6; 715 lb., 719/6; 716 lb., 720/6; 717 lb., 721/6; 718 lb., 722/6; 719 lb., 723/6; 720 lb., 724/6; 721 lb., 725/6; 722 lb., 726/6; 723 lb., 727/6; 724 lb., 728/6; 725 lb., 729/6; 726 lb., 730/6; 727 lb., 731/6; 728 lb., 732/6; 729 lb., 733/6; 730 lb., 734/6; 731 lb., 735/6; 732 lb., 736/6; 733 lb., 737/6; 734 lb., 738/6; 735 lb., 739/6; 736 lb., 740/6; 737 lb., 741/6; 738 lb., 742/6; 739 lb., 743/6; 740 lb., 744/6; 741 lb., 745/6; 742 lb., 746/6; 743 lb., 747/6; 744 lb., 748/6; 745 lb., 749/6; 746 lb., 750/6; 747 lb., 751/6; 748 lb., 752/6; 749 lb., 753/6; 750 lb., 754/6; 751 lb., 755/6; 752 lb., 756/6; 753 lb., 757/6; 754 lb., 758/6; 755 lb., 759/6; 756 lb., 760/6; 757 lb., 761/6; 758 lb., 762/6; 759 lb., 763/6; 760 lb., 764/6; 761 lb., 765/6; 762 lb., 766/6; 763 lb., 767/6; 764 lb., 768/6; 765 lb., 769/6; 766 lb., 770/6; 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893 lb., 897/6; 894 lb., 898/6; 895 lb., 899/6; 896 lb., 900/6; 897 lb., 901/6; 898 lb., 902/6; 899 lb., 903/6; 900 lb., 904/6; 901 lb., 905/6; 902 lb., 906/6; 903 lb., 907/6; 904 lb., 908/6; 905 lb., 909/6; 906 lb., 910/6; 907 lb., 911/6; 908 lb., 912/6; 909 lb., 913/6; 910 lb., 914/6; 911 lb., 915/6; 912 lb., 916/6; 913 lb., 917/6; 914 lb., 918/6; 915 lb., 919/6; 916 lb., 920/6; 917 lb., 921/6; 918 lb., 922/6; 919 lb., 923/6; 920 lb., 924/6; 921 lb., 925/6; 922 lb., 926/6; 923 lb., 927/6; 924 lb., 928/6; 92



## IRON.

No. 505.

LONDON, FRIDAY, SEPTEMBER 15, 1882.

## THE IRON TRADE OF THE PAST MONTH.

IN examining the Board of Trade Returns for the first eight months of this year, we perceive a continued improvement from month to month in the exports of iron and steel, the steadiness of which has probably never been surpassed. The past month, like its predecessor, has been a very satisfactory one, if we judge by results. The deliveries to our foreign customers during August are below those of the best month of 1880 (April) by only 12,000 tons; but, if we compare the corresponding eight months of 1880, 1881, and 1882, we find that this year, so far, has been the best, in proof of which assertion we may cite the figures below. Although they present no remarkable feature, they supply evidence, as we have said, of the continued growth in the shipments of iron and steel.

Total Exports of Iron and Steel for Eight Months ending August 31.

	1880. Tons.	1881. Tons.	1882. Tons.
January..	275,979	197,112	317,390
February..	264,252	192,870	299,911
March..	387,305	290,193	376,206
April..	444,991	329,100	345,701
May..	360,603	356,664	377,418
June..	361,865	362,263	378,210
July..	315,904	356,422	403,333
August..	294,586	361,271	432,972
Total..	2,705,485	2,445,900	2,931,144

The above table shows that the exports for the month of August exceed those of the same month of 1881 by no less than 71,701 tons, the excess in money value being £402,058. Compared with last year, the balance in favour of 1882, so far, is £3,655,444; contrasted with the first eight months of 1880, it is £1,209,059. As far as we are able to judge from appearances, therefore, 1882 promises to be one of the most prosperous years for the iron trade. It will certainly be known in the future as one throughout the course of which the iron trade was in a very healthy condition.

We ventured to express the opinion in our last monthly review of the Board of Trade Returns that the prospects for the English iron trade were of a hopeful nature. It is not overstating the case when we say now that there is every probability that this anticipation will be supported by facts. Recent events, one of which we referred to last month, strengthen that impression. Latest advices respecting the American harvest show the wheat crop to be one of the largest that has ever been produced. Heretofore the largest yield was in 1880, and some authorities go the length of predicting that this year's growth will exceed that of 1880 by 100 million bushels. The estimate is probably extravagant, but that the yield is abundant in quantity beyond precedent, and also excellent in quality, admits of no dispute. When more exact data are to hand, it will still be found that the Americans have a very handsome surplus of cereals to export, in return for which they are sure to take at least a very fair portion of our iron and steel productions, always supposing, however, that prices here will not rise too high. But the most hopeful fact in connection with the prospect of the English iron trade is the remarkable steadiness of the iron market, notwithstanding the probable discontinuance of the restriction agreement between the Scotch and Cleveland ironmasters. When the decision of the makers first became known, the market was somewhat unsettled, but it soon rallied again. The causes of this are not far to seek. Local consumption is reported to be of a most enduring nature. Continental demand, owing to the brisk condition of the iron trades of the Continent, is likewise very well sustained, and promises to be so for the rest of the year. Colonial requirements also promise well. The conclusion, therefore, seems to be forcing itself upon us that, whether the enquiry from the United States be equal to expectation or not, other countries will continue to be as good customers as they are at present, protective tariffs notwithstanding.

After this digression, let us return to the statistics of the past month. Whether it be in pig-iron, bars, hoops, sheets and plates, railway iron and steel, or tinplates, we have to report a better demand. Turning first to the United States, the following table shows that, although our August shipments to that country were still below those of the corresponding month of 1881, they have somewhat recovered, the great deficit in the returns for July having to some extent been mended by the heavy exports of pig-iron in August. As compared with the month of August 1881, we exported 19,363 tons more of pig metal, while, if we compare our exports

of the crude material during last month with those of July, the balance in favour of August 1882 is even greater, as much as 31,252 tons. But, notwithstanding the improvement in pig-iron shipments, the exports of all descriptions of iron to the United States for August were still 1366 tons below those of the same month of last year, there having been a decrease in our exports to America of 16,240 tons for railway material, 1809 tons for hoops, sheets, &c., 3956 tons for old iron, and of 3243 tons for unwrought steel. On the other hand, the exports of tinplates showed an improvement of 4068 tons.

Comparative Statement of the Exports of Iron and Steel to the United States during the Months of August 1882 and 1881.

		Tons.	Increase.	Decrease.
		Tons.	Tons.	Tons.
Railway material	1881	29,634		
"	1882	13,385		
Hoops, sheets, &c.	1881	7,058		16,249
"	1882	5,249		
Cast or wrought manufactures	1881	516		
Cast or wrought manufactures	1882	442		
Old iron	1881	8,872		74
"	1882	4,916		
Steel (unwrought)	1881	11,719		3,956
"	1882	8,476		
Pig-iron	1881	67,609		25,331
"	1882	48,246		
Bars, angles, &c.	1881	1,477		19,363
"	1882	943		
Tinplates	1881	20,709		534
"	1882	16,641		
			4,068	
			23,965	
			Net Decrease	1,366

Leaving the shipments to the United States out of the question, if we compare the exports of pig-iron during the past month with those of August 1881, we shall find that, with the exception of France, all the countries which are consumers of English pig metal took much larger quantities, the corresponding figures being 210,022 and 151,593 tons, while the difference in money value is considerably greater (£630,411 and £435,104 respectively), owing to the advance in the price of pig-iron since last year, crude iron being now about 7s. a ton dearer than a twelvemonth ago. Russia took 9680 tons, Germany 7432 tons, Holland (the destination of part of the exports to that country being probably Germany) 11,568 tons, Belgium 5671 tons, and British North America 4968 tons more during last month than during August 1881. The demand from France declined by 582 tons. The shipments of bars, angles, &c., have slightly improved, nearly all our principal customers having purchased more freely from us. Russia took 531 tons less, while "other countries" fell short by 2621 tons. Among the improved exports to be noted are those of Germany (581 tons more), Holland (664 tons), Italy (378 tons), Turkey (156 tons), British North America (554 tons), British India (1012 tons), and Australia (901 tons more). The consumption of English railway material by foreign countries continues heavy, so that, notwithstanding the falling-off to the United States, it was larger by 10,802 tons than in August 1881. The returns show a large increase in the shipments to British possessions especially. We have sent during August to British North America 13,201 tons, British India 4392 tons, British South Africa 3494 tons more than in the same month of 1881. Italy has also consumed 2605 tons more, Brazil 3317 tons, "other countries" 9384 tons more. Of those countries which have consumed less of our railway material, we may mention Russia, with 2783 tons less; Sweden and Norway, with 1326 tons; Spain and the Canaries, with 2301 tons; and Australia, with 2834 tons less.

The deliveries of hoops, sheets, and plates were altogether 670 tons less (30,135 tons) in August 1881, against 29,505 tons in August, 1882. This decline is chiefly owing to a less active demand from the United States, where, as seen from the table above, we have sent 1809 tons less; but, on the other hand, the falling-off is fully covered by the increased enquiry from Russia, Germany, British India, where we have delivered 374,397, and 1058 tons more respectively. With regard to other countries, the changes have been but slight. The exports of tinplates are better by 3041 tons, owing to the expansion of the demand from the United States; the requirements by all other countries having fallen short. There was also an improvement in the shipments last month of cast and wrought manufactures, the excess in favour of this year being 1428 tons; the total exports being 25,015 tons, against 23,587 tons in August 1881. Australia took 2480 tons, "other countries" 1596 tons more; but, on the other hand, Russia, Germany, Brazil, British North America, South Africa, and India receiving 651, 256, 577, 178, 561, and 826 tons less respectively. We conclude

our monthly review of the Board of Trade Returns, as far as iron and steel are concerned, with the usual statement, showing as nearly as possible the total quantities of iron and steel exported to our principal customers during the periods indicated.

## Approximate Exports of Iron and Steel.

	July 1882. Tons.	August 1882. Tons.	August 1881. Tons.
Russia	28,483	33,984	27,891
Germany	27,299	33,307	25,158
Holland	30,769	30,748	18,362
Belgium	7,852	8,791	3,120
France	17,256	17,752	19,351
British North America	29,455	42,567	24,698
Italy	12,112	7,865	5,095
British India	20,827	19,936	14,100
Australia	27,297	22,104	21,244
Sweden and Norway	3,865	135	1,461
Spain and Canaries	2,726	2,175	4,055
Mexico	6,913	2,569	2,680
Brazil, Chili, and Peru	3,494	7,957	5,408
South Africa (B.P.)	6,867	5,210	2,277

## IRON TRADE SUMMARY.

THE English iron market has been steady during the past week. There are still some elements of uncertainty, but the increasingly favourable nature of the Board of Trade Returns has strengthened its tone. The pig-iron market has been quiet but firm during the week. There have been but slight variations in the Glasgow warrant market, the almost uniform figure at which warrants have changed hands being 50s. cash, the actual changes not exceeding a few pence. Closing quotations on Wednesday were for sellers 50s. 2½d. and 50s. 5d. a month, buyers near. Scotch makers firmly maintain their prices. This is equally true of Cleveland ironmasters, the trade of that district continuing healthy and satisfactory, shipments during the week exceeding the high average of last month. At Tuesday's market at Middlesbrough, the attendance was fair, but business quiet; there was, however, a steady feeling. The quotations for pig-iron No. 3 are with merchants 44s.; but makers, as a rule, quote at 44s. 6d. On the Tyne, iron No. 3 is quoted at 46s. 3d. There is a brisk enquiry for crude iron in the Midlands. In South Staffordshire, current quotations for common pig are from £2 to £2 2s., and £3 7s. 6d. to £3 10s. for hot-blast all-mine. The Lancashire makers, being busy with deliveries against old contracts, are firm in their quotations at 46s. less 2½ per cent. In South Wales there is a steady demand for pig-metal. The hematite iron market is unchanged, the demand from all quarters remaining strong. The value of iron may be quoted at 59s. for No. 1, 58s. for No. 2, and 57s. for No. 3 forge, per ton, net, at works or f.o.b. west coast ports. Forest of Dean pig is stationary at 60s. The improvement in the finished iron market is fully maintained. Works continue to be well employed, but fresh orders are scarcer, the quietness in the demand being partly due to the unpreparedness of consumers to pay the higher prices which producers now quote. The movement for higher wages amongst the ironworkers also somewhat affects the trade. In Cleveland, quotations for ship plates are £6 15s. to £7; angles, £6 to £6 2s. 6d.; common bars, £6 2s. 6d. to £6 5s.; sheets and boiler plates, £8. On the Tyne, the demand for all sorts of finished iron is well sustained, and prices are well kept up at £6 17s. 6d. to £7 for ship plates, £6 5s. for angles, and £6 5s. to £6 7s. 6d. for bars, all delivered in the Tyne. In Staffordshire, crown bars are selling at £6 10s., and prices generally are very firm. In Lancashire, quotations remain steady on the basis of £6 7s. 6d. for bars, delivery equal to Manchester or Liverpool. In Wales, bars are quoted at about £5 10s. to £5 12s. 6d. In West Yorkshire, makers of best Yorkshire iron are fairly well off for work, especially considering the competition of steel, and prospects are fair. There is no change in prices, the latter being the same as those established at the beginning of the year. The tinplate market is steady. Good coke-makes realise from 16s. 3d. to 16s. 9d. and in some instances 17s. per box. A slightly better demand is manifesting itself in the hardware market, but prices show little variation. At Sheffield trade is improving. There is an influx of orders, especially for best bars, sheets, and plates. The Bessemer rail trade is hardly so good as it was, but business in cast steel is brisk. In South Wales, steel rails are steady at £5 2s. 6d. to £5 15s. according to sections and deliveries. In West Cumberland the steel trade is supported by a constant influx of orders, but prices show no variation. In Cleveland, the steel business does not improve. We see it stated that some kind of arrangement as to price is to be come to amongst manufacturers of steel rails in the United Kingdom. Shipbuilders are booking occasional contracts, but on the whole launches are in excess of new orders. The engineering branches keep fairly well employed. There is an improved feeling in the English coal market. Prices are, on the whole, stationary, but, should difficulties arise with the miners, we may expect an early advance. Reports as to stocks are most contradictory, the latter being represented, on the one hand,



## COPEMAN'S PATENT SEAT RAFT.

(For description, see page 221.)

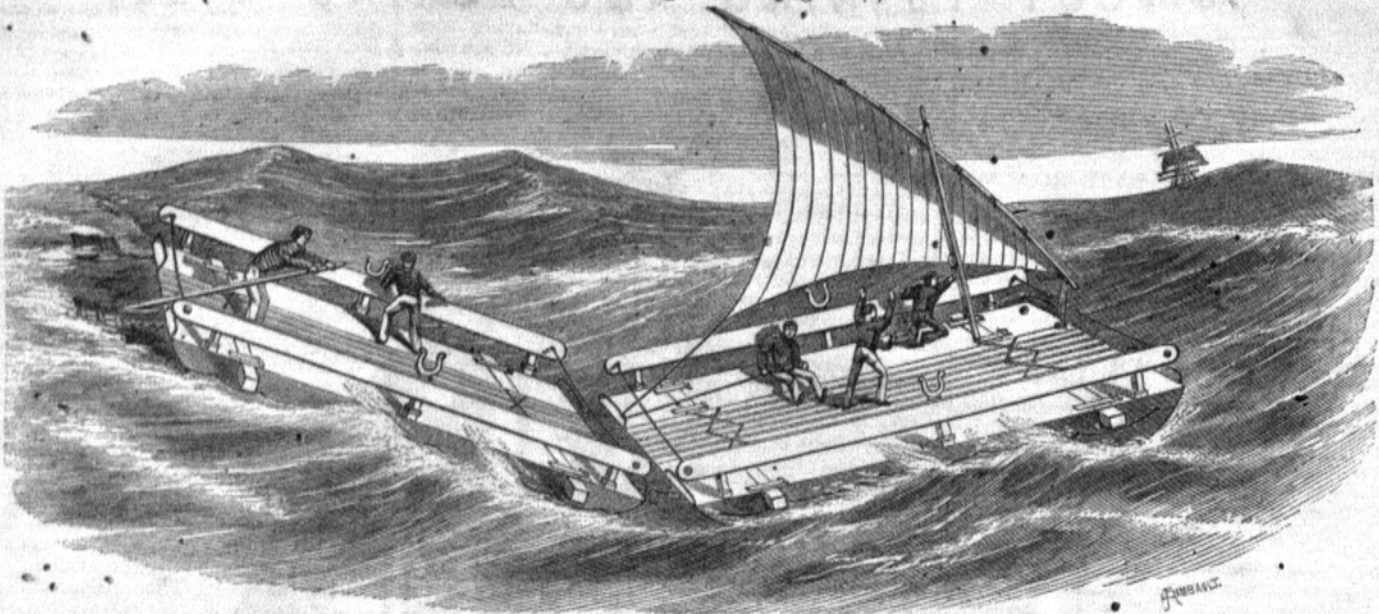


FIG. 1.

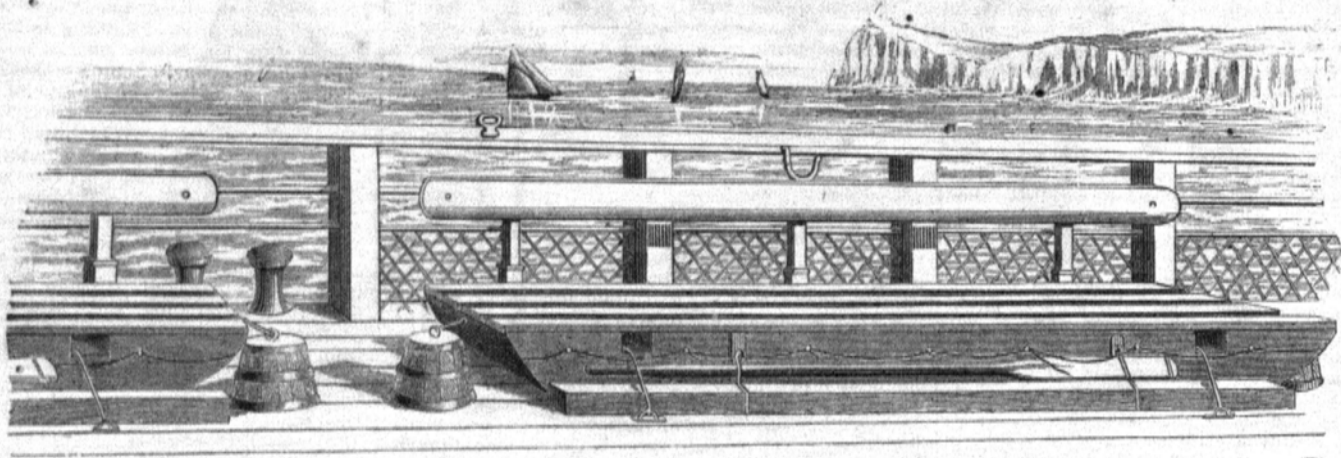


FIG. 2.

## THE "NONPAREIL" CORN DRILL.

BY MESSRS. J. SMYTH AND SONS, PEASENHALL.

(For description, see page 227.)

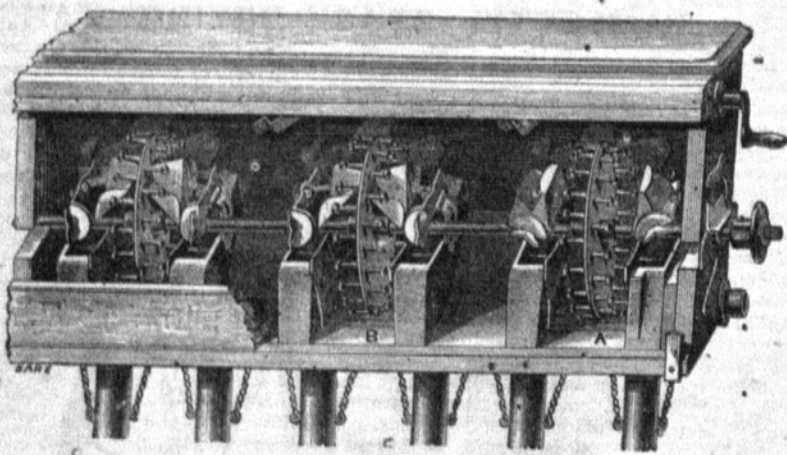


FIG. 1.

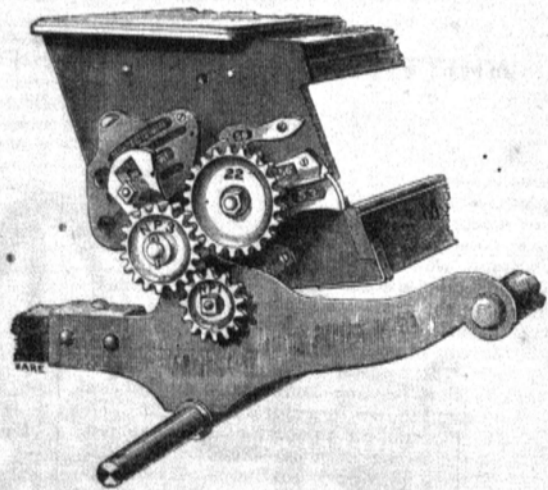


FIG. 2.

## PERMANENT WAY FOR ELECTRIC CONDUCTORS.

BY MR. H. R. MEYER.

(For description, see page 224.)

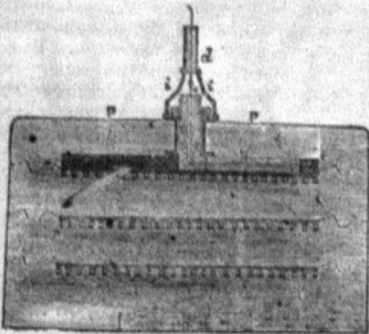


FIG. 1.

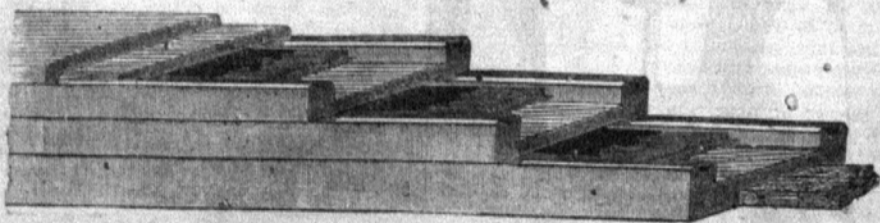


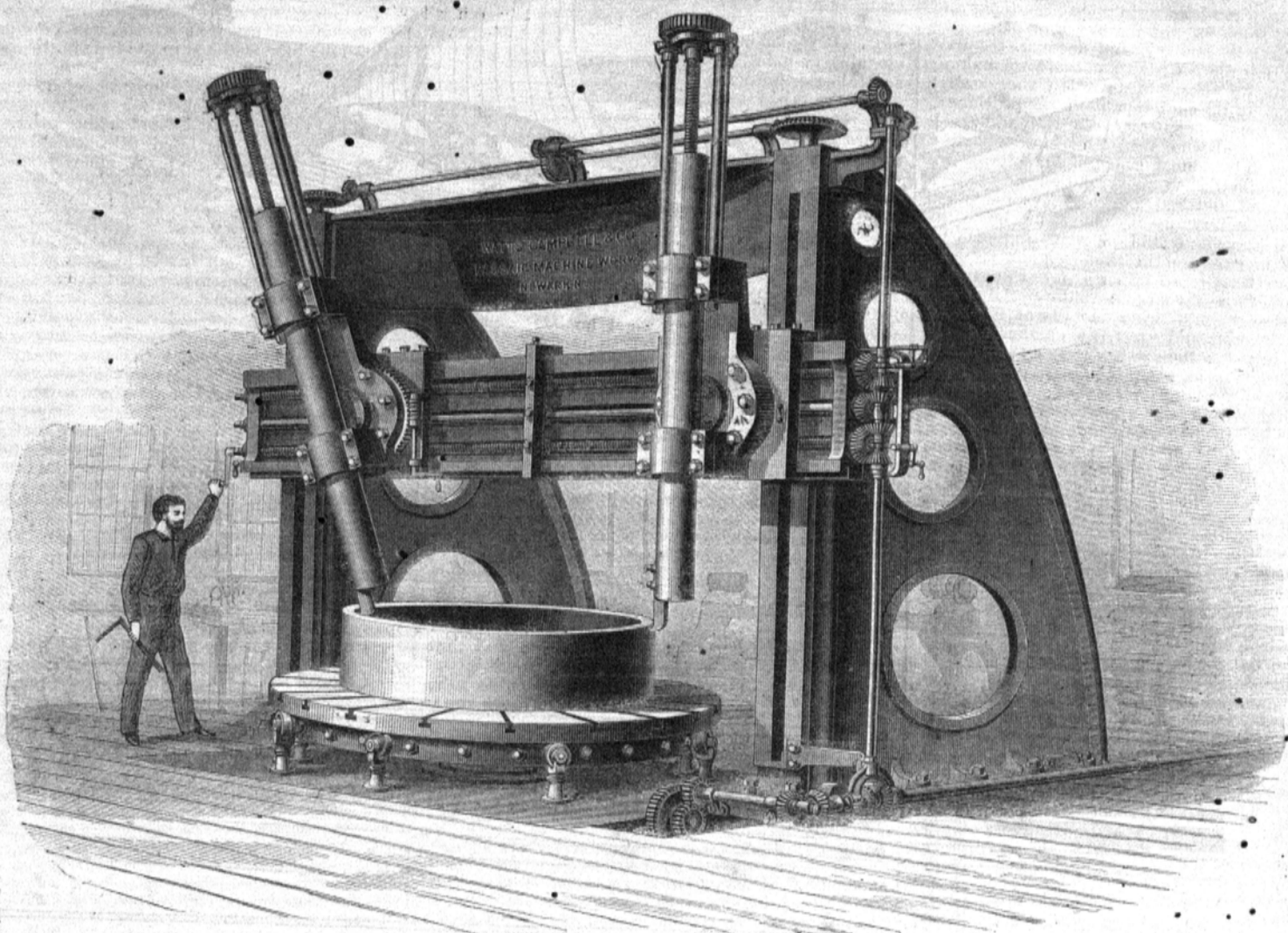
FIG. 2.



16-FOOT TURNING AND BORING MILL.

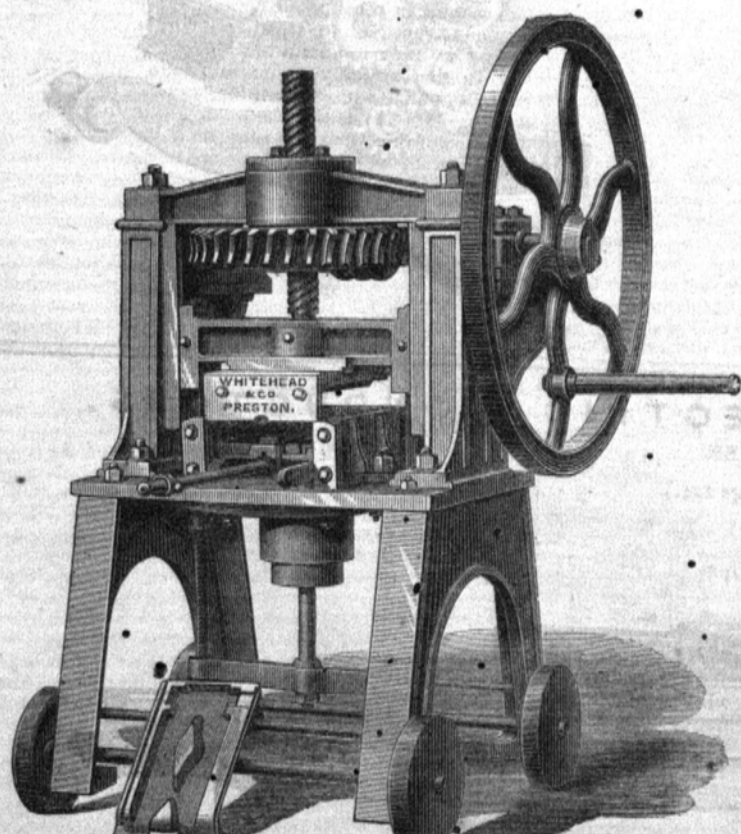
BY MESSRS. WATTS, CAMPBELL AND CO., NEWARK, N.J.

(For description, see page 227.)



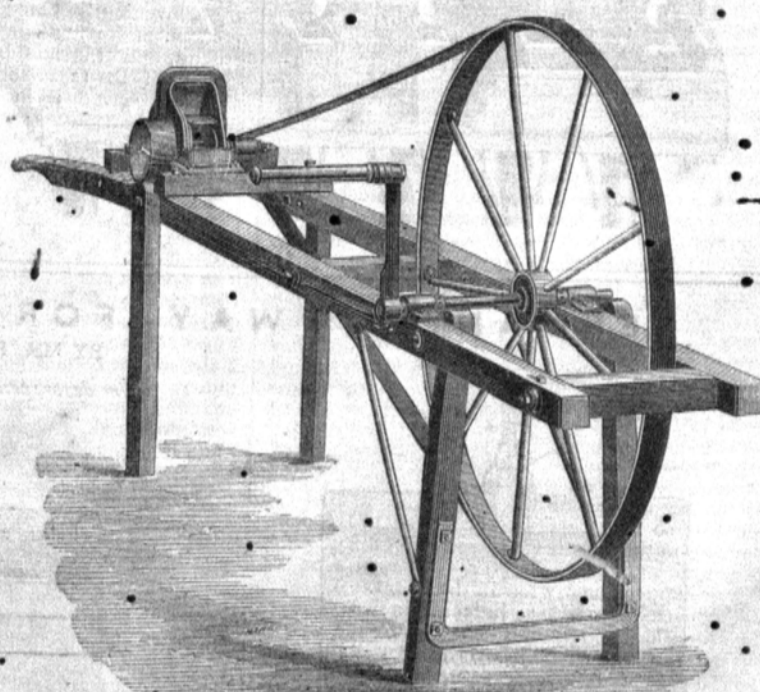
WHITEHEAD'S NEW TILE PRESS.

(For description, see page 227.)



BAMLETT'S STACK-DRYING FAN.

(For description, see page 227.)





as large, while other advices represent them just the contrary. The principal demand is for house and gas coal, as usual at this time of year, but orders for steam coal are getting scarcer, and prices are said to be receding. Coke remains active.

The iron trade of the Continent is in a most prosperous condition. The Austrian iron market not only preserves its previous firmness, but the prevailing activity, which promises to be more than temporary, has brought with it advances in price both of pig and manufactured iron. It will not be out of place here to mention that it appears from accounts received from Vienna that the Austrian iron trade are making most praiseworthy efforts to accord a very cordial reception both at the capital and in the provinces, next week, to those members of the Iron and Steel Institute (about 300) who are going to take part in what promises to be a most successful meeting. In the Belgian iron market firmness continues. Makers both of pig and finished are very reserved, as should a satisfactory arrangement be come to between the Cleveland and Scotch ironmasters, another rise is expected in the Belgian market. The returns of the Belgian imports and exports continue to be of a favourable nature. Belgium imported during the first seven months of this year 115,491 tons of iron and steel, as compared with 136,135 tons in 1881; the exports were 250,428 tons, against 206,689 tons in 1881. Imports and exports of coal are about the same as last year; a very large increase is shown in the export of coke (nearly 100,000 tons) for the first seven months of this year, compared with those of the same period of 1881. The French iron market is unchanged; that is to say, enquiry is good and prices are firm. The pig-iron market of the Meurthe-et-Moselle is especially active, this being the time for renewal of contracts. It is stated by the *Ancr* that two-thirds of the production of 1883 is already engaged. No giving way of quotations need therefore be expected. A steady business continues to be done in the German iron market. Westphalian makers of pig-iron have sold nearly the whole of their production for the rest of the year, and are consequently not very forward in taking up additional deliveries, as they reckon upon an early advance of values. Forges and mills are very briskly at work, the demand upon their capacity being very heavy. In the steel department, busy as it is, fresh orders are coming in steadily. All the coal markets of the Continent are brisk, with quotations very stiff. The American iron market has become dull, but quotations of Scotch pig-iron are as yet steady. The strike of iron-workers may be considered at an end, as the men are returning to work at the old rates, against the orders of the Amalgamated Association.

#### COPEMAN'S PATENT SEAT RAFT.

ONE of the drawbacks of several otherwise valuable life-saving apparatus for use at sea is that their unavoidable size causes them to be in the way on a ship's deck, or to occupy too much stowage space, and then to be more or less inaccessible when they are required in cases of emergency. Hence, if a life-raft of large proportions could be made to do duty on board ship in some other form, and to be well ready for use when the moment of danger arrived, a very marked advance would be made in this class of life-saving apparatus. It is satisfactory to know that such an advance has really been made by Mr. E. S. Copeman, of Downham Market, whose seat raft we briefly noticed in our report of the Naval Exhibition, and which we now take the opportunity of bringing fully before our readers. In the engravings on page 222, fig. 1 illustrates two rafts as in use at sea, whilst fig. 2 shows a raft in its normal condition of a convenient and comfortable seat on the deck of a ship or steamer. The raft is on the catamaran principle, and consists of two or more of these deck benches, which are convertible in a minute or two into a raft or boat capable of carrying upwards of a ton weight. Each bench is a buoyant wooden box, formed in airtight compartments, fitted with copper tanks and supplied with spars, mast, sail, oars, water and provisions. The top of the seat is a wooden spline frame, which can be instantly detached, and used as a life buoy. These benches are placed round the deck, under the bulwarks wherever they may be required, and occupy no more room than ordinary deck seats. When they are required to be formed into a raft, two seats are brought opposite to one another, four feet apart, the cross spars are placed in their sockets and fastened down with metal bolts, and the movable spline frames, which form the seats, are placed lengthways over the spars and make a deck in the middle of the raft. The size of the single raft so constructed is 12 feet or 14 feet long (according to the length of the seats) by 8 feet wide, and will accommodate ten or twelve persons on board, or support nearly 100 in the water. The raft can be constructed as above in less than two minutes, and nothing is then required but to place the end of it on the rail and shoot it overboard. A raft can always be kept ready for launching by placing two benches back to back, in the middle of a deck, the spars being fixed in their places. By attaching several of these rafts together, or using

them separately, provision can be made for the safety of all the passengers and crew of a disabled vessel, however numerous. Great danger and difficulty has often been experienced in reaching sinking ships, but a passing vessel fitted with a raft as described, could tow it alongside to windward of the wreck, and the crew could then be safely reached and hauled on board. The raft also makes a safe and useful boat for sea or river; and for yachts or small vessels it answers the purpose and saves the weight and inconvenience of carrying any other boat. It is also useful for taking out an anchor, for cleaning or painting the outside of a ship, and for several other purposes.

This raft has been tried upon several occasions, and recently before their Royal Highnesses the Prince and Princess of Wales at Cowes, and before the Lords of the Admiralty at Portsmouth, the experiments being considered most satisfactory in all cases. The invention has invariably met with the approval of practical men, for the following cogent reasons:—(1) because with little expense, and without any reconstruction of their vessels, ship owners can provide seats convertible into life rafts, which will enable them to carry all the passengers and crew in case of need; (2) because these rafts can be easily launched in a sea when no boat could be lowered safely; (3) because they are complete in every part of the deck, and no accident to the ship, or the fall of a mast, or spar, could prevent some of them being ready when required; (4) because those who are acquainted with the Indian catamaran, know that this is the only form of boat which will be likely to live in a sea where a ship goes down; (5) because it will give passengers confidence to know there is ample means of escape provided for all; and (6) because on account of its simplicity and inexpensiveness, ships' owners may more readily be induced to supply the requisite accommodation. Our own opinion of the merits of the raft quite coincides with the foregoing, and it is therefore satisfactory to know that a bronze medal was awarded to the invention at the Exhibition of Life Saving Appliances recently held at the Alexandra Palace, and that several large steamship companies, notably the Peninsular and Oriental, have adopted the invention on board their vessels. We cannot conclude this notice better than by supplementing our own commendation of this invention by a paragraph from the report of Mr. John C. Almond (the nautical inspector of the P. and O. Company) upon Mr. Copeman's seat raft, after putting it to a severe practical test. That gentleman writes:—"The opinion of all the gentlemen present was highly in favour of the invention as a means of supplementing the boats usually carried on board our ships, and so adding to the floating appliances desirable in passenger vessels, without taking from deck space, &c., as the seats separately only occupy the room of an ordinary deck settee, and that the adoption of the same is highly desirable, not only as a possible means of saving life, but of utility in many other ways." We should add that the London agent for the raft, is Mr. F. F. Ommaney, of No. 4, Victoria Street, Westminster, and that it is now being exhibited at the Maritime Exhibition at Tynemouth.

#### PERMANENT WAY FOR ELECTRIC CONDUCTORS.

THE multiplication of electric conductors has of late been so great as to set people thinking how they are to be disposed of. Overhead they are an eyesore and a public danger, underground they are conveniently placed and safe. The only open question is the manner of their disposition underground, and this has been tackled by Mr. H. R. Meyer, of B. 12, Exchange Buildings, Liverpool, who has solved it in the manner shown in the engravings on page 222. Mr. Meyer's system consists of slabs of earthenware, cement, glass, asphalt, composition, or other suitable material constructed with a series of parallel grooves; these slabs are laid end to end and the naked wires laid in the grooves, asphalt is then poured freely over the slabs and grooves, and the whole effectively insulates the wires. The grooves can be made large or small, and will accommodate indiscriminately large electric light rods or ribbons, or the smallest telephone wires. In order to economise space, tier above tier is laid of these slabs, and to further secure the wires from all possible injury, the whole can be laid in a strong cast-iron channel. In our engravings, however, the whole is self-contained, and does not require the protection of an iron channel. We have here the wires not only effectively insulated, but kept quite apart from each other, and in certain systematic order. The earthenware and asphalt are the best possible non-conductors, are cheap, and are known to withstand moisture for centuries. A large number of wires can be laid in a comparatively small space; for instance, 1,000 telephone wires could be accommodated in a main measuring about 20 inches by 15 inches in section. There is practically no limit to the number of wires that can be placed in a main, and a great feature of the system is that wires may be added to a main without interrupting those already contained in it. With regard to repairs, Mr. Meyer holds that none

will be needed, inasmuch as, with his perfect system of insulation, defects cannot arise. In our engraving, fig. 1, represents a transverse section, and fig. 2 a perspective view of Mr. Meyer's arrangement. When it is desired to lead a wire from the main to a building or lamp, the cover P is provided with a circular hole, this is lined with a leaden tube, which is soldered on to a leaden washer at the top of the hole and the rim of the tube at the bottom of the hole is beaten outwards to securely fasten it in its place. R is an ebonite arm through which the wire to be led out of the main is passed, one end passing through the tube fastened in the hole in the cover P, and screwed down with an ebonite nut. The wire is then cut off, allowing sufficient length to project through the arm R for twisting round and soldering to the insulated wire leading to the building or lamp. This insulated wire should be protected by leaden coating. A metal funnel I is slipped over the joint and soldered on to the washer, asphalt is then poured in to fill it up, and the top of the funnel is soldered on to the leaden coating of the insulated wire at D. By this means a completely watertight and insulated joint is made, and all accidental strains removed from the ebonite arm R on to the leaden washer and tube fixed in the hole in the cover. The flexibility of the lead allows of a certain amount of "give" in case of strain, without damage to the joint. The bottom or middle layers may be lapped in a similar way, the joint being made at the side of the main instead of at the top. In practically carrying out his invention, Mr. Meyer proposes to form companies in such towns where the corporation or municipal authorities are unwilling to undertake the matter, who would plan out the towns into different districts and centres, and, after giving due notice to all the telephone and light companies, &c., to state their requirements, to lay down between these centres large mains of wires and to rent them out to the companies requiring the accommodation at a fair rental. By this means electric lighting companies would be relieved of heavy outlays and many anxieties.

#### THE IRON TRADE OF AUSTRIA IN 1881.

[SUPPLEMENTARY REPORT.]

By WILHELM VON LINDHEIM, Vienna.

A SUPPLEMENTARY report on the iron industry of Austria was promised in our issue of May 12 last (see IRON, vol. xix. page 365), as soon as fuller official statistics, upon which the report would be based, were issued. Those statistics have now been published, and we hasten to redeem our promise. If repetitions occur, they have become necessary because without them the data now given would not be easily understood. We proceed, in the first place, to furnish in Tables I. to IV. particulars of the output of iron ore, pig-iron, lignite or brown-coal, and coal. Unfortunately, even at this time, complete statistics for 1881 are not yet available for Hungary, and we are therefore compelled to give the figures for 1880.

Owing in a great measure to the revival in railway construction in 1881, ironworks and engineering establishments were fully engaged throughout the year. The total length of new lines opened in 1881 has reached a total of 265½ miles. Since 1872, railway construction had steadily dwindled down, until at last in 1880 almost a total cessation of work set in. In the former year no less than 1323 miles of railways had been opened for traffic. In 1880 the length of new lines thrown open for traffic in both divisions of the Austrian Empire amounted to only 37½ miles, of which 25 miles were in Austria proper. In the same year, however, great activity commenced in the construction of local railways. In this part of the empire concessions were obtained for 98 miles of local lines, of which, however, only 9 miles were actually thrown open for traffic in 1880; the remainder were completed in 1881. In the latter year, concessions for further 283 miles of local railways were granted, but only 47½ miles completed. The length of railways in course of construction amounted at the commencement of 1882 to—

	Miles.
Local railways .. .. .	236
Galizische Transversal-Bahn .. ..	253
Arlbergbahn .. .. .	85
Total .. .. .	574

In Hungary, the length of railway under construction was—

	Miles.
Pest-Semlin .. .. .	494
Ofen-Fünfkirchen .. .. .	494
Various local lines .. .. .	494

Consequently the total length of railway construction in both divisions of the empire was as follows:—

	Miles.
Austrian railways .. .. .	574
Hungarian railways .. .. .	494
Total .. .. .	1068



Province, &c.	Number of Undertakings.		Quantities produced.			Value.		Number of Persons employed.				Average Annual Production of each Person.
	Total.	Being Work-d.	State Mines.	Private Mines.	Total.	Total.	Average Price per Metre-cwt. at Mines.	Men.	Women.	Children.	Total.	
Bohemia .. .. .	111	26	Metre-cwt.	Metre-cwt.	Metre-cwt.	Florins.	Kreuzers.					Metre-cwt.
Lower Austria .. .. .	5	2	—	702,068	702,068	146,622	20'9	540	2	—	542	1,295
Upper Austria .. .. .	2	—	—	5,500	5,500	1,250	22'7	18	—	—	18	305
Salzburg .. .. .	7	1	—	—	—	—	—	—	—	—	—	—
Moravia .. .. .	23	7	—	38,376	38,376	10,361	27'0	44	—	—	44	872
Silesia .. .. .	11	5	—	114,016	114,016	51,522	45'2	206	—	—	206	553
Bucovina .. .. .	4	1	—	70,111	70,111	39,083	55'7	247	—	—	247	284
Styria .. .. .	33	15	—	7,016	7,016	—	—	—	—	—	—	—
Carinthia .. .. .	10	5	—	4,209,741	4,209,741	1,090,424	25'8	2,092	50	67	2,209	1,906
Tyrol .. .. .	7	2	—	880,411	880,411	354,862	40'0	659	6	—	665	1,324
Krain .. .. .	17	10	3,133	13,932	17,065	12,399	72'6	40	—	1	47	303
Galicia .. .. .	11	3	—	82,688	82,688	55,333	66'9	271	12	—	283	292
				62,646	62,646	20,346	42'0	245	4	—	249	251
Total, Austria .. .. .	241	77	3,133	6,186,503	6,189,638	1,788,202	28'9	4,368	74	68	4,510	1,372

Province, &c.	Number of Under-takings.		Furnaces.			Quantities produced.			Value.			Average Price per Metre-cwt. at Furnaces.				Number of Persons employed.				Average Annual Production of each Person.
	Total.	Being Worked.	Cold.	In Blast.	Number of Works in Blast.	Forge Pig.	Foundry Pig.	Total.	Forge Pig.	Foundry Pig.	Total.	Forge Pig.		Foundry Pig.		Men.	Women.	Children.	Total.	
												Fl.	Kr.	Fl.	Kr.					
Bohemia ..	24	9	27	11	431	Metre-cwt.	Metre-cwt.	Metre-cwt.	Florins.	Florins.	Florins.	Fl.	Kr.	Fl.	Kr.	—	—	—	—	Metre-cwt.
Lower Austria ..	4	2	3	2	68	438,573	137,907	576,480	1,958,892	953,011	2,911,903	4	46'6	6	91'0	2,869	55	178	3,102	186
Upper Austria ..	—	—	—	—	—	155,019	948	155,967	615,090	9,479	624,569	3	96'0	10	—	99	—	—	99	1,575
Salzburg ..	3	1	2	1	39	6,045	7,165	14,110	31,947	38,634	70,581	4	60'0	5	39'2	—	—	—	—	—
Moravia ..	12	7	11	10	469	641,478	158,349	799,827	2,430,423	698,874	3,129,297	4	78'7	4	41'0	56	—	—	56	252
Silesia ..	6	4	1	6	285	301,569	30,328	331,897	1,300,295	294,091	1,594,386	3	31'1	9	69'6	1,745	15	—	1,760	454
Bucovina ..	3	—	—	—	—	—	—	—	—	—	—	4	—	—	—	726	6	—	732	453
Styria ..	25	22	7	28	1,246	1,328,475	29,843	1,358,318	5,973,165	147,664	6,120,829	4	49'6	4	95'0	—	—	—	—	—
Carinthia ..	17	7	12	11	443	449,338	4,950	454,288	2,308,099	32,415	2,340,574	5	13'7	6	54'9	832	28	23	883	1,538
Tyrol ..	3	1	3	1	16	4,293	276	4,569	20,320	1,326	21,646	4	73'3	4	80'0	600	8	—	608	747
Krain ..	10	3	7	3	144	34,287	6,609	40,896	238,833	45,995	284,828	6	96'6	6	95'9	11	—	—	11	415
Galicia ..	6	4	2	3	141	18,459	41,587	60,046	80,805	392,091	472,896	4	38'0	9	41'0	242	7	—	249	164
Total, Austria ..	113	60	79	76	3,282	3,378,436	417,962	3,796,398	14,957,869	2,613,580	17,571,449	4	42'7	6	25'3	591	11	3	605	99
Hungary, 1880 ..	—	—	40	68	2,854	1,328,249	111,070	1,439,319	4,825,484	904,124	5,729,608	3	63'0	8	14'0	7,771	130	204	8,105	468
Total, Austria and Hungary ..	—	—	119	144	6,136	4,706,685	529,032	5,235,717	19,783,353	3,517,704	23,301,057	4	20'0	6	65'0	—	—	—	—	—

NOTE.—The statistics for Hungary are for 1880.

TABLE III.—LIGNITE OR BROWN-COAL, 1881.

Province, &c.	Number of Under- takings.		Quantities produced.			Value.		Number of Persons employed.				Average Annual Production of each Person.		Foreign Trade.	
	Total.	Being Worked.	State Mines.	Private Mines.	Total.	Total.		Men.	Women.	Children.	Total.	Quantity	Value.	Exports.	Imports.
Bohemia ..	674	229	Metre-cwt. 1,413,398	Metre-cwt. 64,509,964	Metre-cwt. 65,923,362	Florins. 8,654,290	Kreuzers. 12'43	15,216	520	92	15,828	Met. cwt. 4 165	Florins. 559'4	Metre-cwt. 2,399,030	Metre-cwt. 49,194
Lower Austria ..	11	5	—	185,059	185,059	77,201	41'72	173	5	13	191	908	404'2	—	—
Upper Austria ..	4	4	—	2,716,328	2,716,328	636,251	23'42	987	63	88	1,138	2,387	559'0	—	—
Moravia ..	15	9	—	1,013,316	1,013,316	200,410	19'77	547	7	6	560	1,809	358'0	77,691	3,717
Silesia ..	1	1	—	5,572	5,572	1,621	29'09	3	—	—	3	1,854	540'3	—	—
Bucovina ..	1	—	—	—	—	—	—	3	—	—	3	—	—	—	—
Styria ..	156	68	—	16,401,548	16,401,548	4,646,112	28'33	7,026	861	115	8,002	2,049	580'6	1,069,060	—
Carinthia ..	18	8	—	815,579	815,579	414,423	50'81	900	241	14	945	853	438'5	—	—
Tyrol ..	3	2	201,470	90	201,560	149,424	74'13	221	—	—	221	912	676'0	—	—
Vorarlberg ..	1	1	—	79,319	79,319	45,589	57'47	89	8	—	97	817	469'0	37,716	—
Krain ..	27	17	—	1,233,670	1,233,670	368,914	29'90	642	27	—	669	1,844	551'0	—	—
Görz and Gradisca ..	2	1	—	—	—	—	—	4	—	—	4	—	—	—	—
Dalmatia ..	7	2	—	284,503	284,503	85,907	30'20	360	25	44	429	663	200'0	111,367	—
Istria ..	2	2	—	672,235	672,235	510,522	75'94	799	—	—	799	841	639'0	392,250	—
Galicia ..	8	3	—	82,932	82,932	28,843	34'78	194	—	—	194	427	148'0	—	—
Total, Austria ..	930	352	1,614,868	88,000,115	89,614,983	16,019,507	17'87	26,954	1,757	372	29,083	3,081	550'8	29,978,125	52,911
Hungary, 1880 ..	—	—	224,000	9,909,926	10,133,926	2,783,811	27'0	—	—	—	—	—	—	—	—
Total, Austria and Hungary ..	—	—	1,838,868	97,910,041	99,758,909	18,803,318	18'85	—	—	—	—	—	—	—	—

[illegible]



TABLE V.—PRODUCTION OF THE UNITED ALPINE WORKS, 1881.

Works.	Coal.	Pig Iron.	Merchant Iron.	Tires, Axles, and Forgings.	Castings.	Boiler Plates and Iron Sheets.	Steel.	
							In General.	Bessemer Rails.
Innerberger Hauptgewerkschaft ..	Tons. 62,185	Tons. 40,929	Tons. 10,943	Tons. —	Tons. 815	Tons. 7,004	Tons. 8,040	Tons. —
Mittenberger Eisenwerks-Gesellschaft ..	67,348	42,989	1,932	—	1,096	1,138	22,349	9,819
Vorderberg-Köflacher Montan-Industrie-Gesellschaft ..	115,025	13,067	11,735	81	—	7,216	169	—
Neuberg-Mariazeller Gewerkschaft ..	—	13,462	490	1,434	2,263	4,396	10,039	—
Steierische Eisen-Industrie-Gesellschaft ..	265,680	13,184	2	1,196	1,031	219	19,337	10,456
St. Egydi-Kindberger Eisen-Industrie-Gesellschaft ..	—	9,441	4,809	—	—	—	50	—
Eibiswald and Krumbach ..	13,223	—	118	—	52	75	5,100	—
Totals ..	523,461	133,072	30,029	2,711	5,257	20,048	65,184	20,275

To this activity in railway construction may likewise be ascribed the full employment enjoyed by Austrian rail mills. The total output in 1881 was 86,675 tons, in the production of which nine rail mills were engaged. To enable a comparison being made with former years, and forming an estimate of the total production, the following statement has been compiled:—

Years.	Production of Rails. Tons.
1870..	90,619
1871..	96,262
1872..	111,030
1873..	107,821
1874..	88,625
1875..	83,571
1876..	62,338
1878..	90,162
1879..	86,429
1880..	77,246
1881..	86,675

We may remark with regard to the quantity produced in 1881 (86,675 tons) that small rails of a weight of under 17 kilogrammes per metre run are not included. The average price of rails was 10.56 florins per 100 kilogrammes, against 10.26 florins in 1880, and 11.40 florins in 1870. Prices of iron and steel rose successively in 1881 in accordance with the growing demand, viz.:—

	Florins.	Florins.	
Steel rails, from 10 to 12 ..	per	metre-cwt.	
Bar-iron, " 10 " 11 ..	"	"	"
Pig-iron, " 4.50 " 5.50 ..	"	"	"
Old rails, " 4-5 " 5-6 ..	"	"	"

The cost of pig-iron per metre-cwt. was:—

Years.	AUSTRIA.		HUNGARY.
	Per Metre-cwt. Florins.	Per Metre-cwt. Florins.	
1873 ..	8.50	..	5.54
1874 ..	6.43	..	4.74
1875 ..	5.91	..	4.44
1876 ..	5.55	..	—
1877 ..	5.30	..	4.29
1878 ..	4.95	..	4.09
1879 ..	4.77	..	3.85
1880 ..	4.57	..	—
1881 ..	5.0	..	—

The most important event in last year's history of the Austrian iron trade was the fusion of nearly all the ironworks of Styria and Carinthia and other less important works. The Fridau'sche Eisenwerke will also shortly be acquired by the new association. The latter, under the name of "Oesterreichisch-Alpine Eisenwerks-Gesellschaft," includes now the ironworks named in Table V., whose production during the past year are likewise given.

The share capital of the United Alpine Works amounts to 30,000,000 florins, and further (preference) shares to the value of 30,000,000 florins are to be issued. Of Bohemian works, the Prager Eisen-Industrie-Gesellschaft produced in the financial year 1880-81 the following:—

	Tons.
Coal ..	657,766
Pig-iron ..	30,535
Castings ..	7,035
Bessemer ingots ..	13,558
Bessemer rails ..	10,053
Merchant iron and steel ..	17,271
Finished products ..	2,019
Sheet-iron and tinplate ..	11,144
Total, iron and steel ..	96,615

As already mentioned, the Salgo-Tarjaner Eisen-Industrie-Gesellschaft and the Rima-Muranyer Eisenwerks-Gesellschaft combined in the course of last year. It is estimated that the two will be able, after completing their works of reconstruction, to raise their capacity to 40,000 tons of finished products per annum. Their production in 1881 was as follows:—

	Tons.
Pig-iron ..	18,000
Castings ..	900
Merchant iron ..	24,200
Sheet iron ..	300
Railway material ..	94
Total ..	43,494

## OCCASIONAL NOTES.

## ELECTRICAL CUTTING OF GLASS DURING MANUFACTURE.

At present, large glass cylindrical vessels for scientific and commercial purposes are cut during manufacture by surrounding them with a thin filament drawn out from the molten glass, and then cooling them suddenly by contact with a cold substance. A more sure and perfect method has been devised by Herr Fahdt of Dresden, who surrounds the glass vessel with a copper wire, connected by binding screws with the two poles of a galvanic battery, and made red-hot by forming contact. The rough edges are then rounded off by turning the object in a blow-pipe flame; and, to prevent any unequal contraction of the parts subjected to this action, a slight annealing is effected in the furnace.

## IRON TRANSVERSE SLEEPERS.

The question whether iron sleepers are found by actual experience to be superior to wooden sleepers on German railways was the subject of a discussion at a recent meeting of the Aachen section of the Society of German Engineers. It was maintained that the apprehension of a sudden fracture in consequence of molecular changes caused by continuous vibration was groundless. There have been isolated instances in which material was changed in its structure by varying conditions of tensile and compressive strains, but such a change had hitherto not been observed in the case of transverse sleepers. The fact that iron sleepers are increasingly employed compared with wooden ones proves that they are preferred. Their use is not only more economical, but they are also more reliable, because rails may be much more securely fastened to them.

## CORK BRICKS FOR COVERING BOILERS.

The Nürnberg Exhibition offers much that is novel and interesting, both as regards new products and their special application. Amongst these are cork bricks. These bricks have hitherto only been used for building purposes, on account of their lightness and isolating properties; but they are now also being employed as a covering for boilers, and are said to excel even asbestos in preventing the radiation of heat. They are stated to be very cheap, being prepared of small cork refuse and isolating cement. At Nürnberg the application of cork bricks is largely shown. The effect of such a covering is said to be remarkable, enabling persons to stand on a boiler without feeling the least inconvenience, the temperature over it being about equal to that of a room. Cork bricks, therefore—of which, we may add, Messrs. Grünzweig and Hartmann, of Ludwigshafen, are the inventors and manufacturers—besides effecting a saving of fuel, make boiler-houses more desirable places than they now are. The usual size of cork bricks is 10 by 4½ by 2½ inches.

## DENSITY OF METALS DURING FUSION.

Herren Nies and Winkelmann have communicated to the Munich Academy the result of their investigations as to the change of density undergone by metals on fusion and on subsequent solidification. By keeping tin for a lengthened period at its melting-point, which is 440 degrees Fahr., it was found that lumps of solid metal floated on the surface, as is the case with cast iron. By adding a certain quantity of copper to pieces of solid tin, which increased their weight, specimens were obtained of average density equal to that of the liquid tin, which it thus became possible to fix at 1.007, taking 1 to represent solid tin. The results were not so well defined in the case of lead and cadmium; but zinc behaved like tin, its dilatation at the moment of solidification being 0.2 per cent. The same result, much more characteristic, however, was obtained with bismuth, which in a liquid state is 3 per cent. more dense than when solid. Copper and wrought iron were also experimented upon, and, like the other metals named above, increased in volume on solidification, a phenomenon chiefly characteristic of metals which crystallise in solidifying.

## GERMAN WORKS IN RUSSIA.

We hear that two large works are to be erected by German firms in Russia. Messrs. Böcker and Co., of Schalke (Westphalia), who own large forges, rolling mills, wire-drawing works, tinplate works, wire cable works, and a wire tack manufactory, and who are large exporters to Russia, intend, in order to avoid the high import duties on

their products, to erect similar works to their Westphalian ones at Liebau, near the sea and the German frontier. It is likewise stated that Messrs. Siemens and Halske, of Berlin, will erect at St. Petersburg a large cable manufactory, which is to produce telegraph wire and cables, by which step the whole of Russia's requirements would be amply covered, it being intended to arrange the works for an annual production of 2000 miles of cable for submarine lines. All articles necessary for the working of electric telegraph and other electrical arrangements are also to be manufactured at Messrs. Siemens and Halske's intended works, so that it is hoped Russia may soon be independent of foreign countries for the supply of electric apparatus. This announcement is not wholly unexpected. It is a necessary consequence of Russia's protective policy, and the movement, like the transmigration of Silesian works to Russian Poland, may answer its purpose for a time. But, considering the uncertain nature of Russian finances, it may be open to question whether the latest reaction in favour of oppressive protection is likely to be of duration.

## A SHIELD FOR FIELD ARTILLERY.

It seems a pity that the shield for field artillery which Captain J. B. Parkin, R.A., has submitted to the War Office should not be deemed worthy of at least a trial, for we believe that it would form a very fair protection to the men serving the gun. The inventor proposes to lay a metal rod horizontally and transversely across the gun, supported by arms reaching from the axletree, to which are fixed vertically very flexible bars or blades of steel about 30 inches high and 2 or 3 inches wide, with their free ends upwards. These bars or blades have intervals between them just sufficient to prevent the passage of a bullet, but wide enough to afford a view of the front, sighting, &c. By a proper form and tempering these bars have just stiffness enough to resist the action of bullets, but bend readily when met by shells, and, if struck very low down, would break; bending or breaking, however, probably without causing the shell to explode. As each bar would weigh only about 7 lb., several spare ones could be carried with the gun or ammunition waggon ready at once to replace any which might get broken. To this shield bullets would be perfectly innocuous; it is rarely it would be struck by a shell, and, if so, would be unharmed unless struck low down, where, in fact, the shell might, under any circumstances, prove destructive. By thus dividing the shield into parts capable of independent action, either exposure to the enemy's bullets or damage to the screen is limited to the space occupied by the breadth of the shell. The principle of elasticity is here also made use of to make the shield, in fact, as good as non-existent, so far as danger of exploding shells goes. The shield, it will readily be seen, is on an entirely different principle from that which Mr. Krupp proposed, and constructed, some time ago. Mr. Krupp's shield, consisting of heavy plates, to which the gun itself is screwed or fixed—in fact, the whole arrangement was described as an armoured gun—was, if we remember rightly, discarded for field artillery by the German authorities on account of its great weight, which rendered its use impracticable. This objection of cumbersomeness by no means applies to Captain Parkin's invention.

## THE SOCIETY OF ENGINEERS.

ON Wednesday last more than a hundred members and associates of the Society of Engineers paid a visit to Portsmouth Dockyard. Amongst the company were Mr. Jabez Church, president; Mr. William Schönheyder, vice-president; Messrs. Robert Berridge, Charles Gandon, and A. T. Walmisley, members of the council; Messrs. Joseph Bernays, Vaughan Pendred, and Robert P. Spice, past presidents; Mr. Alfred Williams, hon. secretary and treasurer; and Mr. B. Reed, secretary. On reaching the Dockyard, they divided themselves into three parties, and were conducted by officers, placed at their service by the admirals in command of the ships and the yard, to whatever was most interesting to see. One section went on board the *Excellent* and witnessed the gun drill which was then in course of operation, a second proceeded on board the *Vernon* torpedo school, while the third was conveyed in steam trams around the yard. On entering the *Vernon* the president and officers of the society were received by Captain Gordon, who had prepared a series of interesting experiments for their instruction. In the senior lecture-room a brief lecture on the art of mining and countermining was delivered by Lieutenant Batten. After explaining the various systems of chemical and electrical ignition, the lecturer described what was meant by mechanical, contact, and observation mines, his remarks being illustrated by the blowing up of a toy ship and other experiments. The methods adopted of clearing a channel known to be defended by submarine mines were afterwards described. Charges of 500 lb. of gun-cotton mines will clear a space of 90 feet, so that three lines of countermines will free a channel about 300 feet broad, and allow ships to pass through in safety. In Portsmouth Harbour half a mile of channel has been cleared in four minutes. The system of countermining was subsequently illustrated from the poop, when a number of blowing charges were simultaneously exploded in the channel. Among other things shown to the members was the method of manipulating the electric launch, the advantages accruing to ships from the fitting of lightning conductors, and the Whitehead torpedo, the whole of which, with the exception of the central and secret part, was explained. The party afterwards made a tour of the yard, and visited the extension works, which cover an area of 178 acres, and when the various basins and docks are completed



the Portsmouth yard will be considerably more than double its original size, being increased from 115 to 293 acres, which is about 74 acres beyond the total area enclosed at Chertbourg. The machinery in connection with the extension works are actuated by pneumatic pressure. The air-compressing plant consists of a pair of vertical condensing engines developing about 250 indicated horse-power, and driving a pair of double acting horizontal compressing pumps. The clearance spaces of the pumps are kept filled from a tank connected with the main, so that the air taken in at each stroke is compressed in contact with this water, and pumped into a series of large accumulators up to a pressure of 60 lb. The total accumulator capacity is now about 9200 cubic feet, and is divided between four large spherical cylinders of wrought-iron, 10 feet in diameter by 30 feet high. The great advantage of the compressed-air system, over the hydraulic power for such intermittent work as is required in the dockyard lies in the accumulators. The engine usually pumps them up early in the morning, and the supply of stored power is sufficient to meet the general wants of several hours. The compressed air is conveyed from the accumulators by means of a pipe 20 inches in diameter, and is branched off by means of smaller pipes as necessary to the machines scattered about the various docks and basins. There are at the present time connected with the accumulators two 20-ton cranes, five sliding caissons, twenty-four capstans, besides numerous penstocks and other machinery. In the same building as the air-compressing machinery are the two large main pumps for pumping the docks and basins. The double-acting plungers are 6 feet in diameter and 6 feet stroke, and are driven by a compound engine of 1200 indicated horse-power. These pumps are capable of pumping out the docks at the rate of about 24,000 tons per hour. Owing, however, to the type of construction which permits heavy shocks to come on the large cast-iron jointed barrel, the cost of repairing cracks is exceedingly great, and centrifugal pumps must eventually be substituted. A drainage engine for the docks is also contained in the same building. A new brick building, with a tank for fire purposes above, is about to be erected at a cost of £19,000 to supersede the present temporary shed. The members also visited Whale Island, where they witnessed some practice from the Hotchkiss, Nordenfolt, Gardiner, and Gatling machine guns at plate targets. They were also shown over the *Colossus* and *Decastation*, double turret ships, the *Imperieuse*, barbet ship, and the *Dreadnought*. They also witnessed the methods adopted for bending and shaping the armour-plates for the men-of-war under construction. After a long and interesting day, the party dined together at Cawte's Hotel, returning to London in the evening.

### THE "NONPAREIL" CORN DRILL.

THE inconveniences attending the fixed hoppers hitherto used in corn drills having been recognised by Messrs. James Smyth and Sons, of Peasenhall, Suffolk, they set to work to remedy the defects, and they have well succeeded in doing this in the "Nonpareil" drill, the working parts of which we illustrate in the engravings on page 222. Many of our readers are aware that in the old system, the hoppers consisted of a tube secured to the bottom of the box, and a funnel-top fitting this tube. Every time it was necessary to change the seed and reverse the barrel it was necessary to take off the upper part of the hopper; and it, in replacing it, the workman did not take care to fasten the clasp which keeps it to the tube, the consequence was when the machine was put to work, the shaking caused by the unevenness of the ground, made the hopper rise and become crushed by the cups, which invariably resulted in breaking the cups or hoppers, and often both at the same time. Again this operation took a long time to effect, besides wearing the parts by frequent removal. The new system differs from the old one in the three following points: alteration of hoppers in the box; new arrangement of changing speeds, and improved supports to the box and barrel.

The new hopper (see fig. 1), constructed of wood, carries on its upper part a hinged shoot, also a hinged plate, by means of which the shoot can be moved to and from the cup-wheel. When the drill is in work, the shoot is turned towards the cup-wheel, as at B, fig. 1. When it is desirable to stop the descent of the seed into one or more hoppers, the shoots are tilted backwards, as at A. This is what is also done when finishing an irregular shaped field; that is to say, when drilling so that the part of the drill is overlapping ground already finished; or again, when some of the coulters have been removed for drilling wider distances. To change the barrel, the hopper shoots are simply tilted back, as before mentioned, the bearings are unfastened, which support this, giving the barrel free exit from box, without taking anything to pieces. The hoppers are constructed in pairs, so as to be easily removed from box, being held in position by two screws. Further, with the new arrangement of bearings, the box can be emptied immediately by a simple movement of the regulator handle. It will thus be seen that a great simplification has been effected, by which accidents are almost impossible; and, furthermore, a greater regularity in the distribution is effected, because of the position of the hoppers in connection with the barrel.

Another improvement consists of a simple and ingenious arrangement for altering the quantity of seed sown per acre. The travelling wheel of the drill giving motion, sets going a cog-wheel mounted on a fixed spindle at the bottom of the box. Fig. 2 N.P. 1 shows this cog-wheel fixed to the end of the spindle; N.P. 3 is an intermediate wheel, and 22 a cog-wheel fixed at the end of the barrel. It is this cog-wheel which can be changed at will, and gives a greater or less speed to the barrel. To effect this change it is sufficient to slide the intermediate wheel N.P. 3 on the grooved index plate, the numbers marked on the plate indicating the position it ought to occupy. In order to lessen as much as possible the number of cog-wheels, and at the same time to obtain the greatest number of speeds, the arrangement is such that each cog-wheel works the barrel at two different speeds. Thus eight cog-wheels only, with the new principle, obtain as many speeds as with six-

teen in the old. Messrs. Smyth have retained in their new drill the cup-delivery regulated by a simple change speed wheel. This system has been by long practice recognised as the most simple and certain to insure a regular quantity of seed sown per acre.

### 16-FOOT, TURNING AND BORING MILL.

IN the engraving on page 223, we illustrate in perspective a turning and boring mill of large proportions, for the engraving and particulars of which we are indebted to our contemporary, the *American Engineer*. The illustration is so clear that but little description is necessary. The method adopted for moving the stanchions forward or backward is original, and the whole huge machine is perfectly under the control of the operator. The different motions are all automatic, and are operated by a lever attached to one of the stanchions, by which the stanchions are given a forward or backward motion, the crosshead is raised and lowered, and the saddle and tool bars are moved. The several motions may be made independently of each other, or simultaneously, thus saving much time and labour in handling so large a tool. The driving gear gives a range of fifteen different speeds, so that a 6-inch hole can be bored, or a wheel 30 feet in diameter turned. The slowest speed is one turn in seven minutes—the ratio of gearing being 1 in 232. The machine will bore, turn and keyseat a wheel or pulley 11 feet in diameter and 11 feet face, as a fixture. By moving the stanchions back it will turn any diameter up to 30 feet, with 11 feet face. It has automatic feed motion in all directions, ranging from 1-16 to 1 inch, inclusive. The face plate is 10 feet in diameter, arranged with radial slots for holding work. The spindle is carried on a cast steel step, and when turning a heavy wheel, the outer rim of the face plate is supported on a series of friction rollers to relieve the step, at the same time assisting in steadying the work. The machine requires a floor space 32 feet square, and a height of 20 feet above the floor. The distance between the stanchions is 16 feet 4 inches, and the height over the face-plate to the underside of the cross-head at its greatest elevation is 10 feet 1 inch. The total weight of the machine is 230,000 pounds. The manufacturers of this fine tool are Messrs. Watts, Campbell and Co., Passaic Machine Works, Newark, N. J., to whom it does great credit.

### WHITEHEAD'S NEW TILE PRESS.

IN the engraving on page 223 we give a perspective view of a new and useful tile-press, by Messrs. John Whitehead and Co., of the Albert Works, Preston. The action of this machine is extremely simple. The power is obtained by means of a screw, operated upon by a worm and wheel in connection with the handle. By this a very great pressure is obtained, thus adapting it for the manufacture of large-sized goods, such as Martini, Gilliboni, and other large surface roofing tiles, panels, shields, string courses, cornices, bases, mullions, flooring tiles, ventilating bricks, and an endless variety of general goods. It is fitted with a self-acting motion underneath, which lifts the pressed articles out of the moulds ready for taking away, and when used for roofing tiles it is fitted in addition with a turnover motion for moving them to the pallets for convenience of removal.

### BAMLETT'S STACK-DRYING FAN.

AMONGST the fans exhibited at the Royal Show at Reading and tried in the stack-drying experiments, there was one by Mr. A. C. Bamlett, of Thirsk, which we illustrate in the engraving on page 223. It consists of a small turbine fan with the casing cut away, and possessing great suction power, and being driven from a large flywheel at a comparatively high speed. The whole is mounted on a light portable stand, as shown, and a very moderate amount of power is required to drive it, as we know from having tried it. It is connected by an india-rubber air tight joint to an horizontal tube laid in the stack, communicating it with a hollow space in the centre of the stack. It is readily fixed or detached from the stack tube, and removed from place to place, wheelbarrow fashion, by running the flywheel on the ground, the driving strap being first removed. In order to reduce the friction as much as possible, Mr. Bamlett does not make a mechanical fit between the circular opening in the turbine wheel, through which the air is admitted, and the casing of the fan, which would involve a certain amount of friction; but to prevent the turbine wheel sucking air direct from the atmosphere he causes it to revolve close to a fixed disc of larger diameter, creating an induced outer current between the wheel and the disc, and thus effectively preventing the turbine wheel sucking air direct from the atmosphere. This is no doubt the cause of this fan being so easy to work. We may add that it is reported to have given good results at the Reading trials.

### THE NORTHERN MANUFACTURED IRON TRADE.

IN the manufactured iron trade of the North of England a rather critical period is at hand. For years the rate of wages in that industry has been defined by arbitrators or their offshoots—sliding scales. A sliding scale adopted two years ago was suspended by consent some months since, and the rate of wages that now prevails was fixed by Sir J. W. Pease, M.P., two deferred increases of wages under it carrying the decision of the rate over next month. The employers gave notice to the operatives that after that period they would claim a reduction of wages; and after the lapse of a short period the operatives have put in a notice for a claim of an increase instead. It is probable that the decision on the question raised by these contending

claims will have to be referred to arbitration; and in the present juncture of the trade, and the present temper of the men, the question is one that is surrounded with difficulties. When arbitration first began in the manufactured iron trade of the North, the chief form in which the iron was made was that of rails. The demand for these in the shape of iron fell off eight years ago, and may be said to have now entirely collapsed. As it fell off, the demand for the labour of the ironworker ceased, and hundreds, in the first five of these eight years, left the district or the trade. In the last two years an enormous demand for manufactured iron in another form—that of plates for shipbuilding—has set in in the North-east of England. In the height of the prosperity a decade ago, the demand for iron plates was to the extent of about 40,000 tons every quarter; but this year the associated makers have sold 105,223 tons, and even more in one quarter; and with the other forms of iron—angles for vessels and bars—the production is greater now than it was in the period when iron rails formed the largest portion of the output. This has, of course, called into the district and into the industry labour to even a larger amount than there was in the past decade. But in the sudden interruption of labour, part of it unskilled, there has been naturally some danger to the trade, and that danger has more than once threatened to wreck the board of arbitration that has for thirteen years done incalculable service to the industry and to the district where it is so largely carried on. And the decision on the two claims for alteration in the rate of wages have about them some of the elements that in the past two years have roused much bitterness. The chief factor in the decisions as to the rate of wages has hitherto confessedly been the selling price of the iron manufactured by the labour employed. The realised average price of the iron sold by the associated firms is ascertained quarterly by an accountant, and the realised average price practically decides the rate of wages; for though it is acknowledged that the price of the product is not the sole determinant of the value of the labour, yet it is found in experience to be one of the most reliable, and that the others can be appreciated when the basis of pay is fixed—that is, when it is defined what proportion of the given price shall be received by the workmen. In the North of England iron trade, the puddler has received 1s. in the pound on the average realised price, with an addition to the total shillings of a sum of from 1s. to about 2s. 3d. per ton. As, then, the price of iron rises he appreciates readily the increase to his wages thus:—If the average price were £6, he would receive 6s. per ton, plus 1s. or 2s. as agreed; and if it rose to £9 he would receive 9s., with the same additional 1s. or 2s. It is this general proportion of wages to prices that makes the decision of the arbitrators in the iron trade of the North one that is comparatively easy; and if it were not for the fact that many of the men and some of the employers are outside the respective associations, and that, while they accept the increase of wages that arbitration brings, they demur to the acceptance of reductions in the framing of which they have had no part, the position of the wages of the ironworkers of the North would be one that could be at all times mechanically regulated by the mere ascertainment of the realised average price. For the second quarter of the present year, the average realised price of iron was £6 3s. 11d., but as rails are excluded now from any voice in the decision of the wages, owing to their small quantity, the amended average is a fraction over £6 7s. It is on this average being declared—higher than was expected—that the claim of the workmen for an advance of wages is made. It is probable, now that a claim for an increase has been put in, that the employers will ask for the reduction they have previously hinted at, but not defined. As yet it cannot be said that, from the bare price that has been named, any prediction of the probable result can be drawn, for another quarter is running its course, and the statement of the price for that period will be much more likely to be reliable as a basis for decision. Meantime, the notices of employers and of the men are waiting for reference by the board, and the full employment that has been known all the year continues; but so far the facts that have come before the public point to a belief that there is little ground in prices for change from the present rates.—*Times*.

### INTERNATIONAL IRON STATISTICS.

THE article below, from the able pen of M. Paul Träsenster, of the Ecole des Mines, of Liège, appears in the last number of the *Revue Universelle des Mines*, &c., and has been expressly translated for IRON on account of its great value to the iron trade. M. Träsenster says:—We pointed out, at the beginning of the year, that the activity of the iron trade in 1880 and 1881 was almost entirely due to the increased consumption of three large countries, the United States, Great Britain (European and Colonial), and France. At the same time we expressed fear that the American demand, which was the chief factor in the improvement, would scarcely continue in presence of the deficiency in the principal crops and the state of the money market in the United States. Information received since the 1st January enables us to judge how far the situation has become modified during the first half of the present year. The annual reports of the British Iron Trade Association afford complete and detailed information as to the activity of the chief branches of the iron trade in England and the United States. The production of pig-iron in the chief industrial countries attained the following figures in 1881:—

		Metric Tons.
Great Britain	.. ..	8,510,000
United States	.. ..	4,210,000
Germany	.. ..	2,900,000
France	.. ..	1,894,000
Belgium	.. ..	631,000
Total 1881	.. ..	18,145,000
" 1880	.. ..	16,830,000
" 1879	.. ..	12,956,000

These five countries represent 92 per cent. of the production of the whole world, in which Great Britain, the United States, and Germany figure for nearly 80 per cent. Now,



in the case of these three countries, we can calculate approximately the mean production during the first months of 1882. *Ryland's Iron Trade Circular* and the *Iron Age* give three-monthly statements as to the number of furnaces in blast in each district of England and the United States. By taking into account the mean capacity of the furnaces in the different districts, it is possible to arrive at an approximate estimate of the production. In Germany the monthly statements of the Ironmasters' Association give this information as far as the Zollverein is concerned. By utilising these sources of information, we obtain the comparative figures of the following table, which gives:—

- I. The average monthly production of 1881.  
II. The average production of the first five or six months of 1882.

	I. Tons.	II. Tons.
Great Britain ..	709,000	750,000
United States ..	353,000	303,000
Germany ..	233,000	253,000
	1,295,000	1,306,000

These figures show that the production of 1882 is still greater than that of 1881. It is more difficult to arrive at a correct estimate of the consumption, because that would require a knowledge of the stocks of pig-iron that exist in the different countries. In England and the United States the total amount of stocks of pig at the furnaces and in the public depots were subject to the following variations during the year 1881:—

	Jan. 1, 1881. Tons.	Dec. 31, 1881. Tons.
Great Britain ..	1,565,000	1,763,000
United States ..	581,000	201,000
	2,146,000	1,964,000

The diminution of stocks in America more than counterbalanced the increase of those in England. We do not know the quantity of stocks at the present time; but, in the case of Great Britain, we have the figures relating to Cleveland and Scotland, where there were more than 1,300,000 tons of pig on December 31, 1881. The stocks of these two districts fluctuated as follows:—

	Jan. 1, 1881. Tons.	June 1, 1881. Tons.	Jan. 1, 1882. Tons.	June 1, 1882. Tons.
Scotland 750,000 ..	840,000	955,000	910,000	
Cleveland 330,000 ..	432,000	384,000	352,000	
	1,086,000	1,272,000	1,337,000	1,262,000

The slight diminution noticed since the beginning of the year is due partly to the arrangement made between the ironmasters of Scotland and Cleveland for limiting the production that has been in force since October 1, 1881. This diminution has reference only to common pig, the only class which accumulated; that is to say, it does not include Bessemer pig, the production of which is now very large in the North of England. The production of common pig-iron in Cleveland and Scotland, which reached 276,000 tons a month during the first half of 1881, has only been 239,000 tons on an average during the first months of 1882. For the five months between December 31 and June 1, this represents a falling off in the production of 180,000. At the same time the stocks were diminished by 80,000 tons, while they had increased by almost 200,000 tons during the same months of 1881. Whence it may be concluded that the consumption of 1882 has, up to the present time, been greater than that of 1881. Among the five principal manufacturing countries under consideration, there are three, England, Germany, and Belgium, which export a considerable proportion of their make of iron, while the two others, viz. the United States and France, have not produced sufficient for their consumption during the last few years. The statistics of international commerce enable us to become acquainted with the state of the different markets. For the exporting countries, the quantities sent abroad represent a considerable proportion of the demand. For the United States and France the imports can only obtain any considerable quantity when the consumption exceeds the producing capacity of the works; that is to say, when trade is very good. To permit of comparing the exports of the first months of 1882 with those of former years, we have collected into a table the following particulars:—

- I. The average monthly exports of 1880.  
II. The average monthly exports of 1881.  
III. The average exports of the first five or six months of 1881.  
IV. The average exports of the first five or six months of 1882.

	I. Tons.	II. Tons.	III. Tons.	IV. Tons.
England ..	241,000	323,000	292,000	354,000
Germany ..	83,000	95,000	87,000	85,000
Belgium ..	30,000	32,000	27,000	34,000
Total ..	434,000	450,000	406,000	473,000
Imports ..	68,000	69,000	55,000	62,000
Net exports ..	366,000	381,000	351,000	411,000

It will be seen by the above that the exports of 1882 not only exceed considerably those of 1881, which may partly be attributed to the fact that the winter was less severe and the navigation easier, but that they are even greater than the average of the last two years. It remains to find the outlets which have caused this increase of exports. The United States have continued to receive considerable quantities of pig, finished iron, and steel from Europe, the exports to America from England, Belgium, and Germany being on an average:—

150,000 tons a month in 1880.
114,000 " " " " " 1881.
104,000 " " " " " for the first five months of 1881.
123,000 " " " " " " 1882.

The American market has therefore continued to absorb about 50 per cent. of the English, Belgian, and German exports. The French market has also contributed to their

advance. During the first five months of this year France received on an average 35,000 tons of pig, finished iron, and steel, against 33,000 tons for the twelve months of 1881, and 21,000 tons for 1880. Lastly, the English colonies of India, Australia, Canada, and the Cape, which received on an average 60,000 tons a month of English iron in 1880 and 1881, have received 70,000 tons a month during the first half of 1882. If the monthly exports of the last few years be compared, we arrive at the following averages:—

	1880. Tons.	1881. Tons.	1882. Tons.
United States ..	150,000	114,000	123,000
English Colonies ..	60,000	60,000	70,000
France ..	21,000	33,000	35,000
	231,000	207,000	228,000

In other words, the advance of exports in 1882 over those of 1881 is entirely due to increased activity in the consignments to the three great markets named above. The inland consumption of England appears to have also taken a fresh start, for the production has increased in a greater proportion than the exports, and yet stocks have slightly diminished. This state of things is partly due to the activity of the ship-builders, who launched 1,013,000 tons of new vessels in 1881, against 796,000 in 1880, and 568,000 in 1879. On January 1, 1882, there were no less than 1,264,000 tons of vessels on the stocks, against 843,000 tons in 1881, and 431,000 tons in 1880. It will thus be seen that the tonnage of vessels launched in 1882 will exceed that of all former years; but it is feared that there will be a reaction in 1883, as comparatively few orders have been received for the end of the year. A continuation of the demand by the English colonies is ensured for a few years to come by the development of their railway system and the improved state of their finances. The same may be said of the French demand, although the early starting of several works is calculated to reduce the imports from foreign countries. As at the beginning of the year, it is the American demand which remains the most important, and at the same time the most uncertain, element in the consumption. The fears which we expressed as to the continuation of manufacturing activity in the United States have not as yet been completely borne out by facts. The exports have diminished, as we foresaw; but, at the same time, the imports have increased. During the first four months there was a reduction of 55,000,000 dols., or 18.8 per cent. on the exports, and an increase of 37,000,000 dols., or 17.8 per cent. on the imports, as compared with the preceding year. The exports of gold have also been resumed. At the same time, the length of railways made has been enormous; by June 30, 1882, no less than 4140 miles had been opened, against 1960 miles in 1881, 1888 miles in 1880, and 758 miles in 1879. At the same time, the opinion prevails that this activity will not continue until the end of the year; the lines constructed up to the present time are the complements of systems begun in previous years, and for which the capital had been subscribed, and the rail contracts let, before the 1st January. Since that time the depreciation of railway stock has increased, and new enterprises have been obliged to discontinue the issue of shares and debentures. According to a statement published by the *Economist*, the variations in the quotations of a dozen important lines are represented by the following figures:—

100 in the month of December 1880.	
105 " " " " " May 1881.	
88 " " " " " December 1881.	
79 " " " " " February 1882.	
80 " " " " " April 1882.	
78 " " " " " May 1882.	

The secretary of the American Iron and Steel Association, Mr. Swank, states in his annual report, published at the end of May, that the situation is but little reassuring; and he concludes as follows:—"We must accept the fact that we have entered upon a period of low prices, which will at any rate have the advantage of stopping the importation of foreign iron." The imports will not, however, cease from one day to the next; to stop them entirely, it would be necessary to lessen the cost prices of American products, that is to say, lower the wages, which are two or three times higher than in England. Now, on account of the deficiency in the harvest and under the influence of speculation, the necessities of life have considerably increased in price, while the workmen, far from submitting to a lower scale of wage, clamour for an increase. On June 1 a formidable strike broke out in the iron trade, and, notwithstanding the stoppage of a hundred mills for several weeks, prices have not recovered. These facts show that there is a very marked diminution in the consumption, and that the demands of the men will embarrass American manufacturers. If they wish to stop importation, they must be content with a more moderate return for their work and their capital respectively. Besides, it is not impossible that the demand may look up at the end of the year if the harvest be good. The production of wheat appears to have considerably exceeded that of 1881, without, however, reaching the maximum attained in 1880. There is also a good prospect in the case of other cereal crops. At the same time, maize and cotton are not satisfactory; and it is feared that these two crops will be inferior to what they were in 1881. It appears, therefore, on the whole that the agricultural interest of America must be content with only an average return.

The practical conclusion of this examination may be summed up in a few lines. A study of the statistics of the first six months of the present year shows no falling off of activity in the demand for iron; but there are, as regards the future, the same causes for uncertainty as existed at the beginning of the year. There is still an abundant production; and a restriction of the American market is to be feared at no very remote period. Will the iron trade of Europe find, in the increased requirements of other consumers, a compensation for the probable diminution of exports to the United States? There is reason to hope that it may, especially if the various harvests be good; but, up to the present time, this hope is problematical; and it would be difficult to point to centres of consumption capable of absorbing the excess of European production in the event of the American market being closed.

## THE NAVAL AND MARINE ENGINEERING EXHIBITION AT TYNE MOUTH.

THE North-East Coast Exhibition of Naval Architecture, Marine Engineering, Fishery, Life-saving and Coast-lighting Appliances was opened on Sept. 6 at Tyne-mouth. Though in its conception quite local and partial, the Tyne-mouth Exhibition had gradually assumed proportions not contemplated by the promoters; and so great was the demand for space, and so favourable the situation for extending the bounds that annex after annex was the result, an area of 40,000 superficial feet being provided. To review with any degree of detail the various sections of the exhibition in which our readers are most interested, would largely be going over ground already traversed in connection with the recent successful exhibition held in the Agricultural Hall, as very many of the exhibitors and objects embraced by the first display again find a place in the present exhibition. We will therefore content ourselves with brief notes and a general enumeration of the principal exhibits throughout the main sections. In the naval architecture section, which is contributed to by about 200 different exhibitors, 60 are from the Tyne district, 28 from the Wear and Tees districts, 25 from the valley of the Clyde, and 18 from London; the remainder being from various towns throughout Britain, and in some instances from Norway, Sweden, and the Continent. Conspicuous amongst the numerous models by which the Clyde shipyards are represented is one of the new Peninsular and Oriental steamships *Ballarat* and *Paramatta*, being completed by Messrs. Caird and Co., of Greenock; exhibited by the builders. The dimensions of these vessels are:—Length between perpendiculars, 420 feet; breadth, 43 feet; depth, 36 feet; gross tonnage, 4800; indicated horse-power, 4000; speed, 15 knots. The same firm exhibits a like model of the recently finished mail and passenger paddle steamer *Mona's Isle*, now doing service between Liverpool and the Isle of Man. The Union Steamship Company, London, exhibit a full-rigged model of their recent acquisition, the *Moor*, and also of the *Trojan*. The Peninsular and Oriental Company are represented by a collection of models, comprising specimens of their earliest as well as of their latest mail steamers. One of this company's steamships, the *Clyde*, is represented by a model shown by the builders, Messrs. Wm. Denny and Brothers, of Dumbarton. The Orient Company exhibit half models and oil paintings of their steamships *Orient* and *Austral*. The Barrow Shipbuilding Company exhibit a half model of the *City of Rome*, and Mr. John Paton, jun., Exchange Shipping Company, London, sends a full model of the *Grecian Monarch*. Vessels of all classes, including yachts, tug-boats, sailing ships, cargo and passenger steamers, and vessels of war are shown in the greatest profusion, the arrangement of them throughout the large hall being excellent. From the Lords of the Admiralty comes a selection of the modern men-of-war, with a specimen or two of the old wooden walls, and Messrs. Siemen Brothers exhibit the model of the twin screw cable steamer *Faraday*, 6500 tons burthen, built by Messrs. C. Mitchell and Co., of the Tyne. This shipbuilding firm—between whom and Sir W. G. Armstrong and Co., an amalgamation has been formed—show a collection of the work done by them for the Government of our own and other countries. Other firms exhibiting work of the same class are Messrs. R. Napier and Sons, Messrs. Palmer and Co., Messrs. Doxford and Sons, &c. The Trinity House of London send a collection of exhibits of an interesting and comprehensive character, including objects illustrative of the historical progress of coast lighting, both in the form of lightships and lighthouses. The Commissioners of Northern Lighthouses send a collection of exhibits equally interesting. The River Commissioners of the Tyne and the Wear, and also of the Clyde, are large exhibitors of models and appliances illustrative of river and harbour improvements, &c. A conspicuous object in the collection sent by the Tyne Commissioners is a working model of the Mammoth crane to be used in the extension of the North Pier at the mouth of the Tyne. This crane is constructed to set blocks and bags of concrete weighing 40 tons, at a projection or overhang of 75 feet; and is from the designs of Mr. P. J. Messent, engineer to the commissioners. A feature of great attraction in this section is a model in silver of the great bridge about to be erected over the Forth. Messrs. Cochran and Co., of Birkenhead, exhibit two models of steam launches, one evidently intended for high speed, and the other for rough harbour and coast service. The launches which this firm are now making a specialty of seem well adapted for the purposes for which they are intended, and the design and workmanship is of the highest class.

The marine engineering section is by far the most extensive, and educationally the most valuable of the whole of the sections. Amongst the most important exhibits to be noticed are full-sized working marine engines from the establishments of the Wallsend Shipway Company, Limited, and of Messrs. J. Wigham Richardson and Co., Neptune Shipbuilding and Engineering Works, Low Walker-on-Tyne. The first-named firm's exhibit consists of a pair of inverted direct-acting surface-condensing screw engines, of 100 horse power nominal. The cylinders are 26 and 52 inches diameter, and the stroke 33 inches. The working pressure is 80 lb. per square inch. Messrs. Wigham Richardson and Co.'s engines are of the type introduced by Mr. Alexander Taylor, of Newcastle—improved triple expansion surface-condensing. The cylinders are 16½ inches, 22 inches, and 44 inches diameter, the stroke of all being 33 inches. The working pressure is 150 lb. per square inch, the horse-power indicated being 500. Messrs. Cochran and Co., Birkenhead, exhibit a modification of their steam launch machinery, specially adapted by them for canal steamers. From the experience gained by this arrangement of machinery, now in regular work between Stockton and London, in the steamer *Jason* and *Jupiter*, there is no longer any doubt but that there is a great future for canal steamers, as feeders to the main lines of railway. The principal objects attained have been a gain of 15 per cent. to 20 per cent. in carrying capacity, and a very substantial saving in fuel. The engine is of the simplest possible construction very strong in all its parts, with large wearing surfaces all adjustable, and a link reversing motion got up in the most modern locomotive fashion and



thoroughly case hardened. The boiler is Cochran's patent vertical multitubular type with horizontal flue tubes, and is made as high as possible to pass under bridges, and is small enough in diameter to admit of sufficient side bunkers, even in canal boats, suitable for the ordinary contracted locks. The boiler is, moreover, perfectly accessible in every part, both inside and outside, for cleaning and examination. Messrs. R. and W. Hawthorn are also exhibitors of prominent objects, both in the way of marine and locomotive engines. Amongst these are a pair of highly finished horizontal compound direct-acting engines for H.M. gunboat *Dolphin*, an interesting feature about which is the admission of steam to the cylinders by piston valves, worked by the special valve gear patented by Mr. F. C. Marshall; a pair of inclined direct-acting twin screw engines for the Danish gunboat *Gronlund*, which are intended to indicate collectively 400 horse-power, with 250 revolutions per minute, and a working pressure of 100 lbs. per square inch. Another striking exhibit from the same firm is a set of propeller shafting for a twin-screw vessel of 7000 indicated horse-power collective. This consists of a tail end shaft, 48 feet 6 inches long, 12½ inches in diameter, and intermediate and thrust shaft, together 38 feet 6 inches long by 12 inches diameter in body. These are from the works of Messrs. Krupp, of Essen, and are forged of compressed steel, having a 4½ inches diameter hole bored from end to end. Messrs. Hawthorn also show the screw propeller and shaft of H.M. gunboat *Dolphin*, the propeller being a two-bladed feathering screw of brass, constructed on Bevis' patent principle, and the shaft of steel, forged by Sir Joseph Whitworth and Co. Most of the engines above named are to be seen working under steam, as are also the various patent steering gears, windlasses, capstans, winches, &c., of which an extraordinary number is shown. Amongst the firms exhibiting articles of this class, we may enumerate:—Messrs. Amos and Smith, of Hull, who show, in addition to their well known steam steering gear, a new combination hand and steam gear. Messrs. Higginson and Co., of Liverpool; Messrs. Davis and Co., London; Messrs. Douglas Coulson, Sunderland; Messrs. Napier Bros., of Glasgow; Messrs. Donkin and Nichol, Newcastle; Messrs. Harfield and Co., London; Messrs. S. Baxter and Co., London; Emerson, Walker and Co., London; Messrs. Clark, Chapman and Gurney, Gateshead, &c. The Harrison Patent Steering Engine Co., of Ocean Works, Salford, show one of their patent noiseless steam steering gears, which possess some noteworthy features. The steam-power supplied to all the various machines in motion throughout this section is generated in a large boiler at the extreme end of the buildings—one of Fox and Hopkinson's corrugated furnaces and flue, 25 feet long by 3 feet internal diameter, with conical circulating tubes. Other exhibits in this department, and made to serve in driving the electric machinery, are two Yorkshire engines of 16 and 25 horse-power, semi-portable, especially designed to economise fuel, exhibited by Messrs. John Fowler and Co., Leeds. Messrs. Robey and Co., of Lincoln, have also supplied one 30 horse-power patent Robey engine and locomotive boiler combined, to assist in driving the dynamos supplying the electric light. The electric companies whose systems of lighting are shown throughout the buildings are the Pilsen-Joel Electric Light Company, London; the Hammond Electric Light and Power Supply Company; the Maxim-Weston Electric Light Company; Messrs. Mawson and Swan, Newcastle, exhibit various important electrical appliances and inventions, and Messrs. Menzies and Blackburn, of the same town, have supplied a couple of Otto silent gas engines, twelve horse-power, to assist in driving the electrical machines.

Next to the great number of large engines and machines, seen working under steam, the most striking feature of this section is the plentitude of heavy castings and forgings exhibited. Sir W. G. Armstrong and Co. show specimens of their world-renowned ordnance. The Darlington Forge Company exhibit a complete stern and rudder-frame weighing in all about twelve tons, also crank and propeller shafting dressed, and rough from the hammer. The Tyne Forge Company, Newcastle, show a rough forging of a crank shaft with a long pin, the pin being forged round, instead of being cut out of the solid block. A finished half crank shaft, on Purvis' patent, designed to accommodate itself to the unfairness of bearings that become out of line by wear, &c., also a small finished crank shaft, made from steel scrap. Messrs. John Spencer and Sons, Newburn Steel Works, Newcastle, are the exhibitors of a large selection of the heavy articles turned out from their establishment. In referring to the exhibits of the Newburn Steel Works, Newcastle-on-Tyne, we may first observe that a series of experiments have been carried out there at the request of Lloyd's Committee by their appointed officer, and by surveyors from the Board of Trade and the Bureau Veritas, to test the value of steel castings as compared with wrought iron for crank axles, stern frames, &c. The report shows that in every case the steel casting was superior, giving a tensile strength of 28 tons, with 25 per cent. elongation, whereas the wrought iron was especially weak across the grain. The cast crank axle, from which the specimens were taken, has since been cut up in various directions at the request of the chief engineering surveyor at Lloyd's, to test the soundness of the material, and the parts which are exhibited show no trace of honeycomb. The exhibits include a large crank disc, weighing 6½ tons, turned up and faced, showing its perfect soundness. There are also steel shell hydraulic cylinders, paddle floats, cross-heads, dredger buckets, and a variety of steel castings. The test pieces exhibited give very high results, and show that the proprietors of the works—Messrs. Spencer—are following the subject of steel castings in the proper scientific spirit, and appear to be determined that engineers shall have, in this form, a material on which they may rely. Messrs. Wasteneys Smith, Newcastle, show a large assortment of patent stockless anchors, one of which, of the oval type, weighs 6½ tons, and has been made for H.M.S. *Collingwood*, building at Pembroke; another, of the mercantile type, weighs 56 cwt., and is intended for the large Cunard steamship *Aurania*, now building by Messrs. J. and G. Thomson on the Clyde. Messrs. I. and W. Beardmore, of Parkhead, Glasgow, are the exhibitors—amongst numerous samples of steel test

pieces, &c.—of one double crank shaft, 13½ inch diameter, built of steel, and intended for a ship now being built by Messrs. Palmer and Co.; a steel ingot cast in Beardmore's patent brick mould; also a model of the 12 ton hammer "Samson," erected in their works in March of last year. From the Steel Company of Scotland come numerous test samples of steel plates, angles, bars, castings, &c., also heavy articles in cast steel, such as propeller blades, anchors, crank shafts, &c., including a model of stern frame and rudder, as cast in steel by the company. Messrs. W. Jessop and Sons, of Sheffield, show a collection of their castings, including an actual stern frame and rudder of crucible cast steel fitted up complete after having withstood Lloyd's tests. The Landore Steel Company send specimens of steel plates, angles, section bars, and other steel products; and Stanners Close Steel Company, Darlington, show portions of heavy cast work used in ships and engines. Numerous firms send specimen boiler-front plates, &c., and from the Leeds Forge Company comes a collection of their specialties in boiler-front plates and flues, which, in itself, occupies a large portion of the marine engineering department. Amongst the features of this collection is the first corrugated flue ever made, 10,000 of which have been turned out since its production about five years ago; a patent apparatus for testing the resistance to collapse of flues of full working size; a set of front plate and four corrugated flues fitted together; also a corrugated steel flue just as turned out of the rolling mill, which is to form one of 72 flues for the boilers of the New Guion Line steamship now building by Messrs. John Elder and Co., Govan, Glasgow, which, when completed, is guaranteed to cross the Atlantic at a speed of not less than 20 knots per hour.

Of machines and appliances used for the construction of ships and their machinery there is a good show, conspicuous amongst which are the hydraulic portable rivetters of Mr. R. H. Tweddell, London. Cold air refrigerating machinery is shown by Douglas and Grant, of Kirkcaldy, N.B., and by Messrs. Galway Bambridge and Co., Warrington, the former being on the principle patented by Lightfoot, the latter by Sturgeon. The firms supplying ships' and engine fittings, such as pumps, valves, cocks, governors, gauges, &c., take up a large place in the exhibition. Wire cables and ropes occupy no small space in the exhibition. Messrs. Bullivant showing amongst their other exhibits portions of a cable 21 inches in circumference, having six strands, composed of 120 separate wires, the breaking strain of which is the enormous figure of 1150 tons. In the appliances for life-saving department various patent methods for boat-lowering and detachment are exhibited, mostly all of which, however, we have before described. The exhibition is advertised as open from the 6th to the 30th of September.

#### THE IRON TRADES AND THE EMPLOYERS' LIABILITY ACT.

THE annual general meeting of the members of the Iron Trades Employers' Mutual Insurance Association, which has been established in connection with the Employers' Association as a protection against claims made by workmen under the Employers' Liability Act of 1880, was held on Thursday last at the Association Rooms, Carlton Buildings, Cooper Street, Manchester. Mr. Richard Peacock, the president, occupying the chair. The meeting was of considerable interest, inasmuch as it was the first which had been held since the association issued policies to cover employers in the engineering trades against claims made under the Liability Act, and there was a good attendance. The secretary read the report and balance-sheet, which showed very satisfactory results, and gave much interesting information as to the ratio of accidents in the three classes of accidents into which the several risks to be provided against had been grouped, viz., class "A," machinists; "B," engineers, boiler-makers, millwrights and ironfounders; "C," iron shipbuilders. The revenue for the period ending June 30, at which date the first policies had expired and the new year had commenced, had greatly exceeded the expectations of the promoters, and the year's experience had proved the soundness of the data upon which the association had been established. The administration had been characterised by a spirit of fairness in considering the several claims which had been dealt with and promptly settled; every case that could possibly arise under the first issue of policies had been settled before the report was drawn up, and in regard to the legal expenses and the cost of administration the outlay had been very moderate indeed. The Chairman, in moving the adoption of the report, took occasion to point out that the association was mutual in its character and had been established for the purpose of self-defence against any unjust claims which might be made under the Act. The Association had not been promoted for money making purposes, but was a branch of the Iron Trades Employers' Association, distinctly organised and distinctly managed, its funds and their administrations being kept rigidly apart, even to the extent of having different bankers. The report which had been read had, he considered, quite justified the establishment of such a combination of employers. The results had been in every respect satisfactory, and had exceeded the most sanguine expectations of the promoters and of the committee of management. The figures in the balance sheet told their own story, for they showed equitable and prompt settlements of all claims which had been justly made. They also showed very moderate expenditure in the administration by an unpaid committee of management and a laudable desire to avoid litigation unless driven into it as a matter of duty. Under these circumstances they could not fail of success; a large balance in which every insurer was interested had been carried over to the current year, and had been added to the incoming and increasing revenue upon the policies covering the year 1882-3. The association was thus firmly established, and those employers in the iron trades of the country who belonged to this association were protected at very moderate rates against claims under the Act, which, even if necessary, might become vexatious and unjust in its operations. The motion was seconded by Mr. J. H. Kilson, of Leeds, and was passed unanimously.

Resolutions were also adopted thanking the committee of management and the hon. treasurer, Mr. Joshua Field (Messrs. Maudsley, Sons and Field, London), for their attention to the interests of the association. The committee for 1882-3 was appointed, comprising all the members of the previous year, with one or two additional members for important districts not hitherto represented on the board; and a special vote of thanks to Mr. Peacock for his services as chairman of the meeting and president of the association was carried by acclamation. In the course of the discussion which arose during the proceedings, it was explained that members only of the Iron Trades Employers' Association, of which the insurance department was a distinct feature, could take the benefit of insurance upon the terms under which policies were issued to cover the various classified risks. It was shown by some of the speakers that the promoters had not made a leap in the dark when they fixed the existing tables of risks and premiums, because they had been for many months engaged on an enquiry which no other association could have organised and carried out. They had carefully collected data as to accidents in all the leading branches of the engineering and iron trades over a series of years in all parts of the United Kingdom, and having classified the returns, they had ascertained for the first time in the history of these several industries the rates of risk they had to meet and provide against by insurance. They had felt that it was a case in which commercial speculation or adventure, for profit had no right to enter, and they had been guided by one common feeling to adopt the lowest scale possible, with due regard to risks and security to their funds. It was well known that other combinations in the form of insurance companies, not holding such information as had been collected by the association, had been proceeding altogether in the dark, and had proposed rates of insurance to cover claims under the Act which were between three and four hundred per cent. above the rates fixed by the Iron Trades Employers' Mutual Insurance Association. The Chairman having remarked that such results as had been attained could only be secured where men combined in an unselfish spirit and worked with the greatest unanimity, expressed the hope that before long the insurance of members against claims under the Employers' Liability Act would be a part of the ordinary operations of the parent society, covered by one payment and maintained by one common fund. The meeting, which throughout had been characterised by unusual cordiality, then terminated.

#### PIG-IRON STATISTICS.

WE have received the following from the secretary of the British Iron Trade Association:—

Statistics of the Production of Pig-Iron for the Half-year ending June 30, 1882, and of the Stocks in Warrant Stores and in Makers' Hands in each District of the United Kingdom at that Date.

	Half-year ending June 30, 1882.	Half-year ending Dec. 31, 1881.
	Tons.	Tons.
Cleveland .. .. .	1,332,543	1,310,490
Scotland .. .. .	556,600	604,578
West Cumberland ..	472,038	545,770
South Wales .. ..	476,536	425,476
North Wales .. ..	25,672	17,093
South Staffordshire ..	190,442	225,886
North Staffordshire ..	157,386	151,761
Lincolnshire .. ..	102,861	77,837
Lancashire .. .. .	392,668	359,096
Northamptonshire ..	90,475	105,776
West and South Yorkshire ..	101,095	170,171
Derbyshire and Notts ..	228,433	179,755
Shropshire .. .. .	39,275	37,835
Gloucestershire, Wiltshire, &c. ..	25,000	32,000
Totals .. .. .	4,241,245	4,249,194

\* Estimated.

Stocks of Pig-iron held by Makers and in Warrant Stores on June 30, 1882, with corresponding Returns for December 31, 1881.

	Stock on June 30, 1882.	Stock on Dec. 31, 1881.
	Tons.	Tons.
Cleveland .. .. .	338,571	378,470
Scotland .. .. .	636,537	940,008
West Cumberland ..	56,453	68,051
South Wales .. ..	57,801	53,238
North Wales .. ..	2,437	10,740
South Staffordshire ..	40,573	46,500
North Staffordshire ..	42,851	28,707
Lincolnshire .. ..	15,803	23,844
Lancashire .. .. .	90,671	57,836
Northamptonshire ..	15,486	14,915
West and South Yorkshire ..	20,635	49,676
Derbyshire and Notts ..	20,681	26,686
Shropshire .. .. .	18,930	34,005
Gloucestershire, Wiltshire, &c. ..	5,320	4,500
Totals .. .. .	1,371,769	1,736,262

\* Stocks in Warrant Stores only, no returns having been received from makers.

The stock of pig-iron on December 31, 1881, was .. .. .	Tons.
The production of pig-iron during the first half of 1882 was .. .. .	1,736,262
Deduct stock, June 30, 1882 .. .. .	4,241,245
Total .. .. .	5,977,507
Total consumption of pig-iron to June 30, 1882 .. .. .	4,339,392
Being at the rate per annum of .. .. .	8,678,784
As against an actual consumption in 1881 of .. .. .	8,182,513
Showing an increase at the rate per annum of .. .. .	496,271

\* Makers' stocks in Scotland estimated at same figure as that ascertained for January 1, 1882.



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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.]

## HAND-POWER FANS FOR EXHAUSTING RICKS.

To the Editor of IRON.

SIR,—Having been a competitor at the Reading Hay Dryer trials, I have read the correspondence in your columns with interest, and must ask you to kindly allow me to reply to Mr. Greening, who, I think, by unfairly giving some figures from a report in the *Engineer* of July 28, omitting others, and adding a column of figures of his own, makes it appear that his hand fan is about 200 per cent. more effective than mine. The following is from the *Engineer* of July 28, and from which Mr. Greening quotes:—"The last fan tested, Mr. Bamlett's, was a small unenclosed centrifugal pump-wheel or turbine-wheel fan, 14 inches in diameter, with twelve blades, and 4.75 inches wide. This was mounted in a small open cast-iron frame attached to one end of a light portable wood frame, at the other end of which was a 1-inch wrought-iron fly-wheel, by which, with a tight unanned hide strap, the fan was driven at 17 to 1 of the handle. In the hay meadows this fan was worked by two men, taking turns and not working together, and they worked it with apparent ease at about sixty turns of the handle per minute. As, however, other fans had been tested at forty, this was also. At this speed, the water column supported was very small; yet, when the blank lunge was off, the velocity of the entering air taken close to

the fan was higher than with others that supported a higher column at same speed."

Name of Maker.	Description of Fan.	Revolutions of Fan per Minute.	Revolutions of Hand Wheel per Minute.	Velocity of Air by Air Meter.	Water Column Supported.	Power Required in Foot-pounds.
Greening	Hand common fan	2160	40	984	1'3	10,332
Bamlett	Hand unenclosed Appold pump fan	680	40	1310	0'10	2,650
"	"	1020	60	2420	0'70	5,502

These figures, taken from the *Engineer* without any manipulation, show that my fan, when driven at the proper speed of 60 turns of the handle per minute, instead of being 200 per cent. less effective than Mr. Greening's, absolutely exhausts 150 per cent. more air than his does, though the revolutions of my fan are only half (1020) that of Greening's (2160), and the power required was only about half of his, viz., Greening's 10,332 foot-pounds, Bamlett's 5502 foot-pounds. Perhaps Mr. Greening's modesty restrains him from claiming one advantage his fan possesses. The noise it makes enables the farmer to know when his men are working it, and it might be useful at other seasons for scaring birds off his crops. My fan runs silent.—I am, &c.

Thirsk, September 13.

A. C. BAMLETT.

## NOTICES OF BOOKS.

Letts's Popular Atlas. Parts 30 to 32. London: Letts and Co., 1882.

We have now before us four parts of the concluding volume of this work, and we have again, even at this late period of the work, an evidence of the completeness of the undertaking in which Messrs. Letts embarked. A map of the Eastern United States of North America in ten sheets has now well advanced, and the first sheet of a new six-sheet map of South America promises well for the prospects of the New World. The statistics published on these of the area and population of the different provinces or states compared with England and Wales are replete with information. Messrs. Letts deserve well of the public for having striven conscientiously to popularise a formerly much neglected but highly interesting study.

The Metal Turner's Handbook. A Practical Manual for Workers at the Foot-lathe. By PAUL N. HASLICK. With over one hundred illustrations. London: Lockwood and Co., 1882.

THIS latest work by Mr. Haslick, who is already well known by his *Lathe Work*, and his numerous contributions to technical literature, will meet the wish of many who are engaged in practising metal turnery. There can be no doubt that such a book was much wanted. The lathe, which is claimed to be the creator of mechanism, is a machine in which all mechanics ought to be interested. A knowledge of the art of turning finds useful application in all the mechanical arts. Not only is a large proportion of the community employed in these arts, but individuals interest themselves in their practice, as affording pleasurable and profitable recreation. Turnery gives employment to many workmen, and has special claims on amateurs. We are sure this manual, which is an exceedingly useful book, and a remarkably cheap shillingworth, will tend to promote the practice of a fascinating and useful art.

Report of the Commissioner of the Imperial Mint Osaka, for the Year ending June 30, 1881. Hiogo, 1882.

THE above report shows that the work done at the Imperial Japanese Mint at Osaka is very ably performed both by the foreign and native staff and workmen. It is the seventh report of the commissioner, T. Ishimal, and the eleventh of the mint, and shows that during the year ending June 30, 1881, gold coins to the value of 490,585 yen (dollars) were struck, this being rather more than during the previous year. In the silver coinage there has been great activity, 5,089,113 one-yen pieces having been struck, this being a larger number than ever before finished in a year. Nearly 74,000,000 of copper coins were struck during the year, their aggregate nominal value being over 1,000,000 yen. The total value of coin issued by the imperial mint from its commencement in 1871 to June 30, 1881, amounted to 97,506,529.79 yen. The reports of the assayers testify to the highly satisfactory manner in which the standards of weight and fineness are kept up. The soda-works within the mint ground are now in operation, and small quantities of sulphate and carbonate of soda have been turned out. The sulphuric acid works did not produce so large a quantity of acid as in former years, but another works has been established in Osaka by a private company, showing that chemical industry in Japan is not standing still. We may add that Mr. W. Gowland is the chemist, assayer, and technical adviser, and Mr. R. MacLagan the engineer of the mint.

Elementary Chemical Arithmetic, with 1100 Problems. By SYDNEY LUPTON, M.A., Assistant Master in Harrow School. London: Macmillan and Co., 1882.

We have received this work—an endeavour, the author states, to put into a concise and simple form, suitable for beginners in chemistry and for tyros in mathematics, a considerable quantity of matter which is usually given by teachers in the form of manuscript notes, and to furnish a collection of easy numerical examples, a few of which may be set at the collection of each lecture. So that the book,

perhaps, should be named "Arithmetical Chemistry;" but the solution of so many problems—many of which are more physical than chemical—of which there are no fewer than 1100, justifies the title of an arithmetical rather than that of a chemical book. There are some hundreds of problems of very high utility, but which cannot properly be said to belong to chemistry. Such, for example, as one on page 24. "When 20 grams of nitre ( $\Delta 2:12$ ) are dissolved in 80 grams of water, the solution has a density of 1.136, what would be the volume if no contraction had taken place, and what is it?" Some of Mr. Lupton's definitions of measures are, we think, quite meaningless; thus (page 15), he defines a metre as "the length of a certain bar of platinum at  $0^{\circ}$  C" which is about as explicit as saying that it is the distance between the ends of a particular walking-stick when the latter is placed in water at  $100^{\circ}$  C. His examples of contracted multiplication of decimals are also unsatisfactory, as we cannot gather from the rules given how the 60.142 (page 4) is obtained; we make it 60.138, and it cannot be an error in printing. Of course, 60.138 would in most cases be sufficiently near; but certainly, when rules are given, they should be adhered to in working out examples. We notice ninety-eight pages are devoted to introduction; as the rest of the book is entirely a series of problems, we should have attached more importance to these ninety-eight pages as in them alone is explanatory matter to be found. We consider the most novel part of the book to be from page 83 to 98, in which the higher class application of mathematics to chemistry is shown, such as the reduction of experimental results, the calculation of probable errors, and the use of interpolation curves. The chapter on logarithmic arithmetic will be found most useful to those unacquainted with the use of logarithms. Altogether, the book, though not containing anything that is actually new, is certainly likely to be of much service to students and teachers. There is a certainly excellent and numerous collection of problems, and the method of solution is shown by clear and well chosen examples.

LETTS'S MAP CATALOGUE.—Messrs. Letts and Co. are large map publishers, and well known to be so; but we were not aware to what an extent they carry on their operations until we saw their *Map Catalogue*, to which also is added a list of their atlases, globes, and geographical appliances, both British and foreign.

A NEW MAGAZINE.—Messrs. Longmans, Green and Co. announce that on November 1 they will issue the first number of a new magazine, to be continued monthly, under the title of *Longman's Magazine*. Each number is to consist of from 100 to 128 octavo pages, and the price is to be sixpence. The articles are in most cases to be signed by the contributors, and the editor will be personally answerable for the opinions of the anonymous writers only. The magazine will be freely open to studies of men and manners in this country and abroad, and also to such descriptions by travellers of various places or countries as may be of general interest. Fiction will form a prominent feature in the magazine. At least one serial tale will always be in course of issue, and there will be a plentiful supply of shorter stories by the best novelists. One article will be generally devoted to physical science or natural history. Field sports and games will form the subject of occasional papers.

## BOOKS RECEIVED.

Letts's Popular Atlas. Parts 30 to 32.  
The Phynodderree. By E. Callow. London: J. Dean and Son.  
The Standard of Value. By W. L. Jordan, F.R.G.S. London: David Bogue.

## NEW BOOKS.

Brehm's Zoological Atlas. Classified in 55 sheets. T. R. Johnston.  
Coward Science (The). Our Answer to Professor Owen. By C. Adams. Hatchard.  
History of a Lump of Coal, from the Pit's Mouth to a Bonnet Ribbon. By A. Watt. Johnston.  
Treatise on Marine Surveying (A). By J. L. Robinson. Macmillan and Co.

## OBITUARY.

BRIGGS.—We (*Journal of the Franklin Institute*, note with deep regret the death of Mr. Robert Briggs, C.M., which occurred at Dedham, Mass., on July 24. Mr. Briggs was prominently identified with the Franklin Institute for many years, having served as one of its board of managers, as editor of the *Journal*, and as an active member of some of its most important committees. The appointment of a committee, to whom will be referred the task of preparing a full account of Mr. Briggs' professional career, is anticipated. Mr. Briggs was in his 61st year at the time of his death.

LIONVILLE.—M. Joseph Lionville, editor of the *Journal de Mathématiques*, died in Paris on September 7, at the age of seventy-six. For some time back he had retired from his editorship. M. Lionville was born in Saint-Homer, admitted to the Polytechnic School in 1825, and appointed in 1829 an engineer of the Ponts-et-Chaussées. He was elected in 1839 a member of the section of geometry in the Paris Academy. In 1862 he was appointed a member of the Bureaux des Longitudes.

NAPIER.—Mr. Charles George Napier, C.E., F.G.S., M.I.C.E. of England and Ireland, who died on September 2, at the comparatively early age of 53, after a long illness, was the eldest son of the late Captain H. E. Napier, R.N., F.R.S., and nephew of General Sir Charles and Sir William Napier. Entering the civil engineering profession in 1849 under the auspices of Mr. Hemans, the distinguished Irish engineer, he was employed under him for some years in various parts of Ireland. On the breaking out of the Crimean War, he joined the Army War Office as third in command. Subsequently he continued erecting various works under Mr. Hemans, notably the Athenry and Ennis Railway. He was for some years resident engineer-in-charge of the southern half of the Great Southern and Western Railway of Ireland. He was afterwards employed



in the construction of railways under the Colonial Government at the Cape Colony; and his last employment was as an inspector under the Local Government Board, Dublin. Mr. Napier was widely known and respected throughout Ireland, where almost all his life had been spent.

**PLANTAMOUR.**—By the death of Professor Plantamour, who breathed his last on September 7, Geneva, Switzerland, and science, says the *Times*, have sustained a great and irreparable loss. Emile Plantamour was born at Geneva in 1815. He received his early education in the old College, founded by Calvin, after which he spent eight years in the then celebrated school of Hofroy. In 1833 he entered the Geneva Academy, where he became one of Alfred Gautier's (the professor of astronomy) most promising pupils. After graduating in philosophy, he resolved to make the study of astronomy the work of his life, a design in which he was encouraged by Gautier, who promised to vacate his chair in Plantamour's favour when the latter had completed his education. From Geneva he went to Paris, where he studied two years under the illustrious Arago. Another of his masters was Bessel, of the University of Königsberg, where Plantamour in 1839 took the degree of doctor after publishing a thesis on the methods of calculating the orbits of comets. From Königsberg he proceeded to Berlin, and worked for some time with Encke, who speedily recognised in his quickness of observation and aptitude for complex calculations gifts that eminently fitted him for the career to which he had devoted himself. On his return to Geneva Plantamour received the double appointments of the Professorship of Astronomy in the Academy (since transformed into a University) and Director of the Observatory. In 1848 he took in addition the chair of Physical Geography, and he retained all three positions until his health began to fail him a few months ago. In 1880 he published the results of 10 years' observations of the fixed stars—a work that won him great consideration among the few who were competent to judge of its merits. At a later period he gave much of his time to the study of meteorology; his papers in the *Bibliothèque Universelle* and others journals placed him in the very first rank of living meteorologists, and he was one of the most active members of the Commission of the Helvetic Scientific Society for the observation of atmospheric phenomena. Equally eminent in the domain of geodesy, he became, in 1861, the representative of Geneva on the Swiss Geodesic Commission, and did useful work as a member of the International Geodesic Association, which three years ago held its meeting in this city. Both a modern linguist and a savant, Professor Plantamour was in regular communication with some of the most eminent scientific men of the day, with most of whom he could correspond in their own language. In 1843 he was made a foreign associate of the Royal Astronomical Society of England; he was an honorary member of the Academy of Sciences of Turin, and a correspondent of the French Institute. In connection with the Geneva Society of Arts he organised a watch and chronometer competition, which has proved of great service to the staple industry of Geneva. Watches and chronometers are sent to the Observatory, put to a variety of searching tests, the results published, and prizes awarded to the best timekeepers. Four years ago Professor Plantamour added to the Observatory, at his own expense, a great refractor with an opening of 10 inches, and built a tower for its reception. The name of Emile Plantamour will live long in the memory of his fellow citizens. A man of fortune, who might, had he so chosen, have spent his life in social enjoyment and lettered ease, he devoted himself from his youth upwards to the pursuit of science and the good of his kind. The community in which he lived could neither honour him with titles nor reward him with great emoluments—his modest salary as professor and astronomer did not cover his expenses—and the only recompenses he looked for were the esteem of his countrymen and the satisfaction that search for truth never fails to confer.

## SCIENCE AND ART.

**SOUTH KENSINGTON MUSEUM.**—Visitors during the week ending September 9, 1882:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum, 12,342; Mercantile Marine, Building Materials, and other Collections, 5883. On Wednesday, Thursday, and Friday (admission 6d.), from 10 a.m. to 6 p.m., Museum, 2085; Mercantile Marine, Building Materials, and other Collections, 843; total, 21,153. Average of corresponding week in former years, 19,549. Total from the opening of the Museum, 21,317,496.

**UNIVERSITY COLLEGE, LONDON.**—At the commencement of the coming session the council of University College award (after examination) an entrance scholarship of £35 per annum, tenable for two years, to engineering students. The scholarship is the gift of the Gilchrist educational trustees. Intending candidates should communicate with the secretary of University College at once if they have not yet sent in their names. There are also other entrance scholarships open to—but not restricted to—engineering students, of which particulars are given in the college prospectus which lies before us, and which we understand can be obtained on application.

## MEETINGS FOR THE WEEK.

**TUESDAY, SEPTEMBER 19.**  
HUMAN SOCIETY.—3.30 p.m.  
WARWICK AGRICULTURAL SOCIETY SHOW.  
**WEDNESDAY, SEPTEMBER 20.**  
SOCIAL SCIENCE CONGRESS, NOTTINGHAM, Twenty-fifth Anniversary.  
WARWICK AGRICULTURAL SOCIETY.—Second day.  
**THURSDAY, SEPTEMBER 21.**  
FARNWORTH AGRICULTURAL SOCIETY SHOW.  
SOCIAL SCIENCE CONGRESS.  
**FRIDAY, SEPTEMBER 22.**  
SOCIAL SCIENCE CONGRESS.  
**SATURDAY, SEPTEMBER 23.**  
SOCIAL SCIENCE CONGRESS.  
WORKING MEN'S INDUSTRIAL EXHIBITION, Brunswick House, Vauxhall, to be opened by the Lord Mayor.  
ZOOLOGICAL SOCIETY, 4 p.m.

## METALLURGY AND MINING.

### THE GROWTH OF AMERICAN IRON AND STEEL WORKS SINCE 1880.

**THE** *Bulletin* of the American Iron and Steel Association presents a comparison of the present producing capacity of the iron and steel works of the United States with their condition on March 1, 1880. On July 25, 1882, there were 686 completed blast-furnaces in the country, as against 697 on March 1, 1880. The decrease in the number of blast-furnaces arises from the fact that a great many which have for a long time been out of blast have been transferred to the abandoned list. The number of furnaces, however, affords no clue to their capacity, which is now 8,000,000 net tons a year, against 6,500,000 on March 1, 1880. The increase has been mainly among the bituminous furnaces, which have now a capacity of 4,125,000 tons, against 2,825,000 in 1880. The classification of blast-furnaces according to the fuel used shows but slight changes. There are now 210 bituminous, 225 anthracite, 250 charcoal, and one built to use gas. On March 1, 1880, there were 203 bituminous, 228 anthracite, and 266 charcoal. It is noticeable that bituminous furnaces are increasing in number, while the others appear to be decreasing. The number of rolling mills and steel works has risen in the period mentioned from 382 to 393. The capacity of the rolling mills in finished iron and steel has increased in the same time from 5,250,000 tons to 7,000,000 tons annually, the ability of the American works to produce rails alone having grown from 2,150,000 net tons to 3,110,000 tons. The number of rail mills has decreased, however, standing at 80 now, against 87 in 1880. Of these, 48 mills now make heavy rails, against 54 in 1880; and 2 mills are in course of erection to make heavy rails, while 2 were building in 1880. The number of puddling furnaces is equivalent to 5018 single furnaces, while in 1880 there was the equivalent of 4467; of heating furnaces, 2598, against 2419 in 1880; of trains of rolls, 1424 now, against 1397 in 1880. The number of nail factories has decreased, there being but 66 now, with two building, against 73 on March 1, 1880, while there are now but 4030 nail machines in use, against 4152 then. The causes of this decrease in the nail trade are various; some factories have been burned and not rebuilt, others have been dismantled, and others have been idle so long that they are now regarded as abandoned. Notwithstanding the decrease in the number of nail factories since 1880, there has been no decrease in the production of nails. The number of Bessemer steel works has increased from 11 to 14, and of open hearth steel works from 22 to 27, while the crucible steel works remain at 35. One Bessemer steel works and 5 open-hearth steel works are now being built. The completed Bessemer steel works and the works building have a capacity of 2,250,000 net tons of ingots a year, while on March 1, 1880, the works then existing and building claimed a capacity of but 1,750,000 tons. There were then 22 converters, with 10 building; there are now 36 converters, with 2 building. The completed open-hearth-steel works on March 1, 1880, had 33 Siemens furnaces, and the works building were expected to add 6 more; there are now 51 completed Siemens furnaces and 10 building. The total annual capacity of the open-hearth steel works will be 500,000 net tons when the additions now being made are completed, while on March 1, 1880, the total annual capacity of completed and unfinished works was but 275,000 tons. The number of pots in the crucible steel works has increased from 3,080 to 3,490, with an increase in the annual capacity of the works from 90,000 net tons to 105,000 tons. Only 6 works are now engaged in making the minor grades of steel, against 9 on March 1, 1880; but 47 works now buy steel and roll it into merchantable shapes, against 31 then. Almost every month witnesses either the addition of a steel plant to an ironworks in some part of the country, or else the partial transformation of an ironworks to a steelworks by the adaptation of heating furnaces and rolls to the manipulation of purchased steel blooms and billets. There are now 72 forges making wrought iron from iron ore, against 69 on March 1, 1880, but the annual capacity is now put at 75,000 net tons, against 85,000 tons then. Of bloomeries working up scrap and pig-iron, there are now 52, with one building, against 59 on March 1, 1880; the annual capacity is now 70,000 net tons, against 80,000 tons then. The total annual production of all kinds of iron and steel was 18,000,000 tons in the year ending July 25, 1882, as against 14,030,000 tons in the year ending March 1, 1880.

### THE DURHAM COAL AND COKE TRADES.

**DURHAM** is at once the largest of our coal-producing counties and the largest maker of coke for the metallurgist. In coal it has nothing to compare for steam purposes with the fine "smokeless steam" of Wales, or the well known seams from the north of the Tyne; but the demand for its gas coals, its unexcelled coking coal, and those for steam and household purposes was only satisfied last year by the production in the county of about 28,517,842 tons, according to Hunt's *Mineral Statistics*, South Durham yielding 21,530,913 tons out of that total. And although a special cause will prevent the recommendation of the miners' conference being adopted in Durham, yet it is of the utmost interest to turn to that district and learn the position of the coal and coke trades there. The special cause referred to is the sliding-scale system that rules in Durham, under which the wages of the miners are regulated by the realized average price of the coal produced, an agreement that endures some considerable time longer, and that will prevent the miners claiming additional wages as the conference recommended; though all the indications are that it will yield them in time an increase of wages. In the southern part of the county the demand for coal is most largely for purposes of metallurgy; in the north the demand for shipment both of gas and household, as well as steam coals, is the more prominent. During the summer there is naturally more dulness in the northern part of the county than in the south, for the blast furnaces, alike of Cleveland and Durham and of Furness, constantly claim their coke, while until summer is well advanced the shipments of gas and household coals are comparatively small to those in the autumn. These well-known variations in the demand will have their local influences, but there are other conditions that are general. When the demand for iron for America set in three years ago one of its immediate results was to largely stimulate the demand for coke for metallurgy, and hence the price in Durham rose rapidly but temporarily. A year ago these were the lowest range of prices known, and there is only a slow recovery since then, but the supply is overtaken now by the demand, and the coking collieries are well employed, and on the whole profitably—the contracts that are now running being at rates higher than those that they replaced, while the tendency is, with an increasing production of iron, towards higher prices. Not only are the Cleveland and Durham blast furnaces supplied, where the consumption of coke has been stationary for some time, but also almost entirely those of Furness and West Cumberland, and the prosperity that exists in these districts is enlarging their production of iron and also their consumption of coke. And thus with a fair price (probably 10s. per ton) for coke on the average, there is the first ground for the belief that the price of coals will rise. And while the summer reduces the sales of the best households—which command high prices for local use—winter greatly increases the consumption of this class and of coking coal, and thus there is a tendency towards an increase of that average realized price which in Durham causes the rate of wages to fluctuate. The general tendency of prices in Durham is to decrease in the spring and to increase in the autumn, the largest shipments being made in the latter half of the year. For a considerable period it cannot be said that the price of coals has been generally profitable to the coal-owner, and though by the production of coke there has been more profit, yet the trade has been depressed and practically profitless for some time. The price of coal ruling wages, the latter are low; but whenever the value of the demand rises, there will be under the sliding-scale system that obtains an increase in the wages. The usual increase in the shipments of gas coal from Durham to the great gas companies is now in progress, and though some of the contracts have been made at low rates yet the tendency of prices is higher. The coal trade of Durham, as a whole, has had its volume of available production well taken up, and its past history would seem to show that an increase of prices is probable at some early period. The coal trade in the north follows the mutations of the iron trade, and when the latter rises in value and volume the former does also. There are indications that the price of iron is increasing, and that the production is about to advance again, and should these be fulfilled, locally or generally, there should be a speedy reflection in the Durham district, where iron is the controlling industry. Since 1875 the northern coalfield—Durham and Northumberland—has had its production raised from 32,097,323 tons to 35,592,420 tons, and there are now working 365 collieries, or 18 more than there were in that year of much higher prices, 1875. It is clear that there must have been a large increase of the demand, but it has been at much lower prices. And though an increase of rates is to be expected, the very great enlargement of the local output at home and abroad and the increased competition will prevent an increase to anything like the "famine" prices of seven or eight years ago, prices due in great degree to the abnormal rates for iron then prevailing. In the interval the cost of production of coal has been greatly reduced, and especially by the increased production of each miner in a given time. It is possible that the attempt to "restrict" the period of labour may tend to stop that enlargement of the output and thus to accelerate the momentum towards higher prices; but at the present time the condition of the coal trade of Durham does seem to give some hope that that improvement in price which mine-owners as well as miners long for will speedily be realised. It is a curious fact that as the price of coal and the rate of wages have fallen, the average production of each man employed at the pit has risen. In South Durham, in 1875, the yield per man was 339 tons; it rose to 350 tons in 1879, and last year it was 370 tons. The wages agitation is not likely to have any effect, but the proposed restriction of time, if carried out, will contribute to a higher price for coal, and at least will assist to raise that price from its present unprofitable rate.—*Times*.

**THE MICROPHONE AND FIRE-DAMP.**—A new application of the microphone to the determination of the position of nodes and ventral segments in columns of vibrating air has been communicated to the Academy of Sciences by M. Lerra-Carpi. The microphone is mounted on an elastic membrane stretched over a little drum, and then lowered into the sounding pipe. When the apparatus came to a node, the telephone in circuit with the microphone gave out a rumbling sound, similar to that caused by an induced current. On the other hand, when the microphone passed a belly the sounds became very faint and rare, while at intermediate points they increased or diminished, according as the microphonic sounder was brought nearer to a node or a belly. It is believed that the microphone may thus be made useful as a detector of fire-damp in mines. According to some observers such explosives are always preceded by undulations too feeble to be detected by the human ear, but these latter would be revealed by a system of microphones placed at intervals through the mine.

**GOLD AND SILVER MINES.**—A paper was read on September 8 by Mr. G. Phillips Bevan on "The Gold and Silver Mines of the World." Mr. Bevan gave an interesting account of gold and silver mines, and of mining. He remarked that the prospects of gold mining in India, about which there was so great a *furor* a year ago had turned out as he had predicted they would. The mines were not nearly so profitable as the promoters of companies had appeared to think they would prove to be. The conclusion which he drew from observation was that at the present time silver mining was by far the most profitable of the two industries. Gold-bearing quartz was found in the British Islands, particularly in the neighbourhood of Dolgelly in Merionethshire, where he felt sure that a profitable yield would follow the construction of proper machinery for mining purposes. In the course of a short discussion Mr. Dean, a gentleman who has had experience in Australian gold mining, expressed his opinion that gold mining in Wales could not be made to pay, owing to the enormous cost of winning the precious metal.



**MANUFACTURE OF STEEL DIES.**—The dies for stamping out small parts under the steam hammer are at present made by cutting out the recess to the required shape from a steel block, a process which requires a great deal of time and skill. M. Champney has communicated to the Liège Association of Engineers a method for producing them much more quickly and cheaply. He makes an impression on a heated block of steel, kept from contact with the air, by means of a punch, which is an exact copy of the part that it is desired to reproduce. This punch may be of cast iron, the pattern being made to drawing and easy to correct. The die consists of a small cylinder of cast steel, with slightly conical end, which is intended to be compressed when the recess is formed, the dimensions of the cone being determined by the experience of the operator. The die is heated on a plate covered with a cap of refractory material, under which are poured, at the moment of placing in the furnace, a few drops of oil for maintaining the die in a reducing atmosphere. When hot, it is taken to the steam hammer with the plate and cap, which continues to protect it from contact with the air. It is allowed to fall into a central and cylindrical recess formed in a steel disc placed upon the anvil; the cap of refractory material is taken off quickly; and the punch, fitted in some way to the upper block, is allowed to descend. The steel disc, placed upon the anvil, is provided with an obturator, which closes at the instant the small block of heated steel descends into the recess of the disc. This obturator is a simple slide-valve, which opens and shuts easily; it is provided with a tail, which extends in a vertical direction along the side of the hammer. The latter, in its fall, touches this tail immediately before reaching the disc, and in this way opens the slide-valve, so that the impression is obtained while absolutely free from contact with the air. As it is important to prevent the hammer-head from rebounding, which would take off from the sharpness due to a single blow, M. Champney has devised a trigger arrangement which, placed upon the anvil, accomplishes the object. Dies made in this way appear to be not only cheaper, but also more durable than by the old tedious method.

**ASCERTAINING THE PRESENCE OF FIRE-DAMP IN MINES.**—American papers publish particulars of an invention by Dr. L. Kitsee, of Cincinnati, which appears to be an improvement upon present systems, and which we should like to see tried in practice, in order to see whether it will stand the test of every day wear and tear. The object of Dr. Kitsee's arrangement is to ascertain the presence of fire-damp in mines before they are entered. It is well known that when the atmosphere in a mine chamber contains 9 per cent. or more of fire-damp, it is dangerous, and liable to instant explosion from an exposed flame or a spark from the miner's pick. As the gas first accumulates at the top of the galleries, no one is aware of its presence there—it first makes itself known below. To obtain an earlier and more timely warning is the object of the invention. The miner is to know when the danger point is reached above. Along the roof of the mine, through all its galleries, at a convenient distance from each other, is placed a hollow ball of wire gauze, like that used in the Davy lamp. These hollow balls are joined by a wire, through which a constant current of electricity is sent. The wire connects with the ball, completing the circuit by two pieces of fusible metal (melting at 120 deg. Fahr.). This ball is set in a non-conducting socket, and a weight or spring is so arranged that, when the fusible metal melts, it releases the ball, which revolves in its socket. Around the surface of the ball are teeth, which in turning strike the end of the wire, making and breaking the circuit. The teeth on each ball are different, and each will thus be made by the electric current to ring its own number on the electric bell above ground like the regular fire alarm. In each of these gauze balls is placed a small platinum sponge; all are connected together by a wire in the circuit of a second circuit, carefully isolated from the first. Early every morning, before the workmen enter the mine, the superintendent sends the electric current through the second wires, bringing all the platinum sponges to a white heat. These are so small as not to affect the fusible metal. If, however, fire-damp has accumulated in any one of the galleries of the mine, the incandescent platinum will cause an explosion on the inside of the gauze ball, the temperature be raised, the metal melted, the ball will revolve and the alarm be sounded, as explained above, at the station above ground. Then all that need be done is to work the pump connecting with the gallery where the explosion occurred, for each gallery is always furnished with its own pump, which reaches to the top. When turning on the current, no alarm to sound, the men may enter in perfect safety. This test may be repeated during the day at short intervals, and if a dangerous amount of gas is discovered in any one of the galleries, the men can be ordered away and the gas pumped out. Patents have already been allowed to Dr. Kitsee in the United States, England, France, Germany, Austria, Hungary, Belgium, Spain, and the Dominion of Canada. The fusible metal contrivance was recently tried at Washington with a jet of house gas allowed to escape into an enclosed space, and the alarm was sounded as expected.

## RAILWAYS & TRAMWAYS.

**THE COST OF AN EXPRESS TRAIN.**—Some interesting details have been furnished with respect to the value of the mid-day express train from New York to Detroit, and it is stated that this train is a fair representative of the fast express trains on the leading American railroads. The engine and tender were appraised at 10,500 dols.; the baggage car, 1000 dols.; the postal car, 2000 dols.; the smoking car, 5000 dols.; the two ordinary passenger cars, 2,000 dols. each; and three palace cars, 15,000 dols. each—total, 83,000 dols., or nearly £17,000 sterling. This estimate regarded as beneath rather than over the mark for a fast press, as some of them, containing more cars, are worth 20,000 at least. The palace cars, put down at 15,000 dols. each are in many cases worth an average of 18,000 dols. The cars first came into use soon after the sleeping coaches, the first being used about 20 years ago. In certain cases the cars have cost as high as £5000 sterling, and £6000 here the interior workmanship is very elaborate. A com-

fortable dwelling may thus be built for the cost of an ordinary passenger car, and the question arises how and at what point such luxurious travelling becomes remunerative to the railway companies.

**STEAM WORKED TRAMWAYS.**—The Stockton and Darlington Steam Tramways have now been in constant running upwards of twelve months. Mr. Robert Sutchall, the manager, furnishes some valuable details as to the working expenses of the six Merryweather steep grade and air condensing pattern engines. The figures given include renewals and repairs. The chief gradients are—Two, varying from 1 in 20 to 1 in 30; and a third, 300 yards long, of 1 in 20, and upwards. The sharpest curve is of 40 feet radius. The total cost of running the six engines 190½ miles is £23 10s. 8d., equalling an average cost per mile of 2.97d. This amount is made up as follows:—Wages—Driver (at 35s. per week), steam riser, coke trimmer, and cleaners, £13 10s. 8d. repairs and renewals of the six engines, £3 1s. 8d., an average of 10s. per engine; fuel, £5 16s. 9d.; oil and cotton waste, £1 2s. 3d. As the engines are provided with patent air condensers, there is next to no expense for feed-water. It must also be borne in mind that, with these condensers, the boiler is more durable and requires less cleaning, and the consumption of fuel is considerably reduced. Messrs. Dickinson Akroyd and Co., write, concerning a similar engine, sent by Messrs. Merryweather to open a line in Portugal, stating that the motor works with much better results than Henschell's engines (a German copy of the Merryweather), so much so that, although it is much smaller, it does the same work, with four carriages, and consumes much less fuel.

## ELECTRICITY AND TELEGRAPHY.

**EXTENSION OF ELECTRIC LIGHTING.**—The Gare de l'Est, at Paris, has been illuminated with the Edison incandescent light. The same system has also been introduced into Besançon, the motive power being furnished by a waterfall about a mile distant. We see it stated that proposals have been submitted to the Markets Committee by the Metropolitan (Brush) Electric Light and Power Company for lighting the Central Meat and Poultry Markets with electricity.

## NAVAL ARCHITECTURE.

### LAUNCHES.

#### ENGLISH.

**Eden.**—The royal mail steamer *Eden* was successfully launched at Barrow on September 12 from the yard of the Barrow Shipbuilding Company. About a fortnight since an attempt to launch the vessel proved unsuccessful, on account of the ways, &c., not being properly greased. The new steamer is owned by the Royal Mail Steam Packet Company, Southampton, and is intended for the West Indian Mail service. She is 300 feet long between perpendiculars, 36 feet beam, and 24 feet 6 inches in depth of hold. She will have one pair of compound inverted direct-acting surface-condensing engines, with cylinders 38 inches and 74 inches diameter, stroke 54 inches, and capable of indicating 2000 horse-power. Four boilers with 12 furnaces will supply the steam.

#### SCOTCH.

**City of Benares.**—This iron sailing vessel, built for the East India trade of Messrs. George Smith and Sons, was launched on September 11 by Messrs. Barclay, Curle and Co., from their shipbuilding yard, Whiteinch, Glasgow. The vessel's dimensions are 252 feet by 38.4 feet by 23 feet and her tonnage 1650 tons gross.

**Nubia.**—On September 13, Messrs. D. and W. Henderson and Co. launched from their shipbuilding yard at Melrose, Partick, another addition to the extensive fleet of the Anchor Line. The *Nubia* is of the following dimensions:—Length, 378 feet; breadth, 40 feet; depth, 28 feet 6 inches, with a gross tonnage of 4500. She will be fitted by the builders with compound engines of 600 horse-power nominal. The vessel has been specially constructed for the Indian trade.

**Pacayo.**—On September 13, the London and Glasgow Engineering Company launched from their yard at Govan, this iron screw-steamer for the Brazil Steamship Company (Limited). The vessel is of the following dimensions:—Length, 235 feet; breadth, 31 feet depth, 16 feet. The *Pacayo* will be fitted by the builders with a pair of compound surface-condensing engines, with cylinders 27 and 51 inches diameter, by 36 inches stroke.

**Union.**—On September 12, Messrs. Russell and Co. launched from their shipbuilding yard at Greenock a four-masted iron sailing ship of 2100 tons register. Her length is 288 feet; breadth, 42 feet 9 inches; and depth, 23 feet 9 inches. A peculiar feature in her construction is that she is supplied with two auxiliary screws, fitted one on each side of the vessel amidships, and which can be raised or lowered at pleasure. These will be driven by engines for the purpose, but are only intended to increase the speed of the ship in calms or light winds. The vessel has been built to the order of Mr. A. D. Bordes, of Bordeaux, and is intended for the East Indian trade.

**Vandua.**—On September 13, Messrs. Charles Connell and Co. launched from their shipbuilding yard at Scotstoun, a four-masted iron sailing ship of 2150 tons, being, we believe, one of the largest sailing ships yet built on the Clyde. This is now the fifth vessel which has been built by Messrs. Connell and Co. for the same owners.

**DISASTERS AT SEA.**—There were eleven British and foreign actual shipwrecks reported during the past week, making a total of 960 for the present year, or a decrease of 184 as compared with the corresponding period of last year. British-owned vessels numbered 4, one being a steamer. Total tonnage lost for the week, 4662 tons. Three vessels were wrecked off the coasts of the United

Kingdom, one being British owned, one German, and one Italian; 732 tons of coals were lost, also 639 tons of mahogany and deals, and 1000 tons of general goods.

**GRIFFITHS' SCREW PROPELLER SHIELD.**—As mentioned by us some little time since, Mr. Robert Griffiths has designed a shield for increasing the efficiency of the screw propeller. This shield consists of two plates so arranged that they prevent the propeller acting on the dead-water and are stated to increase the speed of a ship from 6 to 8 per cent., and in addition to prevent vibration and improve the steering. The shield has been fitted to a steam launch, and upon trial the following results are stated to have been obtained:—

	Without Shield.	With Shield.
Mean speed	6.417	6.636
„ rev. per minute	289	265
„ pressure of steam	45.1	42.5

Showing that 3½ per cent. more speed was got with a saving of 15 per cent. of power. The shield is inexpensive, and it can be put on without docking the ship.

### VESSELS BUILT IN THIS COUNTRY FOR USE ABROAD.

The report lately issued by the Customs Commissioners gives a statement respecting the number and value of vessels stated to have been built within this country, and to have been sold to foreign owners, whether governments or private persons. Exports of this description are not, the report mentions, officially taken cognizance of, there being no legal requirement for their registration. These vessels comprise ironclads and other ships of war, torpedo boats, steam and sailing yachts, launches, tugboats, dredgers, lighters, floating docks, and the like. The statement is given below. The report observes with respect to it, that in the absence of any legal power, such as exists with respect to exports generally, to enforce the rendering of the particulars, the figures given, which are compiled from information voluntarily supplied by builders and others, must be regarded as approximate only, but it may safely be assumed that they are not overstated. It would certainly be desirable if exports of this description were included in the official statements of exports from the United Kingdom. At present it appears that they are exempted from the law which requires an accurate description of goods exported to be furnished to the Customs House.

**Number and Value of Vessels Built within the United Kingdom from 1876 to 1881, and delivered to Foreign Governments or Owners resident abroad.**

Year.	Number of Vessels.	Value, £.
1881	119	499,710
1880	90	511,396
1879	55	363,405
1878	43	626,622
1877	44	533,895
1876	58	1,193,100

## ARMS, ARMOUR, AND EXPLOSIVES.

**EXPERIMENTS WITH EXPLOSIVES.**—Some further experiments by the Naval Explosives Committee have been carried out at Chatham to see if any conclusion can be arrived at as to the explosion which caused the loss of the *Doterel*. Some xerotic sicative and a can of gunpowder were put on board the gunboat *Bullfinch*, and the former was exploded. It set fire to the ship, but did not explode the powder. The committee are of opinion that the *Doterel* disaster was not caused by sicative exploding.

**GUN COTTON EXPERIMENTS.**—Some experiments with gun cotton took place last week, under the direction of Captain Bucknill, the divisional officer in charge of the submarine miners at Portsmouth. The experiments, which were watched by a number of officers belonging to the Royal Artillery and Royal Engineers, and by a party from the Vernon torpedo school, were held within the torpedo field opposite the western bastion of Fort Montketon. The first experiment was for the purpose of testing the comparative values of the service method of loading ground mines, and a new method which had been suggested by Captain Bucknill. The iron cases containing the charges are cylindrical in shape, while the gun cotton with which they are filled consists of oblong tablets of the thickness of 1½ inches. According to the method in use, the interstices which necessarily occur are plugged with wood, while by the new and experimental method the gun cotton was firmly compacted with cement. For purposes of comparison, two iron cases, each containing 250 lb. of gun cotton, but differing in the manner of the loading, were deposited on the bottom of the channel, and about 30 feet apart. The explosive was wet in each instance, and was fired by means of a primer of 2 lb. of dry gun cotton placed in the centre of the charge. Target mines, containing crusher gauges and dynamometers were placed near each mine for the purpose of registering the sub-aqueous force produced by the explosions. When all was in readiness the two charges were simultaneously fired from the *Echo*, tug, at the time of slack tide. Two immense fountains of water immediately shot into the air, accompanied by a dull thud which resembles the sound of no other explosion. The service charge rose somewhat higher in the air, the spurt of water being exceedingly ragged and irregular in form. The explosion of the experimental charge, on the other hand, while less violent in a vertical direction, produced the uprising of a considerably wider dome of water, and a larger radius of disturbance. So far as could be judged by the eye, the new method proved the more effective. The second experiment was for the purpose of showing that with wet gun-cotton a leaky case will continue efficient so long as the primer remains dry. A couple of charges of wet gun-cotton, consisting each of 10 lb. and a dry primer of 2 lb., the latter placed in a waterproof bag, were suspended from a spar at some distance from the stern of the vessel. They were sunk at about 5 feet from the surface of the water, and with 30 feet between them, while 5 feet below each charge a case of dynamometers was attached to register the force of the explosion. One of the charges was simply placed in a net, so that the water had



free access to it, while the other was enveloped in a water-proof bag. In the circumstances the success of the experiment would be demonstrated by the approximate equality in the height of the columns of water upheaved. As a matter of fact, when the charges were simultaneously discharged, the one which was freely exposed to the sea threw up the higher fountain, and thus demonstrated the correctness of the contention.

## GENERAL NOTES.

**THE AMERICAN TARIFF.**—The American ironmasters in convention at Cresson, Pennsylvania, are holding the largest meeting that that trade has yet held, the object being to determine what iron duties to recommend the Tariff Commission. They resolved to leave the present duties mainly unchanged, but ask for an increase on cotton ties, tin-plates, and wire rods; also that iron ore duty be advanced from 20 per cent. to one dollar per ton; steel rails unchanged.

**DEPRECIATION IN THE VALUE OF COLLIERIES.**—The striking depreciation in the value of collieries in North Wales was illustrated at Chester on Monday, when Messrs. Churton, Elphick, and Co. offered for sale the Flint Colliery, situate near Flint, with the branch railway and sidings to the Holyhead line in full work, and now raising from the Brasseley thick coal and 5 feet seams 800 tons of good coals per week. In addition there is a cannel seam partially worked, and the lower 4 feet seam intact. The coal mines under a surface area of 820 acres are held under leases and take notes for terms having upwards of 18 years to run at minimum rents. There are three shafts geared for winding, and fitted with three high-pressure winding engines and 100-horse power pumping engine, with seven steam boilers. The auctioneer said a short time since £35,000 was offered for the property. The biddings commenced at £500 and proceeded by increments to £1500, £2000, £2500, £2700, and £2800. At this price, no further bids being obtainable, the colliery was withdrawn.

**THE ALEXANDRIA WATERWORKS.**—The importance of the water supply at Alexandria, great as it is at any time, has been so keenly emphasised during the last few weeks that a few notes regarding it will be of interest. The source of the supply is the Mahmoudieh Canal, which not only communicates with the Nile at Atfeh, but also with the Khatatbeh Canal, which is fed by large pumps, erected by Messrs. Easton and Anderson. At the works, situated at Khatatbeh, there are ten patent screw pumps, each 12 feet in diameter, and capable of delivering 34,532 gallons per minute to the height of 10½ feet. Eight pumps are worked together, delivering 276,259 gallons per minute, and driven by two pairs of compound inverted direct-acting engines of the marine type, running at 75 revolutions per minute, with a pressure of 65 lb. to the square inch. There is also one reserve engine. These pumps, which were made for the Behera Irrigation Company, ran regularly from the middle of April until the commencement of the troubles at the middle of June. The excellence of the machinery may be gathered from the fact that the results obtained by these pumps ranged at 78 to 85 per cent.—that is, the ratio between the work done in lifting the water and the indicated horse-power.

**THE GREAT EASTERN COMPANY'S CONTINENTAL TRAFFIC.**—In consequence of the unprecedented increase of the Great Eastern Company's Continental traffic since the opening of the St. Gotthard Tunnel, and the consequent danger of a block at Harwich, they have decided to open their new quay at Parkeston before the time originally intended. It is so far completed as to afford moorings for three steamers, with a depth of water alongside of from 16 feet to 27 feet, according to the tide, while there are also nearly five miles of siding accommodation available. Two steamers, with full cargoes, have already been discharged at the new quay—one from Antwerp and the other from Rotterdam; and it is intended, besides the daily passenger service to these ports, to run two extra cargo boats weekly to Rotterdam, and one as often as may be required to Antwerp. The new booking office, and the waiting and refreshment rooms at Parkeston, are so far advanced that the passenger traffic will soon be transferred thither from the present makeshift piers at Harwich. The arrangements at Parkeston are as great an improvement upon Harwich as the new quays at Antwerp are upon the old Quai du Rhin; and when the new station of the Belgian State Railway is built in its intended site, contiguous to the quay, there will be a continuity in the company's rapidly developing continental service which cannot fail to secure them a large measure of patronage.

## THE HOME IRON AND COAL TRADE.

**BARNESLEY AND SOUTH YORKSHIRE.**—So far as this district is concerned, the state of the coal trade has undergone but little change since our last notice. The output of the pits, and the tonnage by rail to London, via Doncaster, has been much less than usual owing to the races. The usual orders with regard to the mineral traffic on the Leger and Cup days have been put in force by the M. S. and L. Company, and a large proportion of their engine power during the week has been engaged in the conveyance of specials and excursion trains. The district is also just now much exercised by the threatened demand for 15 per cent. advance, and the stoppage of the pits. A circular has been issued by the officials of the Yorkshire Miners' Association, of whom, Mr. B. Pickard, vice-president of the Miners' National Union is the head, declaring that it would be an easy task to set the pits down, and urging the men to go in for an advance of 15 per cent. On the other hand, the Sheffield and Rotherham District Association, of which Mr. Chappel is the secretary, depreciates a strike, and urges the men to ask for an advance of 7½ per cent., and if not con-

ceded, the event to be put to arbitration, as not one-fourth of the men in the Yorkshire coal field are members of any union, the chances of a stoppage, to say the least about it, are very remote. There is still a very fair demand for coal for London and the South, whilst rather better orders are being booked for the eastern counties and other districts. Prices, however, at the pits have not materially increased. The output, notwithstanding the statements of London merchants, is still in excess of the demand. The steam-coal trade holds very well up, and considering the season, a very good tonnage is sent to the Humber ports. The Hull traffic is in a very healthy state, and all the leading collieries having water communication are making the most use of it. Some of the leading pits have increased their tonnage 1000 tons per month by this method of conveyance. Small coal and slack are good to sell at rather increased rates. The Manvers Main and other companies are supplying several of the leading railway companies with a large quantity of locomotive coal. Makers of coke are busy, and although the Doncaster race week has greatly interfered with the through traffic to North Lincolnshire, trade is active. There is likely to be an interesting event decided at the Denaby Main Colliery, so well known in connection with the question of tonnage rates. In consequence of the M. S. and L. Railway Company charging such high rates for the conveyance of coal and coke from the pit to the Midland and other lines, the owners have purchased a locomotive of their own, and have given notice to the railway company of their intention to work their own traffic, in accordance with the Act of Parliament, at five-eighths of a penny per ton per mile. The railway authorities have refused to allow them to do so, and it is believed the matter will be brought before the Railway Commissioners and the Board of Trade. The district iron trade holds well up, orders on hand being numerous. In some cases ironmasters decline to book orders for further delivery at the present rates. There is a full average output of pig-iron made, whilst manufactured material is in very fair request. There is no falling off to note in connection with the steel trade.

**BARROW-IN-FURNESS AND NORTH LANCASHIRE.**—There is no change to note in the hematite pig-iron trade of the district, and the demand from all sources remains strong and active. A good deal of business is doing, and as the close of the shipping season is approaching, it is noticeable that makers are being pressed for early delivery. They have in hand large orders representing heavy specifications of iron and steel for shipment to America, the Continent, and the Colonies, and orders are coming to hand from all these quarters, which are likely to result in the continuance of activity throughout the winter months. The value of iron is practically undisturbed, and it is noteworthy that while in a few cases iron has been disposed of at lower values, the value of all descriptions of hematite is maintained by those who are the heaviest producers, who have the heaviest stocks, and who are the best criterions of the actual state of the market. 58s. 6d. per ton, net, at works, may be noted as the value for average all-round qualities of Bessemer iron. The shipbuilding trade is very busy, and some heavy contracts are on the point of acceptance at local yards. The steel mills are busy in the production of all qualities of railway and merchant material, and as orders, most of them on foreign account, are largely held, it is pretty certain that the demand for Bessemer iron will be steadily maintained. Iron ore is in steady request, and the mines are especially busy, as foreign ores are dearer in price, and the request for native qualities is therefore stronger.

**BIRMINGHAM.**—Some branches of the hardware industries of Birmingham and district are briskly occupied on account of Government requirements for the army and navy; but apart from the houses favoured with contracts by the War and Admiralty Departments, and others who are deriving an indirect benefit therefrom, activity is not general in the local manufacturing trades. Wheel and axle manufacturers are busy on contracts in connection with railway and baggage waggons for Egypt, and as these orders are extremely urgent, the workmen are employed night and day, and until they are executed general orders cannot be accepted for prompt delivery. As a result of the pressure of the obligations in respect of Government, there is a rapid accumulation of home and colonial orders, and certain establishments have their books filled up till the end of the year. Tinplate workers and galvanisers are in a similar position, in the case of those firms that have undertaken contracts for mess tins and general camp requisites, repeat orders having been given out by Government in preparation for further reinforcements being needed for Egypt. A sudden collapse of the war would almost be disastrous to some local firms, inasmuch as all the articles ordered are subject to approval on inspection; and when the emergency has passed away, the inspection would naturally be more rigorous, and consequently a wholesale rejection of the goods would result in some instances. Saddlers' ironmongers are well occupied on harness furniture, and edge tool manufacturers are briskly employed on entrenching tools for the British army, and cultivating and mining tools for the Colonies and South America. The heavy branches keep in steady occupation; constructive ironfounders on bridge and girder work, piers, tanks for oil, gas, and water; engineers and machinists on general machinery, forge and planishing hammers, hydraulic appliances, and dredgers; galvanisers on corrugated roofing sheets; and chain and cable makers on steel and wire ropes, for mining and other purposes. Bicycle and tricycle manufacturers continue busy, although stocks are very large, owing to the change in popular taste. The brass trade is rather quiet, except in the case of naval brass founders, and certain of the leading establishments who have "the run" for electric lighting appliances.

**THURSDAY EVENING.**—A very firm tone prevailed at the market to-day, and nearly all classes of iron were enhanced in value. Pig iron was in brisk enquiry at 28s. 6d. a ton advance for common Stafford and Northampton pig. The latter could not be bought under 47s. 6d., although last week buyers declined to give 45s. a ton. There was an active demand for galvanised sheets, and steel sheets were in good request for the United States for stamping purposes. Rivet and horse-shoe iron were freely sought for.

**CARDIFF.**—The shipments of iron and steel from this port for the first eight months of the present year amounted to 87,724 tons, the month of August alone showing 10,631

tons, which is an average figure, while in June the highest amount was reached, 17,498 tons. The shipments of steel rails for the whole country in the first eight months of this year were 542,976 tons, against 483,033 tons in 1881, and 434,419 in 1880; while iron rails have receded from 102,733 in 1880 to 37,959 in 1882. The value of the iron rails was only £239,073, while steel rails realised £3,350,390, or nearly fourteen times the amount. The amount of iron sent away last week from this port was 1011 tons, while iron ore was received from Bilbao to the extent of 5628 tons, and 4592 from other sources. Campanil Somorrostro is quoted 15s. 3d., c.i.f.; good Rubio, 15s., c.i.f., with a tendency to weaker prices in consequence of the large amount of ore being landed at Newport. Carthagena manganiferous ores are firm. The tinplate works of Glamorganshire and Monmouthshire now open are in full work, and prices, although not remunerative, do not entail a large loss. Good coke-makes realise from 16s. 3d. to 16s. 9d. per box, and in some instances 17s. have been obtained. The exports for the eight months ending August last were 181,816 tons, against 155,514 tons during the same period of 1881. The spelter and zinc works of the district are well occupied, and work all round may be said to be in a healthier state than at any period since 1874. The amount of steam-coal shipped from the port during the first eight months of the year has been 4,884,025 tons foreign, against 3,640,739 tons in the same period of 1881. The amount shipped in the month of August was 485,276 tons foreign and 92,816 tons coastwise. Patent fuel (eight months), 116,189 tons; August, 14,023 tons. Coke (eight months), 20,787 tons; August, 1480 tons. The amount of coal sent away last week was 130,768 tons foreign and 18,379 coastwise. The price may be quoted at about 11s. per ton for good colliery screened, with a tendency to higher quotations. The contractor at the Coegnant pit, in the Llynvi Valley, has now struck not only the 4 feet, 6 feet, 7 feet, and 9 feet seams, but expects to reach the lower 4 feet shortly. This is a wonderful success on the part of Mr. Hyde, which has set all the neighbourhood rejoicing.

**CARMARTHENSHIRE.**—The demand for pig-iron remains steady, a good deal has arrived for the tinplate works, chiefly "Maryport" brand. The different tinplate works continue busy, and an advance in prices appears likely, particularly as the quotation for tin is hardening. It is said that several of the works have under consideration the introduction of what is in this neighbourhood a new branch, viz., the making of mairée metallique plates, for which there appears to be a growing demand. In August 29,477 boxes were shipped from Llanelly to Liverpool, against 29,677 in July; this number, with about 10,000 per month to Bristol, is rather under the average. The anthracite shipments at Pembrey and Burry Port are slack again, after a decided spurt. During August the port of Llanelly, which with its creeks embraces the whole coast of Carmarthenshire, exported 17,584 tons of coal, against 16,827 in the corresponding period of last year, thus showing a slight improvement. In the past week a fair trade has been done. Freighters are stationary; Pecamp, &c., 10 fr. offering. In the eight months of the year now past 216 vessels have taken away 134,810 tons of all kinds, 53,821 over sea and 80,989 coasting, as shown by the Board of Trade Returns. The foreign trade so far is an improvement on last year, but not up to the average.

**CLEVELAND.**—The iron market at Middlesbrough on Tuesday was fairly well attended, but the business transacted was not large. This was as much owing to the reluctance of makers to accept orders as of consumers to buy. The producers have managed to secure a good many contracts lately, and have very little iron to sell for the next two months' delivery, while for forward longer delivery they are not prepared to commit themselves to any large extent, for prospects are undoubtedly good, and prices are likely to be higher, whether the restriction agreement is renewed with Scotland or not, for it is not thought the output will be materially increased in either district. Stocks are being steadily reduced in this district, and are likely to turn out even better this month than last. Our shipments are very satisfactory and amount for the week ending Saturday to 26,000 tons, and to 40,381 tons for the month up to Wednesday night. Generally, prices were rather stiffer than they were last week, the business being 44s. per ton for early f.o.b. deliveries of No. 3 G.M.B., merchants and some of the makers taking this readily, but the combination makers will not take less than 44s. 6d. There is very little doing in the warrant trade, although stores continue to be drawn upon pretty freely. The stock in Messrs. Connal and Co.'s stores on Tuesday night showed a decrease of 2495 tons, being now 113,386 tons, as compared with 115,881 tons on the former Tuesday. A few American enquiries for pig-iron have come to hand, and an order for 1500 for execution this month has just been secured. In the manufactured iron trade the demand is quieter, partly because of the movements with regard to wages, and partly because consumers are not prepared to pay the prices which producers now quote, and which they firmly adhere to, as their order books are pretty full. Ship plates are £6 15s., angles £6, and common bars £6 5s., all less 2½ per cent. In the foundry trade there are a few more enquiries come to hand inviting tenders. Mr. Charles Wood, of the Tees Iron Works, has despatched 9000 of his patent sleepers abroad during the past fortnight, and has secured orders for 6000 more. The steel trade shows no improvement. The demand for coal has considerably improved, indeed, there is now quite a rush for household qualities, as merchants are stocking in preparation for the winter. Prices have increased and still tend upwards, though as yet they are not higher than they were last year at this time. The prices of iron ore, both Cleveland and foreign, remain the same as quoted last week.

**DERBYSHIRE.**—The district coal trade, although firmer, has of late not shown any great change with regard to prices. Many of the Kilburn deep soft and the black shale pits are rather better off for orders, but on the whole the quantity sent to London by rail has only been moderate. The quantity carried by the Midland from Clay Cross, Staveley, and adjoining districts during last month was not over large, as is shown by the total tonnage which passed over the line. The quantity sent by the Midland to London during the month of August was 163,280 tons, or less by 4697 tons than was sent in the previous month; but there was an increase when compared with the same month of last year, as well as of 1880. The Great Northern, which



now carries from several district collieries, however, sent more by 21,651 tons last month than it sent in the month of June. Although the Staveley and other collieries in the district sent but little coal to Hull last month, a small tonnage of 544 tons was sent from the Hucknall Torkad collieries, whilst the Shireoaks last month supplied no less than 7220 tons, of which 6780 tons were sent by water. The same colliery has during the last eight months sent 40,676 tons, against 31,128 tons in the same period of last year. Kiverton Park also sent 2048 tons last month by rail, against 3476 tons last year, or 8908 in the past eight months as compared with 12,332 tons in 1881. There is a very good demand for locomotive coal and fuel for gas-making purposes; small coal, however, only meets a quiet sale. There is a good importation of coke into the district from South Yorkshire for smelting purposes, the make of pig-iron being large. Most of the foundries are fairly off for orders, and on the whole the iron trade of the district is in a lively state.

**DURHAM.**—The past week has been a pretty steady one in the pig-iron trade, though there has been but little demand. Holders of iron, whether makers or merchants, have been pretty firm in their prices, and there has been very little variation in quotations, which have kept at about 44s. with merchants for No. 3, and 44s. 6d. with the great majority of the makers. There has, however, been a rather limited sale, not that people anticipate much lower rates, for they certainly do not for some time to come, but probably because present wants are supplied, and the bulk of the consumers have covered their requirements for some time ahead. Iron has been going away very fast and shipments are not unlikely to be as large this month as last from the Tees. It is generally considered that the restriction of make in combination with the Scotch trade is at an end, although nothing is definitely stated in regard to the matter. This, perhaps, may rather have the effect of keeping back consumers, though until the autumn shipments are completed they will not stand much change of getting easier rates, even if then. The business doing in manufactured iron has been rather slacker than at the opening of the month, but the firmness displayed by the manufacturers is indicative of their condition, which is a fairly good one, and most of them have work in hand which will carry them through the year. Hence buyers find it difficult to get their orders placed for any reasonably early time for shipbuilding iron, unless they pay the highest rates asked. Thus, though the quotation is £6 15s. to £7 for ship plates, the latter figure has to be paid for good quality and early delivery. Angles are £6 to £6 2s. 6d., bars, £6 5s.; sheets and boiler plates, £8, less 2s. per cent. commission. Puddled bars are still at £4 2s. 6d., net. The ordnance and engineering works in the northern part of the county are well employed. Shipyards are very active, some more orders for ships being lately placed. A combination of the steel rail makers is threatened, which shall embrace the leading firms in different steel districts of the kingdom. The object proposed is to prevent prices falling to what is considered an undue level. These combinations to keep up prices are, however, open to some questioning, and many are strongly opposed to them. The wages question in the iron trade has been up this week, and the manufacturers have given notice of a reduction of 7½ per cent. in the ironworkers' wages from the end of October. The men claim an advance of a like amount. An arbitrator will no doubt have to settle the difference. The household coal trade is improving, and the London merchants are seeking to stock coals, and in some instances are paying a higher price under the stimulus, probably of the attitude of the miners in some part of the kingdom. Manufacturing coals are also affected for the better in some cases, and sellers report that they are able to get a rather better price. Gas coals are firmer. Steam coal unaltered. Coke shows no material change.

**EAST WORCESTERSHIRE.**—Pig-iron of local manufacture continues in brisk enquiry. The number of furnaces at work in South Staffordshire and East Worcestershire has been reduced to forty six, three having been blown out, not through any slackness in the pig-iron trade, but for general repairs. Current quotations for crude iron are still as follows:—£3 7s. 6d. to £3 10s. for hot blast, all nine; £2 10s., £2 12s. 6d., and £2 15s. for part mine; and £2 to £2 2s. 6d. for common pig-iron. There are little or no stocks of crude iron, the output being just about commensurate with the demand. Ironstone and ore generally keep in about the same enquiry, with rates tending to stiffen. Great firmness continues to characterise the district finished iron trade. The makers all round seem to be hardening, not only in this district, but at most of the other iron centres. Regarded as a whole, the outlook for the autumn trade in finished iron and puddled bars, as well as in raw material, looks more promising than it has done for two or three years past, and, with good weather and anything approaching to fair harvest, a permanent rise may be looked forward to. The good American harvest is already causing several enquiries in finished iron to come over to this manufacturing centre, and the home trade may also be reported much improved. Large orders are being given out for heavy sections. The bridge and girder works keep in full activity, and iron pipes continue in active request. The coal trade maintains the slight impetus which set in a few weeks back, and the colliers are doing rather more work. The decision of the recent Miners' Conference at Manchester that the men in each colliery district throughout England, Wales, and Scotland should take steps to secure an increase of wages by October 1 is regarded as an advance in force on the part of the men all along the line. It will be for the colliery owners, as a body, to consider whether an advance in the prices of coal, which would have to accompany any increase in miners' wages, would be justified by the state trade. That will be a moot point for careful attention when the proper time arrives; but at least it is to be feared that the prospective advance of rates will increase the present deplorable underselling in the coal trade.

**FOREST OF DEAN.**—A report of more favourable character affecting the district crude iron industry cannot, in any degree to correct representation, be given this week, the demand continuing only on the hand to mouth level. Local ironmasters have been patiently waiting improvement, but the term is one in which, as pertaining to an Forest metallurgy, becomes still an element more needed for than realised. At the Cinderford furnaces a steady trade is being done, and the daily despatch of metal

may be reported under similar conditions. Nominally, Forest pig-iron is 60s. per ton in yards. The tinplate branch is less brisk than was the case a short time ago, this industry being unfavourably influenced by the larger productions in other districts disproportionate to the demand. Prices are less firm than they were, and prospects generally are in sympathy with the existing position of this branch. Iron ore is only in very moderate request, and prices are ranging from 7s. to 12s. on the mine banks. With regard to the coal trade the demand continues brisk, and some of the proprietors have their "hands full" in meeting orders upon their books. This activity may be traced to the fact that summer prices are still prevailing in the Forest, whilst there has been a slight lifting elsewhere. Merchants, moreover, are anticipating an advance of 1s. per ton in October, and it is with a view to secure stocks before that time that an impetus has been imparted to this industry. The exodus of colliers during the last few years is a matter with which the proprietors would be glad to see overcome by a return of many of their old hands as, in the event of any great improvement or continuation of the existing strain, difficulties are likely to arise. A single firm in the Forest are locally reputed to require an additional 200 men at their pits, which is one of the healthiest incidents of the district collieries experienced for several years.

**GLASGOW.**—The warrant market was dull and inanimate, with only a small business doing, up till Wednesday, when the favourable news from Egypt produced a better feeling, and some dealers made heavy purchases, but a reaction set in before the close of the market. The general public seem to be letting pig-iron alone in the meantime, and most of the business done is on behalf of the regular operators. The uncertainty as to what the ironmasters will do at the end of the month causes an uneasy feeling, though it is generally believed that they are not likely to put in any furnaces, unless the state of their order books demand it. It is said that the makers of some special brands are bare of stocks, and cannot give delivery fast enough to please their customers, and in this instance may require to increase their output. There is rather a lull in business at present, but with favourable harvest weather, an improvement ought to set in shortly. On Thursday, 50s. 2d. to 49s. 10d. cash, and 50s. 4d. to 50s. 1s. a month was accepted; next day, the price fluctuated between 49s. 8d. and 50s. cash, and 49s. 10d. and 50s. 2½d. a month. On Monday, sales were made from 50s. 1½d. cash, and 50s. 3½d. a month, to 49s. 10d. cash, and 50s. 1½d. to 50s. 3½d. a month were paid. On Tuesday, 49s. 11d. to 50s. ½d. cash, and 50s. 1½d. to 50s. 3½d. a month were paid. On Wednesday, a large business was done from 50s. 1½d. to 50s. 4½d., then back to 50s. 2½d. cash, and from 50s. 4d. to 50s. 6½d. a month, closing sellers 50s. 2½d. cash, and 50s. 5d. a month, buyers near. Makers firmly maintain their prices, which are high in comparison with warrants. There are now 109 furnaces in blast against 119 at this time last year. The shipments of pig-iron from Scotland last week were rather disappointing, being foreign 8369 tons, coastwise 2260 tons, total 10,629 tons, against 14,812 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 6533 tons, against 4660 tons in the similar period of last year. The total imports till September 9, 1882, are 157,594 tons, against 207,732 tons till September 10, 1881, showing a decrease for this year of 50,138 tons. The stock of pig-iron in Connal and Co.'s store is now 628,447 tons, showing a decrease for the week of 908 tons. The works in the manufactured iron trade continue to be well employed, but chiefly on old orders. The steel works are even brisker, chiefly on orders for angles and plates. The shipbuilders are occasionally booking fresh orders, but the launches are in excess of the new orders. The shipjoiners have struck work for an advance in wages, but it will not last long, as one of the largest of the employers has already given way. Engineers and ironfounders are all busy, and the prospects for the winter are good. The value of the iron manufactures exported last week amounted to £19,874. There is an improving tone in the coal trade, and it is expected that, if cold weather sets in, prices may rise a little, in the meantime, though a large business is doing, competition is too keen to admit of any advance in prices. The colliers are working steadily.

**LANCASHIRE.**—The attitude of both buyers and sellers in this market remains much the same; on the one hand they are running off contracts, and on the other working on deliveries until it is seen whether makers or consumers will be first compelled to come into the market. At present little or no anxiety is shown either to buy or sell, and there have been very few enquiries of any note stirring in this market during the past week. But, although makers generally are keeping up prices pretty firmly, an easier tone is perceptible in the market, and if it may be taken as any indication of what is probable in the future, merchants show a disposition to undersell. Lancashire makers of pig-iron are still kept busy with deliveries against old contracts, and their quotations remain at 40s. less 2½ for forge and foundry numbers equal to Manchester. District brands of pig-iron are a trifle easier as compared with the top prices ruling of late. Lincolnshire is offered at 47s. to 48s. 6d. less 2½, and Derbyshire, although the best makers still hold for the full prices, can in some cases be bought at comparatively low figures. Middlesbrough is nominally quoted at about 52s. 10d. net cash, but with practically no business doing. The finished iron works throughout the district continue fully going; but, judging from the reports of merchants, the home trade is not at all good, and they are chiefly orders for shipment that are keeping makers busy. For delivery equal to Manchester or Liverpool prices remain steady on the basis of £6 7s. 6d. per ton for bars. In the engineering trades new business appears to be unquestionably falling off, and where new orders are secured they have to be taken at very low figures. Founders' castings especially are quoted for at extremely low prices; general engineering work is also taken on terms which leave no margin for profit, and reports that some of the large machine makers are reducing the number of their men, would seem to indicate that in this branch orders are slackening off. In the coal trade, a better tone is noticeable, and although the increased demand is chiefly in house-fire qualities, other classes of fuel are moving off tolerably well.

Pits generally are getting on to pretty near full time, and stocks are not accumulating. There are, however, still large supplies in the market, which check any material upward movement in values, but there is a strong tendency to stiffen, and the prospects of an agitation amongst the men for an advance of wages cause colliery proprietors to be very chary about selling forward. House-fire coals have in some cases been put up 6d. to 1s. per ton, but it is not likely there will be any general upward movement before the close of the month. In the shipping trade, a fair business is being done, with prices firmer though not quotably higher.

**LEEDS AND WEST YORKSHIRE.**—The makers of best Yorkshire iron in this district are fairly well off for work, especially considering the competition of steel. The prospect of a fair autumn trade is better than it was thought likely to be at the end of last quarter. There is no change in prices, and certainly best Yorkshire iron cannot be obtained on any easier terms than those which were established at the beginning of the year. There is a fair enquiry for axes and boiler plate, as also for special uses required by engineers and machinists. Makers of common iron are a little busier, and have not so much difficulty as formerly in getting more remunerative prices. A good deal of sheet iron continues to be brought into the district from Lancashire and the Midlands, and still the rolling mills in this district are kept fairly going. The railway and tramway engine builders are busier just now than they have been for a long time past; the engagements of the former include some foreign requirements, but the latter are exclusively indebted to home undertakings for the crowded business with which they are favoured. The well-known Steam Plough Works is exceedingly busy, not only in agricultural machinery, but also in constructing portable railways for China, and some of our own colonies. Machine-tool makers are better employed than formerly, and one firm has a good foreign order for lathes of unusual size. Textile machinery is an animated branch, because of both home and foreign requirements. The West Yorkshire collieries are working three or four days per week. Prices are low, whether the article is for home consumption or export.

**LIVERPOOL.**—A better tone again prevails, probably the result of the late brilliant weather, which after all is the greatest restorative. The equilibrium of the pig-iron market continues somewhat uneven, and conflicting rumours to some extent dispel the good done by the unquestionable trade returns recently. Tinplates are just steady, and the market not characterised by movement either way. Unless swept along by some general trade movement, it does not seem probable the demand will be too excessive from legitimate causes, now that the chief part of the canning season has passed. In finished iron a good demand exists for common bars of South Wales makes for the Indian market, but there is not so much new business on Indian account on the whole, owing to the high rates now prevailing. Sheets continue to meet with favour, and the demand is a pretty general one, swelled by orders for America, which run chiefly on this class of iron, and also some special kinds of sectional iron. Some good orders have also crossed the Atlantic for Belgian girders and channels, &c. Canadian buyers are less active, but deliveries to this quarter are large. Mediterranean requirements are once more swelling the volume of business, and Baltic orders are coming in for execution before the frost arrives. Home orders are less active, but this is generally its dull season here. Shipbuilders have at least six to nine months' work in hand, and engineers as well, and will therefore get comfortably over the winter. There is a fair existing enquiry also for new steamers.

**LONDON.**—The metal market remains steady. Shipments continue good, and the promised autumn revival seems to be showing signs of movement. Iron.—This market is still a little unsettled on the announcement of the advance in the Bank rate to 5 per cent. Scotch warrants declined to 49s. 10d., closing at this. Copper steady at £68 5s. spot bars. Tin.—We notice a very strong market, with good demand and advancing prices. Cash tin closes firm at £106 2s. 6d.; English ingots, £109 and £110. Tinplates very firm. Cokes, 17s. to 18s.

**NEWCASTLE AND THE TYNE DISTRICT.**—Our local crude iron market remains steady, with a healthy export business. No. 3 Cleveland pig-iron is quoted 46s. 3d. per ton delivered in the Tyne after payment of 2s. 3d. per ton freight and dues from Middlesbrough, and for No. 4 forge quality 45s. to 45s. 3d. is the figure. For all sorts of finished iron there has been a well-sustained demand, and prices are strongly kept at £6 17s. 6d. to £7 for ship plates, angles £6 5s., and bars £6 5s. to £6 7s. 6d. delivered in the Tyne. Boiler plates rate about £7 17s. 6d. per ton, with a fair enquiry. There is no alteration to note in the iron ore trade; Bilbao red ore is still shipped at 7s. per ton, and the freight to the Tyne is 9s. 3d. In our iron shipbuilding business there is a feeling that lower prices will rule. Present work is vigorously carried on, but still the cry is that unless new orders are more frequently heard of there will be a dulness in the trade before twelve months go over, in place of the almost unparalleled activity of the last three years. Prices are considerably lower for all classes of boats, and orders are still scarce. In the engine manufacturing and others of the great iron industries of this district there is a fairly confident feeling, and the prices in all new business are satisfactory; but this state of things may alter if shipbuilding should come again to a period of stagnation, as many trade prophets assert is fast approaching. In the coal trade of the northern counties we have a less hopeful prospect now than has been seen for many months past. The loading turns for the best of our steam coals are dwindling to a day or two, and prices are giving way. The very best steam coals can be bought at 9s. per ton, less 2½, and in many cases 5 per cent. Gas coals are firmer, and shipments large. The requirements of the great gas companies of the Metropolitan and the Continent are increasing as the days get shorter, and our coalowners are very stiff as regards prices in this important branch of the coal business. Chemicals are rather easier again; soda ash makes 11d., less 1 per cent.; soda crystals £2 16s. 6d., net; and bleaching powder, £4. Firebricks are exported to a moderate extent, even thus far on in the year, but the market is weak, except for the two top brands, Cowen's and Ramsay's.

**NEWPORT.**—There is no change of any importance to record this week in the trade of the district, and everything still points to a prosperous future. The pig-iron



market is quiet, but the prices quoted in our last are fully maintained, and at the time of writing an upward movement seems likely. An exceptionally large quantity of iron-ore has come to hand from Bilbao, most of which has gone direct to the different works. Some little has been banked at the docks, but this was chiefly owing to a want of wagons. The requirements of the works in this district for ore, are gradually increasing, and the future imports of this article must of necessity be large. Prices are firm at 15s., c.i.f., for good Rubio, and 15s. 3d., c.i.f., for Campanil Somorostro. There has not been much speculation in manufactured iron during the week; the fact is, most of our makers have a good number of orders in hand, and are consequently not at all anxious to book further orders for forward delivery at present prices. Orders for steel rails continue to be placed in the district, and in this branch the whole of the works are very busy. An order for rails for the Indian state railways has, we believe, been secured by the Dowlais Company. The Tredegar Company have also found plenty of work for their new steel works, and are busy rolling a quantity of 66 lb. bull-head rails. Tinplates are in much better enquiry, and prices have improved. The Caerleon Tinplate Works, it is reported, are about to be re-started by Messrs. Rees and Griffiths, a firm well known in the district. There has been a great improvement in the shipments of steam coal during the week, and business is being done at advanced prices. The demand for Monmouthshire coal has increased considerably of late, and with the promised dock extension, there is no doubt this class of coal will be more extensively sought after. The enquiry for small coal is kept up, and there is a fair demand for house coals. There is a slight improvement in pitwood, with an advance in prices. The coal clearances for the week foreignwise amounted to 26,907 tons, and coastwise 18,116 tons, against our last returns of 12,799 tons foreign, and 18,688 tons coastwise. Of iron, &c., 3089 tons were despatched to the following destinations:—Lisbon, Dieppe, Corpus Christi, and Passages. The imports comprised 19,914 tons of iron-ore from Bilbao, and 3440 tons from other places. Only 754 tons of pitwood arrived at the port.

**NORTH LINCOLNSHIRE.**—The iron and ironstone trade of this important district continues very fair, and although the output of pig-iron is large, stocks are only low. About the same number of furnaces are in blast as when last reported upon, whilst the two furnaces at the Trent Works, which are rebuilding, progress but slowly. A large and increasing tonnage of ironstone is raised weekly, and, in addition to the large quantity raised at the furnaces, a good tonnage is sent away. The quantity of coke which is imported into the district is large, but there has been an interruption to the traffic during the week, owing to Doncaster races. The question of the tonnage rates—especially for coke—is occupying a good deal of attention. An important meeting was held last week at Barnsley, for the purpose of obtaining some redress. The subject is a highly important one, seeing that all the coal and coke has to be conveyed to the furnaces from district coalfields, whilst supplies of ironstone for Yorkshire, Derbyshire, and other places have to be nearly all sent by rail. With regard to the coal and coke used it may be stated that whereas in 1871 only 84,000 tons were consumed, in 1880 there were 841,807 tons consumed, and last year the quantity was 431,000. During the past ten years the quantity used has varied a great deal. In the year 1871 there were 56 cwt. of coal to each ton of iron made, whilst in 1878 the quantity did not exceed 43 cwt. On the other hand, the traffic in ironstone is also large. Last year there was raised 1,021,506 tons, of the value of £154,608. Of this 694,145 tons were used at the furnaces, and 327,261 conveyed out of the district.

**NORTH STAFFORDSHIRE.**—The improvement in the finished-iron trade of this district observable during the past few weeks is well maintained. Orders are coming in more numerous, and are of a better class than has been the rule for some months, and it is gratifying to note that this improved state of things is largely due to the increased activity of the home market. Merchants engaged extensively in this market are sending in orders for good lots, and are showing a desire to negotiate contracts to cover their requirements for the ensuing quarter; but makers, seeing the favourable turn the market is gradually assuming, are not eager to book largely for extended deliveries. The shipping trade continues active, and there is a better demand just now for iron for the United States. Prices are very firm, and, in fact, some makers who are well off for orders decline to enter new ones except at a slight advance upon the ruling rate of £6 10s. for crown bars. There is a good demand for merchant iron, and for the larger sections, but business in hoops is quiet, and transactions in plates are fewer than could be desired, and mills in this department having some difficulty in finding full work. Pig-iron and ironstone are both sharing in the better fortune of the trade, but prices in neither branch have as yet had any upward move. Furnace mine is still selling at 8s. 6d., and puddled mine at from 11s. There is a rather better demand for manufacturing coal, and most of the pits are working an average of four days per week. In addition to the new rolling mills which are being erected by the Shelton Bar Iron Company, and will be opened almost immediately, Messrs. R. Heath and Son have just re-opened the "New Forges" at Ravensdale, which had been standing for several years; and the Stafford Iron and Coal Company expect to blow in their new blast-furnaces at Great Fenton in the course of the present month. The Chesterton Iron Company have been reformed, with a new directorate, and contemplate the reconstruction of the ironworks and blast-furnaces on the estate (not yet in operation), which will amount to a further development of the iron-producing capacities of North Staffordshire.

**SHEFFIELD.**—Though there is no extra rise in the prices of iron, we note that, during the past week, there is an influx of orders, particularly for best bars, sheets, and plates. The larger houses are doing really well, as they obtain stiffer prices than those competing in the open market. The reports which are coming in from the large ironworks show business to have been fairly good during the last six months, although in some of the commoner branches there has been a depression. The autumn months are sure to be busy, and the proof of that may be found in the fact that extra hands are being secured in the iron

departments of the largest establishments. In the Bessemer steel trade the prospect is scarcely so bright. Very heavy colonial orders for rails have been lost by home manufacturers, and even coast houses who, through difference in railway transit, can sell at 5s. 6d. per ton less money than those here, have been beaten in open competition by the Belgians and Germans. This proves that, excepting for local requirements, the rail trade cannot be held in the Midland counties, and is in its decadence. The railway spring and tire trades, on the other hand, are improving, mostly on account of the home demand. Business in the plate trade is brisk, good lines for ship plates coming in from the Scotch yards, and for boiler plates from the engineering houses. We may note that in the engineers' works here, the shops are almost filled with men, and that there is no sign of any demand for an advance of wages; now that many of those who for so long have been out of employment have secured work. There is an agitation in the coal trade, originating from the resolutions passed at the late conference of miners. The idea is to obtain a rise of wages by the restriction of the output. In South and West Yorkshire the miners are asked to organise—both unionist and non-unionist—for the purpose of making coal scarcer, hence dearer. There is little likelihood of this movement being a success, in the face of the facts that there is a superabundance of coal stacked, many collieries only half worked, and some thousands of miners who will embrace the first opportunity of obtaining full work. The cast steel trade is brisk, especially in best descriptions, and as the American Fall trade is on, this department will be yet busier. There is a stiff demand also from the United States for edge tools, files, razors, and finest cutlery. The cutlery trades generally are the reverse of brisk, orders coming in very lightly on home account, and the Australian markets are remitting the best lines, but these even are lighter than usual. An improvement in the Australian call may now be daily expected. Taking the state of trade in the town as a whole, it may be said that it is more satisfactory than a month ago, but there is yet a large margin for improvement.

**SHROPSHIRE.**—The finished iron trade maintains the slightly improved tone which was reported last week, but there is no special activity or any mention of an advance in prices. The leading local smelters report that the anticipated enquiries for next quarter, to which reference was made a week since, are already coming to hand, owing to the anxiety of consumers to secure their requirements at current rates. This action is evidently prompted by a doubt as to whether prices will not be advanced. At present no change is to be noted, nor is it likely that any alteration will take place until after the local quarterly meetings of the trade. The tone of the market is rather hopeful than active.

**SOUTH STAFFORDSHIRE.**—Business at the hardward factories indicates a cautiousness by buyers in increasing their commitments in the face of the tightening money market. The week's orders are all for small lots, but immediate execution is stipulated. Though iron prices are hardening, that tendency is not seen in hardware. As to a few leading branches, they are weakened by buyers, who purchased at lower rates than now prevail, putting the goods upon the market at under current quotations. This is noticeable in galvanised corrugated sheets, for which, however, makers' prices are £14 10s. delivered at the ports. Japan goods are affected by the competition from makers in London and Manchester and Leeds. The Government is buying ironwork for ambulance, limber, and commissariat waggons. Common lock furniture prices are not hardening, yet a good business is being done upon continental account. Vices and anvils are busy, mostly for the United States. An order for 1000 tons of cast mains is under execution for the Birmingham Corporation. A steel bridge for Benares is being constructed by the Patent Shaft and Axletree Company. There is a slightly improved enquiry for pig-iron at fractionally stronger rates; but makers seek better terms by from 9d. to 1s. 6d. in common qualities, and from 1s. 3d. to 2s. 6d. on superior kinds. Rolled iron is more firmly held. Makers decline to book forward at current prices; steel is, by competition, weakened a trifle. Certain of the leading firms in the galvanised iron hollow-ware trade, including Birmingham, Wolverhampton, and Bilston houses, have met and resolved to advance the price of buckets and all other goods. The extent of the advance is to be determined by a sub-committee, who have been appointed to arrange a new trade list.

**SWANSEA.**—Iron, although quiet, is very firm in price, and local prospects may be considered decidedly healthy. Bars are quoted at about £5 10s. to £5 12s. 6d. Steel rails are steady at about £5 2s. 6d. to £5 15s., according to sections and deliveries. Anxiety is naturally felt with regard to the upshot of the dispute at Landore Steel Works as to the rates of remuneration, &c. The furnace-men will not like the hammermen, discuss their grievance in a spirit of fair compromise, and the melters have been unsuccessful in their attempts to bridge over difficulties. The proprietors are seeking for fresh hands. Landore Works do a good business with our own and foreign governments, and should the existing complication long continue, the orders would doubtless be given elsewhere, and even Belgium might obtain some of them. A large amount of capital has been sunk in the concern, but little has been received by way of dividend. The steam-coal clearances record an increase of 4000 tons, as compared with the preceding week, 25,148 tons having been shipped. Demand is without exception good, and the tendency of prices upward; coal-owners are indeed rather independent as to forward contracts. The house coal collieries are well employed. Dulness, however, reigns supreme in the anthracite coal trade. At the Patent Fuel Works there is no falling off, but rather an additional accession of activity. The spelter manufacturers are doing very well. There is an advance of figures in the tin-plates business. English block-tin is quoted at £105 to £106. For lead (English pig, O.S.B's) £14 7s. 6d. to £14 12s. 6d. is given. The zinc trade is satisfactory. The past week's imports show that 4483 tons of mineral of various descriptions (principally iron and copper ores) have been brought in. The Swansea Blast Furnace Company have again started their second furnace at Landore. Shippers are still seriously hampered by the inadequate facilities placed at their disposal for getting their cargoes loaded at the docks.

**WEST CUMBERLAND.**—The business doing in the

iron trade is very steady, and a brisk demand is maintained all round for all classes of metal. In one or two instances sales are noted at rather less money, but it may be taken for granted that the value of iron has not been disturbed to any appreciable extent. If there is any tendency in the direction of permanent alteration, it is certainly in an upward direction. The value of iron may be noted at 59s. net, at works, for No. 1, 58s. No. 2, 57s. No. 3 forge, and inferior samples cannot be purchased at much less money than this. The stocks of iron at works have not increased, nor are they likely to do when makers have, as at present, so many deliveries to make. The tone of the market generally is hopeful, and it is more than probable that during the winter months the works will be as well employed as at present, and that there will be no lack of contracts. The steel trade is supported by a constant influx of orders, both on home and foreign account, and makers' books are very well lined with contracts, which will exercise a favourable influence over the activity of their works for some months to come. Prices show no variation. Merchant qualities are in good demand, but the contracts chiefly held are for railway material. The progress made by iron shipbuilders in this district has not been very great of late, but the yards are fairly supplied with work, and there is reason to believe new contracts will be booked shortly to take the place of the orders now receiving attention. Iron ore, which has been in good request for some time, is in still greater demand on account of the increased value which is now reported in connection with foreign hematite ores, and it is just within the pale of possibility that this fact may lead to an improvement in the value not only of native ore, but of the crude iron and finished steel which are produced from it in this district. The coal trade is very steady, and an improved demand is likely to set in. A fair Irish trade is being done. Native coke finds a good market. Shipping is still very busily employed.

#### 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 last week. The shipments were:—

Week ending	1882.	1881.	1880.	1879.	1878.
	Tons.	Tons.	Tons.	Tons.	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	6,120	5,037
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	7,728
25 ..	12,375	12,262	23,598	9,463	11,499
April 1 ..	10,107	10,421	15,822	15,053	7,448
8 ..	12,662	10,647	18,309	12,913	9,441
15 ..	11,694	13,736	15,781	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	7,822
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	13,108	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	9,252	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	3,928	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	8,491
Sept. 2 ..	10,076	13,795	15,522	11,795	9,918
9 ..	10,629	14,812	12,546	11,443	9,592
Totals ..	436,174	388,072	498,788	346,797	278,399

#### 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 August of 1882 and the previous four years:—

WEEKLY SHIPMENTS.					
Week ending	1882.	1881.	1880.	1879.	1878.
	Tons.	Tons.	Tons.	Tons.	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	19,115	28,546	—	—
11 ..	21,245	13,474	14,322	—	—
18 ..	19,400	17,464	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	20,569	—	—
13 ..	16,841	15,395	19,239	—	—
20 ..	17,609	16,480	16,471	—	—
27 ..	16,801	21,426	21,648	—	—



		1882.	1881.	1880.	1879.	1878.
		Tons.	Tons.	Tons.	Tons.	Tons.
June	3 ..	8,943	17,568	22,400	—	—
	10 ..	17,628	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	15,982	17,651	—	—
	19 ..	20,002	17,980	18,387	—	—
	26 ..	18,864	21,923	14,067	—	—
Sept.	2 ..	20,536	15,027	20,609	—	—
	9 ..	26,000	22,364	15,375	—	—
Totals	..	633,625	630,089	660,384	—	—

## MONTHLY SHIPMENTS.

MONTHLY SHIPMENTS.					
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 ..	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	60,804	68,808
July 31 ..	74,311	87,580	82,306	61,825	78,642
Aug. 31 ..	95,861	84,901	78,665	61,499	73,275
Totals ..	607,047	606,550	641,893	491,152	525,039

## THE CONTINENTAL IRON AND COAL TRADE.

**AUSTRIA.**—The Vienna correspondent of the *Economist* writes:—"There is much excitement in Austrian ironworks because fears have arisen that the protective duty, which was to have promoted their interests, will tend rather to their injury. Although these ironworks considered themselves safe from foreign competition, through having arrived at an agreement between themselves as to prices, and, above all, in consequence of the protective duties, they have now been outdone by two German works—the Bochum Ironworks and the Dortmund Union—which both offered a lower rate for a considerable amount of steel rails for which tenders were invited by the Austrian North-Western Railway. The fact is that German ironworks are by the high duty enabled to sell at a higher price at home, and can therefore export somewhat cheaper. Germany's iron industry is progressing much more favourably than that of Austria and Hungary. The production of pig-iron in Austria-Hungary between 1870-81 increased but from 403,000 tons to 445,000 tons, that is, by 10 per cent., while that of the German ironworks increased from 1,390,000 tons to 2,900,000 tons, that is, by 108 per cent. The consumption of raw iron in Germany amounted to 1,510,000 tons in 1870, and to 3,000,000 tons in 1881. Austria-Hungary's export of rails amounted to 250,000 cwt. in 1877, and to 516,000 cwt. in 1880. From Germany the export of rails was 4,500,000 cwt. in 1877, and 4,600,000 cwt. in 1880. The import of rails to Austria-Hungary was 8000 cwt. in 1877, and 25,000 cwt. in 1880. The German imports of rails decreased from 1,470,000 cwt. in 1877 to 26,000 cwt. in 1880. These figures, taken at random, cannot satisfactorily explain the influence of the augmented customs tariff. Neither the returns of 1879 nor those of 1880 can enable us to judge the final results of the higher duties, for the simple reason that time enough has not elapsed to test its results. Between the last quarter of 1879, when it was decided to raise the duty, and January 1, 1880, the date on which the new tariff was enforced, the majority of the merchants and dealers ordered immense quantities of all the articles which were to pay higher duty afterwards. It is for this reason alone that the import of 1879 was much above the average, whilst that of 1880 was below the average rate. With the hope of obtaining a more valuable result, we have compared the results of 1870 with those of 1881. The import of rails, upon which a duty of 1 mark 25 pfennigs per cwt. has been imposed, decreased between 1878-81 from 900,000 cwt. to 300,000 cwt., whilst the export increased from 4,074,000 cwt. to 5,014,000 cwt." "Of iron ore, which is still imported free of duty, the import, which in 1878 amounted to about 64 million cwt., increased to 12½ million cwt., and the export rose from 23 million cwt. to 29 million cwt." "Pig-iron, which now pays duty, whilst formerly it was free, is imported in much smaller quantities than formerly. The figures given above, and many others besides, prove that German commerce has been greatly reduced by the new tariff in all cases. Even a number of raw materials which pay no higher duty than before have been affected by the change, because the neighbouring states—as, for instance, Russia—have resorted to retaliatory measures, similar to those adopted by Germany, which have had an evil effect upon the commerce of those countries."

The accounts from the various iron manufacturing districts of the Austrian Empire continue most favourable, and it need cause no surprise, therefore, that the iron market not only preserves its previous firmness, but that the prevailing activity should have brought with it a corresponding stiffening of prices. In consequence of the advance in bar iron, the blast-furnaces of Vordernberg have now also raised their quotations for pig-iron, as will be seen from the values we give below. The tone of the iron trade is altogether improved, and, it need hardly be added, this tendency is fully justified by the encouraging prospects opened out for the various branches of trade. The enquiry for bars,

iron, joists, and plates of all descriptions, continues brisk, some works being overburdened with orders to such an extent as to be obliged to refuse new ones. Similar activity prevails in rail mills, engine and locomotive works, and agricultural machinery establishments. The following are the latest quotations per 1000 kilogrammes:—

	Aug. 5.	Sept. 9.
Florins.	Florins.	Florins.
Charcoal pig-iron, at works—		
Vordernberg white ..	51—53	52—54
Innerberg white ..	51—53	52—54
Hüttenberg white and mixed ..	51—53	52—54
Hüttenberg grey ..	54—56	54—56
Hüttenberg Bessemer pig ..	57—59	57—59
Other Carinthian and Styrian pig ..	51—54	51—54
Spiegeleisen ..	64	64

	Aug. 5.	Sept. 9.
Florins.	Florins.	Florins.
Coke pig-iron, at works—		
Schwechat Bessemer pig ..	55—57	55—57
Schwechat white and mixed ..	50—52	50—52
Schwechat grey ..	55—56	55—56
Hüttenberg Bessemer pig ..	55—57	55—57
Hüttenberg white and mixed ..	51—52	51—52
Hüttenberg grey ..	53—54	53—54
Moravian grey pig ..	54—56	54—56
Moravian white pig ..	50—52	50—52

	Aug. 5.	Sept. 9.
Florins.	Florins.	Florins.
English and Scotch pig, at Vienna—		
Grey Scotch pig iron ..	63—64	63—64
Coltness Bessemer pig ..	65—67	65—67
Grey Cleveland pig ..	53—54	53—54

	Aug. 5.	Sept. 9.
Florins.	Florins.	Florins.
Manufactured iron—		
Carinthian and Styrian bar ..	130	130
Ditto sheet iron ..	175—195	180—200
Bohemian, Hungarian, and Moravian bar ..	120	120
Ditto sheet iron ..	165—185	170—190
Joists ..	125—130	130—135

	Aug. 5.	Sept. 9.
Florins.	Florins.	Florins.
Carinthian and Styrian Bessemer ingots from charcoal iron, at Vienna ..	95—105	95—105
Bessemer steel rails, at Vienna ..	115—125	115—125

More activity is noticeable in the Austrian coal market. Although the position of the trade on the whole is not yet very brilliant, a sensible improvement is taking place, industrial establishments beginning to lay in stocks.

**BELGIUM.**—The following figures show the imports and exports of metallurgical products of Belgium for the first seven months of 1882, compared with the same period of 1881:—

	Imports.	Exports.
	1882.	1881.
Tons.	Tons.	Tons.
Crude steel ..	24	1,028
Steel bars, plates, and wire ..	5,604	5,103
Manufactured steel ..	849	1,140
Pig-iron ..	92,365	109,720
Scrap iron ..	4,698	3,515
Iron wire ..	3,002	2,950
Iron rails ..	38	298
Plates ..	733	234
Other descriptions of hammered, drawn, or rolled iron ..	3,222	4,584
Nails ..	255	190
Forgings ..	3,202	2,724
Castings ..	1,499	4,648
Totals ..	115,497	136,135

The imports of iron ore during the first seven months of 1882 were 689,503 tons, against 658,122 tons during the same period in 1881; the exports were 193,313 tons and 203,408 tons respectively.

The Belgian imports and exports of coal and coke during the first seven months of 1882 and 1881 were as follows:—

	Imports.	Exports.
	1882.	1881.
Tons.	Tons.	Tons.
From Germany ..	180,760	194,461
Holland ..	146,108	126,273
England ..	131,670	132,822
France ..	58,004	74,722
Other countries ..	665	171
Totals ..	516,807	528,458
To Holland ..	56,169	61,026
France ..	2,143,477	2,112,163
Germany ..	—	1,310
Luxemburg ..	—	88,775
Other countries ..	76,466	62,217
Totals ..	2,276,113	2,249,406

There is no change to record with regard to the Belgian iron market. The demand is still considerable, and work is general, but many negotiations remain in abeyance, owing to apprehensions of buyers with regard to affairs in the East. Prices are very firm, but do not show at present any tendency to rise. In a recent tender for two bridges in Portugal, the only two competitors were two Belgian firms, the Société Internationale de Construction (Braine-le-Comte) and the Société des Ateliers de Willebroeck. The total cost is estimated at 1,200,000 fr. The tenders of the competing firms were very near one another.

**BRUSSELS, WEDNESDAY EVENING.**—Firmness continues in our iron market. At the Bourse des Métaux to-day, the attendance was large, and the demand fair enough. Many attempts to conclude contracts were made, but without great success, the producers both of pig-iron and manufactured iron expecting that the events in Scotland and the North of England concerning the restriction of production will not lead to over production, and that, therefore, prices will rise once more. English pig is also

firm here. The last official quotations per 1000 kilogrammes are as follows:—

	Sept. 6.	Sept. 13.
Francs.	Francs.	Francs.
Belgian foundry pig ..	75	75
Belgian forge pig ..	65	65
Luxemburg foundry pig ..	57.50	57.50
English foundry pig ..	65	65
Bars, No. 1 ..	137.50	137.50
Joists ..	145	145
Angle iron ..	150	150
Mailrod ..	145—150	145—150
T iron ..	145—150	145—150
Ordinary plates ..	190	190
Boiler plates ..	210	210
Sheets ..	290	290
Steel rails ..	160	160
Tires ..	235	235
Axles ..	245	245

In the coal market, there are very bright prospects. Since there is now no possibility for Belgian ironmasters to contract for coke in Germany, the demand in that country being very large, our own market is strong, and every kind of fuel is well maintained at last week's quotations. Current prices are:—

	Sept. 6.	Sept. 13.
Francs.	Francs.	Francs.
House coal ..	16—18	16—18
Large coal ..	16—19	16—19
Unscreened coal ..	11.50—14.50	11.50—14.50
Small steam coal ..	10—11	10—11
Small coking coal ..	11	11
Coke ..	19	19
Ditto half washed ..	21	21

**FRANCE.**—We hear of tenders being invited for the end of this month for 7700 tons of fishplates, 30,000 tons of chairs, and 1600 tons of bolts, for the State railways. The adjudication for 198,352 tons of steel rails has now been finally settled. The last lot adjudicated upon, 4850 tons, has been given to Terrenoire, at 224 fr. 50 c. per ton, delivered at Bastia and Ajaccio (Corsica). It is stated that an English rail mill tendered lower, but that its tender "was not taken into consideration." The following is the division of the contract, as given by *L'Ancre*:—

	Tons.
Acieries de France ..	35,532
Société de Terrenoire ..	28,307
Société du Creusot ..	26,484
Acieries de Longwy ..	20,379
Châtillon-Commentry ..	18,794
Forges de Saint-Chamond ..	17,190
Forges de Saint-Nazaire ..	16,462
Denain-Anzin ..	15,300
Société du Nord et de l'Est ..	11,175
Acieries de Firminy ..	8,779

The French iron market is practically unchanged. That is to say, the demand is fully sustained, and manufacturers both of pig and finished iron are well booked forward. There is more than usual activity in the pig-iron market, owing to the time for renewal of delivery contracts having expired. Such contracts as have been renewed are reported to have been made at prices higher than those ruling last year. It is stated by *L'Ancre* that about two-thirds of the production of pig-iron in the Meurthe-et-Moselle has been engaged, and there is consequently no fear of a reaction in prices for some time to come. At present prices are very firm. There is great activity in the Haute-Maine, and numerous contracts for 1883 have already been concluded. Quotations are—for rolled coke iron, 210 fr.; mixed qualities, 230 fr.; ordinary sheets, 220 fr.; sheets of 1 millimetre, 240 fr. to 250 fr.; plates, 250 fr. to 260 fr.; hammered iron and crude axes, 240 fr. to 250 fr.; finished axes, 330 fr. to 340 fr. In the Nord the previous healthy tone continues. The following are the ruling quotations:—

	Sept. 6.	Sept. 13.
Francs.	Francs.	Francs.
Merchant bars ..	190—195	190—195
Plating iron ..	200—205	200—205
Angle iron ..	200—205	200—205
Joists ..	190—195	190—195
Heavy plates ..	220—225	220—225
Ordinary plates ..	250	250
Boiler plates ..	280	280

If in the Paris market quotations are not so firm as they were, it is owing to the action of merchants, for enquiry has by no means slackened. At the present time quotations have gone down to 197 fr. 50 c. for merchant iron and 207 fr. 50 c. for plating sections.

The French coal market is very active. In the Nord a briskness prevails, which is unusual at this time of year as a rule. Prices, consequently, are tending towards a rise.

**GERMANY.**—The German iron market is characterised by great firmness, with an expected advance in values in the near future. In Westphalia, according to the *Essener Zeitung*, the tendency is towards greater stiffness. Speculation has not as yet ventured to extend its operations to the iron market, because the prevailing activity is fully warranted by a steady demand. As orders have come in for some months past with great regularity the general presumption that the improvement will be of some duration is, on the whole, fully justified. Most rolling mills have covered their requirements of Luxemburg pig for the fourth quarter at 57 fr. per ton; a good many have also secured puddling pig at ruling rates, and a giving way of prices of manufactured iron during the next three months seems to be excluded. As in puddling pig, so in foundry pig, Bessemer pig, and spiegeleisen, furnaces appear to have disposed of the greater part of their production for the fourth quarter. As regards the rest, they very carefully restrain from binding themselves at present, as they reckon upon an advance in price. This supposition seems to be well grounded, for the demand for pig-iron is still increasing, and coal and coke, as a rule, go up in autumn. Rolling mills are still fully engaged, and in some instances unable to keep the terms of their delivery contracts, and for this reason new orders for various descriptions of finished iron can only with difficulty be placed. Sheet-iron, as well as angle and profile iron,



are in great request by locomotive and carriage manufacturers, while for heavy plates shipbuilders and boiler-makers are good customers. There is a steady enquiry also for steel, and mills are well employed. There are numerous orders for axles, tires, rails, longitudinal and transverse sleepers, awaiting execution. Great activity prevails also in engineering establishments and foundries. The latest official quotations at Dortmund for iron and steel, per 1000 kilogrammes at works (English descriptions per ton at port of shipment), are:—

	Sept. 4.	Sept. 11.
White-grained puddling pig ..	64-66	64-66
Spiegeleisen ..	76-78	76-78
German foundry pig No. 1 ..	76	76
German foundry pig No. 2 ..	72	72
German foundry pig No. 3 ..	66	66
German Bessemer pig ..	72	72
English foundry pig No. 3 ..	44-45	44-45
English Bessemer hematite pig ..	58-60	58-60
Luxemburg pig ..	47	47
Bar-iron ..	145	150
Fine-grained iron ..	170	170
Angle-iron ..	150	150
Joists ..	150	150
Boiler-plates ..	220	220
Boiler-plates No. 2 ..	205-210	205-210
Fine Siegen plates ..	195-200	195-200
Fine-grained plates ..	250	250
Charcoal plates ..	280	280
Low Moor plates ..	310	310
Bessemer steel rails ..	160-166	160-166
Bessemer steel rails (defective) ..	135	135
Bessemer steel pit rails ..	135-145	135-143
Iron pit rails ..	135	135

The Silesian market is firm. Puddling pig, which is steady, is quoted at 65 to 66 marks per 3000 kilogrammes at furnaces. The weekly output of forty-three coke blast furnaces is 7500 tons. Manufactured iron is firm, the minimum price for bar being 137½ to 140 marks at mills. There is an active enquiry for sheet iron. Coke plates are 190 to 192½ marks; black plates, 215 marks per ton at works.

The German coal market is as active as the iron market. Prices have been almost generally raised throughout Upper Silesia, the only exception being those collieries which have still large stocks to dispose of. In Westphalia, the demand for industrial, gas, and coking coals is well maintained, while domestic fuel is growing more active. Export is good. Coke is selling readily at firm prices. At Dortmund quotations per 100 cwt. at the pit's mouth or at coke ovens are as follows:—

	Sept. 4.	Sept. 11.
Best coal (Stückkohle) ..	40-45	40-45
Cobbles ..	36-40	36-40
Large washed nuts ..	37-40	37-40
Washed smith's coal ..	30-33	30-33
Screened coking coal ..	26-28	26-28
Inferior coal ..	20	20
Gas coal ..	36-37	36-37
Mixed coal ..	30-33	30-33
Prime coke ..	60-68	60-68
Patent coke ..	68-78	68-78
Small coke ..	42-45	42-45

# SCOTCH PIG-IRON QUOTATIONS.

(From the Glasgow Herald.)

	Th.	Fri.	Sat.	Mon.	Tu.	Wed.
Gartsherrie (in yard) ..	25½	25½	25½	25½	25½	25½
Coltness (at quay) ..	26	26	26	26	26	26
Langloan ..	25½	25½	25½	25½	25½	25½
Glengarnock ..	24½	24½	24½	24½	24½	24½
Carnbroe ..	24½	24½	24½	24½	24½	24½
Summerlee ..	25	25	25	25	25	25
Eglinton (at quay) ..	23½	23½	23½	23½	23½	23½
Shotts ..	25½	25½	25½	25½	25½	25½
Calder ..	24½	24½	24½	24½	24½	24½
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. 4211 to No. 4322, being the entries from Sept. 5 to Sept. 11, 1882.

## NEW APPLICATIONS.

A more simple Holder for Filaments in Electric Incandescent Lamps.—*L. R. Bishop, New Kent Road, Surrey.* [4235]  
 Accumulators or Secondary Batteries.—*A. communication.* [4299]  
 Apparatus Employed in the Treatment of Coal in order to obtain Coke Therefrom.—*R. de Solderhoff, Louvain, Belgium.* [4283]  
 Apparatus for Drying Grain, &c. in Bulk.—*G. M. Capel, Passenham, Northampton.* [4244]  
 Apparatus for Elevating Grain, &c.—*G. F. Hone, Ebbw Vale, Middlesex.* [4223]  
 Apparatus for Holding and Releasing Cords for Venetian and Roller Blinds, &c.—*J. Hudson, Bolton, Lancs.* [4232]  
 Apparatus for Indicating and Recording the Amount of Salt in the Water of Steam Boilers, &c.—*J. W. Plunkett, Dugdale Priory, Kent.* [4252]  
 Apparatus for Indicating the Speed of Revolving Shafts.—*A. communication.* [4237]  
 Apparatus for Protecting Trees.—*A. communication.* [4231]  
 Apparatus for Saving the Waste Heat of Sugar Boilers.—*A. communication.* [4230]  
 Apparatus for Separating Dust from Air.—*A. communication.* [4218]  
 Apparatus for Setting up and Distributing Type.—*A. communication.* [4258]  
 Apparatus for Steering Vessels, &c.—*W. Pepper, Kingston upon Hull, Yorks.* [4222]

Apparatus for Utilising Pneumatic Pressure as Motive Power.—*A. communication.* [4247]  
 Apparatus used in the Manufacture of Ammoniacal and other Chemical Salts.—*J. Forbes, Chemical Works, Old Ford, Middlesex.* [4214]  
 Apparatus used in the Purification of Gas.—*W. W. Hargreaves, Crayford, Kent.* [4262]  
 Automatic Pressure and Vacuum Brakes.—*J. C. Pearce, Crewe, Chester.* [4271]  
 Automatic Smoke Consumer and Fuel Economiser.—*J. Butler, Nottingham.* [4308]  
 Boilers.—*M. V. O'Riordan, Cork.* [4315]  
 Boule Stands.—*H. Wyful, Sheffield, Yorks.* [4318]  
 Boxes or Trunks.—*C. H. Stanbury, 91, Fleet Street, London.* [4264]  
 Carbonisation of Coal, &c.—*J. Hardman, Milton, Stoke-on-Trent, Staffs.* [4312]  
 Carriages, &c.—*H. Mueller, Notting Hill, Middlesex.* [4215]  
 Casting Metals for the Manufacture of Electrodes for Batteries, &c.—*J. Woodward, Shepherd's Bush, London.* [4273]  
 Chains for Working upon Chain Wheels.—*A. communication.* [4295]  
 Combination Pipe Joints.—*C. Hanksman, 117, Great Russell Street, Bedford Square, Middlesex.* [4207]  
 Construction and Manufacture of Handles of Table Cutlery, &c.—*J. Lee, Sheffield, Yorks.* [4207]  
 Construction of Fire-escapes.—*P. K. Klien, 8, York Buildings, Adelphi, and E. B. Allen, Cheyne Walk, Chelsea, Middlesex.* [4306]  
 Construction of Machines for Packing Flour, &c., into Packets.—*J. Joyce, Edmonton, Middlesex.* [4233]  
 Construction of Metallic Fencing.—*Partly a communication.* [4236]  
 Construction of Signals to be used upon Railways.—*P. Lofthouse, Radcliffe, Lancs.* [4221]  
 Coupling and Uncoupling Railway Carriages, &c.—*G. F. Hughes, Kenosworth, Yorks.* [4322]  
 Decorating Bricks, &c.—*I. B. Shaw, Tunstall, Walsall, Staffs.* [4219]  
 Distillation of Coal.—*W. Crowther, Quarndy, near Huddersfield, Yorks.* [4265]  
 Distributing Water Gardens, &c.—*J. T. Foot, 30, Paddenswick Road, Hammermith, Middlesex.* [4301]  
 Drying, &c. Organic and other Substances.—*D. H. Hemmers, 7, Williamson, and W. Fairweather, all of Glasgow, Lanarkshire.* [4206]  
 Dynamo Magnetic Electric Machines, &c.—*T. Donithorne, Gracechurch Street, London.* [4250]  
 Electrical Regulation of Steam and other Engines, &c.—*A. communication.* [4220]  
 Electrical Storage Batteries.—*E. Frankland, Reigate Hill, Surrey.* [4303]  
 Electric Bell and Signal Apparatus.—*T. R. Brailsford, Trinity Square, Tower Hill, London.* [4296]  
 Electric Governors for Steam Engines, &c.—*A. Blechynedd, Newcastle-upon-Tyne.* [4300]  
 Electric Lamps.—*J. G. Statter, Snaphorpe, Wakefield, Yorkshire.* [4304]  
 Electric Signalling Apparatus.—*A. communication.* [4246]  
 Fire-escapes, &c.—*A. communication.* [4246]  
 Fowling Pieces.—*G. L. Jeffries, Birmingham, Warwick.* [4227]  
 Galvanic Batteries.—*G. V. Holmes, 5, Essex Place, and S. H. Remens, Argyl Street, Middlesex.* [4309]  
 Gas Burners.—*J. J. Sheddock, Bonnet, Herts.* [4248]  
 Generating Electricity, &c.—*W. R. Lake, Southampton Buildings, Middlesex.* [4270]  
 Governing Apparatus for Steam Vessels.—*J. Deveraux, Great Dover Street, Surrey, and E. Winkhurst, Grove Road, Middlesex.* [4288]  
 Holders for Wire Rope.—*T. Archer, jun., Dunston Engine Works, Gateshead, Durham.* [4239]  
 Implements for Raising Potatoes, &c.—*S. Corbett, Wellington, Salop.* [4234]  
 Keyboard Instruments.—*A. communication.* [4208]  
 Lamps.—*A. communication.* [4208]  
 Lawn Tennis Bats.—*A. A. Trimmings, 51, Grove Road, Holloway, Middlesex.* [4278]  
 Lifts, Hoists, &c.—*J. S. Stevens, Queen's Road, Battersea, Surrey, C. G. Major, 31, Peake Road, Battersea, Surrey, and D. P. Edwards, 35, Charles Street, South, Glamorgan.* [4240]  
 Loading and Unloading Vessels.—*A. communication.* [4241]  
 Loom Shuttlers.—*J. Riley, and A. Orrell, both of Bradford, Yorks.* [4270]  
 Lubricators.—*A. communication.* [4217]  
 Machine for Cutting, &c. Sheets of Glass.—*A. communication.* [4285]  
 Machinery for Raising, Lowering, and Conveying Substances.—*F. J. Harrison, Queen's Road, Rock Ferry, Chester.* [4294]  
 Machinery for Ring Spinning, Suitable for Cotton, &c.—*E. Olbrhe, Todmorden, Yorks.* [4282]  
 Manufacture and Treatment of Soaps.—*W. Green, commonly called W. V. Green St. Lawrence, Thanet, Kent.* [4226]  
 Manufacture of Cigarettes, &c.—*E. L. Delaney, 40, Newington Causeway, Middlesex.* [4230]  
 Manufacture of Glass Coverings for the Keys of Musical Instruments.—*A. communication.* [4257]  
 Manufacture of Incandescent Lamps, &c.—*W. Crookes, 1, Regent Street, London.* [4238]  
 Manufacture of Iron and Steel.—*W. W. Chipman, 8, Southampton Buildings, London.* [4205]  
 Manufacture of Rollers Employed for Pointing Cards.—*J. Sykes, Lindley, Huddersfield, Yorks.* [4319]  
 Manufacture of Shot.—*T. Spence, 13, Oxford Terrace, Gateshead-on-Tyne.* [4314]  
 Manufacture of Starch.—*A. communication.* [4224]  
 Manufacture of Strainers, &c.—*G. Tidcombe, jun., Watford Iron Works, Watford, Herts.* [4242]  
 Manufacture of White Lead, &c.—*W. V. Wilson, 7, Mile End Road, London.* [4275]  
 Match Boxes.—*E. de Pass, 68, Fleet Street, London.* [4310]  
 Means for Working Valves for Sanitary Purposes.—*W. G. Sturt, 36, Western Road, Wood Green, Middlesex.* [4200]  
 Method of Coating with Nickel the Surface of Iron Plates, &c.—*A. communication.* [4252]  
 Method of Removing Bone Black from Filters.—*A. communication.* [4249]  
 Mule Throatspinning and Doubling Machinery.—*W. Lancaster, Acreington, and E. Slater, Burnley, Lancs.* [4263]  
 Multiple Cylinder Engines.—*F. Wynn, Hanover Square, Middlesex.* [4293]  
 Needle Instruments for Speaking Telegraphs.—*E. J. Houghton, 1, Pilkington Road, Peckham, Surrey.* [4289]  
 Obtaining and Utilising Electric Currents.—*T. Slater, Naiting Hill, Middlesex.* [4251]  
 Open Firegrates.—*S. C. Ferris, Torquay, Devon.* [4287]  
 Ornamentation of Wooden or other Surfaces.—*W. A. Hunter, Plumpton, near Penrith, Cumberland.* [4284]  
 Ornamenting and Decorating Glass, &c.—*W. H. R. Zoye, Philadelphia, U. S. A.* [4282]  
 Paper Cutting Machinery.—*W. H. Latham, and F. C. W. Latham, both of Bolton, Lancs.* [4252]  
 Plating Iron and Steel with Silver.—*H. S. Elworthy, Stratford, Essex.* [4253]  
 Portable Case for Holding Disinfectants, &c.—*N. M. Raff, and H. W. Herbst, both of Canterbury Works, Dorset Street, Essex Road, Middlesex.* [4274]  
 Preparation for the Obtaining of Antimony, &c.—*Therefrom, A. Irvine, Edinburgh, Midlothian.* [4296]  
 Production and Treatment of Carbonised Materials used for Filtration, &c.—*A. communication.* [4237]  
 Purifying Steam and other Boilers.—*M. Coulson, Spenny-moor, Durham.* [4244]  
 Ratchet Braces.—*A. communication.* [4233]

Rollers Employed in Pointing Cards.—*J. Sykes, Lindley, Huddersfield, Yorks.* [4319]  
 Rolling Wire Rods.—*W. Morris, Oakengates, Salop.* [4216]  
 Rotary Engines.—*A. communication.* [4280]  
 Saddles.—*J. P. Rees, 19, Queen's Road, Dalston, Middlesex.* [4256]  
 Secondary or Storage Batteries.—*A. communication.* [4216]  
 Secondary or Storage Batteries.—*A. communication.* [4216]  
 Shells for Small Arms.—*A. communication.* [4216]  
 Shuttle-box Shifting Mechanism for Looms.—*D. Anderson, Glasgow, Lanark.* [4250]  
 Spirit Sails.—*W. Rowden, Whitstable, and C. E. Doughty, Margate, Kent.* [4243]  
 Steam Engines.—*C. Jones, Liverpool, Lancs.* [4300]  
 Steel Frames and Pin Plates as used in Pianofortes.—*E. Parr, 16, Long Lane, London, and J. H. Gibson, 61, St. Paul's Road, Camden Town, Middlesex.* [4253]  
 Steering Engines.—*T. Davison, Glasgow, Lanark.* [4251]  
 Storing Electrical Energy.—*T. Slater, Notting Hill, Middlesex.* [4266]  
 Telephone Receivers.—*C. A. Teske, 4, Rose Hill Road, Wandsworth, Surrey.* [4243]  
 Tramways, &c.—*C. P. Evans, Birmingham, Warwick.* [4222]  
 Transmitting Rotary Motion by Friction, &c.—*T. Foster, Manchester, Lancs.* [4268]  
 Treatment of Feet.—*S. Heilmann, 8, Quality Court, Middlesex.* [4282]  
 Treatment of Starchy Substances Relating to Browning, &c.—*W. Lawrence, St. Mary Axe, Middlesex.* [4277]  
 Umbrellas and Sunshades.—*W. E. Knight, Stoke Newington, Middlesex.* [4251]  
 Ventilating Wheeled Vehicles.—*J. Leather, Liverpool, Lancashire.* [4220]  
 Voltaic Batteries.—*F. W. Durham, Station Road, New Barnet, Herts.* [4254]  
 Washing Apparatus Suitable for the Treatment of Paper Making Materials, &c.—*W. B. Nulton, 4, Cambridge Terrace, Harlesden Green, Middlesex.* [4216]

## ABSTRACTS OF SPECIFICATIONS RELATING TO METALS

PUBLISHED DURING THE WEEK ENDING SEPT. 9, 1882.  
 (Prepared by PHILIP M. JUSTICE, 53, Chancery Lane, W.C.)

Manufacture of Cutlery.—331 (1882).—*H. M. Marsden.* Provisional Protection only.—Two pieces of sheet steel are passed through suitably shaped rolls, so that they shall be of two thicknesses; they are then cut into strips of required length, the thicker portion forming the bolster and tang, the thinner portion forming the blade. Before heating, forging, or rolling the blanks, they are "pickled" to remove all dirt from their surfaces.

Crushing Minerals, Ores, &c.—456 (1882).—*R. E. Shill.*—The material is fed into the machine by means of an endless screw conveyor, which receives motion direct from the main driving shaft, and is then operated upon by rollers mounted on one end of a lever, the reverse end of which is acted upon by a spring tending to force the periphery of a roller against the interior of a revolving disc, and thus greatly increase the pulverising power. In addition to the main revolving disc, there is a second disc driven independently and so as to cause a differential motion of the two discs. Within the second disc the rollers work, the two discs forming the chamber in which the material is operated upon.

Hot Blast Stoves.—486 (1882).—*E. A. Corbier.*—The pipes for hot blast stoves are constructed of steel containing a small proportion of carbon. Cast iron pipe stoves being first employed to heat the blast to as high a degree as they are capable of withstanding.

Springs.—516 (1882).—*W. J. Wirth, communicated by J. A. Wedemann.*—The springs are designed to be used in place of the spiral metallic springs employed in spring mattresses, sofas, &c. The spring has two arms, formed by bending wire into a rectangular shape, the wire being coiled spirally at a central point. The two arms are secured respectively to the bottom of the couch, and the underside of the mattress, or covering, or to strips of cane.

Brake Blocks.—534 (1882).—*J. Steele.*—To replace worn out brake shoes, a metal shoe is provided, which either fits inside the old wood block, or the wood block may be removed, the metal shoe being bolted to the hanger plate now in use.

Welding Metals.—672 (1882).—*Abel, communicated by J. Lafitte.* In uniting two pieces of metal, instead of applying the customary fluxing material, such as borax, or sal-ammoniac, in the form of powder; it is proposed to mix it with metal filings, and form it into a flexible sheet which may be pressed against the surfaces to be united.

Gas Furnaces.—5731 (1881).—*R. S. Casson.*—This relates to improvements on Patent No. 243, dated 21st January 1876. The gas generator chamber is formed with an inwardly inclined front, having gratebars between which air enters from a closed chamber which is itself supplied with air from a fan. The hopper or feed is placed above the inclined front, so that the fuel will gradually sink to the bottom of the furnace. Opposite the inclined front are air pipes, supplied with blast under pressure, which is conducted from the heating pipes through channels along the sides of the gas flue to the fire bridge.

Metal Roofing.—326 (1882).—*Seefels, communicated by H. Klehe.* Provisional Protection only.—The metal plates are stamped out into a trough shaped form, and overlap each other on the roof.

Blast Furnaces.—514 (1882).—*J. Brown.*—In blast or cupola furnaces, having the tuyeres enclosed in an annular boiler or chamber, it is proposed to fit each tuyere with a hinged lid or cover so that the supply of air to each may be regulated. The operation of the tuyeres may also be rendered automatic, so that they may wholly or partly close, on the blast ceasing, or on a tuyere becoming choked up.

Furnaces.—580 (1882).—*Morgan-Brown, communicated by A. le Folton.*—To prevent clinkers forming on the heated side walls of furnaces, said walls are so formed as to incline inward and upward so as to reduce the pressure of the fuel against them. Gratings are also placed in said side walls with dampers for the regulation of the draught. The bearing bar of the furnace grate is supplied with two ribs to support the ends of the adjoining section of gratebars, and is provided with notches to ensure the proper spacing of said bars.

Alloys of Manganese.—620 (1882).—*G. Scott.*—In the manufacture of triple alloys of manganese. Titaniferous steel sand is employed in combination with manganese and carbon, instead of the granulated iron which is usually employed.

Shaft Couplings.—637 (1882).—*Lake, communicated by F. O. Deschamps, E. T. Clark and E. H. Burr.*—This relates to ball and socket shaft couplings. The sockets receive spheres keyed upon the shafts designed to be coupled together. The said spheres are formed with grooves, and the sections of the coupling device are provided with openings into which steel plugs are screwed. The lower end of these pins are formed with cavities into which small balls are fitted which work in grooves on the sphere, the balls acting as keys to retain the spheres within the sockets.

Horse Shoes.—679 (1882).—*Gavett, communicated by J. Kierman.* Provisional Protection only.—Instead of leaving the surface of the shoe entirely flat, it is formed with a continuous calk extending downward and around the shoe.

Permanent Way.—690 (1882).—*G. Schwarzkopf.*—This relates to an improvement on Patent No. 613 of 1879, the improvement consisting of the adaptation of the clamping levers to various kinds of rails and sleepers. The longitudinal metal sleepers have a rib running lengthwise on the top. The rail itself consists merely of a head which is attached to said rib by the clamp, or the ordinary rail may be employed, in which case the arrangement is modified.

Rolling Mills.—693 (1882).—*J. Walter.*—To the axis of one of the rollers a driving pulley is attached, the second roller being driven by friction. Below each of the main rolls are placed smaller rollers carried on the ends of pivoted levers adjustable as to pressure. These are again driven by friction off the main rolls, their object being to reduce the material to any degree of fineness.

Treating Metals.—695 (1882).—*Clark, communicated by L. Comandor.*—The metal or alloy is subjected when heated to powerful compression, and then allowed to become completely cool while







# THE BOARD OF TRADE RETURNS

Of the Exports of Iron, Steel, and other Metals, with Coal, Coke, and Patent Fuel, from the United Kingdom during the Month of August 1882, as compared with August, 1881; also the Exports for the Eight Months ended August 31, 1881 and 1882.

ARTICLES, AND TO WHAT COUNTRY EXPORTED.	August 1881.	August 1882.	8 Months 1881.	8 Months 1882.
<b>IRON—Pig.</b>				
To Russia ...	21,440	31,524	78,716	86,754
Germany ...	22,231	29,061	150,240	195,585
Holland ...	16,750	28,318	138,080	203,861
Belgium ...	3,120	8,701	57,567	56,120
France ...	10,460	15,887	105,257	121,600
United States ...	48,240	67,009	265,887	341,780
British N. America ...	4,964	9,932	23,126	41,042
Other countries ...	77,883	18,898	137,196	135,735
<b>Total</b> ...	<b>151,503</b>	<b>210,022</b>	<b>950,124</b>	<b>1,175,026</b>

<b>BAR, ANGLE, BOLT AND ROD.</b>				
To Russia ...	718	277	2,015	2,150
Germany ...	486	1,667	4,743	7,472
Holland ...	194	858	2,211	3,421
France ...	10	32	506	930
Italy ...	1,196	1,674	13,956	11,394
Turkey ...	1,370	1,534	6,513	6,333
United States ...	943	1,177	8,304	14,753
British N. America ...	5,037	5,591	27,452	25,830
India ...	1,003	2,105	19,500	27,431
Australia ...	3,193	4,024	19,600	36,568
Other countries ...	10,113	8,550	6,068	64,251
<b>Total</b> ...	<b>24,196</b>	<b>27,347</b>	<b>183,057</b>	<b>207,500</b>

<b>RAILROAD, OF ALL SORTS.</b>				
To Russia ...	2,808	25	13,050	4,104
Sweden and Norway ...	1,101	135	4,743	9,042
Germany ...	5	—	237	627
Holland ...	—	—	356	6,919
Spain and Canaries ...	2,015	615	9,703	7,436
Italy ...	2,215	4,824	18,720	46,410
Turkey ...	—	—	—	459
Egypt ...	—	—	4,061	155,408
United States ...	29,634	13,385	210,125	24,156
Mexico ...	2,680	2,569	23,285	24,156
Brazil ...	3,455	6,772	31,154	31,886
Peru ...	23	—	993	730
Chili ...	169	11	634	3,096
British N. America ...	10,189	23,490	72,338	71,853
India ...	577	4,071	2,329	25,365
Australia ...	8,007	63,185	106,002	56,816
Other countries ...	7,927	5,093	59,721	64,938
<b>Total</b> ...	<b>78,478</b>	<b>89,280</b>	<b>552,773</b>	<b>640,797</b>

<b>WIRE OF IRON OR STEEL (except Telegraph Wire).</b>				
To Russia ...	5,726	5,268	47,676	57,146
Germany ...	1,475	1,649	8,108	8,504
Holland ...	1,405	1,802	9,141	14,518
France ...	377	584	3,825	5,080
Spain and Canaries ...	960	168	4,758	4,382
Italy ...	449	474	4,178	4,622
United States ...	2,388	3,107	9,943	8,449
British N. America ...	7,588	5,245	23,782	24,065
India ...	3,988	1,006	7,898	8,593
Australia ...	4,970	3,028	21,854	28,641
Other countries ...	4,572	4,934	31,806	45,603
<b>Total</b> ...	<b>39,135</b>	<b>29,565</b>	<b>189,905</b>	<b>218,720</b>

<b>TIN PLATES.</b>				
To France ...	622	126	4,310	2,073
United States ...	16,641	20,700	113,512	148,071
British N. America ...	914	650	7,258	5,618
Australia ...	461	509	5,004	3,930
Other countries ...	3,032	2,747	25,340	20,664
<b>Total</b> ...	<b>21,700</b>	<b>24,741</b>	<b>155,514</b>	<b>181,856</b>

<b>CAST AND WROUGHT IRON (except Ordnance).</b>				
To Russia ...	1,230	579	6,501	5,118
Germany ...	1,031	775	6,108	6,288
Holland ...	1,040	686	3,909	6,235
France ...	918	1,095	5,143	11,147
Spain and Canaries ...	670	1,609	5,722	7,527
United States ...	516	442	4,220	4,557
Peru ...	40	30	281	1,924
Brazil ...	1,712	1,135	13,510	9,877
British N. America ...	1,476	1,298	10,187	8,310
India ...	1,700	1,139	9,015	12,831
Australia ...	3,030	2,204	33,343	35,079
Other countries ...	5,101	7,044	43,297	55,149
<b>Total</b> ...	<b>23,577</b>	<b>25,015</b>	<b>188,108</b>	<b>216,028</b>

<b>OLD IRON (for remanufacture).</b>				
To United States ...	8,872	4,016	50,461	64,581
Other countries ...	1,146	4,028	14,508	25,388
<b>Total</b> ...	<b>10,018</b>	<b>8,044</b>	<b>64,969</b>	<b>89,969</b>

<b>STEEL, UNWROUGHT.</b>				
To France ...	292	474	2,191	3,814
United States ...	11,719	8,476	74,814	112,825
Other countries ...	2,734	2,578	16,859	21,920
<b>Total</b> ...	<b>14,745</b>	<b>11,528</b>	<b>93,864</b>	<b>138,559</b>

<b>MANUFACTURES OF STEEL TOTAL OF IRON AND STEEL.</b>				
To Russia ...	1,183	1,292	10,010	11,617
Germany ...	3,012	4,372	24,450	29,314
Holland ...	1,002	9,995	87,587	93,119
France ...	10,902	10,168	150,802	140,251
Spain and Canaries ...	10,902	9,995	87,587	93,119
Italy ...	44,998	58,80	320,955	340,002
United States ...	23,510	10,859	71,701	60,913
Foreign West Indies ...	22,588	22,302	172,162	181,701
Argentina Republic ...	10,352	6,035	87,706	73,701
British N. America ...	14,993	14,410	121,010	143,330
India ...	15,368	14,386	124,438	145,310
Australia ...	10,732	23,426	200,052	190,788
Other countries ...	54,103	59,347	333,935	500,363
<b>Total</b> ...	<b>321,052</b>	<b>350,279</b>	<b>2,436,018</b>	<b>2,730,867</b>

<b>HARDWARE AND CUTLERY.</b>				
To Russia ...	7,508	6,506	42,638	49,093
Germany ...	33,442	33,875	114,500	127,665
Holland ...	7,078	7,437	51,470	50,330
France ...	29,010	10,168	150,802	140,251
Spain and Canaries ...	10,902	9,995	87,587	93,119
Italy ...	44,998	58,80	320,955	340,002
United States ...	23,510	10,859	71,701	60,913
Foreign West Indies ...	22,588	22,302	172,162	181,701
Argentina Republic ...	10,352	6,035	87,706	73,701
British N. America ...	14,993	14,410	121,010	143,330
India ...	15,368	14,386	124,438	145,310
Australia ...	10,732	23,426	200,052	190,788
Other countries ...	54,103	59,347	333,935	500,363
<b>Total</b> ...	<b>321,052</b>	<b>350,279</b>	<b>2,436,018</b>	<b>2,730,867</b>

<b>MACHINERY AND MILLWORK.</b>				
To Russia ...	36,318	31,923	111,327	122,235
Germany ...	33,915	33,104	257,270	243,577
Holland ...	28,391	6,010	85,391	90,005
Belgium ...	2,223	6,304	18,309	34,991
France ...	10,921	18,408	128,394	128,137
Spain and Canaries ...	20,741	10,784	175,808	170,880
Italy ...	10,792	8,040	47,203	104,749
Egypt ...	7,295	—	—	—
United States ...	10,044	4,820	93,524	73,447
Brazil ...	10,701	7,887	93,524	73,447
British India ...	57,719	43,016	421,020	254,945
Australia ...	15,740	47,430	212,044	231,109
Other countries ...	41,974	81,700	429,413	602,832
<b>Total</b> ...	<b>312,815</b>	<b>310,286</b>	<b>2,187,505</b>	<b>2,372,549</b>

ARTICLES, AND TO WHAT COUNTRY EXPORTED.	August 1881.	August 1882.	8 Months 1881.	8 Months 1882.
<b>OTHER DESCRIPTIONS.</b>				
To Russia ...	98,816	18,408	442,330	640,499
Germany ...	80,356	73,114	496,246	675,793
Holland ...	21,205	30,834	435,694	559,071
Belgium ...	31,977	42,335	212,051	304,003
France ...	61,055	64,169	461,536	545,395
Spain and Canaries ...	9,815	27,037	188,481	185,288
Italy ...	24,535	24,030	172,253	243,258
Egypt ...	11,929	511	94,092	60,733
United States ...	51,470	51,470	252,820	355,660
Brazil ...	45,776	4,776	105,408	194,570
British India ...	58,188	58,188	436,150	897,379
Australia ...	34,420	82,060	255,267	525,555
Other countries ...	71,578	147,894	652,444	952,130
<b>Total</b> ...	<b>544,119</b>	<b>750,466</b>	<b>3,695,381</b>	<b>5,446,219</b>

<b>ARMS (SMALL).</b>				
To Russia ...	25,485	29,211	200,677	204,436
Germany ...	21,957	26,517	151,048	204,700
France ...	6,876,652	6,101,875	61,423,916	68,676,976
<b>Total</b> ...	<b>27,442</b>	<b>28,717</b>	<b>180,972</b>	<b>209,271</b>

<b>BRASS, MANUFACTURES OF (not being ordnance).</b>				
To Germany ...	7,051	6,370	55,009	31,983
Holland ...	4,047	3,021	38,399	27,125
Belgium ...	2,379	3,636	18,342	28,685
France ...	11,049	8,229	102,799	70,401
British India ...	2,765	—	16,882	276
Other countries ...	2,990	1,046	27,103	13,248
<b>Total</b> ...	<b>31,793</b>	<b>24,304</b>	<b>251,504</b>	<b>161,716</b>

<b>WROUGHT.</b>				
To Russia ...	2,951	532	11,734	7,020
Germany ...	933	648	3,384	4,036
Holland ...	399	755	7,697	4,436
France ...	440	339	5,592	23,685
Italy ...	1,771	680	6,392	5,914
Turkey ...	1,955	2,239	16,923	15,503
Egypt ...	1,891	—	18,887	7,414
British India ...	6,771	14,877	106,664	79,302
Other countries ...	11,161	8,795	53,769	57,867
<b>Total</b> ...	<b>27,241</b>	<b>28,714</b>	<b>180,972</b>	<b>209,271</b>

<b>MIXED OR YELLOW METAL SHEATHING.</b>				
To Russia ...	21,837	30,788	194,914	246,527
<b>Total</b> ...	<b>80,803</b>	<b>83,706</b>	<b>627,390</b>	<b>610,514</b>

<b>LEAD.</b>				
To Russia ...	1,763	408	6,593	5,193
Germany ...	141	78	702	892
France ...	575	156	1,414	984
China & Hong Kong ...	50	10	347	425
British India ...	413	242	9,410	8,741
Australia ...	410	280	2,353	1,805
Other countries ...	863	449	2,822	3,745
<b>Total</b> ...	<b>4,081</b>	<b>2,385</b>	<b>20,849</b>	<b>27,212</b>

<b>TIN, UNWROUGHT.</b>				
To Russia ...	2,104	919	9,315	11,767
Germany ...	248	1,375	4,905	7,621
France ...	1,768	2,055	17,415	18,879
Turkey ...	625	615	4,014	4,701
United States ...	915	5,116	5,830	6,105
Other countries ...	9,551	1,510	20,541	18,693
<b>Total</b> ...	<b>8,251</b>	<b>11,630</b>	<b>63,016</b>	<b>70,730</b>

<b>ZINC OR SPelter.</b>				
To Russia ...	14,578	16,657	90,260	120,237
<b>Total</b> ...	<b>14,578</b>	<b>16,657</b>	<b>90,260</b>	<b>120,237</b>

Sweden & Norway ...	237,104	288,662	799,149	1,322,735
Denmark ...	104,681	135,810	772,827	984,349
Germany ...	84,027	98,567	528,103	583,403
Holland ...	247,811	243,050	1,333,301	1,490,834
France ...	49,932	47,074	275,010	274,482
Spain and Canaries ...	367,349	311,013	2,175,013	2,049,532
Italy ...	89,104	96,118	683,264	750,182
Turkey ...	179,193	182,842	1,215,528	1,223,200
Egypt ...	19,161	17,197	161,076	161,076
Brazil ...	78,463	49,093	530,318	548,258
Malta ...	53,547	39,232	285,521	247,320
British India ...	30,391	68,534	298,669	429,131
Other countries ...	61,776	70,347	709,227	935,578
Total	340,857	361,574	2,625,918	2,624,302



	VALUE.			
	Month ended August.	Eight Months ending August.	1881.	1882.
<b>IRON RAILS.</b>				
To Russia .....	798	32	482	62
Sweden and Norway .....	900	902	9,994	12,922
Germany .....	10	—	1,231	105
Spain .....	311	50	1,529	798
Italy .....	480	—	5,753	—
United States .....	33,594	1,050	447,904	120,168
Brazil .....	—	1,750	13,168	8,882
Chili .....	100	68	959	2,760
British North America .....	—	341	7,587	1,450
British India .....	5,665	2,884	23,712	20,543
Australia .....	6,896	2,620	15,863	20,526
Other Countries .....	19,453	4,418	30,810	41,933
<b>Total .....</b>	<b>57,331</b>	<b>13,805</b>	<b>550,556</b>	<b>239,073</b>
<b>STEEL RAILS.</b>				
To Russia .....	8,930	—	73,008	17,054
Sweden and Norway .....	7,794	100	22,828	37,650
Germany .....	—	—	—	—
Spain .....	13,547	3,424	47,046	16,249
Italy .....	12,350	29,446	117,231	97,355
United States .....	135,666	86,336	941,822	876,019
Brazil .....	18,795	35,391	151,807	188,822
Chili .....	781	—	2,423	14,525
British North America .....	70,349	15,725	470,998	174,071
British India .....	12,643	54,814	102,740	410,073
Australia .....	38,615	26,224	321,474	191,185
Other Countries .....	44,293	97,253	297,488	609,783
<b>Total .....</b>	<b>383,532</b>	<b>198,853</b>	<b>2,618,276</b>	<b>3,350,399</b>
<b>TOTAL OF IRON AND STEEL RAILS.</b>	<b>440,863</b>	<b>404,718</b>	<b>3,168,822</b>	<b>3,580,493</b>

## PRICES CURRENT OF MANUFACTURED GOODS OF BIRMINGHAM AND DISTRICT.

\* This List being compiled exclusively for the pages of IRON, all rights of reproduction are reserved. 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.

Prices of manufactured hardware show very little variation, and there are no alterations to advise at present. The home demand exhibits slight improvement, but orders only come to hand sparingly, the country buyers taking smaller parcels than is generally the case at this period of the year. Foreign orders are not so plentiful, although some fair inducements are being received from South America, Australia, and the Cape. The demand for galvanised sheets is fairly maintained, and iron generally is in good request.

### ABBREVED LIST.

**AMERICAN WIRE HOBS.** 1 lb., 2 1/2 lb., 3 1/2 lb., 5 lb., 7 lb., 10 lb., 15 lb., 20 lb., 25 lb., 30 lb., 35 lb., 40 lb., 45 lb., 50 lb., 55 lb., 60 lb., 65 lb., 70 lb., 75 lb., 80 lb., 85 lb., 90 lb., 95 lb., 100 lb., 110 lb., 120 lb., 130 lb., 140 lb., 150 lb., 160 lb., 170 lb., 180 lb., 190 lb., 200 lb., 210 lb., 220 lb., 230 lb., 240 lb., 250 lb., 260 lb., 270 lb., 280 lb., 290 lb., 300 lb., 310 lb., 320 lb., 330 lb., 340 lb., 350 lb., 360 lb., 370 lb., 380 lb., 390 lb., 400 lb., 410 lb., 420 lb., 430 lb., 440 lb., 450 lb., 460 lb., 470 lb., 480 lb., 490 lb., 500 lb., 510 lb., 520 lb., 530 lb., 540 lb., 550 lb., 560 lb., 570 lb., 580 lb., 590 lb., 600 lb., 610 lb., 620 lb., 630 lb., 640 lb., 650 lb., 660 lb., 670 lb., 680 lb., 690 lb., 700 lb., 710 lb., 720 lb., 730 lb., 740 lb., 750 lb., 760 lb., 770 lb., 780 lb., 790 lb., 800 lb., 810 lb., 820 lb., 830 lb., 840 lb., 850 lb., 860 lb., 870 lb., 880 lb., 890 lb., 900 lb., 910 lb., 920 lb., 930 lb., 940 lb., 950 lb., 960 lb., 970 lb., 980 lb., 990 lb., 1000 lb.

3/4; 11 inch, 1/2; 12 inch, 1/2; 13 inch, 1/2; 14 inch, 1/2; 15 inch, 1/2; 16 inch, 1/2; 17 inch, 1/2; 18 inch, 1/2; 19 inch, 1/2; 20 inch, 1/2; 21 inch, 1/2; 22 inch, 1/2; 23 inch, 1/2; 24 inch, 1/2; 25 inch, 1/2; 26 inch, 1/2; 27 inch, 1/2; 28 inch, 1/2; 29 inch, 1/2; 30 inch, 1/2; 31 inch, 1/2; 32 inch, 1/2; 33 inch, 1/2; 34 inch, 1/2; 35 inch, 1/2; 36 inch, 1/2; 37 inch, 1/2; 38 inch, 1/2; 39 inch, 1/2; 40 inch, 1/2; 41 inch, 1/2; 42 inch, 1/2; 43 inch, 1/2; 44 inch, 1/2; 45 inch, 1/2; 46 inch, 1/2; 47 inch, 1/2; 48 inch, 1/2; 49 inch, 1/2; 50 inch, 1/2; 51 inch, 1/2; 52 inch, 1/2; 53 inch, 1/2; 54 inch, 1/2; 55 inch, 1/2; 56 inch, 1/2; 57 inch, 1/2; 58 inch, 1/2; 59 inch, 1/2; 60 inch, 1/2; 61 inch, 1/2; 62 inch, 1/2; 63 inch, 1/2; 64 inch, 1/2; 65 inch, 1/2; 66 inch, 1/2; 67 inch, 1/2; 68 inch, 1/2; 69 inch, 1/2; 70 inch, 1/2; 71 inch, 1/2; 72 inch, 1/2; 73 inch, 1/2; 74 inch, 1/2; 75 inch, 1/2; 76 inch, 1/2; 77 inch, 1/2; 78 inch, 1/2; 79 inch, 1/2; 80 inch, 1/2; 81 inch, 1/2; 82 inch, 1/2; 83 inch, 1/2; 84 inch, 1/2; 85 inch, 1/2; 86 inch, 1/2; 87 inch, 1/2; 88 inch, 1/2; 89 inch, 1/2; 90 inch, 1/2; 91 inch, 1/2; 92 inch, 1/2; 93 inch, 1/2; 94 inch, 1/2; 95 inch, 1/2; 96 inch, 1/2; 97 inch, 1/2; 98 inch, 1/2; 99 inch, 1/2; 100 inch, 1/2; 101 inch, 1/2; 102 inch, 1/2; 103 inch, 1/2; 104 inch, 1/2; 105 inch, 1/2; 106 inch, 1/2; 107 inch, 1/2; 108 inch, 1/2; 109 inch, 1/2; 110 inch, 1/2; 111 inch, 1/2; 112 inch, 1/2; 113 inch, 1/2; 114 inch, 1/2; 115 inch, 1/2; 116 inch, 1/2; 117 inch, 1/2; 118 inch, 1/2; 119 inch, 1/2; 120 inch, 1/2; 121 inch, 1/2; 122 inch, 1/2; 123 inch, 1/2; 124 inch, 1/2; 125 inch, 1/2; 126 inch, 1/2; 127 inch, 1/2; 128 inch, 1/2; 129 inch, 1/2; 130 inch, 1/2; 131 inch, 1/2; 132 inch, 1/2; 133 inch, 1/2; 134 inch, 1/2; 135 inch, 1/2; 136 inch, 1/2; 137 inch, 1/2; 138 inch, 1/2; 139 inch, 1/2; 140 inch, 1/2; 141 inch, 1/2; 142 inch, 1/2; 143 inch, 1/2; 144 inch, 1/2; 145 inch, 1/2; 146 inch, 1/2; 147 inch, 1/2; 148 inch, 1/2; 149 inch, 1/2; 150 inch, 1/2; 151 inch, 1/2; 152 inch, 1/2; 153 inch, 1/2; 154 inch, 1/2; 155 inch, 1/2; 156 inch, 1/2; 157 inch, 1/2; 158 inch, 1/2; 159 inch, 1/2; 160 inch, 1/2; 161 inch, 1/2; 162 inch, 1/2; 163 inch, 1/2; 164 inch, 1/2; 165 inch, 1/2; 166 inch, 1/2; 167 inch, 1/2; 168 inch, 1/2; 169 inch, 1/2; 170 inch, 1/2; 171 inch, 1/2; 172 inch, 1/2; 173 inch, 1/2; 174 inch, 1/2; 175 inch, 1/2; 176 inch, 1/2; 177 inch, 1/2; 178 inch, 1/2; 179 inch, 1/2; 180 inch, 1/2; 181 inch, 1/2; 182 inch, 1/2; 183 inch, 1/2; 184 inch, 1/2; 185 inch, 1/2; 186 inch, 1/2; 187 inch, 1/2; 188 inch, 1/2; 189 inch, 1/2; 190 inch, 1/2; 191 inch, 1/2; 192 inch, 1/2; 193 inch, 1/2; 194 inch, 1/2; 195 inch, 1/2; 196 inch, 1/2; 197 inch, 1/2; 198 inch, 1/2; 199 inch, 1/2; 200 inch, 1/2; 201 inch, 1/2; 202 inch, 1/2; 203 inch, 1/2; 204 inch, 1/2; 205 inch, 1/2; 206 inch, 1/2; 207 inch, 1/2; 208 inch, 1/2; 209 inch, 1/2; 210 inch, 1/2; 211 inch, 1/2; 212 inch, 1/2; 213 inch, 1/2; 214 inch, 1/2; 215 inch, 1/2; 216 inch, 1/2; 217 inch, 1/2; 218 inch, 1/2; 219 inch, 1/2; 220 inch, 1/2; 221 inch, 1/2; 222 inch, 1/2; 223 inch, 1/2; 224 inch, 1/2; 225 inch, 1/2; 226 inch, 1/2; 227 inch, 1/2; 228 inch, 1/2; 229 inch, 1/2; 230 inch, 1/2; 231 inch, 1/2; 232 inch, 1/2; 233 inch, 1/2; 234 inch, 1/2; 235 inch, 1/2; 236 inch, 1/2; 237 inch, 1/2; 238 inch, 1/2; 239 inch, 1/2; 240 inch, 1/2; 241 inch, 1/2; 242 inch, 1/2; 243 inch, 1/2; 244 inch, 1/2; 245 inch, 1/2; 246 inch, 1/2; 247 inch, 1/2; 248 inch, 1/2; 249 inch, 1/2; 250 inch, 1/2; 251 inch, 1/2; 252 inch, 1/2; 253 inch, 1/2; 254 inch, 1/2; 255 inch, 1/2; 256 inch, 1/2; 257 inch, 1/2; 258 inch, 1/2; 259 inch, 1/2; 260 inch, 1/2; 261 inch, 1/2; 262 inch, 1/2; 263 inch, 1/2; 264 inch, 1/2; 265 inch, 1/2; 266 inch, 1/2; 267 inch, 1/2; 268 inch, 1/2; 269 inch, 1/2; 270 inch, 1/2; 271 inch, 1/2; 272 inch, 1/2; 273 inch, 1/2; 274 inch, 1/2; 275 inch, 1/2; 276 inch, 1/2; 277 inch, 1/2; 278 inch, 1/2; 279 inch, 1/2; 280 inch, 1/2; 281 inch, 1/2; 282 inch, 1/2; 283 inch, 1/2; 284 inch, 1/2; 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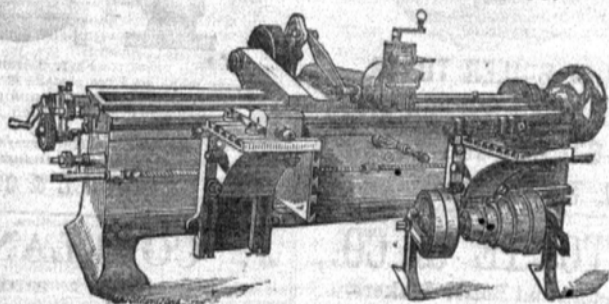
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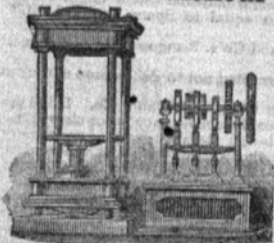
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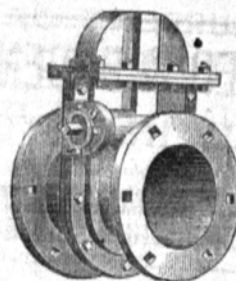
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## IRON.

No. 506.

LONDON, FRIDAY, SEPTEMBER 22, 1882.

## SOCIAL SCIENCE.

THE National Association for the Promotion of Social Science met on Wednesday, at Nottingham, for the celebration of its twenty-fifth anniversary. On the occasion of this commemoration, it may not be uninteresting, nor without profit, to recall to mind the circumstances under which the society was originated, and to cast a retrospective glance at its labours and their results. In this task we are greatly assisted by *A Manual for the Congress*, published by Mr. J. T. Clifford-Smith, the secretary of the association, which contains a narrative of past labours and results. The association was founded on July 29, 1857, at a private meeting called by Mr. G. W. Hastings, and held at the residence, in Grafton Street, of the late Lord Brougham, who presided on the occasion. At that meeting was commenced the organisation which has since assumed so prominent a position, and the twenty-fifth anniversary of whose first congress is now being celebrated in the town of Nottingham. The association was founded with a view of affording to those engaged in all the various efforts happily begun for the improvement of the people an opportunity of considering social economics as a great whole. It was decided, after mature deliberation, to divide the association into five departments—(1) jurisprudence and amendment of the law; (2) education; (3) punishment and reformation; (4) public health; (5) social economy. The aim of the officers appointed was "to obtain aid from all those interested in social improvement, without reference to classes or opinions; sincere help was welcomed from whatever quarter it was offered; and in reply to all enquiries as to the policy of the association it was distinctly stated that its object was to elicit truth, not to propound dogmas, and that in every department any argument coming within the limits of the subject for discussion, and temperately and fairly urged, would be listened to with respect." The maintenance of this freedom of opinion, on the one hand, and an endeavour, on the other, to guard against the organisation becoming the instrument of advancing the mere crotchets of individuals, have always been aimed at; and to the upholding of this fundamental principle the prosperity of the association is, no doubt, in great part due.

The order of the departments was modified in 1864, and their number reduced to four. During the years 1861, 1862, and 1863, a sixth, a department for trade and international law, had been added. But, acting on a report drawn up by the general and foreign secretaries (Mr. Hastings and Mr. Westlake), the following reorganisation was adopted. The portion of the third department which related to the administration of the criminal law and the treatment of criminals, and also that portion of the sixth department which related to international and commercial law, was merged into the first department, that of jurisprudence and amendment of the law. The education department remained as it was, with the addition of such questions as ragged schools. The department of punishment and reformation ceased to exist. To the former fourth, now the third, department, that of health, were added all the questions relative to habitation, and some miscellaneous topics, such as baths and washhouses, and most of those of recreation and amusement, which had been taken up by the fifth department. The latter department, which now became the fourth in order, was termed the department of political economy and trade, to which were referred all the questions on production and trade, which were formerly sent to the sixth department. A department for art, or for art and literature, was also recommended at the time; but the experiment was at first made by organising at first a section of the education department for art and literature. That department was finally constituted in 1876, and has since proved to be a useful and a popular adjunct to the organisation and work of the association. The latter, as now constituted, includes the following departments:—(1) Jurisprudence and Amendment of the Law. In it are discussed the science of jurisprudence and the amendment of the law; including the principles of law and legislation, comparative jurisprudence, international law, municipal civil law, and criminal law, together with the treatment of criminals, and questions connected with prisons and industrial and reformatory schools. (2) Education. This department deals with the various questions relating to education, whether of the upper, middle, or lower classes of society. (3) Public Health. This department considers the various questions relating to public health, and the organisation and administration of the sanitary laws. (4) Economics. In this department are examined the various questions relating to economics—social, political, and commercial.

cial. (5) Art. In this department are considered all questions bearing upon art in its relation to the civilisation, education, and industrial development of the people, and on the best methods of cultivating a sound and high standard of taste in all ranks of the nation.

The effects of the labours of the Association for the Promotion of Social Science are reflected by our legislative history of the last two decades. Much, no doubt, remains to be set right in accordance with the aims of the association; but great reforms have been effected. A faithful record of those labours and their results forms part of the *Manual*, and it is to the latter that we invite the attention of our readers. But we may, in conclusion, briefly refer to some of the more important results. In the first department, the effects of the labours of the association were felt in the passing of the Bankruptcy Act of 1861. Time has, no doubt, shown that the provisions of this act demand extensive modification, but from the efforts of the association may date the consolidation and simplification of the law of bankruptcy, with all its subsequent advantages. In the passing of a law of partnership, as enacted in the 28 & 29 Vict. c. 89, the association has had its share. The association has laboured hard, likewise, in promoting legislation with a view of better defining the law of copyright and of amending our patent laws; hitherto without success. In the appointment of a public prosecutor, the association has also had a share. With regard to the second department, that of education, a review of the active part taken by the association in all matters relating to national education will testify to its deep and practical interest in the subject. The association has laboured as diligently in the public health department, as evidenced by the passing of the Act 22 & 23 Vict. c. 3, and the Public Health Act of 1875. The enactment for repressing the adulteration of food (23 & 24 Vict. c. 84), passed in 1860, was a fruit of the labours of the health department of the association. In the measure which became law as the 35 & 36 Vict. c. 77, for the regulation of mines, several of the suggestions of the council of the association were embodied. Smoke abatement also forms part of the efforts of the association. Turning to the department of economics, the labour and capital committee appointed by the association in 1858, to enquire into the question of strikes and trade unions, has done much good. The committee has collected a large amount of information, which was published in a report comprised in a volume of 640 pages. It has taken an active share in the settlement of wages disputes in all parts of the country, and the Trades Union Bill, which passed into law on June 29, 1871, as the 34 & 35 Vict. c. 31, bears the mark of the work of the committee. The action of the association in matters of trade disputes has been most beneficent, the principle of arbitration being most assiduously advocated. The system of Post Office Savings Banks had its direct origin in a paper read before the association at the Bradford meeting in 1859 by Mr. (now Sir) C. W. Sikes, of Huddersfield. It was not until the year 1876 that a separate department of art was established by the association. Since its formation, however, addresses of deep interest and value have been delivered at the annual congresses by eminent artists and others, and many instructive papers have been read and usefully discussed. This youngest of the departments has as yet yielded no actual and definite results as an outcome of its labours, but the association may with confidence look forward to an increasing interest in those labours and the growth of more practical results and greater usefulness.

Indeed, practical results and extended usefulness are the great aims of the association which now commemorates its twenty-fifth anniversary. The outlines of the narrative given in the *Manual* are sufficiently clear to indicate the scope and design of the useful work performed by the association, and to exhibit at a glance the methods by which lasting results have been attained. As a record of labours extending over a quarter of a century, carried on at all times quietly and unostentatiously, and by men of all shades of party politics, the narrative deserves the careful consideration of all unacquainted with the mode of procedure of the association.

## IRON TRADE SUMMARY.

THE English iron market has been very steady during the past week. Business in nearly all departments of the iron trade appears to be in a satisfactory condition, and the cessation of hostilities in Egypt will, no doubt, further strengthen the steady tone of the iron market. Pig-iron has been tolerably firm this week, although business has not been particularly brisk. This may be accounted for by the fact that makers are well supplied with orders. We are glad to hear that Cleveland ironmasters are able to, and do, take a holiday occasionally, for, according to our Middlesbrough correspondent, very few ironmasters were present at the iron market on Tuesday, "they having taken advantage of the full state of their order books and the steadiness of prices to go to the Iron and Steel Institute Meeting at Vienna." Merchants sold No. 3 iron on Tuesday at 44s., but makers held out for

their old quotation, 44s. 6d. Orders for long deliveries are not entertained at present. Shipments are very heavy indeed this month, being up to Wednesday night 66,326 tons, as compared with 60,107 tons at the same date in August. This confirms our continental advices, according to which there is an unusual demand for English foundry and Bessemer pig in the Westphalian district. The Glasgow warrant market has been in a dull condition since we last wrote, and quotations have slightly declined since last week. Closing prices on Wednesday were, for sellers, 49s. 11½d. cash, and 50s. 2d. a month; buyers, 1½d. per ton less. Makers are firm in their rates, which are comparatively higher than those for warrants, and they are well able to maintain their position, being full of orders. All expectation of any renewal of the agreement between the Scotch and Middlesbrough masters may be considered to have vanished. On the Tyne, a moderate business is doing in crude iron, prices remaining unchanged, No. 3 Cleveland being quoted at 46s. 3d. delivered to the Tyne. Prices of pig-iron are steadily maintained also in Lancashire, and they are especially firm in the Midlands, where a good demand exists. In South Wales, quotations of pig-metal show an advance all round of 3s. per ton. The hematite iron market continues steady, both enquiry and previous quotations being well sustained in West Cumberland and North Lancashire. The crude iron branch of the Forest of Dean has improved, stocks being reduced. The state of the finished iron market is about the same as last week. It is quieter, however, in the North than in the Midlands. In Cleveland, plate makers manage to keep their prices up to £6 15s. for ship plates; but bar and angle manufacturers have to submit to lower rates, angles being not £6, and common bars £6 2s. 6d. In Lancashire, for delivery equal to Manchester, quotations for bar iron are very firm at from £6 7s. 6d. to £6 10s. per ton. In South Staffordshire, prices are stronger all round, in some cases to the extent of 2s. 6d. to 5s. per ton. In East Worcestershire, marked bars are £7 10s., and a rise in the price of finished iron is considered a probable contingency at no distant date. An improvement is perceptible in the Birmingham market. At Sheffield, business looks very healthy, especially in the iron department, the call being principally for sheets, plates, and bars. The Bessemer market is stiffer for best qualities. Billets are 2s. 6d. per ton dearer than a fortnight ago. Converters of finest cast steel are very busy. The steel rail trade in South Wales continues in a very satisfactory condition. Prices are very firm, and makers generally decline to quote for early delivery. Blooms are quoted at £4 12s. 6d. to £4 15s. per ton, f.o.b. In the north-west, steel makers are busily employed. The shipbuilding trade at Barrow and vicinity is very brisk. Work is plentiful at present also in Tyne and Wear yards, but it is useless shutting our eyes to the fact that new business is what is wanted. Engineering establishments continue prosperous. The English coal market is active, and according to present appearances, very little doubt is entertained that winter prices will be established by the end of this month.

The iron markets of the Continent preserve the features of previous weeks. Their favourable tendency is unshaken. In Austria the iron trade is active, and prices are slowly advancing. The Belgian iron market has undergone no great change since last week. Business is quiet in pig-iron, but there is a brisk demand for finished iron. English foundry pig is very firm. The minimum quotation for bar iron No. 1 has been raised to 140 fr. per ton; there are, however, still numerous sales at 135 fr. and 137 fr. 50 c. In the French iron market activity continues, and prices are firm. The forgers of the Nord, at their usual monthly meeting on September 14, held at Maubeuge this month, resolved not to sell merchant iron under 190 fr., and plating sections under 195 fr., excepting for important contracts. The returns just published by the Comité des Forges de France show that the French imports of iron and steel during the first six months of this year exceeded those of the same half-year of 1881 by 21,100 tons, or over 12 per cent. Exports of iron and steel are still declining. The imports of iron ore during the two corresponding periods exhibit a difference of 94,249 tons in favour of 1882. A firm tone continues in the iron trade of Germany. Westphalian and Luxemburg puddling pig manufacturers have sold nearly their whole production for the last quarter of this year, and foundry and Bessemer pig is largely imported from England, German furnaces being unable to meet the demand. Briskness is the prevailing feature in the finished iron market. According to all advices, there seems to be great probability for a general advance in coal rates on the Continent. Trade is very brisk both in coal and coke. Great activity especially prevails in the German coal trade, where prices are hardening, and some descriptions are quoted higher this week. The American iron market is quiet, for American pig, both at New York and Philadelphia. Quotations of Scotch pig iron have been steady at New York; for one or two brands slightly higher rates are quoted. The sale of steel rails is not very active, but negotiations for large deliveries are reported to be pending. The Amalgamated Association has declared the great strike to be at an end.