

to the fact that importers are desirous of securing deliveries prior to the threatened rise in duties. This spurt will probably keep some firms in the district well employed for a few weeks on Russian account, but this will, of course, be followed by a complete depression in the same market. Orders from the Cape remain at a satisfactory average, and advices from New South Wales are more encouraging, so far as machinery is concerned, the market being, however, dull for general hardware. Good shipments are being made for India, and the orders promise further improvement. The recent reduction in marked iron has led to orders being placed in the district with somewhat more freedom for marked bars, sheets and plates of certain special makes, but in the medium qualities of unmarked iron, which must without question be ranked as constituting the backbone of the local iron trade, there has been but little movement. Local consumers, influenced by the fact that prices have now gone back very nearly to the point at which they stood prior to the recent inflation, are beginning to give limited orders, the descriptions mostly in request at present being foundry pig, angles, plating bars and common sheets. The accumulation of stocks on smelters' hands, notwithstanding that production has been curtailed, has left the blast-furnace proprietors no alternative but to reduce wages, and they have resolved to give notice on the 12th instant for a drop of 10 per cent. The best qualities of pig are fairly sustained in price, but cinder pig is weak. The demand for galvanised iron is quieter, but the leading firms are still pretty full of orders.

THURSDAY EVENING.—Business quiet on 'Change to-day. Makers, however, mustering strongly, and showing anxiety to sell. Buyers few in number, and no specifications of importance offered, the sales made being chiefly job lots of unmarked iron at low prices. Small purchases were made by tube makers, bedstead and safe manufacturers and iron braziers firms. Merchants more disposed to buy than sell. Tin plates weak. Fair demand for galvanised sheets. At a meeting of a recently-formed conciliation board in the wrought-iron trade of the district, held to-day, owing to dissensions between masters and men, a resolution was adopted for breaking-up the board.

CARDIFF.—The metal industries have none of them experienced any actual improvement, and here and there difficulty is being made as to the reception of deliveries under contract; but there is no change for the worse; on the contrary, the signs of life in the trade are increasing, though the area to be animated is very wide. The Cyfarthfa works keep rolling merchant bars, though it cannot be said that the entire power of the works is put forth. Operators in iron ore are placed in some difficulty, through a superabundance of imports. It is only three months ago since ironmasters could safely raise their prices between the exit of one buyer and the appearance of another in the same ten minutes, and next day regret all that they had done on the previous. Now a week does not bring forth the business of an hour in February. This sufficiently reveals how much of the demand was unhealthy and unduly stimulated production in advance of the actual needs; but, by the same token, the present depression will act as a healthy counteraction. The tin-plate industry is also suffering from over production, while concurrently new works are being erected. The explanation of this is to be found in the new inventions for an economical manufacture, old plant being altogether at a discount; and where old-established concerns cannot make a profit, new ones on the newest principles are able to live and thrive. As usual the trade doctors are completely at variance as to how the trade is to be righted; but the stern ruling which weeds out the weak before strength is confirmed to the strong, plainly puts the advocates of diminished production on the side of natural law. In the steam-coal trade there is in certain quarters extreme pressure to meet demands. The coaling in the Mersey from the pits of this district is on an unusually heavy scale—emigration going on with a great impulse, and assisted by remittances from successful relatives in the States and Canada. Nothing is more remarkable than the fixed annual augmentation of the steam-coal trade. Through bad and good seasons and varying prices, the average quantity persistently increases, and it is only quite recently that capital seems to have given over invading these regions and preventing that return to the difficulties of coping with an urgent demand which are consoled if not relieved by an augmentation of price. A new port has come into existence in competition for Cardiff exports, viz., Sharpness. It has made its maiden attempt to ship a cargo of coal at its single coal tip, and having been fairly successful in cackling like a hen over its first chick. The Sharpness Dock has done something to pull away trade from Gloucester; it is now feeling after the crumbs which the glutted Cardiff docks can so very well spare. The timber and corn ships, by loading at Sharpness, instead of proceeding to Newport or Cardiff, save extra port dues and ballasting, and can therefore take freights to compensate for the extra mileage from the colliery. Hence there is no doubt that the trade at Sharpness will increase. A new facility has been given to trade, but the rates of the Great Western and the Severn and Wye Railways must be reduced if they would share even the shadow of the bloated prosperity of the Taff Vale Railway Company.

CLEVELAND.—There was rather a large attendance on 'Change at Middlesbrough on Tuesday, and business was rather better than it has been of late. Prices for pig-iron were firmer by 6d. a ton, being mainly caused by the Glasgow rise. The market prices may be quoted as—No. 1, 47s. 6d.; No. 3, 36s. 6d.; No. 4 foundry, 36s.; No. 4 forge, 36s. 6d.; l.o.b. makers' wharf, cash Monday. It is most encouraging that the critical state of the American iron trade seems not to be affecting the trade here. A failure or two, brought about by the differences in speculation, seems to be about the worst result of the relapse. Notwithstanding the great increase in the production, matters are much healthier than they were, and even give promise of a steady improvement. The stock returns for last month are much more favourable than were expected, considering the Whitsuntide holidays and the reduced shipments to America. Merchants are more disposed to buy now, especially No. 3. That number is rather scarce at present. Shipments continue good both to Scotland and the Continent. Enquiries were again astir from America, as freights are much lower now. Cleveland iron can, at its present price, compete successfully with that

of native make. The trade report, as issued by the Middlesbrough Chamber of Commerce, contrasts the quietness of the month of May as compared with April, when a panic ensued amongst speculative holders of iron and brought down prices with a rush. The variation of prices during May was within narrow limits, and of a legitimate character. A want of confidence was natural, and set a restraint upon all except those who were compelled to buy for pressing needs. The analysis of exports for May is interesting. They amounted in all to 81,829 tons, being 10,373 tons more than in May, 1879, but 6182 tons less than in April this year. The exports foreign fell off 14,447 tons, but coastwise they improved 8258 tons upon the preceding month of April. The shipments to America fell off from 26,406 tons in April to 11,190 tons in May. Germany took 12,773 tons, or 2500 tons increase; Belgium 5585 tons, or 2100 tons decrease; Holland 6335 tons, or 1460 tons increase; France 4845 tons, or 1507 tons decrease; Sweden, 1325 tons; Russia, 1994 tons; Spain, 1574 tons; Portugal, 920 tons; Norway, 300 tons; Denmark, 153 tons. Scotland took 19,252 tons, or 7557 tons more than in April. In manufactured iron prices have followed suit with those of the raw pig, having dropped 25s. The exports for May amounts to 6253 tons foreign, being 3305 tons less than in April and 10,427 tons coastwise, being 3224 tons increase, so that there is a net decrease of 81 tons. The United States took 2062 tons; India, 1600; Australia, 1302; Brazil, 545; Norway, 267; Holland, 224; and Germany, Belgium, Portugal and Sweden the remainder. Ironfounding and engineering are working steadily. A few orders for railway chairs and bridge work have recently been received. A growing trade has sprung up in slag bricks; a large London warehouse has recently been built of those made under Mr. Charles Wood's process. The shipbuilding yards are fully occupied; the fall in iron is of course highly favourable to this trade. The coal trade is rather firmer in price for households. Coke also is firmer.

DERBYSHIRE.—Although having the advantage of being nearer the metropolis, and enjoying a cheaper tonnage rate for forwarding coal, some of the district pits are not near so well off for orders as they were a short time ago. Pits raising a very good quality of household coal, are only working short time, the tone of trade evidently getting further depressed. Some of the largest collieries in the district around Clay Cross and Staveley, are executing some fair orders, and on account of these the Midland is taking a good tonnage to the metropolis. It ought, however, to be added that the returns for May show that in that month by far the lowest tonnage sent during the year is shown. Best Silkstones at the pits, range from 7s. to 7s. 6d., and best hards from the upper seams 6s. to 6s. 6d. per ton, contracts of course being taken at lower prices. The pits in the Ilkeston district are upon short time, and judging from the output of the district no immediate improvement can be expected. Steam-coal as is generally the case at this season of the year, is in rather better request, but slack and engine fuel for manufacturing purposes shows but little improvement. Amidst all that is discouraging it is satisfactory to note that whilst the output has of late increased in a marked degree, the loss of life at the district pits has not been augmented. In 1855 the coal raised in the district amounted to about four and a half million tons per annum. The quantity raised at the present time is about fourteen million tons yet the sacrifice of life had not materially increased the number of tons raised per life lost being about forty per cent. less than any other. The iron trade is not so good as it was a short time ago, and although the blast-furnaces are kept fully going, the output has outstepped the demand. A moderate business is only done by engineers, boiler makers, and other similar workmen. There is very little change to note in the district, except that the Unstone Coal and Coke Company have asked their miners to submit to a reduction of ten per cent. The miners have, it is said, been taken by surprise, and resistance is talked of, but in the face of the slack trade, and the stoppage of two other collieries, a short time ago, their chances of success are very remote indeed. One of the two furnaces at Wingfield, now the property of the Dodworth and Silkstone Coal and Iron Company (Limited), have been blown-in, and the other will be lighted as early as possible.

DURHAM.—Though the pig-iron trade has been slightly better this week, and rather more money has been asked and realised, there is at the bottom no more confidence apparent as regards the future. There will inevitably be small fluctuations up and down in pig-iron. There always are, as merchants could not exist without; but the general outlook reveals little or no silver lining to the cloud. Where trade should be strong—either in a prospective demand on a large scale for pig-iron, or, still better, for manufactured iron, which would carry the pig-iron trade with it—there is nothing but accruing weakness and want of confidence. Orders in both cases are being worked out, and there are no more coming in of any consequence, except perhaps, for the ship-plate trade, and even in this branch what demand there is for prompt delivery. Shipbuilders do not place orders forward, either because they themselves have not orders for prospective execution or for the reason that they judge, and no doubt rightly, that the future is likely to bring lower prices. Prices of manufactured iron are going down every week; they are now undoubtedly in some cases getting towards their minimum, as can be seen when it is stated that bars and angles are £5 5s. to £5 7s. 6d. Ship plates could be placed for forward delivery at about £6 or a little over, but there are no buyers. For present delivery nothing is heard of below £6 5s. A large breadth of plates continues to be turned out at Consett, Darlington, &c., and the mills are very fully occupied. Pig-iron has been at about 37s. to 37s. 6d. as quoted by makers where they offer it, but merchants early in the week were taking less. The Durham coal trade has, on the whole, been quiet. Household coals have in a measure recovered from the depression observable lately in the London market. The coke trade has been slack. Prices can hardly be said to differ from those of last week—11s. to 12s. delivered at the blast-furnaces on Tees-side.

FOREST OF DEAN.—The house-coal trade of this district is still badly placed, and it is the exception where the pits are running with any degree of regularity. Collieries of well-established firms are scarcely exceeding an average of four days per week. At Lydney Docks there is a

slightly better trade this week, as several vessels having brought North of England pig-iron for Messrs. Richard Thomas and Co., tin-plate makers, are being chartered with coal for the Forest, and a steamer is expected also for coals. Quotations are uncertain, and merchants making contracts with the proprietors at lower rates than remembered for very many years. It is rather important to mention the fact that the *Nereid*, 800 tons, has just left Sharpness with Welsh coals for Quebec. The importance is further attached to the Severn bridge, as this was the first cargo of Welsh coals which have passed this new route. The coal was served by Messrs. Nixon, Taylor and Cory, of Cardiff, from their collieries at Mountain Ash. The cost of shipping at Sharpness, as against Newport, is 2s. in excess, but regarding the fact that outward-bound ships from Sharpness are compelled at present to take ballast, unless there is cargo, the alternative in question is more costly and less expeditious than the Severn bridge route; moreover, if a coal shipping trade can be established at Sharpness, the Forest of Dean may largely benefit. The iron trade is unimproved and the Cinderford stocks of pig increase. There is no disposition on the part of Messrs. Crawshaw to sell at current values, and they are therefore holding on. The tin-plate trade is less satisfactory and the mills in some instances are only working short time. This applies also to the ironstone miners of the district who are not making full time. Some important appeals were made on Tuesday by colliery proprietors to the union assessment authority for abatements in the rating charges. The Forest Bridge Colliery Company, represented by Mr. Arnold Thomas appealed for an abatement of 2d. per ton from a basis of 8d. per ton. Bilson and Crump Meadow Colliery Company, also represented by Mr. Thomas, applied for a similar easement from 6d. and 1d. was conceded in each case. Messrs. Brain of Trafalgar Collieries were relieved from 8d. to 7d. As a plea for these abatements it was urged that the existing basis was made in 1871, since which time very great changes have arisen as applying to colliery proprietors.

GLASGOW.—The warrant market has been firm during the past week, and prices have risen about 2s. per ton from the lowest point touched. This, however, is not to be accounted for by any improved consumptive demand, or future prospects. The cause of the advance is entirely speculative. For some time back, investors have been buying iron largely, and taking it out of the market, so that warrants are now scarce; and, as the "bears" are unable to borrow iron, they are forced to buy, so as to meet what engagements they have falling due. At one time sellers were asking 1½d. per ton less for iron due one month fixed than for prompt cash. The general impression amongst dealers is that prices will again fall as soon as the market has righted itself. On Thursday prices rose from 44s. 7d. to 45s. 6d. cash, and next day fluctuated between 45s. and 45s. 5d. cash. On Monday, 45s. 4½d. to 45s. 11d. cash was paid; and on Tuesday business was done up to 46s. 3½d. cash, and 46s. 1½d. a month fixed. On Wednesday a good business was done from 45s. 9d. cash to 46s. 5d. cash, and 46s. 4d. a month open; closing sellers 46s. 5d. cash, and 46s. 6d. a month; buyers one penny per ton more. Makers' iron is in slight request, and several brands have been reduced in price during the week. There are still 116 furnaces in blast, against 88 last year. The shipments of pig-iron from Scotland last week were—Foreign, 9183 tons; coastwise, 4015 tons; total 13,198 tons against 8402 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 5060 tons against 4072 tons in the similar period of last year. The total imports into Grangemouth till June 5th, 1880, are 96,240 tons against 100,912 tons till June 7th, 1879, showing a decrease for this year of 4672 tons. A few hundred tons of iron is being sent in to Connal's store daily, and the stock there now amounts to 444,997 tons. The manufactured iron trade is extremely quiet, and the utmost difficulty is found in keeping the mills going with any degree of regularity. A further reduction has been made in official prices, the quotations now are common bars £6 to £6 10s., ship-plates £7 10s. to £8, nail rods £6 10s. per ton, less 5 per cent. discount. The exports last week were moderate, the chief items being for New South Wales, machinery valued at £13,650; for the Continent, sewing machines at £2300, cast-iron goods at £1930; for the East, machinery at 5573, wrought iron goods at £2237; for America, malleable iron goods at £1838; and for the West Indies, machinery valued at £1780. The shipbuilding and engineering industries are quiet, and a want of employment is still felt in this district, and work in many quarters is rather intermittent. The local trade is without any change, and is reckoned unprofitable to all concerned with it.

LANCASHIRE.—Both the iron and coal trades of this district continue in a very depressed condition, and complaints are made that producers are even in a worse position than they were twelve months ago. This, of course, may be very well understood when it is remembered that both smelters and manufacturers have in many cases entered into large purchases of the raw material at the recent enhanced values to cover sales to buyers, who now decline to take deliveries, and a considerable quantity of iron, as a consequence, has been forced upon the market at very low figures. But notwithstanding the extreme depression which now prevails there is no real ground for the feeling, almost approaching to panic, which is exhibited in some quarters. The present crisis has been almost entirely brought about by over-speculation, and amongst the best-informed authorities in this district no apprehension is entertained that trade will relapse into the depressed condition which prevailed a couple of years back. In the meantime the improvement which had undoubtedly set in has been checked, and the position of the market may be fairly described as one of waiting, buyers, in the face of falling values, being naturally anxious to take advantage of the lowest prices. At Manchester, on Tuesday, there was again a very flat market, and the reported improvement from Glasgow had very little effect upon business. Lancashire makers of pig-iron are very badly off for orders, and a further considerable reduction of the output is in contemplation. For delivery into the Manchester district the nominal quotations are 50s. per ton, less 2½ per cent., for both foundry and forge pig-iron, but as at this figure there is nothing to be done makers would be open to quote lower prices if offers were made. Lincolnshire and Derbyshire irons are now being offered here at very low prices, and from some makers they can be bought

at from 46s. to 48s. per ton, less 2½ per cent., delivered into Manchester district. There is, if anything, a firmer tone in north-country iron, and the average quotations for G. M. B's delivered equal to Manchester, are about 45s. 4d. to 45s. 10d. per ton net cash. The hematites continue extremely low in price, and can be bought for delivery into this district at considerably under 70s. per ton. The finished-iron trade is still in a very unsatisfactory position, makers who have sold being unable to get specifications from buyers. Orders for prompt delivery are being pressed for at very low figures, and Lancashire bars, delivered into the Manchester district, can be bought at from £6 to £6 10s. per ton, with other descriptions of finished iron in proportion. In the engineering branches of trade, where works are kept going, it is as a rule only on old orders, and the general complaint is that there is little or no new work coming in. There is still no improvement in the coal trade of this district, and very few of the pits in Lancashire are working more than about three days a week. All descriptions of round coal are plentiful in the market, and bad to sell. This has naturally had an effect upon the gas-coal contracts which are usually given out at this time of the year, and the Manchester Corporation have been able to secure contracts extending over the next five years at prices lower than those paid last season. Engine classes of fuel are without material change, as although there is less pressure on the part of consumers, the production is smaller, and sellers as a rule are firm at late rates. The average quotations at the pit mouth are about as under: Best coal, 7s. 6d. to 8s.; seconds, 6s. to 6s. 6d.; common, 4s. 9d. to 5s. 3d.; burgy, 3s. 9d. to 4s. 3d.; and slack, 3s. to 3s. 6d. per ton.

LEEDS AND WEST YORKSHIRE.—The West Yorkshire iron trade is, at all events for the present, quite as satisfactory as it can be expected to be. Were our forges more dependent than they are on the manufacture of common iron-work, the state of the case might have to be otherwise reported of. But it is most satisfactory to know that the demand for the best Yorkshire manufactured iron has increased somewhat rather than in the least diminished since our last report. This is owing mainly to the freedom with which railway companies are replenishing their rolling stock. Orders for axles are in hand which will keep all parties busy for weeks to come. Some good work of a high class in the shape of "uses" in connection with engineering and heavy tool making has also come in. The output of boiler-plate keeps steady, but there is not that certainty about it, so far as the future is concerned, as there is in other branches. The common iron industry is not so reliable as a month since it seemed likely it would be; ironmasters not pushing for orders, even although there appears at last more likelihood of a rebound in prices. The cut-nail trade keeps buoyant, and the manufacture of horse-shoe nails as patented by Mr. Horsfall, of Armley, Leeds, having obtained a good deal of attention and recommendation recently, is promising to become an extensive branch of the trade. Messrs. John Fowler and Co., of Leeds, have had the good fortune to construct the largest colliery winding engine ever made, and it has been erected and was started a few days ago at the Harriss Deep Navigation Pits, near Cardiff. The same eminent firm are much busier than they have been for a long time past in the agricultural machinery line. There is nothing new or special to report as to either locomotive engineering or machinery in general. The coal trade appears to be dull and unprofitable.

LONDON.—The metal market here continues dull, but shows some signs of a better feeling. Pig-iron is decidedly improved, and seeing this department usually gives an incentive to others, we hope for a steady advance. Copper, firm; £55 10s. for Chili bars. Tin seems at a stand, but rather inclined to advance than otherwise. Market firm at £69: English, £74 for ingots. Lead, steady at £14 15s. for English. Tin plates: prices are so much depressed that makers do not care to book a head. Ridiculous prices are talked of, and perhaps small parcels may have been sold at them to make a market; but, generally, holders of second-hand lots are inclined to wait for better values.

NEWCASTLE AND THE TYNE DISTRICT.—A considerable feeling of depression still pervades the iron trade of this district, but only as regards the raw material. Indeed, manufacturers begin to realise that unless a favourable change soon comes about, they must take steps to reduce the make; this is at present being considered by some of them. The continued reduction of the prices in Scotland has added to the depression here; but now that the Scotch manufacturers of pig-iron are about to reduce the make, there is a feeling that demand and supply will soon be righted, and that a healthier state of trade will ensue that will be free from the ill effects of such inordinate speculation as caused the recent rapid decline in prices. There is also a strong expectation that large orders for the American market will have to come in, as the cheap rates at which steamers are bringing grain and provisions from America will necessitate return cargoes at some rate, however low; and this ground for hope is even apart from the possibility of the American duty being taken off iron and steel. Although makers show little disposition to sell or even quote, No. 3 pig-iron can be bought from merchants here at 36s. 3d. to 36s. 9d., and No. 4 forge at about the same rates, or a trifle beyond; some few makers are selling at 37s. 6d. to 38s. The rolling mills in this locality are still actively employed, and although prices are lower, there is still a good margin between the comparative reduction that has taken place in pig-iron and those realised for manufactured iron. Ship plates are sold here for £6 5s. to £6 10s. per ton, and angles at £5 7s. 6d. to £5 10s., less the usual commission; bars being £5 7s. 6d. per ton. Iron ship-building is carried on with undiminished activity, and the lower prices of iron continue to have a beneficial effect on this branch of the trade, enabling the builders to tempt shipowning firms with easy offers of new vessels. At some of the yards there is again a complaint of tardy delivery of iron; the delay is in some measure caused by the short stoppage consequent on the brief disruption between employers and employed that took place a few weeks ago. Messrs. Palmers' Iron and Shipbuilding Company have just launched a large vessel, and they have other eight on the stocks in various stages. At Messrs. C. Mitchell and Co.'s building yard, Low Walker, eight berths are occupied, the keel for a large steamer having been laid a few days ago. Messrs. J. Wigham Richardson, and Co.'s premises at Low Walker are being extended, so that the firm may build

larger vessels than they have hitherto done, and in the last dozen years or so they have turned out some splendid specimens of naval architecture. A large steamer has been launched by Messrs. A. Leslie and Co. at Hebburn, and several others are almost ready: nine building berths are occupied in their yard. At all the other shipyards there is similar activity. Forges and foundries are well supplied in work, and engine manufacturing concerns are very busy, more especially in marine engines. The coal trade of the Tyne and Wear remains quiet. Sufficient demand exists to keep the steam-coal mines in regular work, and barely that, for loading turns are in most cases immediate. The best steam-coals are selling at 8s. 9d. to 9s. 6d. per ton, and secondary sorts at 8s. to 8s. 6d., free on board, less 2½ per cent. Unscreened gas and manufacturing coals are about 1s. per ton lower than they were three months ago; they now range from 6s. to 6s. 6d. per ton. Notwithstanding the rise on the London market in the past week, which is believed to be but temporary, the market for house-coals here is extremely dull, and prices are drooping. There is a superabundant supply of small coals for manufacturing purposes, and they can be had at the staiths for 2s. 6d. to 3s. per ton—a very low price. Coke is dull, and very cheap to buy. Rather a better feeling has crept over the chemical trade since last week; prices had reached their lowest point, and now that the downward tendency has been checked, a gradual rise is looked for, stocks being very small. Soda ash, 48 to 52 per cent., is quoted at 1½d. net; soda crystals, £2 15s. 6d. net; and refined alkali, 52 per cent., 1½d., less 2½ per cent. Business in firebricks, retorts, &c., is not brisk. Messrs. Ramsay quote their bricks 50s. per thousand for export, but they offer them for the London market, according to quantity and other circumstances, at 40s. to 45s. Mr. Cochran Carr's well-known "E and M" bricks are 40s. to 42s. 6d. Copper and lead works are in fair work, in face of a decline in prices, which, however, in the case of copper, has been arrested, buyers coming more freely forward. Other articles of Tyneside manufacture need no special mention this week.

NORTH STAFFORDSHIRE.—With the exception of a slight increase in orders for the Colonies there is no change to note in the state of the finished-iron trade of this district. At home, merchants are steadily turning their backs upon contracts for forward delivery, and are merely buying from hand-to-mouth. Most of the warehouses are, however, well stocked, and as long as trade remains in the country continues quiet there will be no necessity to provide for the event of their being emptied. Quotations which are actually unremunerative, are impotent to draw orders, and nothing remains but to wait patiently for the turn in the tide, which can hardly be expected to occur for some months to come. There is no sign whatever of a revival of the American demand, and the export trade with other countries is very quiet. Some of the bar mills are employed eight turns a week, but these will probably be reduced to a par with the rest before long. Orders for plates are by no means numerous; and but little new business is doing in hoops. The pig-iron trade is decidedly flat, and prices are unsteady. No improvement in the demand for ironstone is reported, and the production is being curtailed. The supply of coal is much in excess of the consumption, and rates rule low. The colliers who have been on strike at Talke and Harecastle for about a month have submitted to the reduction of 10 per cent. against which they struck, and at other collieries a similar drop in wages has been accepted without any interruption of work.

SHEFFIELD.—The iron market is exceptionally dull, pending indications of the turn the trade will take. There is a glut of material, especially raw, and business is again suffering from over-production. We cannot gather, however, if any fresh concessions have been made, and holders are very firm in their demands. There appears to be an opinion amongst those engaged in the trade that business will again revive, and we note that agents are not pressing sales when reductions are asked for. During the recent revival one or two iron houses, which have been in a poor position for many months past, have recovered their status, and in addition booked heavy lines at rates above those of to-day. These orders will keep the mills employed for some time to come, and help to make business more steady. We notice that the ship and boiler plate rollers are yet doing a good trade at rates which must prove remunerative. The demand for a reduction of wages made on the ironworkers, on account of the decreased value of iron, has not yet been acceded to, the men here obeying the Staffordshire list, and a short time ago were preparing new scales of payment. Now that the tide has turned adversely, they are endeavouring to maintain their present position. It is feared that before long there will be the old "strike" difficulties in the trade. Standard firms continue to send out an heavy output. In the Bessemer department, rates are the same as last week, and converters decline to make any further concessions. Rates are, No. 1 Bessemer ingots, special tempers, £8 per ton, ordinary £7. Trade is slow at these rates, buyers demanding 5s. less on above. Holders are of opinion that in a week or two, when quarterly settlements are effected, prices will recover. The coal trade is, if anything, more stagnant, and agents are remitting the increases of prices made at the beginning of last month. Quotations: Best branch, 11s. 6d.; Silkestone, 9s. 6d.; seconds, 7s. 9d.; nuts, 5s. 6d.; slack, 3s. 9d. to 4s. Some of the railway companies have been buying best Silkestone at 6s. 6d. per ton on contract, but the coalmasters are uniting to prevent such a quotation being again given. Meetings amongst themselves are being held on the subject. Numbers of colliers are emigrating from this district on account of trade being so bad. The old staple trades of the town have been very dull since Whitsuntide, and there are few indications of an improvement. The Australian mails are bringing little up, but there are better accounts from the South and West African settlements. Country buyers will not come forward until the harvest prospects are more definite. Altogether the trade of the town is duller than six weeks ago.

SOUTH STAFFORDSHIRE.—The approach of the holiday season is resulting in more orders being received by the makers of trunks and bath and toilet ware, but as compared with last year not so much is being done. Tinsplating and medium stamping sheets are both reduced in price, and for common tinsplating 16s. 6d. per box is the quotation. Better qualities produced at the leading works are not to be

had below from 20s. to 21s. per box. The home trade generally is very quiet, and short time at the shops and factories is the rule. Of the foreign markets Russia is perhaps the best, but this improved demand is not the result of healthy buying, but in view of the tariff alterations. From Sydney advices are fairly satisfactory, and machinery firms have orders in hand for some time to come. The demand for general hardware is hardly so good from any of the Antipodean markets, but with India prospects are encouraging. As to the state of individual trades, the spring and axle makers, of Wednesbury, report themselves as upon the whole quiet, yet some fair foreign orders are under execution. The frying-pan makers are in want of new business, and the common tray and waiter makers are likewise less busy than they could wish; still these latter are executing United States and South American orders. The ironmasters are getting in more specifications now that June has well commenced which previously had been held over. Prices are unchanged upon last report.

WEST CUMBERLAND.—There is a very quiet demand for all descriptions of hematite pig-iron, and the movements which have lately characterised the market have not in any way tended to justify the assurance that for some time to come at least there will be any change for the better. Makers of pig-iron are very busily employed, and although at the present moment the actual business doing is comparatively small and limited to a few orders for Bessemer and forge iron, the greatest activity prevails, although a gloom overhangs the whole of the district as to what is to be the result of the rapid decline which has taken place during the past few months. It is no doubt certain that the effect of the over-production will be experienced for some time to come, for makers sold during the recent brief period of good trade almost as largely to speculators as to actual users of iron, and some of this overstock has yet to be cleared out. The market is in a peculiar state, for on the one hand makers are in a position to sell at half the price which was ruling a few months ago, and yet there is not the confidence in business circles which will justify buyers in speculating as much as otherwise they would be disposed to do. The furnaces throughout the district are in full work, with one or two trifling exceptions: but at nearly all the works notices of reduction in wages to so large an extent as 20 per cent. have been given, and this movement is giving promise to become very general, not only at iron and steel works, but at iron mines and at other works throughout the district. The shipbuilding trade is more briskly employed than it has been of late. Finished-iron workers are fairly employed, but at one of the establishments in the district the mills have been stopped owing to want of trade. The coal trade is fairly steady, considering the competition experienced in the Irish market. The coal and coke trades are, however, suffering to some extent in regard to prices.

CONTINENTAL MINING AND METALLURGY.

FRANCE.

IT is significant of the general condition of the Continental markets that the standard rate of the market of France has at last receded. For several months the Nord has been fighting the battle of the makers with equal skill and determination, it has now had to yield to the pressure of external competition. Our readers are aware that every three or four weeks the owners of mills and forges in the department of the Nord meet and discuss the dimensions of the rate to be adopted, and to hold good till their next meeting. On the 27th ult., the Nord forge-masters met as usual and decided with one accord to bring irons down from 240 fr., a rate which has been kept up since the winter, to 220 fr. (£8 14s. 6d.) "The group of the Nord," says *L'Ancore*, "the most important in France for the magnitude of its iron trade, will, thanks to the understanding which unites the forge-masters of the Sambre and the Scheldt, remain within studiously reasonable limits; there will be no more sudden elevations of rates, but there will be none of those senseless depressions of rates which have done so much harm in late years. The programme of the Nord is this: to keep the foreigner at arm's length from our markets, to make every concession necessary for thus keeping him at a distance." The internal consumption of France continues to be very large, and with the steadily increasing prosperity of the country, there is no reason why it should become smaller. The action of the Nord, which looks on itself as the guardian of the French frontier on its weakest side, is expressly directed against the competition of Belgium. The reduction of rates agreed is to be supplemented by a "bonification" made to buyers who are more sorely tempted by Belgian offers. The hope of a turn for the better taking place at the end of June has now become very weak.

At Paris this decision of the Nord forgemasters has caused great uncertainty. What with the competition of merchant with merchant, maker with maker, maker with merchant, and Belgian offers over the heads of both, buyers are bewildered, and prices have lost all steadiness. Quotations, however, do not exceed 235 fr. for merchant irons, 245 fr. for beams, and 295 fr. for plates 3 millimetres thick. Belgian offers are on the footing of 220 fr., and 230 fr. carriage and duty paid. Old iron and scrap has declined in value. Current demands, however, are well sustained, or a more rapid fall would before now have set in. Several of the Paris engineering houses have good orders from abroad and the colonies. Thus: Séraphin Brothers have a heavy lot of sugar-making machinery on colonial account; David, Desouches and Co., of Pantin, carriages for the Northern of Spain.

Forge pig warrants are quoted at 15 fr., or within 5 fr. of the duty: a decline in pig is likely to accompany and facilitate the decline in irons.

The north-eastern departments have themselves been unfavourably influenced by Belgian and German competition. In Haute-Marne, native and foreign pig are selling on the same level; coke irons fluctuate between 225 fr. 50 and 250 fr. Wire-rod, a speciality of Champagne mills, is in good demand, and prices are strengthened by the falling off in make due to the late droughts, which stopped water-

wheels in several places. Meurthe-et-Moselle is engaged on old orders, and is doing very little current business.

At Creil (Oise), according to *Le Charbon*, the works of Ponsard and Co., for making steel by the Ponsard process, have been started. So far, results have not been satisfactory.

Cleveland pig is delivered, freight paid, at 54 fr. 35 at Dunkirk, Calais, Boulogne; 55 fr. 60 at Dieppe; 62 fr. 12 at Havre; 56 fr. 85 at Caen, Saint-Malo, Bordeaux; 71 fr. 25 at Marseilles.

On the 28th ult. the Chamber of Deputies adopted the following resolution relative to imported agricultural machinery:—"Ploughs of all descriptions and machinery used only for the cultivation of the soil, for sowing, for harvesting either grains or grasses, for winnowing and cleansing corn and grain, and for preparing food for cattle, to be admitted free."

The Paris coal trade is now in its dead season. The Burnhope Colliery, Newcastle-on-Tyne, has contracted with the Western of France for the supply of some 40,000 tons of pit coal to be delivered at Dieppe at 13s. and at 15s. 10d. at Honfleur and Saint-Malo. Yeo, of Dieppe, recently contracted with the same company for 48,000 tons of patent fuel at 17s. per ton.

BELGIUM.—The iron trade appears to be losing the place it took as the herald of a general industrial revival, and is beginning to suffer from low prices and scanty orders. No. 3 English pig can be had at Antwerp at 57 fr. or 58 fr. The Athus furnaces are therefore selling their make at 55 fr., equal to 60 fr. delivered at Charleroi. The lowering of pig will relieve the mills to some extent, but coal remains dear, as it is in general demand for more prosperous industries than the iron trade, and wages have suffered no reduction. The exceptional low rate for the carriage of minettes will not be put in force this present summer, and Couillet and Monceau will each probably blow out a furnace shortly. Before a couple of months are over it is supposed that four or five furnaces will have stopped work at Charleroi. Trade with China and Japan is difficult, the markets of those countries being in a state of disorganisation. Beams are a little stronger than bars and split irons, but prices are said to be unremunerative. Forged and machine nails and Paris points are likewise dull, and speculators have ceased buying in the expectation of seeing a further fall in prices. Rates, so far as they have any fixity, at Charleroi, are:—No. 1 merchant irons, 130 fr. to 140 fr.; beams, 140 fr. to 150 fr.; plates, 165 fr. to 175 fr. Steel shows a disposition to sympathise with the weakness of iron, if we may judge by the tender made by the Cockerill works of 197 fr. (17 16s. 4d) for 4000 tons of rails for delivery at Santander. The Ougrée Ironworks are about to set up Bessemer apparatus and so add a third to the two steelworks existing in the province of Liège. The continued prosperity of the latter has stimulated the imitiveness of the directors of the Ougrée company.

Now that the State has given way to "the urgent representations of industry" in the matter of trucks, of which it has just ordered nearly 2000, "industry" has found out that the equilibrium between trucks and goods locomotives has suffered disturbances, and asks the State to restore it by ordering additional engines. That the rolling stock on Belgian lines should be properly proportioned is axiomatic; but would "industry" have preserved to them a sense of administrative symmetry if it were certain that the Belgian authorities would supply themselves with non-Belgian goods? The Savigniano Works have a contract with the Roman Railway for 200 carriages; these are to have Belgian bodies and fittings, and to be finished in Italy.

The *Semaine Industrielle*, of Liège, is surprised that the Iron and Steel Institute has "omitted from its autumn programme a visit to the Brussels Exhibition," where there is much to be seen of great interest to metallurgists. The programme in question was drawn up, not by the Institute, but by the German Iron Trade Association, who could hardly include Brussels in a German invitation—not yet, at least. Doubtless, Brussels will not be overlooked by the members of the British iron trade, who have once passed the "silver streak"; for "many shall run to and fro, and knowledge shall be increased."

M. Barella has reported to the Belgian Academy of Medicine on the researches made by Dr. Fabre, of Commeny, into diseases to which coalminers are more particularly subject. Coal absorbs oxygen rapidly, up to 100 times its own volume, thus depriving the air of a sensible proportion of oxygen, while what remains is vitiated by the gaseous carbon compounds given off by the slow combustion of the coal. Hence mines are subject to a functional anemia, which has to be combated by appropriate means whenever it presents itself. A supply of air is more essential than a supply of light, and the best ventilated collieries need to be still better ventilated. Wet in the working is also a fruitful source of ill-health; but it has no special effect on miners more than other people.

LUXEMBOURG.—The Brussels *Interests* informs us that a rope suspension railway has been opened between the blast-furnaces at Rodange and the ironstone workings a mile and a half distant. The cables are elevated on posts, and carry corves of ironstone at the rate of from 300 to 400 tons a day, with the help of four men, who fill and empty the corves.

GERMANY.—The following are given as the statistics of the exports and imports of the German empire for the first quarter of 1880 (in metric tons):—

	Exports.		Imports.	
	1880.	1879.	1880.	1879.
Pig and scrap ..	89,500	109,000	23,700	113,000
Merchant irons ..	39,150	25,500	2,370	7,600
Rails ..	57,990	31,900	2,990	3,330
Wire ..	21,680	13,620	690	990
Unclassed goods ..	54,200	—	6,100	—
Engines and boilers ..	11,340	—	4,840	—

The decrease in the imports is attributed to the action of the import duties, the rise in the exports to the general elevation of demand.

Reports from Dortmund continue to be unfavourable, nearly all descriptions of iron being weaker. The Siegen-furnaces offer good forge pig at 55s.; and the syndicate of Luxembourg and Lorraine makers have reduced their price to 56s., in spite of the long contracts they have on hand. Luxembourg and Siegen pig are thus much more nearly alike in price than they are in quality. Merchant-irons

have lost another 5s., and have come down to 145s., some Rhenish works taking 140s. Plates and wire have also lost 5s. per ton; but steel rails are able to keep up at 220s., which rate they have held for several weeks past. Hollow ware and commercial castings generally have had an artificial firmness given to them by the agreement of founders to sell at common rates. There is a German Ironfounders' Association, and at a meeting held by it at Düsseldorf at the end of May, it was resolved to maintain present price-lists until at least pig, fuel and wages have gone lower than at present they were disposed to do. It was very sensibly concluded that a lowering of prices would not stimulate consumption.

Business on the eastern side of the empire is not more brilliant than on the western. In Silesia, pig-making is at a standstill, and the mills, as a rule, are lifeless. Mills which went with the times, and sold at current rates instead of holding back in hope of better, still have orders on their books, the Laurahütte being especially favoured. But the smaller works find themselves without customers, and are putting into stock. If, during the next few months, demands do not improve, another period of forced realisations and elastic markets will come about. Industrial shares are excessively dull, even the best.

Pothoff and Golf, of Berlin, have patented a system of iron framing for carrying metallic revolving shutters. This has many advantages over wooden framing, and is worth notice as a useful extension of the uses of iron.

Dr. K. von Scherzer, Austrian Consul-General at London, accompanied the Archduke Rodolph in the tour made by the latter through the manufacturing districts of Great Britain in 1878, and has published his impressions of what he saw in a book he calls "Studien während einer Fürstenreise durch die britischen Fabrikbezirke (Stuttgart, Maier). Staffordshire made a very painful impression on him; the indisposition to work, the disorganised family life, the horrible abuse of spirituous liquors, appalled both the Archduke and his companion.

Amongst the numerous essays which accompany the catalogue of the Düsseldorf Exhibition is one on the cutlery and metal trades of Western Germany, which we take the liberty of abstracting:—

In Solingen and Lennep the manufacture of arms and tools reaches very far back. A Count Adolf, of Berg, a crusader, is said to have settled Damascene sword cutlers in Damascus in 1147, and in 1290 scythe-makers from Styria settled in Remscheid. In the 15th century Ratingen was celebrated for its helmets and armour. In the 16th and 17th centuries, there were considerable exports of arms made from Remscheid and Solingen. At the beginning of the 18th century, the wearing of arms then beginning to go out of fashion, trade fell off at Solingen; but before long the gradual introduction of the modern system of standing armies created a large business in cutting and thrusting weapons, of which Solingen had its share. Scissors-making grew into an important industry during the 18th century, and the present one has seen the adoption of a number of small trades—umbrella-fittings, porte-monnaie frames, revolvers, &c. In 1792, Solingen occupied 18,000 hands in the metal trades, including some 4000 engaged in the manufacture of arms. Remscheid, Cronenberg, and Lüttringhausen formed originally the centre of the manufacture of scythes, sickles and bar iron. A secession of the guild of makers of these implements in 1687 led to their manufacture being transplanted into the Mark district. The departed trade was succeeded by a development of tool-making—files, saws, chisels, planes, drills, &c.

The manufacture of blue scythes, which at one time was a secret confined to Styria, was begun in 1772 in Müngsten. Remscheid was, and is, the centre of the manufacture of tools and implements, which stretches from Velbert in the north, over Cronenberg, Lüttringhausen, Radevorm Wald, Halver, to Wermelskirchen in the south, and borders the Solingen area of manufacture. The value of the goods manufactured in the commune of Remscheid in 1866 was £999,500. Nearly half of these goods went abroad. Both Remscheid and Solingen are indebted in part for their prosperity to the numberless mountain mills, which are utilised in the turning of grindstones and raising of hammers. Up to the present certain manufactures were carried out exclusively by small masters, working themselves with or without help. Now things are done on a larger scale. In 1876 there were still in Remscheid 1125 little masters, with 1252 helps and 597 apprentices; there were also 255 manufacturers with 2547 hands.

In strict connection with the manufacturing industry of Berg is that of Mark, carried out in the communes of Hagen, Altena and Iserlohn. In 1661 Solingen cutlers started manufacture at Elipa, near Hagen. The Berg smiths, who seceded in 1687 from Cronenberg and Lüttringhausen settled on the Gevelsberg, the Euseperstrasse, and in Hagen. The goods they made were all heavy, but of very various kinds. Fine tools and implements came to be made principally in Berg, coarse in Mark. In the valleys of the Volme and the Leune wire-making has been carried on for ages; the fine bar-iron, known as Osemundeisen serves as the raw material. Iserlohn was celebrated in the middle ages for its armour. The privileges of the wire-drawers of Altena were confirmed in 1456. In Hagen coarse, in Altena medium, and in Iserlohn fine wire was made. With the present century trade began to take on larger proportions. The old tilt hammers were replaced by rolls, and the manufacture now comprises chains of every size up to the largest rods, nails, wire for wire brushes, &c., pins and sewing needles. Pin-making was brought in 1720 from Naumberg to Iserlohn, and in 1796 employed 200 hands—hands very literally, for each pin was hand-made. Altena, as well as Iserlohn, now makes pins. The mining of calamine at Iserlohn naturally introduced the manufacture of brass goods. The art of making brass thimbles was in 1760 brought from Utrecht to Hemer and Sundwich. The making of rings of all kinds and buttons followed, and at the beginning of the present century stamped ware began to be produced, the most various metals—iron, copper, zinc, tin, &c., being worked up in Iserlohn and its vicinity. The manufacture of bronze and cast goods, of nickel silver goods and harness fittings grew up gradually. In Lüdenscheid button making and small-ware making generally have become prosperous trades.

The metal trades have long been established in Aix-la-Chapelle (Aachen). The calamine deposits at Aix and

Stolberg became the natural foundation of the brass trade. French emigrants from Amiens founded in 1450 the first brass foundry in Aix. The trade thrived, and brass smiths are found as members of the City council in 1505. In 1614, however, the city was taken by the Spaniards under Spinola, and the Protestants were expelled. Protestant brass workers settled at Stolberg, and these manufactures took good root. In 1819 there were 50 to 60 furnaces at Stolberg melting 13,000 cwt. of brass a year. An emigrant from the Spanish Netherlands introduced the manufacture of needles into Aix in 1520; Bertscheid, Stolberg and Eschweiler sharing in it later. The wire was got from Altena and Neuremberg. In 1813 there were 3000 cwt. wire converted into needles at Aix by 2000 men. In 1804 the first pin factory was founded there, the wire coming from Stolberg. In the middle ages Aix was celebrated for its arms, but of those branches of manufacture, as of the gun and pistol trades, scarcely a trace is left, the gunsmiths were driven in 1685 by a great fire to Liège.

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 2220 to No. 2302, being the entries from June 1st, to June 7th.

NEW APPLICATIONS.

Alkali Manufacture.—C. Wigg, Liverpool.	[2259]
Apparatus for Lighting Gas.—C. L. Clarke and J. Leigh, Manchester.	[2259]
Artificial Illumination.—J. J. W. Watson, St. Marychurch, South Devon.	[2271]
Bed Bottoms.—R. Hunt, Liverpool.	[2291]
Bicycles, &c.—R. Green, Birmingham.	[2226]
Bottle Stoppers.—A communication.—F. Wirth, Frankfurt-on-the-Main, London.	[2270]
Brick Kilns.—J. P. Cramp, Finedon Iron Works, Northamptonshire.	[2282]
Candesticks.—E. Henneguin and K. Callard, London.	[2285]
Cheques.—S. Simons, London.	[2287]
Combing Machines.—A communication.—E. de Pass, Fleet Street, London.	[2234]
Compressing Air, &c.—P. Brotherhood, London.	[2300]
Decanter Stands.—J. Bejemann, London.	[2281]
Driving Bogie Axles.—J. Apsey, London.	[2280]
Drying Scotch, &c.—M. Higgins, London.	[2289]
Electric Lamp.—S. Cohn, London.	[2236]
Electric Lamps.—G. G. Andree, Dorking, and E. Easton, Westminster.	[2282]
Excavator.—J. P. Sang, London.	[2284]
Explosive Compound.—A communication.—G. W. von Natorp, Berlin.	[2230]
Explosives.—R. Punsdon, Brighton, Sussex.	[2283]
Extract of Fish.—A communication.—W. Clark, London.	[2284]
Fast Pile Fabric.—J. Mellden, J. Mellden, T. Mellden, J. Lees and J. Hardy, Oldham, Lancashire.	[2272]
Felt Manufacture.—W. Bywater, Leeds.	[2247]
Fencing.—J. Sainty, Wisbech, Cambridgeshire.	[2282]
Figured Woven Goods.—J. Kippax, Bolton-le-Moors, Lancashire.	[2268]
Filling Aerated Water.—R. Foote, Liverpool.	[2281]
Force Pumps.—A. Graf, London.	[2246]
Gas Manufacture.—W. T. Sney, London.	[2255]
Gas Manufacture.—W. W. Monk, Bournemouth.	[2290]
Gas Motor Engines.—A communication.—J. Livesey, Westminster.	[2259]
Gate Stop.—S. J. Bury, Whitstone, Middlesex.	[2273]
Gill Boxes.—G. Ingham and W. H. Ingham, Greetland, near Halifax, Yorkshire.	[2231]
Horn-Plates for Railway Vehicles.—A communication.—W. R. Lake, London.	[2302]
Increasing Gas Illumination.—M. Williams, Wigan.	[2265]
Incubating Apparatus.—M. Arnold, Acton, Middlesex.	[2280]
Inlaid Articles.—G. Hirst, Whitley, Yorkshire.	[2251]
Invalid Beds.—J. A. Daniel and R. Whiteley, Halifax.	[2276]
Ironing Machinery.—A. B. Furlong, London.	[2258]
Knives and Forks.—W. B. Darwin, Sheffield.	[2266]
Lamp Wicks.—A communication.—C. Quitmann, London.	[2228]
Lime Burning.—J. W. Rayner, G. T. Rayner and P. Evans, Liverpool.	[2288]
Linear Measures.—L. Appleton, London.	[2211]
Liquid Measuring Apparatus.—M. Graham, Dunbar, East-Lothianshire.	[2254]
Looms.—J. H. Briarley, London.	[2230]
Looms.—T. Sagar, Burnley, Lancashire.	[2293]
Looms, &c.—R. Greenwood and W. H. Hayhurst, Blackburn, Lancashire.	[2283]
Machine for Combing Horse Hair.—J. R. Meyer, Birmingham.	[2205]
Machine for Lacing, &c., Wires.—C. H. Cousins, Lincoln, Lincolnshire.	[2266]
Mach. Machines.—A communication.—J. H. Johnson, Lincoln's Inn Fields, London.	[2285]
Metallic Belts.—A communication.—J. H. A. Blackman, Vienna, Austria.	[2232]
Musical Notation.—A. Mills, London.	[2220]
Non-Fading Signs, &c.—J. Budd, London.	[2256]
Obtaining and Employing Electric Currents.—T. Slater, London.	[2272]
Oil Lamps.—T. Kennedy, Birmingham.	[2271]
Packing Joints.—J. Kirkman, Chorley, Lancashire.	[2295]
Painting on Cloth, &c.—B. de Dutkiewicz and A. B. Domshe, Paris.	[2249]
Pipe Joint.—J. Robbins, London.	[2288]
Power Looms.—J. Northrop, Shipton, Yorkshire.	[2282]
Preparing Yarn.—W. Brywater, Leeds.	[2285]
Propellers.—A. Fildes, Ulverston, Lancashire.	[2251]
Purifying Sewage.—P. Spence, Manchester.	[2217]
Railway Signalling.—E. Gilbert, Dundee, and A. B. Gilbert, Edinburgh.	[2215]
Recovering Useful Matters from Healds.—H. Booth, Manchester.	[2207]
Repairing Broken Shafts, &c.—A communication.—W. P. Thompson, London.	[2282]
Ring Spinning Frames.—T. Guest and T. Brookes, Manchester.	[2277]
Rotary Steam Engines.—A communication.—H. H. Lake, London.	[2286]
Rules.—J. T. Humphrey, Plaistow Bridge, Essex.	[2243]
Steam Regulator.—J. D. Churchill, London.	[2257]
Steam Steering Engines.—C. W. King, Manchester.	[2250]
Steel Castings.—A communication.—J. Inray, London.	[2241]
Steering Apparatus.—T. B. Heather, London.	[2298]
Stencilling.—E. D. Rogers, Finchley, Middlesex.	[2275]
Stopping Vehicles.—A communication.—J. C. Newburn, Fleet Street, London.	[2254]
Table Cutlery.—T. McGrath and C. H. Wood, Sheffield.	[2207]
Timber Cutting Machinery.—A communication.—W. R. Lake, London.	[2290]
Travelling Box and Table.—G. R. Gwyn, London.	[2237]
Velocipedes.—A communication.—H. J. Hadden, London.	[2224]
Velocipedes.—L. Hardaker, Leeds.	[2290]
Ventilating Beds.—G. O'Brien, London.	[2238]
Volute Springs.—T. Brown, Newburn, Northumberland.	[2201]
Waterclosets.—J. Hubber and F. Hubber, Exeter.	[2304]
Watering Apparatus.—J. Deverill, jun., Slough, Buckinghamshire.	[2274]
Window Sashes.—N. Welton, Whitburn, Durham.	[2214]
Wood Troughs and Spouts.—G. Baumber and A. Legon, Rochdale, Lancashire.	[2263]

ABSTRACTS OF METALLURGICAL SPECIFICATIONS

PUBLISHED DURING THE WEEK ENDING JUNE 5, 1880.

(Prepared by PHILIP M. JUSTICE, 14, Southampton Buildings, W.C.)

Preservation of Metals from Rust.—4550 (1879). *H. C. H. and others.*—For coating machinery or large articles, Russian tallow, lard, white resin, wax, castor oil, camphor, palm oil and annatto are used.

Iron and steel.—4441 (1879). *J. H. Wilson.*—Provisional only. Borax and saltpetre are placed with the metal in a crucible, cupola or furnace. For refining iron muriate of ammonia is "blown" in. **Aluminium Bronze.**—4446 (1879). *J. Webster.*—Sheet copper is preferably employed, upon which a coating of aluminium is deposited. The coated copper is then melted in a crucible with about one per cent of an alloy consisting of nickel, copper, tin and aluminium.

Heating or Melting.—4439 (1879). *J. G. Willans.*—Carbonic oxide gas mixed with hydrocarbon vapour and air are employed for the generation of heat. The carbonic oxide may be formed in the furnace or brought from a distance. The asphalt should be closed and the air admitted through pipes in regulated quantities. The hydrocarbon employed is preferably creosote, which is dropped into the fuel chamber from above.

Treating Ores and Reguluses.—4481 (1879). *M. Henderson.*—When the ores contain notable quantities of magnesia, lime, alumina, &c., they are converted into a copper regulus in the usual manner. If nickel or cobalt are present, arsenical pyrites is added for the purpose of preventing these metals from passing into the slag. The calcined ores or reguluses are crushed and mixed with the powdered bisulphate of an alkali, preferably "nitre cake" (bisulphate of soda) and subjected to a low red heat in a furnace, after which the charge is withdrawn and lixiviated, and the metals precipitated from their solutions in the usual way.

Ferro-Phosphorus.—4490 (1879). *Glaser.* Communicated by the Hoeder Bergwerks. The object is to produce an iron compound containing from a per cent upwards of phosphorus. In the basic Bessemer process this phosphoric metal is added to the charge until the iron to be blown contains from 1 to 2½ per cent of phosphorus. Iron containing little silicon is preferred, as the phosphorus acts as a combustible. To produce ferro-phosphorus in the blast furnace, ores containing a small percentage of iron and a large percentage of phosphoric acid are employed, also poor phosphates of lime and the slag resulting from the Thomas and Gilchrist process.

Copper.—4498 (1879). *J. Bevan.*—A charge of copper is melted in the furnace and desulphurised by the admission of air. The slag is skimmed off and lime and common salt is added to and mixed with the molten metal for the purpose of refining.

COMMERCIAL.

THE FRENCH TARIFF AND THE IRON TRADE.

ON Wednesday a very influential deputation from the British Iron Trade Association waited upon Earl Granville at the Foreign Office, to urge upon him the desirability of securing for the British iron trade in negotiating the treaty with France, the most favourable terms. Earl Granville was accompanied by Sir Charles Dilke and Mr. Kennedy.

Earl Granville, in reply, said: "As you are aware, this is a subject on which I am not entirely ignorant, but the fact of my being interested in it would not make me less anxious about the other trades of the country with regard to this treaty. There was one point which was mentioned by Mr. Samuelson about the treaty, which is one upon which I am rather inclined to agree with him, viz., that unless there is some amelioration as far as the iron trade is concerned it is of no great importance having a treaty at all, but that would not be a satisfactory thing to the trade of the country generally, for there are a great many interests which are affected. For instance our shipping would be deprived of the advantages they have now by the general treaty, and be left to the mercies of the general tariff which has just passed the Chambers. The general tariff has not been so adverse in one way at least. The augmentation of duties has not been so marked with regard to iron as with regard to some other branches of trade, but that may be explained by what Mr. Samuelson has said, because the iron trade was not certainly very fairly treated in the original treaty. Sir Charles Dilke is very much more able to deal with the question, for he has been in active communication with the negotiators, and we have arrived at the preliminary stage, which is a satisfactory step, with the French Government, and Sir Charles is much more able to say than I am whether there is a likelihood of our interest being considered, and I am rather inclined to think that they will be fairly considered. (Sir Charles Dilke nodded assent). I do not mean to say that we will get as much as we can wish and desire, but the French Government certainly would endeavour to meet us in this matter. I have already spoken on the general subject to a previous deputation, and my observations have been reported in the public papers. With regard to the wine duties, I think that if we can find anything by looking at it from a general aspect, and not to benefit any particular country, we may find ourselves in a position to make an alteration in that way. I am not aware that I can give any information to the deputation; but if there is any, I should be glad to answer questions you may put to me.

Mr. Samuelson, who had introduced the deputation, in thanking his lordship, said that when the time came for descending into the details, the board of management of the iron trade would be glad to render any assistance which the Foreign Office were disposed to accept.

NEW COMPANIES.

ASTURIAN MANGANESE MINING COMPANY, LIMITED.—Registered 25th ult., with a capital of £4000 in £5 shares, to acquire manganese mines, situated in the province of Oviedo or elsewhere in Spain.

BREADMONT COMPRESSED AIR LOCOMOTIVE COMPANY, LIMITED.—Upon terms of an agreement of the 20th ult., this company proposes to acquire and work the English, foreign and colonial patents granted to Colonel Frederick Edward Blackett Breadmont for improvements in motor engines worked by compressed air or elastic fluid under high pressure. It was registered 25th ult., with a capital of £300,000 in £10 shares. The purchase consideration is £100,000 in cash, and the allotment of one-fourth of the total number of ordinary shares issued by the company, such shares to be credited as fully paid.

CALEDONIAN STEAMSHIP COMPANY, LIMITED.—This company was registered 25th ult., with a capital of £100,000 in £25 shares, to carry on the business of shipowners in all branches.

CULM DAVEY BRICK AND TILE COMPANY, LIMITED.—Registered 25th ult., with a capital of £15,000 in £25 shares, to carry on the ordinary brick and tile company.

GREEN HURTH LEAD MINING COMPANY, LIMITED.—This is a re-construction of a company of same name which was incorporated on the 27th of July, 1874, and is now in course of voluntary winding up. The object of the company is mining in the county of Durham and elsewhere. It was registered 25th ult., with a capital of £2400 in £1 shares.

LATEST STOCK EXCHANGE PRICES.

BRITISH MINES.

Authorised Issue.	When x d or x in.	Div.	NAME.	Paid.	Closing quotations, Thursday night.	Business done, Thursday.
12,000	5	nil.	Ashton, Limited	all	8—12	
10,250	5	27 Feb.	Devon Great Consols, Limited	1	8—9 pm	
6,144	2	16 Oct. 72	East Caradon, Liskeard	3.11.6	14—15	
1,000	—	30 Oct. 74	East Lovell, Helston	4.0.0	17—18	
12,000	—	15 April	Great Laxey, Limited	all	17—18	
18,000	1	30 Nov. 75	Hingham Downs Consols, Limited	9	18—19	
9,000	—	14 Jan. 70	Marka Valley, Liskeard	22.9	18—19	
40,000	4	27 Feb.	Mynydd Iron Ore, Limited	3	2—12 dis	
2,800	—	—	Prince of Wales, Calstock	—	—	
512	—	15 April	South Caradon, Liskeard	14	80—100	
6,143	—	29 April	South Condarrow, Camborne	6.5.6	9—10	
4,500	—	1 April	South Wheal Frances, Redruth	7.12.4	14—16	
12,000	6	20 Dec. 76	Tankerville, Limited	all	3—4	
6,000	—	14 June 77	Tin Croft, Redruth	10	13—15	
15,000	4	15 Jan.	Van, Limited	all	17—19	
6,000	—	—	West Hassett, Redruth	6.10.0	15—17	
3,700	—	14 Feb. 78	West Chiverton, Porranabuloe	16	17—20	
900	—	—	West Seton, Camborne	55.15.0	17—20	
512	—	—	Wheal Bassett, Redruth	6	3—4	
5,179	—	—	Wheal Grenville, Camborne	15.12.0	7—8	

COLONIAL AND FOREIGN MINES.

15,000	2	1 April	1/	Alamillos, Limited	all	1—14	
60,000	1	17 May 76	1/	Almada & Tirato Consolidated Silver Mining Limited	all	1—14	
70,000	—	—	—	Argentine, Limited	all	—	
12,000	5	—	nil.	Australian, Limited	7	14—15	
20,000	20	31 July 78	2/	Australian United Gold, Limited	all	—	
20,000	25	—	nil.	Bilbao Iron Ore, Limited	all	15—20	
10,000	50	—	—	Cape Copper, Limited	7	38—40	
20,000	4	17 March	17/6	Chicago Silver, Limited	all	—	
13,350	10	30 Nov. 76	nil.	Chontales Consolidated, Limited	all	1.16—3.16	
61,000	2	12 Feb. 75	4/	Colorado United Mining, Limited	all	17—24	
10,000	5	3 May 77	3/	Copians Limited	all	17—18	
92,045	2	12 April 72	1/	Don Pedro, North del Rey, Limited	all	6—7	
27,528	1	17 Jan. 77	nil.	Eberhard and Aurora, Limited	all	3—3	
100,000	10	—	nil.	Eschequer Gold and Silver Mining, Lim.	all	1—1	
10,000	1	31 July 73	5/	Flagstaff, Limited	all	1—14	1.1.16.3.16.1
25,000	10	1 April	5/	Fortuna, Limited	all	4—5	
55,000	2	13 Feb. 79	1/	Frontino and Bolivia Gold, Limited	all	3—3	
27,400	2	15 May	4/	General Mining Association, Limited	all	3—4	
100,000	8	—	nil.	I. X. L. Gold and Silver Mining, Limited	all	—	
15,000	3	1 April	8/	Linares, Limited	all	5—6	
105,000	1	15 July 75	1/	London and California, Limited	all	—	
7,027	2	12 April 72	—	Lusitanian, Limited	all	—	
60,000	5	—	nil.	New Quebrada, Limited	all	3—4	
20,000	5	—	nil.	New Zealand Kapanaga Gold, Limited	all	—	
20,000	5	—	nil.	Nouveau Monde Gold Mining	all	1—1	
20,000	1	—	nil.	Panulillo Copper, Limited	all	3—4	1.5.16.4.5.16.3.16.4
80,000	4	—	nil.	Pestarena United Gold, Limited	all	—	
10,000	3	15 Dec.	10/9	Pontgibaud Silver Lead Mining & Smelting	all	10—21	
100,000	20	13 Feb.	1/4	Port Philip, Limited	all	8—8	
54,000	2	—	7/0	Richmond Consolidated Mining Company, Limited	all	14—15	14 1/2
1,854,800	100	2 Jan.	5 p.c.	Rio Tinto, Lim. 5 p. et. Mort. Deb. (Spanish Coupon Bonds)	all	94—96	
225,000	10	27 April	10	Do. Shares	all	107—11	
100,000	10	—	nil.	Rosa Grande, Limited	all	1.10—3.16	
25,370	10	—	1/6	Ruby and Dunderberg Consol. Min. Lim.	all	—	7.7 1/2
120,000	1	28 Nov.	1/6	Scottish Australian, Limited	all	1—2	
80,000	1	—	1/9	Do. New	all	—	pm
121,500	2	15 April	1/	Sierra Buttes Gold Mining, Limited	all	1—1	1.7.16
140,625	2	—	3/	Do. Plumas Eureka, 1872	all	2—2	
50,000	2	—	—	S. E. Wynad Estates and Gold Mining, Lim	all	1—1	
100,000	1	—	—	South Indian Gold Mining, Limited	all	1—1	1 1/2 12 1/2
251,000	Stock.	31 Dec.	25 p.c.	St. John del Rey, Limited	all	210—220	
68,230	10	27 June	23/	Tharsis Sulphur and Copper, Lim.	all	225—305	
31,000	10	—	23/	Do.	all	7	
41,174	—	—	nil.	United Mexican, Limited	29.5.84	2—2 1/2	dis
10,000	10	16 Dec.	1/6	Vancouver Coal, Limited	all	6—6	
71,000	1	—	nil.	York Peninsula, Limited	all	—	
40,000	1	13 July	—	Do. Preference	all	—	

COAL, COPPER, IRON, &c., COMPANIES.

6,331	100	1 April	£5	Bolckow Vaughan, Limited "A"	all	120—130	
18,000	100	—	2.17.1	Do. "A"	all	1—20 pm	
27,000	100	30 March 76	nil.	Chillington Iron, Limited	all	4—5	
11,000	20	12 March 74	21	Darlington Iron Company, Limited	15	—	
71,475	23	30 Dec. 74	20/	Ebbw Vale Steel, Iron & Coal, Limited	20	18—21 dis	8.8.4 1/2
70,000	1	27 Feb.	1/	English and Australian Copper, Limited	20	18—18	
20,000	10	20 Jan. 75	nil.	Huntington Copper and Sulphur, Lim.	92	—	
2,000,000	100	3 May	6 p.c.	Lehigh & Wilkes Barre Coal & Mort. 6 p.c. Sterl. guar. by Cent. Rail Co. of N. J.	all	91—100	
10,000	70	—	nil.	Lydney and Wiggpool Iron Ore, Limited	5 1/2	8—10 dis	
22,000	10	1 April	—	Muntz's Metal, Limited	53	—	
5,000	100	—	nil.	Nantyglo & Blaenau Iron Works "Pref"	all	22—27	
50,000	3	31 July 77	2 1/2 p.c.	Limited	all	13—18 dis	
20	—	—	nil.	Nerburda Coal and Iron, Limited	17	18—20	
15,000	10	—	—	New British Iron	all	—	
12,000	20	28 Aug. 74	nil.	Newport Abercrom Black Vein Steam Coal, Limited	all	6—7	
12,000	20	30 June 75	nil.	New Sharncliffe Collieries, Lim. Pref.	all	30—40	dis
30,000	50	12 March 75	nil.	Pelsall Coal and Iron, Limited	17 1/2	—	
10,000	15	—	nil.	Rhymney Iron, Limited	all	20—22	
10,330	100	—	—	Do. New	all	6—7	
22,000	25	15 Dec.	12/	Do. 7 p.c. Deb., Regist. 1890	all	—	
				Do. 7 p.c. to Bearer, 1890	all	—	
				West Cumberland Iron and Steel, Lim.	20	6—7 dis	

HULL MUTUAL ASSOCIATION FOR THE INSURANCE OF IRON STEAM-SHIPS, LIMITED.—This company was registered 25th ult. for the purpose of insuring vessels belonging to members against every description of sea risks. Every member undertakes to contribute to the assets of the company in the event of winding up any sum that may be required not exceeding £10 for each vessel insured by him.

MANA GOLD COMPANY.—This company was registered 26th ult., with a capital of £200,000 in £1 shares, to acquire a concession granted by the governor of the Colony of French Guiana, in South America, for mining rights over land in the district of Mana, on the left bank of the river of that name in French Guiana, and known as Placer Pas-tup-tot. An unregistered agreement of 20th of March is to be adopted by the company.

MONARCH AND CHALK GREEK MINING COMPANY, LIMITED.—Upon terms of an unregistered agreement of 14th ult. between Henry Halmann, of Hortense, Colorado, and Felix Francis Wilson, this company proposes to acquire mineral property situated in Colorado, United States of America. The company was incorporated 25th ult., with a capital of £200,000 in £1 shares.

SOUTH GANSTON DOCK AND WAREHOUSE COMPANY, LIMITED.—Registered 27th ult., with a capital of £30,000 in £10 shares, to purchase the South Ganston Dock and other property in the county of Lancashire, and to carry on the business of warehousemen, wharfingers, merchants, and brokers.

TEST VALLEY IRONWORKS, LIMITED.—Upon terms of an agreement of 8th ult., this company proposes to purchase the property and effects of Albert Zillwood, of the Test Valley Ironworks, Ramsey, Hants. It was registered 28th ult., with a capital of £10,000 in £10 shares. The purchase consideration is £500.

VALPARAISO DRAINAGE COMPANY, LIMITED.—This company proposes to acquire from Don Juan C. Vera the rights and benefits granted to him by the municipality of Valparaiso by concessions dated respectively 16th September, 1876, and 7th of October, 1878, empowering him to construct drains and other works for the extraction of waste water and sewerage matter from private houses and public buildings in the city of Valparaiso, and to utilise the sewerage so extracted. It was registered 31st ult., with a capital of £50,000, divided into 3330 ordinary, and 1670 deferred shares of £15 each. The ordinary shares are entitled to share in profits in priority to deferred shares up to £6000 per annum; out of the remaining net

annual profits, the deferred shares are to receive a dividend equal to £15 14s. per cent.

VANA MURRINA COMPANY, LIMITED.—Under an agreement of 15th ult. (unregistered), this company proposes to acquire the business of Murrina and other glass manufacturers carried on by the Aurora Glass Company, Limited, and the English and foreign patents connected with the company's manufacturing processes. The company was registered 31st ult., with a capital of £150,000 in £1 shares.

WOTHERTON BARTLES AND LEAD MINING COMPANY, LIMITED.—Incorporated 31st ult. with a capital of £13,000 in £10 shares, to purchase and work mining property upon terms of an unregistered agreement.

PARTNERSHIPS DISSOLVED.

Reynolds and Place, Idle, Yorkshire, iron-workers.—Green and Cowell, Kidderminster, coal merchants.—J. Aspinall, J. Bennett, T. M. Yates, and J. Parker, Rochdale and Bury, coal merchants.—Howley Park Coal Company, Morley, Yorkshire, coal masters.—Hope and Todhunter, Workington, Cumberland, slate merchants.—Day, Brown, and Quail, Cambridge Road, London, E., coal merchants.—Woodall and Co., Dudley, fire-iron manufacturers.—Miles and Evans, Southampton, coal merchants.—Brady and Co., Alfred Terrace, Holloway, and Midland Railway Station, Upper Holloway, coal merchants.—J. Hollingworth and Co., Saddleworth, Yorkshire, wheelwrights; as far as regards J. Hollingworth.—Maberley and Co. Sautoy, Exeter Hall, Strand, civil engineers.—J. Grainger and Son, Birmingham, pencil-case manufacturers.—C. Tennant and Co., St. Killox, Glasgow, chemical manufacturers; as far as regards W. Galbraith.—Dramfield and Holme, Liverpool, Pontefract, Royd Moor, near Hemsworth, and various other places, dock and railway contractors.—Pollock and Pollock, Leeds, mechanical engineers.—Town and Pilling, Colne, Lancashire, iron-founders.—R. Houghton, A. W. Cleworth, and J. Cleworth, West-houghton, Lancashire, engineers.—Wortley Fire Clay Company, Leeds, coal proprietors; as far as regards H. Kitson.—J. W. Dore and Co., Middlesbrough, iron-merchants.—Jagger and Turner, Birmingham, manufacturing jewellers.—Lyon and Co., Bishopsgate, street, Within, City, coal merchants.

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

[FOR THE PRESENT AND PAST WEEK.]

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

(June 10, 1880.)

METALS AND ORES.			
	JUNE 3.	JUNE 10.	
COPPER (per ton)—			
Chili, for 90 per cent.	50 0/	50 5/	
Wallaroo	71 0/	70 0/	
Burra Burra	70 0/	70 0/	
English Tough	60 0/	62 0/	62 0/
English Ingot, best.	62 0/	63 0/	63 0/
Sheets sheathing and rod	66 0/	67 0/	67 0/
Bottoms	78 0/	78 0/	
Ore per unit	0 11/8	0 11/2	
PHOSPHOR BRONZE			
Special Bearing Metal (p in)	112 0/	112 0/	
Other alloys (per ton)	120 0/	135 0/	135 0/
TIN (per ton)—			
Strait (Cash)	68 10/	69 0/	
Do. for art.	—	—	
Biliton	—	—	
Banca	—	—	
English Ingots	77 0/	74 0/	
Do. Bars	78 0/	70 0/	
Do. Refined	83 0/	77 0/	
Australian	68 10/	60 0/	
TIN PLATES, per box, I.C.			
Do. L.O.B. London	0 16/	0 19/	0 19/
IX. do.	0 21/	0 21/	0 24/
I.C. charcoal	0 21/	0 20/	0 20/
I.X.	0 27/	0 32/	0 32/
LEAD (per ton)—			
Soft English pig	14 10/	15 0/	14 10/
Do. W.B.	—	—	
Spanish soft	14 10/	—	14 10/
Do. with silver	—	—	
Sheet milled	16 0/	—	16 0/
Red lead	17 10/	—	17 10/
White	22 0/	—	22 0/
Patent shot	19 0/	—	19 0/
ZINC (per ton)—from No. 9 Gauge.			
Sheets, rolled	23 0/	—	22 0/
Do. foreign	23 10/	—	23 10/
SELENIUM (per ton)—			
Selenian, com.	19 5/	—	18 5/
Rhenish	—	—	
English	—	—	
QUICKSILVER, bot.	6 7/6	—	6 7/6
ANTIMONY (per ton)—			
Australian	31 10/	34 10/	31 10/
Spanish	—	—	34 10/
French Star	69 0/	—	69 0/
REGULUS—			
Crude (per cwt.)	1 14/	—	1 14/
NICKEL (per lb.)—	0 3/6	—	0 3/6
BRASS (per lb.)—			
Sheets, 48x24.	0 0/8	—	0 0/8
Tubes	0 0/11	0 1/	0 0/11
Wire	0 0/8 1/2	—	0 0/8 1/2
Yellow metal	0 0/6	0 0/6	0 0/6
ASBESTOS (per lb.)—	0 0/3	0 0/3	0 0/3
PLUMBAGO (per ton)—			
Ceylon lump	0 17/6	—	0 17/5
Do. chip	0 10/6	—	0 10/6
Do. dust	8 6/	—	8 6/
COALS (per ton)—			
East Hartlepool	1 2/	—	1 2/
Lambton	1 4/	—	1 4/
Tees	1 4/	—	1 4/
Hartley	1 2/	—	1 2/
Hetton	1 4/	—	1 4/
Hawthorn	1 2/	—	1 2/
Tunstall	1 2/	—	1 2/

OILS, CHEMICALS, &c.

	JUNE 3.	JUNE 10.	
OILS (per ton)—			
Olive, Malaga	44 10/	—	44 10/
Do. Gioja	44 0/	43 0/	43 0/
Do. Levant	44 0/	43 0/	43 0/
Do. Mogador	—	—	
Do. Tunis	—	—	
Do. Seville	44 16/	45 0/	44 10/
Do. Sicily	43 0/	40 0/	40 0/
Seal, pale	29 0/	—	29 0/
Seal, yellow	27 0/	—	27 0/
Seal, brown	25 0/	—	25 0/
Sperm head	70 0/	—	70 0/
Cod	26 0/	26 10/	26 0/
Whale, pale	26 10/	—	26 10/
Do. yellow	25 10/	—	25 10/
Do. brown	20 0/	—	20 0/
E.I. Fish	—	—	
Rapeseed, English, pale	29 15/	30 0/	29 15/
Do. brown	26 15/	26 17/6	27 15/
Foreign Pale	—	—	
Ground nut and Gingelly			
Madras	30 10/	31 0/	30 10/
Palm oil, fine	31 0/	—	31 0/
Palm nut oil	32 10/	—	32 10/
Linseed oil	27 0/	27 2/6	26 15/
Cotton seed oil	25 10/	—	25 10/
Lard	40 0/	41 0/	41 0/
Cocunut, Cochin	35 0/	36 10/	35 0/
Do. Ceylon	32 5/	34 0/	32 5/
Mauritius	37 10/	—	37 10/
C. Price & Co.'s patent	0 3/6	—	0 3/6
Oil CARE (per ton)—			
Linseed, Ldn.	10 0/	10 10/	10 0/
American bls.	10 0/	10 10/	10 0/
Do. bags	9 2/6	9 5/	9 2/6
Marseilles	9 5/	—	9 5/
Rape, English	5 0/	—	5 0/
Do. Foreign	—	—	
Green Cotton	6 0/5	—	6 0/5
TALLOW—F.C.	41 0/	42 0/	41 0/
S.American Beef	34 10/	35 0/	34 10/
Do. Sheep	32 10/	33 0/	32 10/
Australian Beef	30 10/	33 0/	30 10/
Do. Sheep	31 10/	—	31 10/
Rough Town Fat	24 0/	—	24 0/
PETROLEUM—			
Fine (per gal.)	0 0/5 1/2	—	0 0/5 1/2
Do. spirit	0 0/6	0 0/7 1/2	0 0/6
TURPENTINE—Spirit—			
French	—	—	
American (Crude)	1 15/	—	1 15/
WHALE OIL (per ton)—			
Arctic	1000 0/	—	1000 0/
Southern	500 0/	—	500 0/
BRIMSTONE (per ton)—			
Rough, 24s Ind.	7 0/	—	7 0/
Do. Jds. do	7 6/	—	7 6/
Roll	8 15/	—	8 15/
SULPHUR, Flour (per cwt.)	0 10/0	0 12/6	0 10/0
Acid, (per lb.)			
Acetic, fine	0 0/4	—	0 0/4
Do. common (per gal.)	0 1/5	0 1/6	0 1/5
Chloric	0 2/5	—	0 2/5
Muriatic (per cwt.)	0 4/	0 6/	0 4/
Do. common	0 4/	0 5/	0 4/
Nitric	0 0/4 1/2	—	0 0/4 1/2

	JUNE 3.	JUNE 10.	
ORALIC (per lb.)	0 0/4 1/2	—	0 0/4 1/2
Sulphuric, concentrated	0 0/1	—	0 0/1
Do. Brown	0 0/6 1/2	0 0/1	0 0/6 1/2
Tartaric Crystal	0 1 1/8	—	0 1 1/8
Do. Fulv.	0 1 1/8	—	0 1 1/8
AMMONIA—			
Carbonate, per lb.	0 0/6 1/2	0 0/6 1/2	0 0/6 1/2
Sulphate, White & grey (per ton)	0 18/	0 18/6	0 17/5
ARSENIC—White Lump (per ton)	24 0/	—	23 10/
Powdered, do.	10 15/	—	6 10/
Bleaching powder	0 6/6	—	0 6/6
BORAX, Rfd., do.	2 15/	3 0/	2 15/
COPPERAS (ton)	2 10/	—	2 10/
BI-SULPHIDE CARBON (per ton)	24 10/	26 0/	24 10/
PORTLAND CEMENT—			
1st quality, in cks 400 lb. gross, inc. cks., f.o.b.	0 9/	—	0 9/
Do. in cks, 200 lb. net (per ton)	2 0/	—	2 0/
Sacks extra, x/6 each.	—	—	
Charlton White Paint (per cwt.)	1 12/	—	1 12/
Calley's Torbay Paint, Brown	0 30/	—	0 30/
Do. Red	0 34/	—	0 34/
HYPOPHOSPHITES (per lb.)—			
Iron	0 0/3	0 10/	0 0/3
Time	0 5/3	0 7/	0 5/3
Magnesia	0 0/	0 0/	0 0/
Manganese	0 0/	0 0/	0 0/
Soda	0 5/3	0 6/	0 5/3
LEAD (per cwt.)—			
Acetate, best	1 19/	2 0/	1 19/
Nitrate	1 15/	—	1 15/
Red (per cwt.)	0 16/6	—	0 16/6
White	1 4/	—	1 4/
LITHARGE (per cwt.)	0 18/	—	0 18/
LIME (per ton)—			
Acetate, Grey, 85 %	21 0/	—	21 0/
Do. Brown 70 %	14 0/	—	14 0/
POTASH—			
Chlorate (lb.)	0 0/6	—	0 0/6
Muriate, 80 % ton	6 15/	—	6 15/
Pruss. Red (lb.)	0 1/11	—	0 1/11
Do. Yel. lb.	0 0/11	0 0/11 1/2	0 0/11
Sulphate, 80 % (per ton)	14 0/	16 0/	9 10/
SALTPETRE (per cwt.)—			
Engl. refnd. kgs.	1 7/	—	1 7/
Do. barrels	1 7/	—	1 7/
Do. Bengal	0 19/6	1 1/6	0 19/6
SODA—			
Ash, ————	0 0/1 15-16	0 2/	0 0/1 15-16
Bicarb. (per cwt.)	0 10/9	—	0 10/9
Caustic, 60 % to 72 %	0 10/	0 12/	0 10/
Nitrate (per ton)	14 0/	14 5/	14 0/
Crystals (per ton)	3 5/	—	3 0/3

* Per ton extra in London, Staffordshire, 15s.; Scotch, 10s.; Lancashire, 15s.; Welsh, 10s.

LONDON PRICE LIST OF IRON.

[FOR THE PRESENT AND PAST WEEK.]

(June 10, 1880.)

	JUNE 3.	JUNE 10.	
IRON, per ton			
(at works)—			
Bars, Welsh, common	5 15/	—	5 15/
Do. Best	6 5/	—	6 5/
Scotch, Common	6 10/	7 0/	6 10/
Do. Best	7 10/	8 0/	7 10/
South Stafford, common	7 5/	—	7 5/
Do. Best	8 0/	—	8 0/
Sheets, singles, Cleveland	9 10/	—	9 10/
Staffordshire	10 10/	—	10 10/
Do. doubles, Staffordshire	12 0/	—	12 0/
Do. Lattens, Staffordshire	13 10/	—	13 10/
Plates, Ship, Stafford	9 10/	—	9 10/
Do. Scotch	8 10/	—	8 10/
Do. Boiler, Stafford	7 10/	—	7 10/
Hoops, Stafford	7 10/	—	7 10/
Nail Rods, Stafford	8 0/	—	8 0/
Swedish in Lond.	12 0/	—	12 0/
Angle Iron, Welsh	—	—	
Do. Stafford	8 0/	—	8 0/
Pud. Bars, Welsh	—	—	
Do. Stafford	5 10/	—	5 10/
Do. Scotch	—	—	
Rails, Welsh	6 0/	—	6 0/
Do. Stafford	7 10/	—	7 10/
North England	6 0/	—	6 0/
Light Rails, Welsh	7 0/	—	7 0/
Do. Stafford	8 0/	—	8 0/
Pig Iron at Glasgow			
Scotch warrants	2 5/6	—	2 5/6
Do. No. 1	2 10/	2 15/	2 10/
Indian Charcoal, London	1 17/6	—	1 17/6
Wrought Iron Girders (riveted up)	18 0/	24 0/	18 0/
Bolts and Nuts	16 0/	21 0/	16 0/
Fish Bolts	16 0/	23 0/	16 0/
Washers	17 10/	10/	17 10/
Rivets	15 0/	18 0/	15 0/
Spikes	16 0/	19 10/	16 0/
SWEDISH IRON—			
f.o.b. Gotteburg, nett cash.			
Pig	11 0/	12 0/	11 0/
Bar, rolled	11 10/	12 10/	11 10/
Do. hammered	11 10/	12 10/	11 10/
Billets	11 10/	—	11 10/
Horse Nail Rods	—	—	
BELGIAN IRON—			
f.o.b. Antwerp, less 2 1/2 per cent.	6 10/	—	6 0/
Bars and Silt Rods, common			
Best	—	—	
Best Best	—	—	
Hammered	—	—	
Puddled Steel	—	—	
Bessemer	—	—	
Hoops	—	—	
Rails	—	—	
Roll Girders	—	—	
STEEL—			
Best cast	40 0/	65 0/	40 0/
Do. dbl. shear	45 0/	50 0/	45 0/
Do. single do.	35 0/	40 0/	35 0/
English spring med. quality	35 0/	40 0/	35 0/
Blister	30 0/	32 0/	30 0/
Swedish keg	30 0/	32 0/	30 0/
Milan	20 0/	21 0/	20 0/
Bessemer rails	7 0/	8 0/	7 0/
SCRAP (per ton)—			
Old rails for remanufacture, D.H.	3 5/	3 12/6	3 5/
Ditto flange or bridge	3 2/6	3 10/	3 2/6
Engineers scrap	3 5/	3 10/	3 5/
Light scrap	2 0/	2 5/	2 0/
Scrap metal	1 10/	2 10/	1 10/
Old steel scrap	3 18/	4 0/	3 18/

WIRE—		£ s.	£ s.	£ s.	£ s.
Best best drawn killed					
gal. tel., Nos. 0 to 5	.....	16 10/	—	16 10/	—
Do. 7 & 8	.....	17 0/	—	17 0/	—
Do. 9	.....	18 0/	—	18 0/	—
Do. 10	.....	18 10/	—	18 10/	—
Do. 11	.....	19 0/	—	19 0/	—
Do. 12	.....	19 10/	—	19 10/	—
Rolled black fencing wire					
(per ton) 1 to 4	.....	11 10/	—	11 10/	—
Do. 5	.....	12 0/	—	12 0/	—
Do. 6	.....	12 10/	—	12 10/	—
Do. 7	.....	13 0/	—	13 0/	—
Bright Iron Wire (Charcoal wire, 4s. 6d. per bundle extra) per bundle					
of 63 lb. 0 to 6	.....	0 12 6	—	0 12 6	—
Do. 7 to 8	.....	0 13 6	0 14/	0 13 6	0 14/
Galvanised, 80s. per ton extra.					
Best best annealed drawn fencing wire, per ton					
0 to 6	.....	16 10/	—	16 10/	—
Do. 7	.....	17 0/	—	17 0/	—
Do. 8	.....	17 6/	—	17 6/	—
CASTINGS (per ton) at works—					
Girders	.....	6 10/	7 10/	6 10/	7 10/
Chairs	.....	4 10/	5 0/	4 10/	5 0/
Floor plates	.....	5 12 6	—	5 12 6	—
Pipes, 1 1/2 to 2 in.	.....	6 12 6	7 0/	6 12 6	7 0/
Do. 3 to 4	.....	6 2 6	6 5/	6 2 6	6 5/
Do. 5 to 8	.....	6 1/6	6 4/	6 1/6	6 4/
Do. 10 to 12	.....	6 0/	6 2 6	6 0/	6 2 6
Do. 18	.....	5 17 6	6 0/	5 17 6	6 0/
Bolts and Nuts		17 10/	20 0/	17 10/	20 0/
Fish Bolts	.....	18 10/	21 0/	18 10/	21 0/
Spikes	.....	17 10/	21 10/	17 10/	21 10/
Rivets	.....	14 10/	21 0/	14 10/	21 0/
Washers	.....	19 10/	21 10/	19 10/	21 10/

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 May, 1879, as compared with that of 1880. Also the exports for the month of May 1880.

ARTICLES, AND TO WHAT COUNTRIES EXPORTED.	May, 1879.	May, 1880.	5 months, 1879.	5 months, 1880.
IRON—Pig.				
To Russia	18,116	13,259	17,725	17,725
Germany	45,813	26,601	81,107	81,107
Holland	41,210	14,970	67,265	67,265
Belgium	10,171	10,111	60,814	60,814
France	7,359	6,524	40,310	40,310
United States	5,305	73,731	44,005	44,005
British N. America	1,680	8,571	31,171	31,171
Other countries	17,819	13,529	48,265	48,265
Total	147,815	166,381	797,725	797,725
BAR, ANGLE, BOLT AND ROD.				
To Russia	470	769	2,426	2,426
Germany	444	216	1,056	1,056
Holland	252	300	1,777	1,777
France	12	30	118	118
Italy	1,114	510	4,487	4,487
Turkey	1,581	108	2,860	2,860
United States	184	6,566	30,029	30,029
British N. America	2,009	4,397	17,813	17,813
India	3,002	2,195	10,954	10,954
Australia	1,130	2,447	12,268	12,268
Other countries	7,801	5,480	47,439	47,439
Total	19,501	21,054	142,617	142,617
RAILROAD, OF ALL SORTS.				
To Russia	8,150	92	327	327
Sweden & Norway	1,053	340	874	874
Denmark	1	1	42	42
Germany	681	49	40	40
Holland	1,054	504	1,520	1,520
Spain and Canaries	1,214	174	4,131	4,131
Italy	4,180	3,344	7,138	7,138
Turkey	—	—	4	4
Egypt	—	320	3,582	3,582
United States	1,720	29,439	93,873	93,873
Brazil	3,490	1,815	9,904	9,904
Peru	542	220	687	687
Chili	11	40	405	405
British N. America	9,001	5,215	17,742	17,742
India	1,047	300	3,424	3,424
United States	8,261	7,592	60,974	60,974
Australia	7,074	8,202	19,841	19,841
Other countries	2,194	3,036	24,263	24,263
Total	49,831	60,802	259,022	259,022
WIRE OF IRON OR STEEL (except Telegraph Wire).				
To Russia	3,078	3,043	25,731	25,731
HOOPS, SHEETS, & PLATES.				
To Russia	1,205	1,124	4,216	4,216
Germany	802	510	2,865	2,865
Holland	1,112	708	3,545	3,545
France	176	365	1,138	1,138
Spain and Canaries	412	491	2,467	2,467
Italy	713	797	4,564	4,564
United States	323	6,992	20,698	20,698
British N. America	661	1,394	4,539	4,539
India	3,288	1,204	11,718	11,718
Australia	2,986	3,178	18,077	18,077
Other countries	5,718	4,647	28,944	28,944
Total	17,836	22,220	100,111	100,111
TIN PLATES.				
To France	553	207	1,315	1,315
United States	11,775	13,804	71,134	71,134
British N. America	598	1,111	3,680	3,680
Australia	232	330	1,184	1,184
Other countries	3,374	2,046	8,425	8,425
Total	16,532	17,588	85,744	85,744
CAST OR WROUGHT IRON (except Ordnance).				
To Russia	1,285	943	3,104	3,104
Germany	999	504	2,850	2,850
Holland	1,472	384	2,952	2,952
France	376	516	2,515	2,515
Spain and Canaries	1,077	667	2,920	2,920
United States	217	710	3,488	3,488
Peru	235	34	267	267
Brazil	7,445	983	8,294	8,294
British N. America	744	1,722	5,711	5,711
India	1,090	1,141	6,043	6,043
Australia	1,726	4,207	24,592	24,592
Other countries	8,604	5,428	22,017	22,017
Total	27,627	24,631	105,916	105,916
OLD IRON (for re-manufacture).				
To United States	3,260	28,755	167,226	167,226
Other countries	3,600	3,918	12,034	12,034
Total	6,860	32,673	179,260	179,260
STEEL, UNWROUGHT.				
To France	949	253	2,514	2,514
United States	450	5,838	24,500	24,500
Other countries	1,730	1,918	8,480	8,480
Total	2,129	7,009	35,494	35,494
MANUFACTURES OF STEEL.				
Total of Iron & Steel.	291,911	310,603	1,713,330	1,713,330
HARDWARE AND CUTLERY.				
To Russia	8,120	7,814	30,621	30,621
Germany	17,220	16,818	71,535	71,535
Holland	5,801	5,812	3,750	3,750
France	10,876	12,189	59,480	59,480
Spain and Canaries	16,228	9,050	42,684	42,684
United States	18,933	38,477	190,314	190,314
Spain and West India	9,270	12,013	28,659	28,659
Brazil	20,107	24,480	118,059	118,059
Argentina Republic	9,160	8,381	26,193	26,193
British N. America	9,858	15,497	61,001	61,001
India	12,246	10,030	79,930	79,930
United States	20,504	32,404	140,547	140,547
Australia	39,200	32,582	140,700	140,700
Other countries	62,161	68,700	305,800	305,800
Total	254,166	304,866	1,343,762	1,343,762
MACHINERY AND MILL WORK.				
STEAM ENGINES.				
To Russia	28,915	10,991	78,671	78,671
Germany	37,937	22,000	71,860	71,860
Holland	11,514	12,537	36,118	36,118
Belgium	1,705	3,889	18,510	18,510
France	10,558	15,166	55,109	55,109
Spain and Canaries	12,779	10,110	73,493	73,493
Italy	15,049	25,135	90,050	90,050
Egypt	3,384	1,395	13,060	13,060
United States	40	1,745	2,665	2,665
Brazil	2,753	7,506	25,413	25,413
British India	18,660	57,486	251,413	251,413
Australia	21,674	24,414	107,514	107,514
Other countries	67,581	47,807	265,959	265,959
Total	233,359	240,181	1,077,934	1,077,934

ARTICLES, AND TO WHAT COUNTRIES EXPORTED.	May, 1879.	May, 1880.	5 months, 1879.	5 months, 1880.
OTHER DESCRIPTIONS.				
To Russia	118,516	100,740	335,202	335,202
Germany	95,535	70,280	273,818	273,818
Holland	21,672	13,608	60,811	60,811
Belgium	21,652	22,074	104,708	104,708
France	50,126	61,001	223,853	223,853
Spain and Canaries	10,140	22,101	101,481	101,481
Italy	21,817	24,225	87,252	87,252
Egypt	4,087	17,016	49,994	49,994
United States	10,440	37,487	167,008	167,008
Brazil	10,343	10,039	65,859	65,859
British India	20,280	25,870	152,140	152,140
Australia	33,135	28,464	105,351	105,351
Other countries	64,860	60,128	318,430	318,430
Total	505,585	487,900	2,038,380	2,038,380
BRASS, MANUFACTURES OF (not being ordnance).				
COPPER, UNWROUGHT.				
To Germany	2,303	6,575	16,911	16,911
Holland	1,884	4,818	17,246	17,246
Belgium	1,861	582	6,720	6,720
France	11,468	9,278	45,024	45,024
British India	500	380	382	382
Other countries	3,029	851	23,781	23,781
Total	21,225	22,941	113,100	113,100
WROUGHT.				
To Russia	6,146	2,482	11,801	11,801
Germany	680	516	3,326	3,326
Holland	1,658	380	2,018	2,018
Italy	152	257	3,792	3,792
France	1,908	507	1,784	1,784
Turkey	4,067	1,104	8,221	8,221
Egypt	1,104	1,440	8,421	8,421
British India	4,781	10,575	55,718	55,718
Other countries	7,046	5,230	28,311	28,311
Total	26,032	28,623	124,809	124,809
MIXED OR YELLOW METAL.				
SHEATHING.				
Total Copper	79,128	67,416	361,070	361,070
LEAD.				
To Russia	2,117	1,055	1,122	1,122
Germany	280	170	481	481
France	280	102	625	625
United States	30	1	195	195
China and Hong Kong	17	324	3,111	3,111
British India	392	220	877	877
Australia	246	134	544	544
Other countries	903	724	3,597	3,597
Total	4,000	2,744	10,242	10,242
TELEGRAPHIC WIRE AND APPARATUS.				
To Russia	282,450	71,272	373,170	373,170
TIN, UNWROUGHT.				
To Russia	1,196	704	2,776	2,776
Germany	1,643	200	2,177	2,177
France	1,577	1,056	9,282	9,282
Turkey	136	532	1,116	1,116
United States	511	423	11,870	11,870
Other countries	2,190	1,931	8,192	8,192
Total	7,253	4,936	35,813	35,813
ZINC OR SELLER.				
COAL, COKE, CINDERS, AND PATENT FUEL.				
To Russia	144,005	121,700	408,565	408,565
Sweden & Norway	112,305	131,822	471,038	471,038
Denmark	71,539	62,792	314,148	314,148
Germany	159,190	217,521	811,046	811,046
Holland	25,933	51,277	109,348	109,348
France	236,440	238,603	1,582,907	1,582,907
Spain and Canaries	80,646	60,222	368,179	368,179
Italy	131,477	102,702	555,899	555,899
Turkey	21,417	20,871	112,050	112,050
Egypt	44,733	62,218	258,365	258,365
Brazil	27,652	20,218	126,507	126,507
Malta	37,480	31,898	153,373	153,373
British India	85,685	55,273	334,576	334,576
Other countries	270,730	300,675	1,507,682	1,507,682
Total	1,449,253	1,561,794	7,194,253	7,194,253
COAL, &c., for steamers engaged in foreign trade.				
Total	374,435	385,736	1,830,801	1,830,801

EXPORTS OF FOREIGN AND COLONIAL METALS AND ORE

For the month of May, 1880, as compared with the corresponding month of 1879. Also the foreign exports for the five months of 1880 as compared with 1879.

ARTICLES.	May, 1879.	May, 1880.	5 Months, 1879.	5 Months, 1880.
Copper, unwrought or part wrought.				
From Chili	1,249	1,172	5,809	5,606
From Peru	2,438	4,288	11,355	20,728
From Bolivia	275	711	891	2,052
Steel: Unwrought.				
From Russia	299,631	73,850	1,147,494	399,391
Quicksilver.				
From Bolivia	34,061	18,063	79,570	89,369
Tin, in blocks, ingots, bars, or slabs, and regulus.				
From Bolivia	108,549	76,766	226,795	470,040

The quantity and value of iron and coal exported during May, 1880, compared with the same month of 1879.

YEARS.	Quantity.	Value.
IRON.		
1880	361,070	2,654,674
1879	291,911	1,813,717
Increase	69,159	840,957

IRON AND STEEL RAIL EXPORTS

During the month of May, 1880, as compared with May 1879; also for first five months of 1879 and 1880. The Board of Trade make the usual reservation as to accuracy.

	QUANTITIES.			
	Month ended		Five months ending	
	May, 1879.	May, 1880.	May, 1879.	May, 1880.
IRON RAILS:				
To Russia	20	20	73	20
Sweden and Norway	17	113	33	113
Germany	109	—	1,078	—
Spain	162	—	964	501
Italy	619	721	1,663	2,558
United States	—	6,305	301	45,099
Brazil	323	187	1,345	898
Chili	20	22	50	49
British North America	—	—	568	242
British India	864	41	3,298	2,477
Australia	391	577	4,367	2,135
Other Countries	1,235	778	4,464	4,278
Total	3,743	8,764	18,004	58,364
STEEL RAILS:				
To Russia	7,840	—	10,218	165
Sweden and Norway	658	276	8,531	661
Germany	501	34	78	34
Spain	501	107	4,865	2,599
Italy	3,530	2,454	6,535	3,837
United States	1,720	22,668	2,598	47,505
Brazil	2,877	1,374	12,544	7,151
Chili	—	—	587	302
British North America	8,317	5,125	17,125	16,564
British India	4,358	3,109	22,142	43,850
Australia	5,959	6,640	26,908	23,151
Other Countries	3,215	2,718	19,049	20,952
Total	40,165	44,735	118,070	166,977
TOTAL OF IRON AND STEEL RAILS	43,908	53,499	136,074	225,341

	VALUE.			
	May, 1879.	May, 1880.	May, 1879.	May, 1880.
	£	£	£	£
IRON RAILS:				
To Russia	140	188	679	188
Sweden and Norway	91	904	185	904
Germany	608	—	6,007	—
Spain	819	—	5,404	3,495
Italy	3,116	5,168	5,353	10,249
United States	—	44,217	4,505	283,274
Brazil	1,763	1,872	7,995	7,840
Chili	70	195	350	443
British North America	—	—	5,701	2,021
British India	4,853	501	20,198	18,827
Australia	2,179	3,653	22,748	15,188
Other Countries	6,830	4,788	26,726	20,613
Total	20,460	62,686	102,545	183,603
STEEL RAILS:				
To Russia	46,115	—	60,264	2,320
Sweden and Norway	5,777	1,255	55,199	4,091
Germany	4,658	246	4,212	246
Spain	5,701	950	29,046	20,196
Italy	19,666	20,763	10,164	20,838
United States	6,683	187,030	10,639	157,829
Brazil	17,543	12,532	80,149	53,577
Chili	—	—	3,650	2,423
British North America	54,797	40,388	135,021	119,728
British India	24,014	21,822	136,314	295,708
Australia	36,010	47,548	184,493	185,186
Other Countries	19,999	23,509	72,174	104,185
Total	242,848	356,043	723,412	1,208,590
TOTAL OF IRON AND STEEL RAILS	263,307	418,729	825,957	1,392,193

IRON EXPORTS.

COMPARATIVE exports of pig, merchant, and railway iron for the last twelve months.

PORT.	1879. June.	1879. July.	1879. Aug.	1879. Sept.	1879. Oct.	1879. Nov.	1879. Dec.	1880. Jan.	1880. Feb.	1880. March.	1880. April.	1880. May.
(PIG IRON.)												
Ayr	—	—	—	—	—	—	—	—	—	—	—	—
Arbroath	106	965	2,280	1,850	5,510	2,606	555	—	4,281	10,666	6,909	4,591
Borrowstoness	100	102	—	—	—	—	—	—	—	—	—	—
Cardiff	20	7	208	60	1,103	300	700	650	110	18	4,766	2,400
Charlestown	—	15	—	—	—	—	—	—	—	—	—	—
Dundee	—	—	—	—	—	—	—	—	—	—	—	—
Glasgow	5,504	6,912	8,432	10,786	21,120	19,185	12,314	13,895	10,775	24,123	24,625	22,180
Goole	—	—	—	—	—	—	—	—	—	—	—	—
Grangemouth	1,584	2,460	2,110	2,870	3,447	1,285	350	600	1,084	3,985	3,863	1,793
Greenock	10	178	180	2,490	6,000	10	60	200	—	200	300	50
Grimby	16	20	35	50	5	—	—	250	—	400	450	35
Hartlepool	1,540	1,109	2,223	2,118	4,140	2,795	4,690	1,222	1,863	4,999	6,582	3,272
Hull	2,001	2,009	1,618	1,478	2,721	2,191	3,705	2,158	3,707	3,132	4,794	5,048
Liverpool	1,801	2,514	2,851	10,792	21,311	17,637	11,391	54,494	10,748	21,800	20,742	12,130
Middlesbrough	25,440	26,639	31,288	40,691	48,528	31,723	1,086	38,380	38,532	50,119	58,574	40,222
Newcastle-on-Tyne	2,184	4,109	4,498	5,114	7,392	7,523	3,350	9,480	3,600	5,103	7,053	4,083
Newport	—	110	—	—	50	1,000	—	1,550	381	2,737	—	3,302
North Shields	—	400	322	—	250	66	—	—	—	—	—	—
Port Glasgow	—	—	—	—	—	—	—	—	—	—	—	—
South Shields	—	—	—	—	140	510	—	—	—	—	—	—
Stockton	—	—	—	—	—	—	—	—	—	—	—	—
Sunderland	180	50	—	—	—	—	—	655	970	—	175	—
Swansea	—	20	—	—	—	—	—	20	228	1,250	—	—
Troon	310	2,250	400	20	3,850	2,000	1,620	1,620	40	2,200	2,850	2,833
Whitehaven	850	4,320	1,280	3,800	700	2,100	1,200	1,100	1,050	2,748	6,037	2,975
(MERCHANT IRON.)												
Arbroath	6	—	—	—	—	—	—	—	—	—	—	—
Cardiff	—	823	3,560	936	1,299	2,016	2,708	263	982	1,553	1,335	334
Glasgow	592	723	954	619	883	716	716	1,435	14	573	353	702
Grangemouth	—	—	—	—	—	—	—	—	—	—	—	—
Greenock	—	—	—	—	—	—	—	—	—	—	—	—
Grimby	33	15	5	8	4	5	50	—	—	18	23	60
Hartlepool	795	905	42	564	632	80	517	210	94	33	171	179
Hull	804	913	1,274	1,505	2,670	3,505	2,239	2,985	1,137	983	1,735	2,470
Liverpool	6,790	6,337	5,850	7,014	10,179	12,640	11,114	13,046	18,945	14,013	7,907	—
Middlesbrough	4,022	3,480	2,775	1,095	943	1,013	517	37	50	30	195	245
Newcastle-on-Tyne	1,220	1,336	1,250	1,683	1,510	1,377	3,075	231	379	678	689	1,074
Newport	—	38	—	—	—	381	20	—	—	—	—	644
North Shields	124	12	—	—	—	—	—	—	—	—	—	—
Port Glasgow	—	—	—	—	—	—	—	—	—	—	—	—
South Shields	—	47	29	58	187	189	5	80	—	—	—	—
Stockton	—	—	—	—	—	—	—	—	—	—	—	—
Sunderland	11	6	—	—	545	—	—	—	—	—	1,130	—
Swansea	—	385	936	912	39	1,015	52	240	86	—	—	—
(RAILS.)												
Arbroath	—	—	—	—	—	—	—	—	—	—	—	—
Cardiff	4,532	5,551	10,174	11,380	10,192	6,007	7,043	12,005	9,503	17,139	18,663	14,517
Glasgow	—	593	—	2,330	—	—	3,504	794	640	82	—	—
Greenock	—	—	760	—	—	—	—	—	—	—	—	—
Grimby	—	—	—	410	687	1,005	410	1,000	—	2,208	500	—
Hartlepool	—	—	—	—	—	—	—	—	—	—	—	—
Hull	2,283	7	0	157	827	1,315	—	1,594	354	978	1,746	369
Liverpool	8,420	8,042	7,440	8,492	9,105	12,580	8,050	11,732	6,634	13,607	12,541	24,127
Middlesbrough	4,358	2,205	1,005	1,684	2,031	1,733	450	2,000	300	5,304	5,670	2,139
Newcastle-on-Tyne	—	1,171	42	—	—	—	—	—	—	—	—	—
Newport	4,091	10,080	5,013	8,757	3,222	4,200	5,803	7,237	6,895	8,893	—	14,119
Port Glasgow	—	—	—	—	—	—	—	—	—	—	—	—
South Shields	—	—	—	—	—	—	—	—	—	—	—	—
Sunderland	—	—	—	—	—	—	—	—	—	—	—	—
Swansea	—	—	1,344	—	733	346	—	608	—	553	1,027	—
Troon	—	—	—	480	6,000	—	—	—	—	—	—	—

COAL AND COKE EXPORTS

To foreign parts from the principal English ports in the months of May, 1879 and 1880, and for the whole year 1879.

PORT.	Coal, May, 1879.	Coke, May, 1879.	Coal, May, 1880.	Coke, May, 1880.	Coal, 12 months ending May, 1879.
Alloa	15,766	—	7,400	—	159,699
Arbroath	7,343	—	6,705	—	76,804
Ardrrossan	7,081	30	4,764	—	62,070
Ayr	656	—	970	—	7,944
Blyth	10,628	—	14,677	—	199,557
Borrowstoness	3,703	—	2,422	—	32,849
Cardiff	432,280	2,300	405,558	1,457	4,253,678
Charlestown	22,795	—	16,101	—	184,514
Dundee	5,879	—	11,104	—	62,125
Glasgow	34,763	171	24,179	593	244,780
Goole	32,153	—	23,179	—	255,649
Grangemouth	11,650	—	10,711	—	118,768
Granton	13,605	—	9,188	—	120,436
Greenock	21,753	—	16,341	—	190,231
Grimby	22,339	—	27,211	—	257,016
Hartlepool	27,717	1,306	56,110	2,248	517,258
Hull	20,442	—	40,689	176	412,368
Irvine	134	—	644	—	4,787
Liverpool	54,912	600	50,395	135	552,181
Llanelli	6,201	—	5,752	—	71,127
Middlesbrough	2,091	1,304	2,055	4,692	26,515
Newcastle	26,682	8,002	373,190	19,101	3,754,794
Newport	101,415	25	91,666	1,455	938,042
North Shields	34,404	—	14,692	—	260,448
Port Glasgow	—	—	—	—	10,619
St. David's	4,448	—	2,422	—	54,907
Seaham	5,314	—	6,312	—	33,374
South Shields	20,118	—	42,058	—	1

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Door springs, X, 75 to 80%; XX, 70 to 75%; XXX, 65 to 67%; XXXX, 55 to 60%; brass resilience, 10 to 15%; climax, 5 to 10%; universal, 30 to 60%; paragon, 10 to 15%; smiths', 10 to 15%; O'Connor's vertical spring hinge door spring, 15 to 25%; Gerish's spring hinges, iron, 20 to 25%; brass, 10 to 15%; japanned Door chains, 30 to 60%.

Files, 25 to 50%; Fryng pans, best, 50 to 55% common, 60 to 65%; kitchen firebricks, in sets, 10 to 15% per lb.; tongs only, 10 to 15%; poker only, 10 to 15%; fish hooks, 30 to 35%; best, common, 50 to 55%; light kitchen fenders, 5 inch assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 25 to 30% per doz.; bright fronts, 30 to 35%; Manchester pattern kitchen fenders, 5 feet 1 inch top, black front, a feet 9 inches to 3 feet 3 inches, 37 to 41% per doz.; 3 feet 3 inches to 3 feet 9 inches, 42 to 46%; Cut wire fencing staples, 6 to 6 1/2, 22 to 24% per cwt.

Gridirons, London pattern, fluted, 60 to 65%; light ditto, 61 to 67%; handring round bar, 50 to 55%; doublet, 37 to 42%; round bar, 1/4 per bar, 57 to 62%; best fluted bar, 54 to 62%; flat bar, 57 to 62%; common flat bar, 57 to 62%; common Gridirons, 1, 1/2 and 2 per bar, 65 to 70%; Goffering tongs, two prongs, 5/6 to 6/6 per doz.; Gimblets, 20 to 25%.

Holdfasts, japanned, 20 to 25% per cwt. Hammers, plate-layers' keying, 33 to 35%; miners', 27 to 28%; sledge, 27 to 28%; stone sledge, 27 to 28%; stone, hand, 28 to 30%; stone-masons' hand, 2 to 6 lb., 28 to 30%; pin maul, 2 to 6 lb., 35 to 37% per cwt.; sledge hammers, 6 lb. and upwards, 28 to 30% per cwt.; riveting hand-hammers, 28 to 30%; miners', not steered, 22 to 24% per cwt.; common Kent hand hammers, 30 to 50%; patent hammers and staples, 20 to 25%. Cast hinges, polished joint light patent tariff butts, 200, 45 to 50%; 333, 42 to 47%; 504, 35 to 40%; polished joint, best best butts, best best, 45 to 50%; ditto light tariff, broad butts, 45 to 50%; best heavy, broad butts, 30 to 35%; Patent Hinges, edge butts, light, 60 to 65%; strong, 40 to 50%; Patent Scotch butts, 54 to 57%; same off broad and narrow. Patent table, bed and back-flap hinges, 50 to 52%; extra strong bed hinges, 42 to 53%; patent chest, 45 to 50%; patent strap, 45 to 53%. Hinges, 40 to 55%; fill hinges, 40 to 55%; japanned and garnet hinges, double washered, light and strong, 35 to 40%; best best patent London or Lancashire tees, 52 to 60%; patent light japanned Scotch tees, 55 to 62%; light patent hooks and hinges on plate and to drive, 20 to 25%; weighty patent hooks and hinges, weighty Gothic, 21 to 26%; scalloped edges, not japanned, 22 to 24%; Scotch japanned, Tees double washered, 20 to 23%; Gothic Scotch japanned, Tees 23 to 28%; Gothic Scotch, Tees self colour, 27 to 29%. Wrought hinges, common and best, 35 to 40%; best best, 30 to 35%; heavy wrought hinges, common black, 14 to 16% per cwt.; common bright, 16 to 18%; filed edges, 17 to 19%; japanned Gothic fancy, 16 to 20% per cwt. common bright, broad eye, 10 to 22%; japanned broad eye fancy, 21 to 22%; best bright, 22 to 24%; best broad eye, 23 to 25%; best self-colour frog hooks 25 to 26% per cwt.; Lancashire hinges wrought, 30 to 35%; Pressed hinges, common, 60 to 65%; best, 52 to 57%; common brass butt hinges, 13 inch sanded, 15 to 18% per gross, pairs net; very light, 12 inch, 9 to 12% per gross, pairs net; hornshoes, fullered fore, 18 to 20%; fullered hind, 19 to 21%; stamped, fore, 18 to 20%; hind, 18 to 20%. Hollowware, 40 to 45%; common to best, enamelled, 15 to 20%, delivered in Liverpool, London.

Ironfoundry, general.—Ash grates, 11 to 12 1/2; air-bricks, 2/6 to 3/6, half, single, 3/6 to 4/3; double, 6/3 to 7/3; bars and bearers, 9/6 to 10/6 per cwt.; barrow wheels, 10/6 to 11/6; bake pans, 9/6 to 10/6; cast bushes, 11/6 to 13/6; camp ovens, 10 to 11; cooking stoves, 12/6 to 13/6; cogs for blocks, 17 to 19; cellar grating, 10/6 to 12/6; clock weights, 9 to 11; Dutch stoves, 11 to 13; dumbbells, common, 9 to 11; best best japanned, 10 to 11; frying pans, cast handles, 12/6 to 14/6; frying pans with wrought handles, 10 to 18; furnaces, up to fifty gallons, 7/3 to 14; galvanised furnaces up to fifty gallons, 9 to 11 per gallon; furnace doors, 12 to 14; furnace grates, 9 to 11; forge backs, 12/6 to 13/6; heaters for box irons, 8/6 to 10/6; heaters for urns, 10 to 11; jack wheels, 18 to 20; oven doors and frames, 12 to 14; pots, three legged, Danish, plumbers' and Negro, 10 to 12; plumb bobs, 13/6 to 15/6; puddling

pans, 13/6 to 15/6; pump spouts, 14 to 16; sash weights, 8/6 to 9/6 ditto, with pulleys, 12 to 13; shoe anvils, 11/6 to 12/6; slippers 12/6 to 13/6; Italian irons, 35 to 50%.

Knitting pins, iron, 4/3 to 5/3 per lb.; steel knitting pins, 15 to 24 W.G., 1 to 2/6 per lb.; brass knitting pins 1 1/4 to 1/6 per lb.; keys and banks, 50 to 55%; extra strong plate, 30 to 32%; extra strong Banbury, pin'd keys, 30 to 35%; brass shutter knobs, 55 to 60%; brass cupboard turns, 55 to 60%; brass drawer knobs, 53 to 60%; brass ash pan knobs, 55 to 60%; brass range knobs, 40 to 45%; kettle ears, 7/3 to 8/6.

Lock furniture, brass, 60 to 65%; buffalo, 25 to 30%; china lock furniture, 57 to 62%; ebony lock furniture, 21-inch, Wilkes' spindles, 15 to 18% per dozen sets; sham ditto, 8 to 9% per dozen sets; Norfolk latches, common, best, 65 to 72% common. Suffolk latches, 70 to 75%; best Suffolk latches, 45 to 55%; tinned struck ladle bowls, 4-inch, 15/6 to 16/6; 4 1/2-inch, 18/6 to 20/6; 5-inch 23 to 25% per gross net.

Netting, wire, galvanised, 57 to 62%, delivered Cast nails—lath, 10/6 to 11/6 per cwt.; cast wall nails 9/6 to 10/6 per cwt.; cast headed bills, 8 by 8 ounce, 15 to 16/6 fine round cast bills, 1-inch, 14 to 16/6; strong round cast bills, 1-inch, 13 to 16/6; cast slate pegs, 13 to 17/6; cast garden loops, 15 to 17/6 per cwt., all at works. Patent wrought nails, 40 to 42% per thousand and 35 to 37% those sold as weighty by the cwt.; patent machine-made horse nails, 25 to 30%; cut-galls, clasp, clout or rose nails, 3 inch and upwards, 9/6 to 11/6 per cwt.; cut lath nails, 1 inch and upwards, 12/6 to 14/6; cut flooring brads, 2 1/2 inch and upwards, 9/6 to 10/6; fine cut tacks, 1/2 inch, 34 to 37/6 per cwt.; 3/4 inch, 30/6; 1 inch, 26/6 to 27/6 per cwt.; fine cut joiners' brads, or strong, 1 1/2 inch, 15 to 17/6; 2 inch, 14 to 16/6; 2 1/2 inch, 14 to 16/6; 3 inch, 13 to 14/6 per cwt.; cut shoe bills, strong, or 12 W.G., 12/6 to 14/6 per cwt.; middle, or 14 W.G., 12 to 14/6; fine, or 15 W.G., 14/6 to 15/6; fine cut tacks, per packet, 80 to 82%; fine cut brads, per packet, 65 to 67%; wrought nails, long count, 15 to 20%; wrought nails, May, 1860 list, to 32 1/2; wrought Bromsgrove nails, March, 1878, list, 20 to 22 1/2; best countersunk clout nails 1 inch, 35/6 to 37/6; 2 inch, 20 to 27/6; 2 1/2 inch, 22 to 25/6; best best countersunk and half-countersunk horse nails, fine best; Swedish charcoal iron, 17/6 to 19/6 list prices. wrought rose or deck-head spikes, 4 inch, 15/6 to 16/6; 5 inch, 15/6 to 16/6; 6 inch, 15 to 16/6; fine, 16 to 17/6 per cwt.; extra; galvanised, 9/6 to 8/6 per cwt.; wrought rose nails for India, 1 inch, 10/6 to 11/6; 2 inch, 13 lb., 20 to 21/6; 3 inch, 20 lb., 19 to 20/6; malleable nails, coffin nails, black, 35 to 40%; white lacquered and gilt, 25 to 30%; sacking; moulders' nails and chisels, 1 1/2 inch to 3 inch, 28 to 29/6; bright nuggets, 28/6 to 29/6; tile pegs, 15 to 16/6 per cwt.; bright nails, 4 to 5/6 extra; tinned nails, 12 to 13/6 extra; galvanised nails, 10 to 12/6 extra; nuts, square forged, untapped, 1 inch, 10 to 12/6 per gross; 1 1/2 inch, 25 to 26/6 per cwt.; 2 inch, 23 to 24/6 per cwt.; square forged nuts, tapped, 1 inch, 1 1/2 to 1 1/4 per gross; 1 inch, 30 to 32/6; 1 1/2 inch, 27 to 29/6; forged hexagon, untapped, 1 inch, 11/6 to 12/6; 1 1/2 inch, 32 to 34/6; 2 inch, 27 to 29/6; forged hexagon, tapped, 1 inch, 12 to 14/6; 1 1/2 inch, 32 to 34/6; 2 inch, 31 to 33/6; machine-made nuts, square untapped, 1 inch, 20 to 22/6; 1 1/2 inch, 21 to 23/6; 2 inch, 18 to 20/6; square tapped, 1 inch, 25 to 26/6; 1 1/2 inch, 23 to 25/6; 2 inch, 24 to 26/6; machine-made hexagon nuts, untapped, 1 inch, 22 to 24/6; 1 1/2 inch, 22 to 24/6; 2 inch, 24 to 26/6; hexagon tapped, 1 inch, 35 to 36/6; 1 1/2 inch, 36 to 38/6; 2 inch, 38 to 40/6.

Oddwork, tinned and black, 20 to 25% list; Paris pointes best English, 14/6 to 15/6; foreign, 15/6; planes, 25 to 30%; iron axle pulleys, 11 inch, 18/6 to 19/6; brass face axle pulleys, 28 to 40/6 per gross; 1 1/2 inch, 18/6 to 19/6; 2 inch, 20/6 per gross; brass escutcheon pins, 1 inch to 1 1/2 W.G., 17 to 12/6 per lb.; bright gimps pins, 1 to 1 1/2 W.G., 16 to 18/6 per lb.; black, 17 to 19/6; brass 1/6 to 1/8 per lb.; japanned cut gimps pins, 1 inch, 17 to 18/6 per lb.; tinned, 18 to 19/6; cut clog or coffin pins, japanned, 1 inch, 15 to 16/6; tinned, 17 to 18/6; brass pin pointers, 1/4 to 1/6; plate locks, fine 50 to 52 1/2; strong, 40 to 42 1/2; Lancashire plate locks, 30 to 35%; powder measures, 30 to 35%.

Rivets, 30 to 35%; Rivets, iron boot rivets, 1/3 to 1/4 per lb. patent machine-made Rivets, 30 to 35%; wrought timen's Rivets, 50 to 55%; round or panhead boiler Rivets, 1 inch, 23 to 24/6; 1 1/2 inch, 18 to 19/6; 2 inch, 19 to 21/6; 2 1/2 inch, 16 to 17/6. Delivered in London or Liverpool; machine-made wire Rivets, 1 inch, 14/6 to 15/6 per cwt.

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Spades and Shovels, common, 57 1/2 to 55%; second, 15 to 40%; best 30 to 35%; best strong country Shovels; 25 to 30%; best hammered Spades and Shovels, 5 to 10%; Ship Scrapers, black steel blades, 45 to 50%; bright, 42 1/2 to 47 1/2; cast-steel black, 42 1/2 to 47 1/2; bright, 37 1/2 to 42 1/2; best cast-steel black, 35 to 40%; bright, 30 to 35%; iron Wood Screws, 65%; brass wood Screws, 60 to 62%; copper, 35 to 45%; Stove Screws, 50 to 52 1/2; dowel Screws, 60 to 65%; brass headlock Screws, 40 to 47 1/2; gilt, silvered and plated head Screws, 40 to 45%; Jute Sash cord, 52 1/2 to 57 1/2; flax Sash-cord, 25 to 30%; best flax, 5 to 10%; super flax, 7 1/2 to 12 1/2; extra super flax Sash-cord, 5 to 10%; patent steel ribbon Sash-line, 25 to 35%; copper Sash-chain, 52 1/2 to 57 1/2; zinc Sash-chain, 47 1/2 to 52 1/2; iron prepared, 40 to 45%; copper Sash-cord, 15 to 20%; Bad Irons, common, 9/6 to 11 per cwt.; best japanned, 13/6 to 14/6; best best japanned, 17 to 19 per cwt.; Shoe heels, York No. 1, 3/5 to 3/8; No. 2, 4 to 4 1/2; No. 3, 8 to 8 1/2 per gross net; Dundee hot turned, 5/9 to 6/3; bright-edge imperial or solid Scotch, 9/6 to 10/6; bright York 6 1/2, 8 to 8 1/2; bright solid, 6/6 to 7/7; toe plates, 9/6 to 10/6 per gross. Stair rods, turned ends, 75 to 80%; solid fancy ends, 60 to 65%; cased tube, 30 to 35%; patent solid ornamental, 35 to 40%. Sofa Springs, coppered, 8 by 6 inches, 25 to 27 per gross; 9 by 7 in, 22 to 23/6; 7 by 7 inches, 17/6 to 19/6 per gross; galvanised Waterloo Scoops and beds, 17/6 per doz.; japanned Waterloo scoops and beds, 16 inch, 15 to 16/6; japanned scoops and beds, light, 16 inch, 15 to 16/6 per doz.; Shutter bars, common spring, broad and double, 75 to 77 1/2; Scotch iron drop, 77 1/2 to 80; brass drop, 70 to 72 1/2; brass drop and catch, 67 1/2 to 70 1/2; registered brass spring box shutter bars, 52 to 62 1/2; double-handed brass spring box, 57 1/2 to 63; Saddlers' tools, 5 to 10/6; Stocks and Dies for smiths' use, 35 to 40%; ditto for engineers, 10 to 20%; Steel toys, 10 to 30%.

Traps, bowspring, sham Dorset and real Dorset rabbit traps, 45 to 60% list prices; common traps, 4 inch, 5/6 to 8/6 per doz. net; run traps, 2 1/2 inch, 4 to 8/6 per doz.; bird traps, 3/9 to 4/6 per doz.; wolf and other double flat spring, common bridge, 1/4; axle bridge, 1/4 per lb., 40 to 45%; hawk or pole traps, 54 to 60%; wrought mole traps japanned, 26 to 30/6; galvanised, 3/9 to 4/6. Tin plating, 1 C, 25 to 26. Timmen's machines and tools, 5%; brass Bell Tube, 1 inch and upwards, 1 to 1 1/2 per lb.; copper bell Tube, 2 to 3 1/4 per lb.; zinc bell Tube, 45 to 50% list; Patent cased Tube, 45 to 50%; cut to lengths, 40 to 45%; burrished and lacquered brass tube, 30 to 35%; polished and lacquered twisted brass tube, 30 to 35%; patent spring iron tube, 30 to 35%; patent cased taper iron tube, 30 to 35/4 parallel iron braced tube, 30 to 35/4; twisted iron parallel tube, 30 to 35/4; patent cased twisted iron parallel tube, 30 to 35/4; iron Gas Tubes, 70 to 72 1/2; fittings, 72 1/2 to 75 1/2; iron Water Tubes, 60 to 65%; fittings, 62 1/2 to 67 1/2; iron Steam Tubes, 52 to 55%; fittings, 55 to 57 1/2; galvanised iron Gas Tubes, 57 1/2 to 60/6; fittings, 60 to 65/4; lap-welded Boiler Tubes, 60 to 62 1/2; delivered in London, Liverpool or Glasgow; table catches, 30 to 40/6; ditto, improved brass follow, 20 to 25/4; wrought Japanned Tea Kettles, 50 to 60%; galvanised Turnip skips, 21 inches, light, 25 to 26 per doz.

Vices, common black, 38 to 34 per cwt.; common bright, 40 to 42 per cwt.; black staples vices, solid box black, 42 to 48/6; bright, 47 to 49/6; solid box, black staple, with spherical washer, 40 to 45/6; bright 47 to 55/6.

Washers, light iron, 7 1/2; heavy washers, 13 to 16 lb., W.G., 11/6 to 12 per cwt.; 1 inch thick, 2 per cwt. extra; 5-16 inch, 1/4; 1 inch 4/4; shock bright washers, 3 to 3 1/2 per cwt. extra; Wall hooks, 23 to 25 per cwt.; Washing tubs, galvanised oval, 22 inch, 19 to 20/6; 24 inch, 34 to 35/6; round, 22 inch, 38 to 40/6; Water bowls, hammered, list price, 50 to 62 1/2; light seamed 9 inch, 8 per dozen; light wired 9 inch, stamped, 11 to 12/6; Wave wire list price, iron, copper and brass, 45 to 50%; iron Wire, bright, 9 to 6, 12/6 to 13/6 per cwt.; galvanised, 10/6 to 17/6; fine galvanised iron wire, No. 23, 5 to 5 1/2 per stone 14 lb.; annealed tinned wire No. 18, 3/9 to 4/6 per stone 14 lb.; cut tinned bottling wire, No. 22, 4/3 to 5 per stone 14 lb.; weaving and binding wire, No. 23, 3/9 to 4/6 per stone 14 lb.; bright or annealed fine wire, 23, 5/4 to 5/6 per stone 14 lb. net; cast steel wire, 0 to 6, 1/3 per lb.; metallic or horticultural wire, 6 to 14, 5/6 to 6/6 per lb.; No. 15, 21 to 25/6; 16 to 20, 18 to 20/6; in 1 lb. rings, 13 inch diameter, 1/3 per lb. extra; prepared bright fencing Wire, 0 to 6, 12/6 to 13/6 per cwt.; annealed drawn fencing wire, 0 to 6, 11 to 11/6; annealed drawn galvanised, 0 to 6, 15/6 to 16/6. Bright or annealed steel, 0 to 6, round or oval 13/6 to 14/6 per cwt.; black rolled, 11 to 14, 9/6 to 11/6 per cwt.; galvanised rolled, 1 to 4, 12/6 to 13/6 per cwt.

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CONTRACT FOR WORKS.

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By order,
H. CAMERON RICHARDSON, Secretary,
8, Tokenhouse Yard, E.C.,
9th June, 1880.

DER PRACTISCHE

Maschinen-Constructeur.

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Unter Mitwirkung bewährter Ingenieure und anderer Fachmänner aus dem In- und Auslande her gegeben von
Wilhelm Heinrich Uhlend,
Civil-Ingenieur und Patent-Anwalt in Leipzig.

Verlag von BAUMGARTNER'S BUCHHANDLUNG in Leipzig.

Inhalt des 11. Heftes: Regulator für hydraulische Motoren. Ueber das Wasserrohr-Kessel-System und dessen praktische Anwendung. Unkrautauslese und Getreidesortiermaschine von Ingenieur Kruger. Muhlstein-Stellzeuge. Patent-Präzisions-Sagenmaschinen. Pulvermeter und Ejektor in Wasserstationen. Raderfräsmaschinen mit Patent-Theilapparat. Der Stahl für Schiffsbau und Maschinenconstructionen der Zukunft. Kessel-Speisewasser-Filter. Wick's logotypische Setzmaschine.

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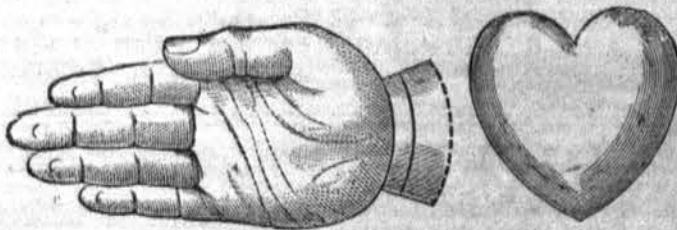
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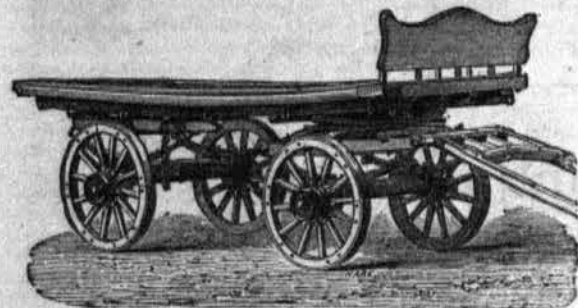
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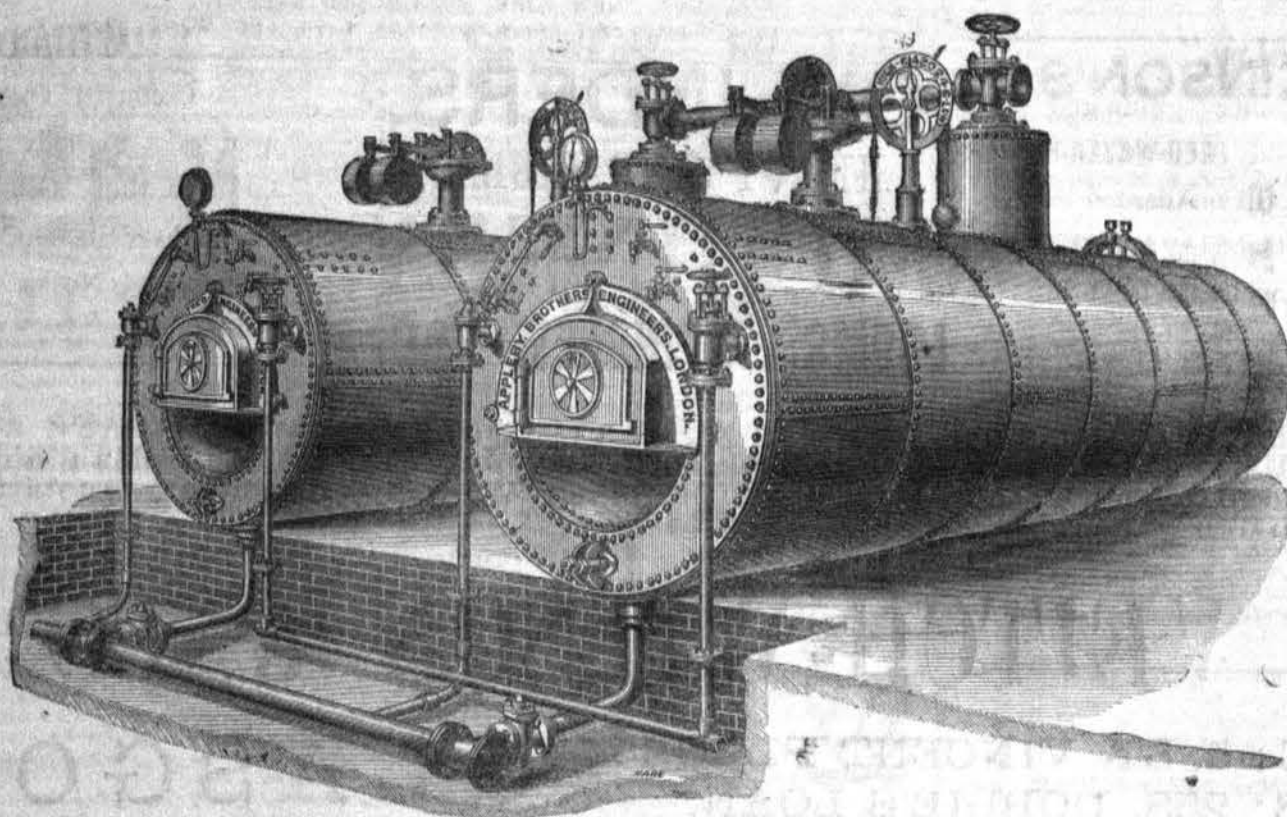


Fig. 46, see Appleby's Handbook of Machinery.—Section 1.

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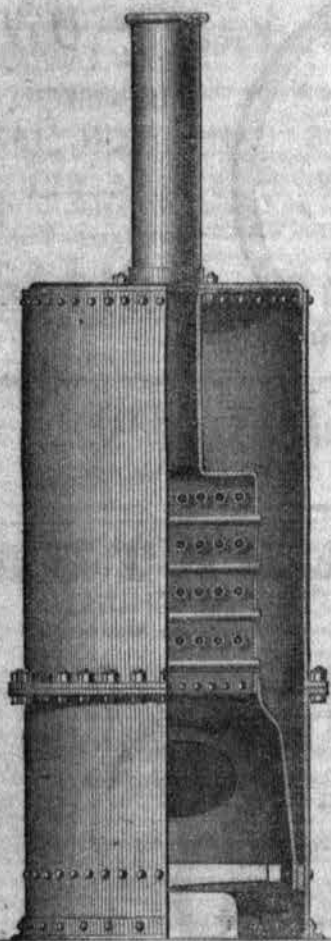


FIG. 53.

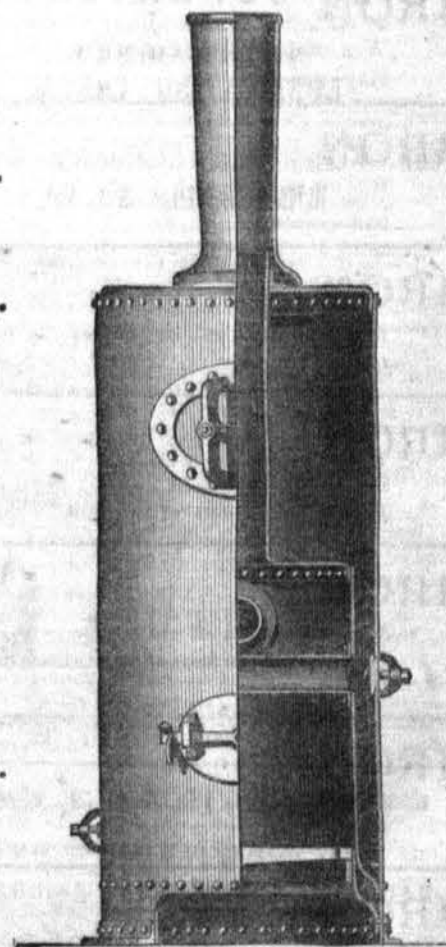


FIG. 52.

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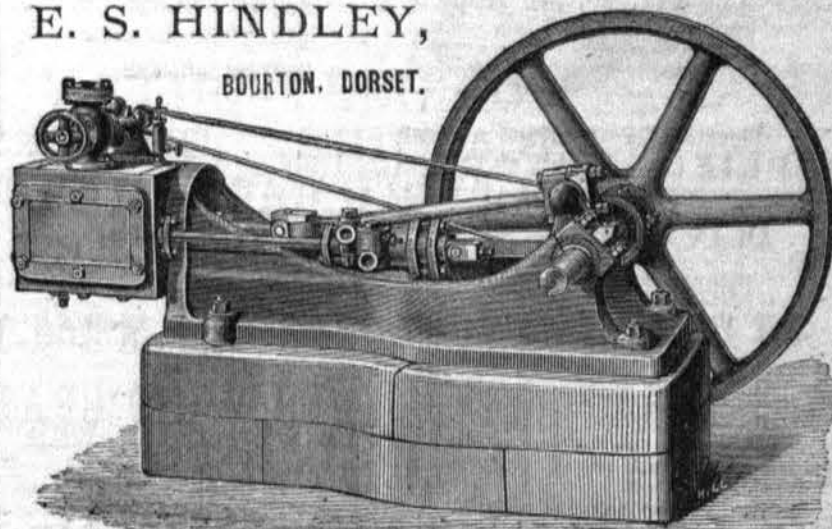
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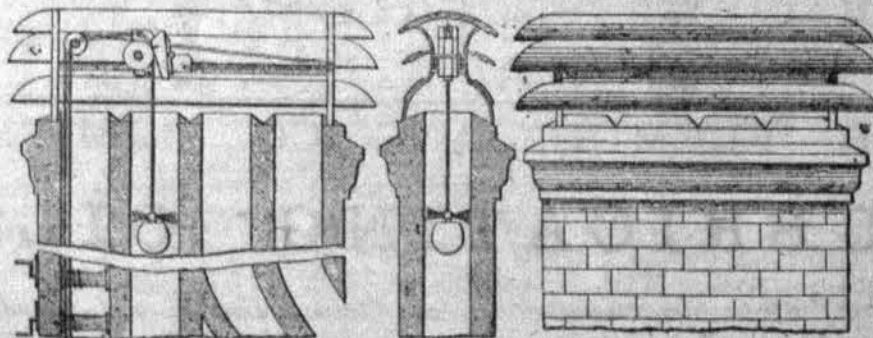
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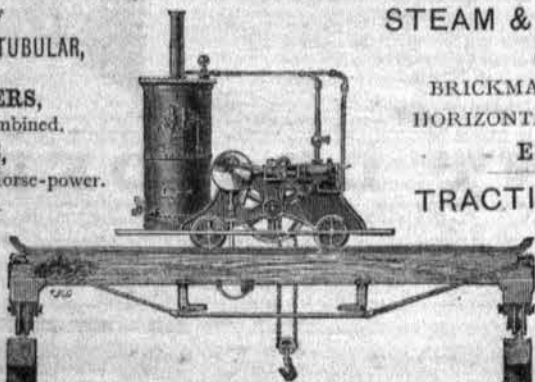
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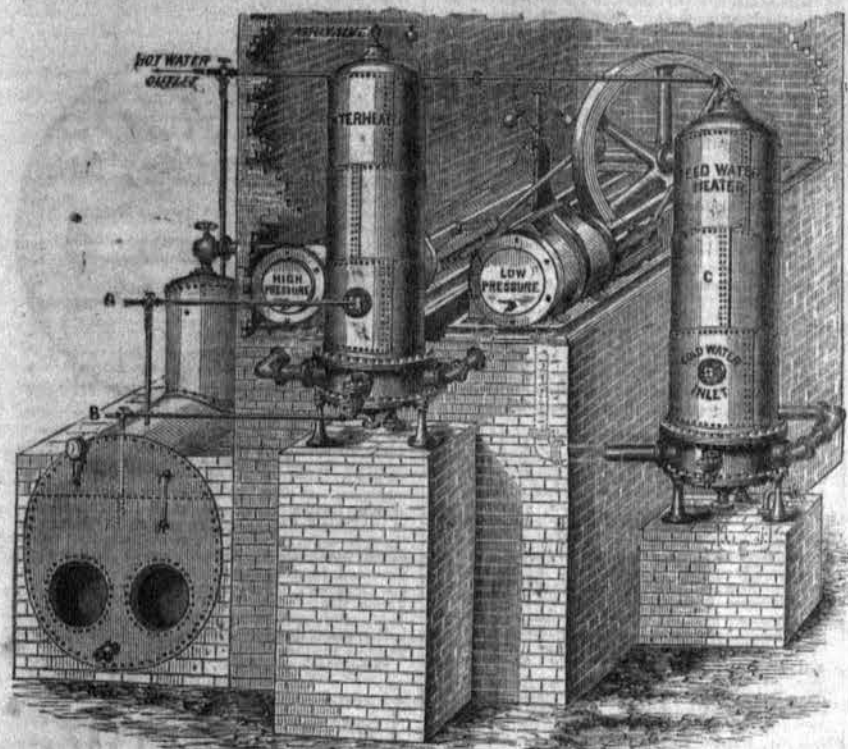
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TIPTON, STAFFORDSHIRE.

And at 147, QUEEN VICTORIA STREET, LONDON, E.C.,
Sole Makers of Berryman's Improved Patent

**UNIVERSAL EXPANDING BRASS
TUBULAR HEATER,**

AS APPLIED TO HIGH-PRESSURE, CONDENSING AND
**COMPOUND ENGINES
LAND AND MARINE.**



The great success which has attended the introduction of these Celebrated Heaters to High Pressure has led to their being applied to Condensing Engines also, and as Interheaters for Compound Engines—Stationary and Marine; and from actual experience J. W. and Co. have now reliable information as to the precise amount of Saving in Boiler Mending and Coal which can be realised by the judicious use of Exhaust steam from High Pressure, Condensing or Compound Engines with these justly

CELEBRATED BERRYMAN HEATERS.

The Interheater shown in the above sketch is fixed at any convenient distance from the Cylinders in or outside the Engine-room. The Exhaust steam from the High Pressure Cylinder is passed through the inside of the Solid-drawn Bent Brass Tubes in the Interheater, and thence into the Steam Chest of the Low Pressure Cylinders.

N.B.—The application of these Heaters to Compound Engines largely increases the effective power, especially where Engines are under their work, and they can be added to any existing plant.

AS INTERHEATERS & FEEDWATER HEATERS,
65 ARE NOW IN USE IN GREAT BRITAIN AND IRELAND EFFECTING VERY GREAT
SAVING. ILLUSTRATED PRICES AND TESTIMONIALS on application to the Works.

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The system adopted by F. M. and Co., in the Construction of their Galvanised Corrugated Iron Buildings combines many advantages which no other form of building can offer. At a minimum cost they provide every required accommodation, while

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Morton
and Co.,*
LIMITED.

ESTABLISHED OVER
THIRTY YEARS.

the construction secures great strength and durability, together with protection against fire. Illustrated Catalogues and Estimates sent on application when Purchasers should supply full particulars of requirements.



Open Shed for Covering Large Areas.

WROUGHT IRON ROOF PRINCIPALS, GIRDERS, AND GENERAL WROUGHT IRON WORK.
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London	1851
London	1862
Paris (class 53)	1867
Paris (class 63)	1867
Naples	1871
Trieste	1871
Moscow (Gold)	1872
Moscow (Silver)	1872
Brussels (do.)	1876

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WEIGHING MACHINES
for
PIT BANKS.**

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Manchester and Liverpool ..	1867
Royal	1869
Royal	1870
Manchester and Liverpool ..	1871
Manchester (Gold)	1875
(Society for Promoting Scientific Industry)	
Ayrshire	1876
Highland Society	1879
Royal Cornwall	1877
Royal Manchester Liverpool and North Lancashire ..	1878

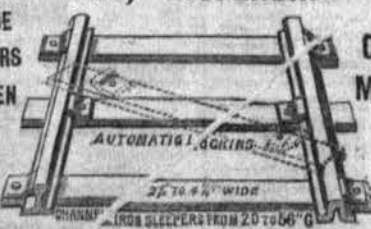
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A NARROW GAUGE RAILWAY —LECRAND'S PATENT— COMPLETE IN TWO PARTS, From £250 per Mile WROUGHT IRON SLEEPERS TO FIT ANY RAIL, DISPENSING WITH SPIKES AND ALL LOOSE PIECES.

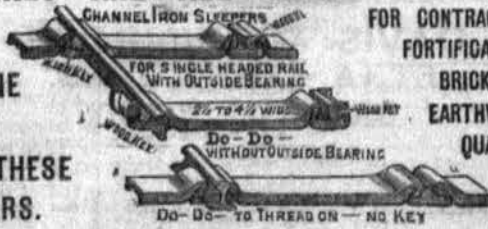
FOR FEEDERS TO TRUNK LINES,
QUAYSIDES, ARSENALS,
FORESTS, MINES,
SUGAR AND COFFEE
PLANTATIONS.



THE OUTSIDE
CLIPPING SLEEPERS
ARE LAID FIRST, THEN
THE INSIDE SLEEPERS
ARE HAMMERED UP AS
FROM THE DOTTED LINES.



OVER 1000
MILES OF LINE
ARE NOW
LAID WITH THESE
SLEEPERS.



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FORTIFICATIONS
BRICKYARDS
EARTHWORKS
QUARRIES

SOLE AGENTS, SHAW BROTHERS, BIRMINGHAM.
DRAWINGS & PARTICULARS ON APPLICATION, TO SAVE TIME, PLEASE GIVE GAUGE, WEIGHT OF RAIL AND KIND OF TRAFFIC

TWO SILVER MEDALS, PARIS, 1875.
THE GLENBOIG STAR
FIREBRICK WORKS,
NEAR COATBRIDGE, N.B.
JAS. DUNNACHIE,
2, West Regent Street, Glasgow.
CONTRACTOR TO HER MAJESTY'S GOVERNMENT.

Manufacturers of Fire Bricks for Steel, Iron, Brass, Gas, Chemical and Glass Furnaces, Copper roasting, calcining and refining furnaces. The special bricks for the Siemens regenerative gas-furnace (this is the brand recommended by Dr. C. W. Siemens), gasometer towers, runners, plugs and scrapers, German tubes, Gannister of highest quality, ground fireclay. No other firebrick combines such a high degree of infusibility with the perfect absence of cracking and splitting up under sudden cooling.
Each brick bears the registered Trade Mark.

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Quotations, Illustrated Catalogues, &c., on application.
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GOULTY, ESTABLISHED 1850.
MECHANICAL VALUERS, AUCTIONEERS
AND APPRAISERS.
Head Office: Albert Square, Manchester.

Partnerships. — Gentlemen
(Practical Engineers) desirous of entering established Engineering concerns, are invited to communicate with the undersigned, who have numerous bona fide establishments open to admit such. References are given and required. — **WHEATLEY KIRK, PRICE AND GOULTY, Albert Square, Manchester.**

Engineering Firms of Good
REPUTE, open to admit partners, or desirous of selling outright, are requested to communicate with the undersigned, who have numerous clients open for such. — **WHEATLEY KIRK, PRICE AND GOULTY, Albert Square, Manchester.**

RIVER THAMES.
TO FOREIGN GOVERNMENTS, SHIP-BUILDERS, AND IRON MANUFACTURERS.
To be let or sold (together
or separately), the very extensive premises known as the MILLWALL IRONWORKS and SHIPBUILDING YARDS situated at Millwall, on the North Bank of the Thames, four miles below London Bridge, and opposite to Messrs. Penn's Engineering Works at Deptford.

The Ironworks consist of Armour-plate, Ship-plate, and Merchant Iron Rolling Mills, having an estimated capacity for manufacturing weekly:—
140 Tons Armour-plates (the largest sizes that are rolled).

100 " Boiler Frame and Ship-plates.
150 " Merchant Bars and Angles.
50 " Forgings, Crank Shafts, Steel Posts, &c.
With all the necessary machinery for finishing the same.

At these works the whole of the ironwork for H. M. S. "Northumberland," several foreign war ships, and a large number of merchant vessels, together with that for the Crown and Civilian Iron Works at Plymouth and elsewhere, was prepared.

The shipbuilding yards have a river frontage of about 1200 ft., and an inland depth of above 500 ft. Their capabilities may be judged by the fact that the "Great Eastern" steamship, and a large number of vessels for the Indian and Foreign Governments, together with floating docks for the Russian Government, were built here.

The whole of the works cover an area of about 20 acres, and have railway communication with the various docks and all parts of the Kingdom; they are ready for immediate business, or, if preferred, the whole of the boilers, machinery, and plant could be removed, and would form a complete Government establishment for building ships—iron-clad or otherwise—iron forts, docks, bridges, railways, or general iron manufacture.

For further particulars address, Mr. J. P. Davis, at the Works, Millwall, London, E.

IN LIQUIDATION.
To be Sold by Private
TREATY, as a going concern, on the Great Northern Line of Railway, a well-established ENGINEERING BUSINESS, comprising the following branches, viz:—
The Manufacture of Stationary Engines and Boilers.

Portable and Combined do.
Agricultural Implements of all classes.
And especially the Manufacture of Wrought Iron Cranks, for which a complete Plant of Patent Machinery has been put down; also General Iron Founding with all the Appliances for carrying on and extending a first-class trade.

The Machinery and Tools are by well-known makers, and the new Buildings are erected upon land secured on a 999 years' lease.

Full particulars can be obtained from Mr. Isaac Jenks, of Wolverhampton; Mr. Thomas Leman, Accountant, Nottingham; or Messrs. Corser, Fowler and Langley, Solicitors, Wolverhampton.

Freehold Yards, Dock, Buildings, and Steam Plant, now a Ship Building Yard, but suitable for any works requiring space and steam.
Bideford. — Cox's Ship Build-
ING YARD FOR SALE BY AUCTION, at the Mart, London, June 23rd. Upset price only £5,500 to close a Mortgage Account. Printed particulars and Plan may be obtained of Messrs. Downer and Woods, 79, Lincoln's Inn Fields, London.

200 TONS NUTS, BOLTS, &c.,
ALWAYS IN STOCK.
SAMUEL MARSDEN & SON.
LONDON ROAD, MANCHESTER.
Patentees and Makers of Special Machinery for Bolt, Spike and Nut Making.

RUTE IRON WORKS, CARDIFF.
Important Sale of Engineers' Tools.

Messrs. Fuller, Horsey,
SONS and Co. are instructed by the Proprietors (consequent upon a dissolution of their partnership) to SELL BY AUCTION, on the premises, Rute Ironworks, Cardiff, on WEDNESDAY, June 23rd, and following days, at 12 precisely each day, in lots, the PLANT, Machinery, Stores and Stock (the plant is of modern description, chiefly by Buckton, Smith, Bearcock and Tansett; Collier; De Borge; Craig and Donald; Maudslay Brothers; and others), including five screw-cutting, surfacing and boring lathes from 8 to 24 inches centre, twelve vertical and horizontal drilling machines, three multiple drilling machines from twenty to sixty spindles, slotting and shaping machines, two planing machines, three plate-planing machines, Smith and Coventry's screwing machines, a powerful steam riveting machine by Cook, three powerful punching and shearing machines (will punch up to 4 inches through 14-inch plate), a powerful double-angle iron shearing machine with steam engine attached, two circular saws for cutting iron, bending and straightening machines, three wrought-iron cupolas, two fans, two over-head travellers (six and eight tons), with gantries, two Wellington travellers (of three and twelve tons), by Stothert and Pitt, two horizontal steam-engines of 20 and 25 horse-power respectively, three Cornish boilers, loam mill, saw bench and pattern makers' lathes, 16-ton weigh-bridge, two Pooley's weighing machines, three Tangye's Hydraulic Jacks up to 10 tons, 40 tons foundry boxes, five tons pig-iron, five tons wrought and cast scrap, 10 tons new bar iron, three tons steel engineers', smiths' and boiler-makers' tools, an assortment of general stores, chains, ropes, blocks and falls, &c., crabs, 300 loads wood block-iron and timber, 300 dry pine boards, timber whips and trolleys, leather bands, Office furniture, and numerous other effects. May be viewed two days preceding and mornings of sale, and catalogues had on the premises, and of Messrs. Fuller, Horsey, Sons and Co., 11, Billiter Square, London, E.C.
Note.—The extensive Premises to be Sold. Held from the Marquis of Bute for an unexpired term of about 88 years, at a very low ground-rent.

BOARD OF PUBLIC WORKS, IRELAND.
NOTICE.

To ENGINEERS AND CONTRACTORS.
Sealed Tenders will be
received on or before WEDNESDAY, the 24th instant, for the CONSTRUCTION and ERECTION OF SLUICES at Killaloe and Meelick, on the river SHANNON, and of an ACCOMMODATION BRIDGE at the latter place. Tenders to be addressed to the undersigned.

The Plans and Specification can be seen at this Office, where also Lithographic Copies of the Plans, printed Copies of the Specification, and Forms of Tender can be obtained on application in writing and payment of One Guinea. The Board will not be bound to accept the lowest or any Tender.

Separate Tenders must be made for the execution of the Works at Killaloe and Meelick, respectively, in one bulk sum for each; but the following items making up same, must also be stated:

1. The Cost of Masonry, Excavation, and Unwatering in connection with the Sluices.
2. The Cost of the Ironwork of the Sluices, including the Erection of same.
3. The Cost of the Erection of the Accommodation Bridge at Meelick.

By Order,
EDWARD HORNSBY, Secretary.
Office of Public Works, Dublin, 4th June, 1880.

TO ENGINEERS AND OTHERS.

This Corporation, being
desirous of receiving TENDERS for the MANUFACTURE and DELIVERY at the Trinity Wharf, Blackwall, of sundry IRONBUOYS of stated dimensions and descriptions. Notice is hereby given that the Drawings may be inspected and the Forms of Tender and Specification obtained on application at the Store Department at this House on any day between the hours of 10 a.m. and 4 p.m. Tenders, sealed, and marked outside "Tender for Iron Buoys," must be addressed to the Secretary and delivered at this House on MONDAY, the 21st inst., and no Tender can be entertained that is not made on the Form provided. The Corporation does not pledge itself to accept the lowest Tender.

By order,
ROBIN ALLEN, Secretary.
Trinity House, London, 8th June, 1880.

Burton-on-Trent. — For Sale,
by PRIVATE TREATY, a LEASEHOLD, compact, and valuable large FOUR STORED MILL, situated at Burton-on-Trent, on the banks of the river Trent, with extensive newly-erected MACHINERY and PLANT therein, lately used as chemical, barytes, paint, and colour works, worked by water power derived from the river Trent, a never-failing source. Together with the dwelling-houses, two cottages, gardens, and several pieces of meadow land thereto belonging, the whole containing 8a. 3r. 34p., and being held for the term of 21 years, computed from the 10th of October, 1875, at the annual rent of £251 5s. Two additional wheels and a small outlay would bring up the power to 50-horse, and there is ample space and accommodation for the addition of extra works, such as the manufacture of flour, chemicals, crushed bones, or vitriol, &c., and capable of doing an extensive trade. The premises are well situated for freight or carriage, either by railway or canal. — For further particulars, and permission to view, apply to Mr. A. J. FURT, Solicitor, 42, Furl Street, Derby.

IRON FIELD, NORTH OF IRELAND.
To be Let, a Valuable Min-
ING FIELD, situated in County Antrim, Ireland, near to the Northern Counties Railway, and within about an hour and a half distance from the Ports of Belfast and Larne. The ground has already been opened and the ore tested, and found to be of excellent quality. A cargo may be taken for trial on terms. Applicants to address themselves to Messrs. Harrison and Miles, Solicitors, Kendal; or Robert H. Orr, Esq., 2, Lombard Street, Belfast.

Northamptonshire. — The Woodford House Estate, for many years the seat of the late General Arbuthnot, a highly important Freehold (and small part leasehold) Residential and Sporting Property, of upwards of 750 acres, possessing great mineral value, adjoining Twywell, and within a mile of Cranford, both having stations on the Huntingdon branch of the Midland Railway, three miles from the market town of Thrapston, which has stations on the Midland and London and North Western Railways, and seven miles from Wellingborough. The estate is of an undulating character, intersected by good roads. It includes a family residence, occupying a pleasing site, overlooking a timbered park, surrounded by well-grown plantations, interspersed by walks, tastefully arranged pleasure grounds, capital walled kitchen garden, greenhouse, stabling, small farmery, &c., two good farms, with suitable homesteads; also accommodation land in the thriving village of Woodford. The Pritchley, Fitzwilliam, and Oakley Fehmonds are within easy reach, and there are several noblemen's and gentlemen's seats in the locality. Some of the richest beds of iron ore and limestone underlie the greater portion of the Estate, parts of which are now being worked, and it is believed there is no district where these minerals can be found under more favourable circumstances, or put into the market at a cheaper rate. There are private rails and tramways on the property connecting it with the Midland Railway by sidings at Twywell.

Messrs. Farebrother, Ellis,
CLARK and Co. are instructed to offer the above valuable ESTATE for SALE by AUCTION, at the Mart, Tokenhouse Yard, London, on WEDNESDAY, 14th July, 1880, at 2 o'clock, in Lots. Particulars, with plans and conditions of sale, may shortly be obtained of Messrs. Walters, Devereux and Walters, Solicitors, 9, New Square, Lincoln's Inn, W.C.; Messrs. Hemmley and Hemmley, Solicitors, 5, Albany Court Yard, Piccadilly, W.; Messrs. Farrer, Overy and Co., Solicitors, 66, Lincoln's Inn Fields, W.C.; Messrs. Green and Cheese, Solicitors, 2, Warwick Street, Charing Cross, S.W.; of Messrs. Longbourne, Longbourne and Stevens, Solicitors, 7, Lincoln's Inn Fields, W.C.; of Mr. S. Prickett, at the ironworks office on the estate; at the Mart; and, with orders to view, of T. H. Horrocks, Esq., 30, Lincoln's Inn Fields, W.C.; and of Messrs. Farebrother, Ellis, Clark and Co., 3 and 6, Lancaster Place, Strand, W.C., and 18, Old Broad Street, London, E.C.

Lambeth. — Third and last Portion of the Stock and Plant of Messrs. G. Baker and Son, Builders and Contractors, being the remainder of the stock of first-class, well-seasoned timber, mahogany, &c., and the valuable wood-working and other machinery and plant.

Messrs. Frank Lewis and
CO. will SELL BY AUCTION, on the PREMISES, in Palace Road, Lambeth, on MONDAY, June 21st, and following days, at twelve for one o'clock each day, the valuable MACHINERY and PLANT, comprising a trying-up machine, with 15 feet table, by Worsam and Co., a general joiner, a moulding and planing machine, and a vert moulding machine by the same makers, two saw-sharpening machines, three circular-saw benches, a rack saw bench, 50 feet long, mortising, tenoning and moulding machines by Furness, a hand saw, a multiple wood-boring machine, a 16 inch back gear screw-cutting lathe, with 18 feet bed and 20 feet lengthening piece, a 6 inch ditto, with 8 feet bed, a screw-cutting and drilling machine, an 11 inch back gear lathe, with 10 feet bed, a pattern maker's lathe, a powerful punching and shearing machine to shear 20 inch and punch 14 inch, three smaller ditto, a planing machine for iron, with 5 feet sliding table, a screwing machine, a pair of plate rolls 3 feet wide, a bracing apparatus, two forges, anvils, large and lathe tools, stocks and dies, benches and vices, 15 horse-power portable engine, 35 horse-power beam engine, 20 horse-power ditto, 3 horse-power vertical ditto, large Cornish boiler, three portable steam cranes to lift 5 tons by Appleby Brothers, 10 ton overhead traveller, 34 feet span with strong timber gantry 74 feet in length, five overhead travelling crabs, Murray's chain pumps, large iron blocks and gin wheels, differential pulleys, heavy chain slings and falls, one inch steel wire rope one mile long, double and single purchase crabs, a new patent mortar or pug mill, a hydraulic testing machine up to 100 tons, a cement testing machine, pulley, bevel and other wheels, shafting, &c., about two tons of old brass and lead, 3 weighing machines, patterns, 45 tip waggons and 100 bin carts; also the remainder of the stock of Timber, Mahogany, &c., including about 20,000 feet dry pine in planks and boards of fine quality, 20,000 feet yellow deal from 1 inch to 4 inch, 10,000 feet excellent well-seasoned waincot, 10,000 feet of very fine Spanish and Honduras mahogany in various thicknesses, 1700 feet sycamore, 50 squares 14 inch yellow flooring, large quantity of pitch pine in planks, veneers, 30 carpenter's benches, drawing and setting-out boards, two dumpy levels and a theodolite by Elliott Brothers, moulding plates, joiners' cramps and numerous other items. — May be viewed the Friday and Saturday before sale, and catalogues had on the premises, and of Messrs. FRANK LEWIS AND CO., Auctioneers, &c., 95, Gresham Street, E.C.

BRICK-MAKING MACHINERY.
FOR SALE.

A Bargain. Quite new. (Under special circumstances), a double set of Murray's
CRUSHING ROLLERS
(Hedgehog and Plain),
AND A
MIXING MILL.

ALSO SEVERAL
SECOND-HAND PORTABLE ENGINES
FOR SALE.

Can be seen and all particulars obtained on application to F. W. RYLANDS & Co., Engineers and Machinists, 73, Southwark Street, and the Grove, London, S.E.

New Edition.
"How to Make Money by
PATENTS." Free, by post, 14 stamps. — BARLOW and YOUNG, Patent Agents and Consulting Engineers, 23, Southampton Buildings, W.C.

Ten-Horse Horizontal En-
GINE and BED for SALE, with a 10-horse Cornish BOILER, new 12 months ago, 26ft. of 24in. shafting, with 7 Plummer Blocks, and 10 small Pug Mills, the whole for 150 guineas; a thorough bargain. — Apply to C. HOLDEN, 1, Goding Street, Vauxhall, S.E.

Kingston Union. — Coal. —

The Guardians of the Poor of the Kingston Union will, at their meeting to be held on Tuesday, the 15th inst., proceed to consider TENDERS for the SUPPLY of 100 tons of Screened Hutton Lyons WALLSEND COAL, delivered on the Workhouse premises.

Tenders must be sent to me at the Workhouse not later than 10 o'clock a.m. on the morning of the 15th inst.

The Guardians do not pledge themselves to accept any Tender.

(Signed)
JAMES EDGELL, Clerk to the Guardians.
By order,
Board-room, Kingston Workhouse,
1st June, 1880.

In the matter of the Companies Acts, 1862, 1867, and 1877, and in the matter of Thomas Harrison and Company, Limited. In Liquidation.

The Creditors of the above

named Company are required on or before the 10th day of July, 1880, to send their names and addresses, and the particulars of their debts and claims, and the nature and particulars of any securities held by them (if any), and the names and addresses of their Solicitors (if any), to Robert Stanley Blease, Liquidator of the said Company, at the Office of Messrs. J. S. and R. S. Blease and Sons, Accountants, 25, Castle Street, in the City of Liverpool, or in default thereof they will be excluded from any participation in the assets of the Company, it being intended to make a distribution thereof immediately after the said 10th of July, 1880, and the said Robert Stanley Blease will not be liable for any debt or claim of which he shall not then have had notice.

Dated this ninth day of June, 1880.

ROBERT S. BLEASE, Liquidator.

Ironstone Royalty. — To be

LET, in Mid-Lincolnshire, within easy access from Collieries and Furnaces. — For particulars, apply to C. F. care of W. S. Wetherell, Esq., 117, Cannon Street, London, E.C. None but Principals or their Agents need apply.

Fencing. — Redwood Rails

and POSTS (pointed), one or two Cargoes delivery July and August. Name number of each required and Port of Delivery. — Apply, D. H. L., "Iron" Office.

For Sale, a Second-hand

Single-roller BONE MILL, made by Heverley Iron and Wagon Co. — Address, EDWARD FISHER and Co., Chemical Works, Beverley.

Wanted, a Second-hand 10

or 12 H.P. Horizontal High-pressure STEAM ENGINE, by EDWARD FISHER and Co., Chemical Works, Beverley.

DIAMOND BORING.

ARTESIAN WELLS bored STRAIGHT and TRUE—Large and small diameters—easy to line and put down Pumps—Tenders given for Wells, Pumping Machinery, and Engines, complete.

PROSPECTING FOR MINERALS to any depth.—The only system by which a true section of the strata can be obtained from the cylindrical cores taken out.

Total boring by this system in Great Britain to end of last year, 101,000 feet.
For terms apply to JOHN VIVIAN, C.E., Whitehaven, Cumberland.

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The only house in America giving Special Attention to Manganese and Manganiferous Iron Ores.

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NEW YORK.
Telegrams: "Marvel, New York."

A SILVER MEDAL, PARIS, 1878.
For Excellence of Quality.

WAS AWARDED TO

THE GLENBOIG FIRE CLAY
COMPANY,
ESTABLISHED 1836.

Office: 68, BATH STREET,
GLASGOW.

MANUFACTURERS OF FIRE BRICKS FOR HIGH HEATS AND SUDDEN CHANGES OF TEMPERATURE.

Repairs in smelting, puddling and other furnaces occasion such expense and loss of time that it becomes a matter of the greatest necessity to build these furnaces of bricks possessing the highest refractory power. Our experience shows that where ever our bricks have been introduced, they have superseded those of local make. They are specially adapted for Siemens' regenerative gas furnaces; for blast, puddling and glass furnaces; every description of furnace exposed to the most intense heats and sudden changes of temperature, as they do not crack and drop when quickly cooled or heated. References can be given both in Great Britain and the Continent to many of the largest firms in the iron, steel and other trades where our fire bricks are in constant use.

Quotations given delivered at Antwerp, Rotterdam, Bremen, Hamburg, Havre, Dunkirk, &c.
Shipping ports, Glasgow, Leith, Grangemouth, Granton, Boness, &c. &c.

FOREIGN EDITION.

IRON

An Illustrated Weekly Journal of Science, Metals, and Manufactures in
IRON AND STEEL.

ESTABLISHED IN THE YEAR 1823 AS "THE MECHANICS' MAGAZINE."

CONDUCTED BY PERRY F. NURSEY, C.E.

PUBLISHED EVERY FRIDAY, FOR CIRCULATION IN THE UNITED KINGDOM, AND ON THIN PAPER (UNDER 4 OZ.), FOR FORWARDING TO ALL PARTS OF THE WORLD.

No. 388. Vol. XV.

LONDON, FRIDAY, JUNE 18, 1880.

PRICE SIXPENCE.
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Superior to ordinary Silica, and equal to three
lives of Fireclay brick.
J. GRAYSON LOWOOD & CO.,
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SOCIATE of the Royal School of Mines,
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Analyses of Iron and Steel, Spiegelisen, Man-
ganese, Ores of all kinds, Nickel and Copper,
Alloys, Coal and Coke, Fireclays, &c., performed
on reasonable terms.
Gentlemen visiting Sheffield to study Chemistry
will find every convenience in the Laboratories
at the above address.

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GUTTA-PERCHA GOODS**
FOR GENERAL MECHANICAL PURPOSES
Contractors to the Admiralty.
**ST. JOHN'S LEATHER AND INDIA-RUBBER WORKS,
NEWCASTLE-ON-TYNE.**
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ASBESTOS MILLBOARD JOINTING,
ASBESTOS BOILER COVERING,
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ARE UNRIVALLED.
SOLE PATENTEES & MANUFACTURERS
**THE PATENT ASBESTOS MANUFACTURE
COMPANY, LIMITED.**

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10, MARSDEN STREET, MANCHESTER;
From whom Price Lists and all Information can be
had.

ISAAC JENKS & SONS,

Manufacturers of
**SPRING STEEL, CAST STEEL, &c.
RAILWAY SPRINGS, COACH
SPRINGS, SHEET AND BAR IRON,
TAPER BRAKE, LEVER BARS, &c.**
Minerva & Beaver Works, Wolverhampton.
Brand, Steel JENKS. Brand, Iron BEAVER.

**THE RAILWAY
WHEEL AND AXLE WORKS COMPANY,
STOURBRIDGE.**
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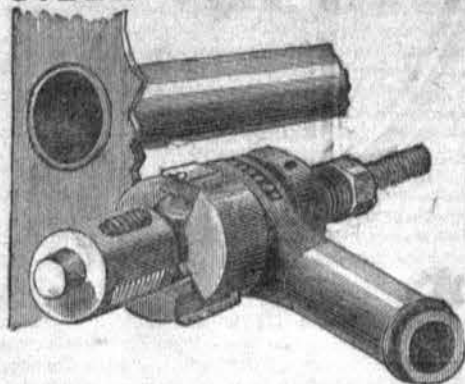
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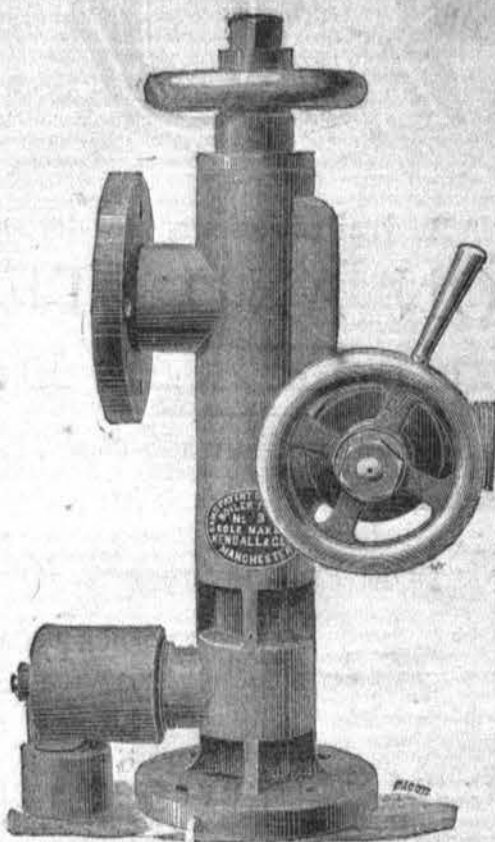
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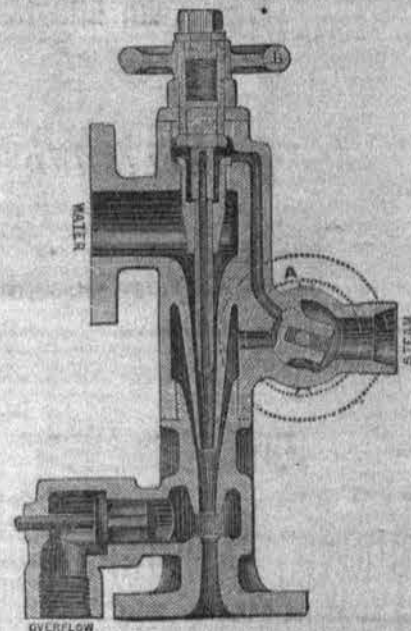


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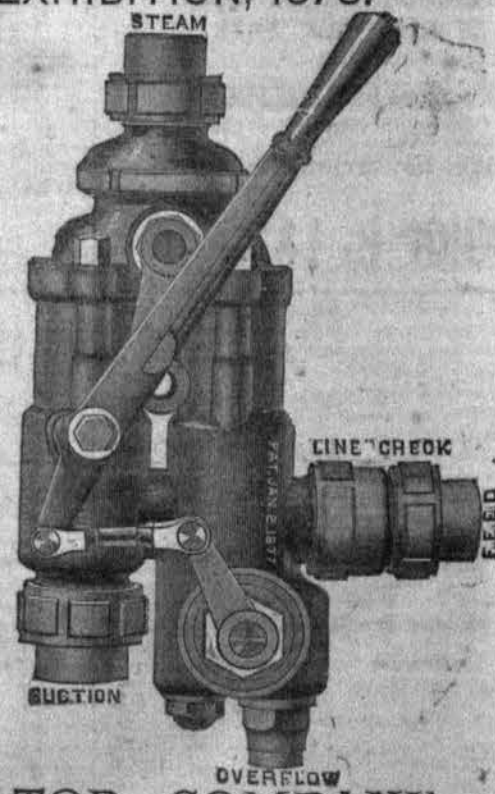
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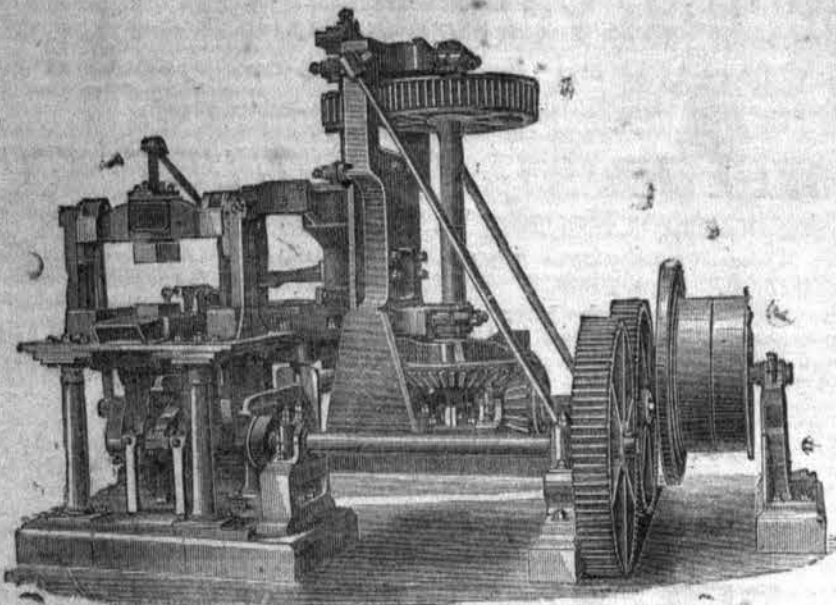
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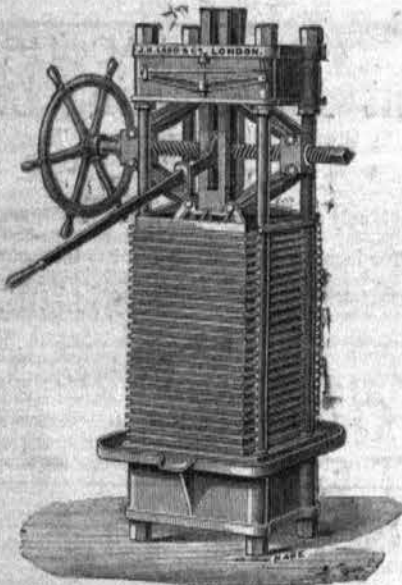
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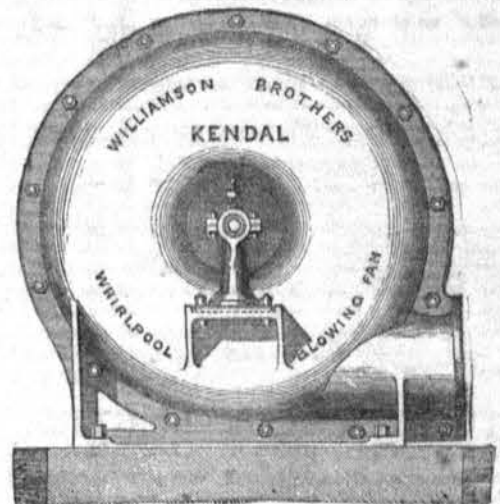
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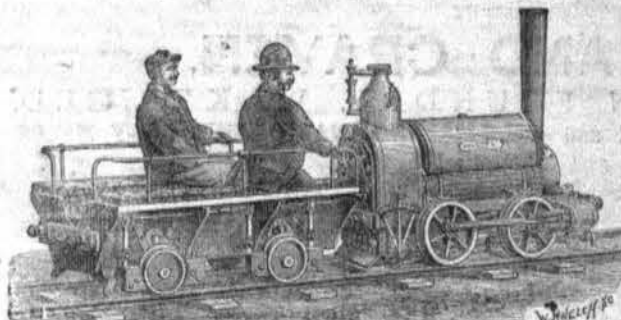
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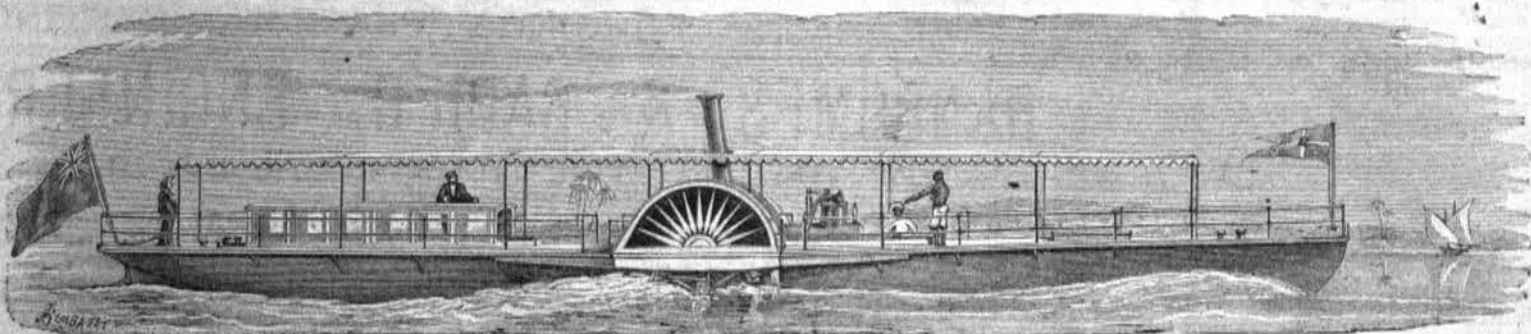
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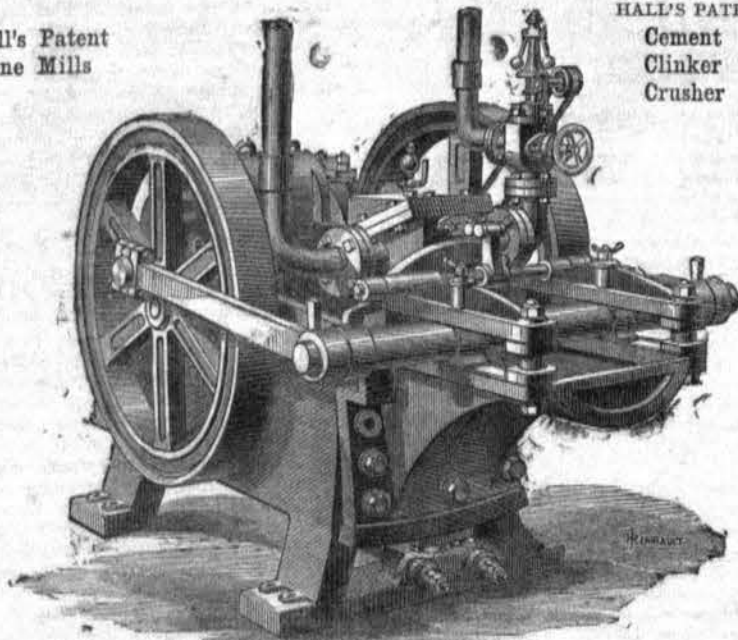
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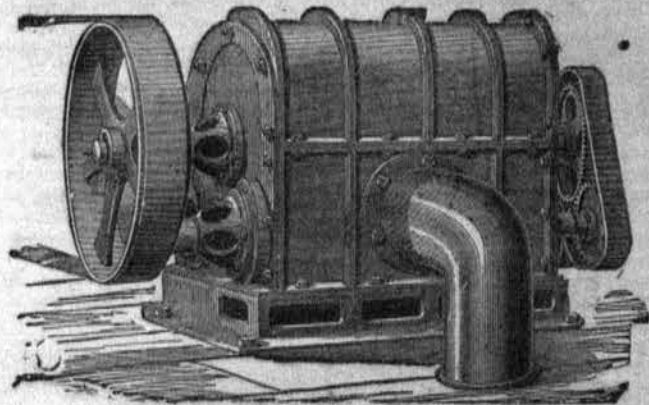
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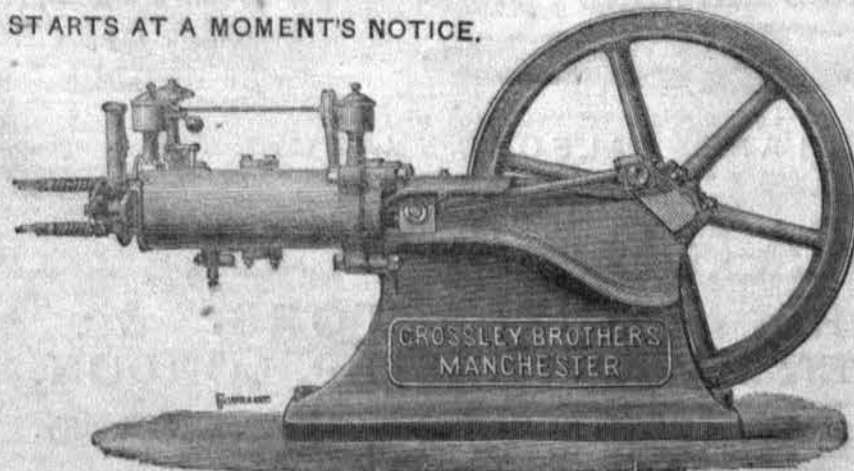
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LONDON, FRIDAY, JUNE 18, 1880.

CONTINUOUS RAILWAY BRAKES.

IN the face of the comparatively slow progress made by our railway companies in adopting continuous brakes on their passenger trains, it appears hardly credible that more than twenty years have elapsed since the merits of these appliances were pointed out to railway officials by the Board of Trade. Yet such is the fact, for so far back as the 25th of September, 1858, the subject was brought under the notice of the companies by means of a circular letter, in which their attention was specially drawn to the report of the present Chief Inspector of Railways, Colonel Yolland, upon the merits of certain continuous brakes. And from that time down to the present the Board has not ceased, on behalf of the travelling public, to importune railway companies on this same point. This has been done through the medium of reports upon railway accidents—notably those for the years 1857 and 1870—by means of circulars, and of a set of requirements issued by the Board in 1862, in all of which the subject of brake power, and of continuous brakes, forms a conspicuous feature. Proceeding in a still more marked and decisive manner, the Board, in August, 1877, issued a circular, in which the aspect of the subject was discussed at length and the necessity for immediate action strongly urged upon the companies. All this having been found insufficient to stimulate them into healthy—and, if possible, united—action, the Board in 1878 tried what a mild legal enactment would effect. The object of this Act was to oblige the companies to make periodical returns respecting their action in the matter of continuous brakes; and the intention of the Board in seeking the Act was apparently to bring some slight moral pressure to bear upon the companies, and to stimulate them to more energetic action. The returns have been duly made, but in their results they reveal such an indisposition on the part of the companies to do anything, if not an absolute spirit of obstructiveness, that they have called forth another circular from the Board of Trade, which has recently been issued and is now before us.

In that document the Board call special attention to the discussions which have taken place in the last Parliament and in the present Session on the subject of continuous brakes for railway trains, and also to the returns recently laid before Parliament for the half-year ended the 31st of December, 1879. From those returns it appears that little progress has been made, either in the adoption of continuous brakes, or in the selection of any system or systems which can be worked in connection with those adopted on other railways. At the date last mentioned, it seems that not more than 23 per cent. of the number of engines, and 28 per cent. of the number of carriages used in passenger trains were fitted with any of the systems returned by the companies as continuous brakes. Moreover, of the brakes so returned, many fail to comply with the conditions laid down in the Board of Trade Circular of 1877, to which we have before referred. Some are only sectional, not being continuous throughout the train; some can only be applied by the guard or guards, and not by the engine-driver; some can be applied by engine-driver and guard; while others are not automatic—that is, capable of self-action when a train from any cause becomes divided. This supineness on the part of the companies is to be regretted, and comes with a very bad grace after the action taken by the Board of Trade from first to last in the matter. It has dealt tenderly, not to say compassionately with the companies; and if the obliquity of their moral perception is so great that they cannot read between the lines, they must take the consequences. The Board expresses its regret that so little has been done in the way of arriving at a decision and united action in a matter which has so long excited public interest, and which has formed the subject of so much discussion in Parliament and of so much official correspondence. And it may well do this; for of late the case for prompt action has been strengthened, not only by the increase of traffic, and especially of fast trains, but by the invention of improved forms of brake. Notwithstanding this, little has been done by the companies towards the general adoption of continuous brakes, and still less towards united and harmonious action in the matter. The Board expresses itself now, as heretofore, most anxious that action should be taken in this matter by the companies themselves, and that the interposition of Parliament should thus be rendered unnecessary. But, as the Board puts it, it is obvious that such a state of things cannot be allowed to continue indefinitely, and that, if the companies decline or fail to act in the matter, steps, no doubt, will be taken to compel them.

It will thus be seen that the Board of Trade having exhausted argument, and gentle persuasion proving of no avail, it now very properly, and by no means obscurely, hints at the possibility of legislative interference. Still wishing, however, to defer the

day of reckoning, and to give the railway companies a last chance, the Board, in the circular, once more presses the matter on the attention of the companies, and at the same time requests that they will, on or before the 31st day of July next, inform the Board, not only what steps they are taking to adopt continuous brakes, but whether they will give an undertaking that the passenger trains on their line shall, within a period to be named in the reply, be fitted with brakes of the description which is contained in the Schedule to the Act of 1878, and which runs as follows:—(1) Brakes instantaneous in action and capable of being applied by engine-driver and guards; (2) self-acting; (3) capable of being applied to every vehicle of a train; (4) in regular use in daily working; (5) materials employed of a durable character, easily maintained, and kept in order. This is bringing things to an issue, and the step would seem to leave the companies no room for doubt or hesitancy in the matter. It is still, however, a question how far the companies will agree upon the adoption of any uniform system. This, we fear, they never will; in fact, their whole conduct in the past completely negatives the supposition. Such a course cannot be expected of them. Of course, after all that has been said and done, Parliament might now very properly enlarge the powers of the Board, but it could not be asked to demand the adoption of any particular form of brake. It is, however, a question whether the Legislature might not now enforce certain definite requirements, which are the approved result of practice and experience. If the Board were empowered to require that every passenger train should be fitted with brakes fulfilling certain essential conditions, the first step towards securing uniformity and security would be taken. Then, in order to render the traffic interchangeable, the companies whose interests extend to each other's lines, by reason of their running powers, would doubtless act in concert to secure uniformity in their brake arrangements. This would probably lead to the selection of the best example of brake, and would thus relieve the Board of the invidious and disagreeable task of choosing between rival systems.

The only question at present remaining for decision is what should be the form of brake adopted? This would be answered in different ways, by different railway men, as their inclinations or their interests might guide them. Their instincts, if followed, could hardly lead them wrong. There is no need for us to advocate the adoption of this, that, or the other form of brake, merely because we believe in, or can prove its superiority. We can go much farther than this, and let the question stand for answer purely upon its own practical merits. Although comparatively little has been done in the way of adopting continuous brakes, as we observed at starting, still that little is sufficient to indicate where merit lies; and if we take the brake which it is admitted fulfils all the Board of Trade requirements, and test it by the extent of its adoption in practice, we shall certainly not be wrong in selecting it as the brake which should be—to use a popular expression—"the brake of the future." The question, as to which brake this is, is answered at once by a reference to page 145 of our present volume, where we give some returns respecting the Westinghouse brake, which admittedly complies with all the Board of Trade requires, being continuous and automatic. It is not our present purpose to indicate the extent to which each system of continuous brake has been adopted, for some would cut but a sorry figure; but we shall, in another article, describe each brake briefly, and point out how far each does or does not comply with the requirements of the Board of Trade. We will only now note the extensive adoption of the Westinghouse brake as indicated by the report in question. From that it will be seen that its own inherent merits, had, up to the end of January last, led to the application of the automatic system to no fewer than 362 engines, and 2337 carriages in England alone. The total adoption of automatic and non-automatic brakes in all countries including America was to 5396 engines, and 21,329 carriages. And here we should mention, in justice to the North-Eastern Railway Company, that having given the Westinghouse automatic brake a full and fair trial on a portion of their stock, they have decided to fit the remainder with it. This decision, be it noted, was arrived at before the issue of the recent Board of Trade circular. We merely advance these facts to show that one particular form of brake has, in the face of the supineness and manifest indifference of some railway companies, made great progress in the favour of others; and that, this being the case, it is worth while for those who are now hesitating in the matter to give it their earnest attention. In the meanwhile it behoves all to give good heed to the most recent protest of the Board of Trade against official stubbornness, lest a worse thing befall them.

OUR TRADE SUMMARY.

THE depression that for the last few weeks has affected nearly every department of the iron trade has apparently reached the lowest point, and hopes are generally entertained of a return in the opposite direction. In the Glasgow warrant market, however, which is a great centre of speculative business, although prices have been kept up by

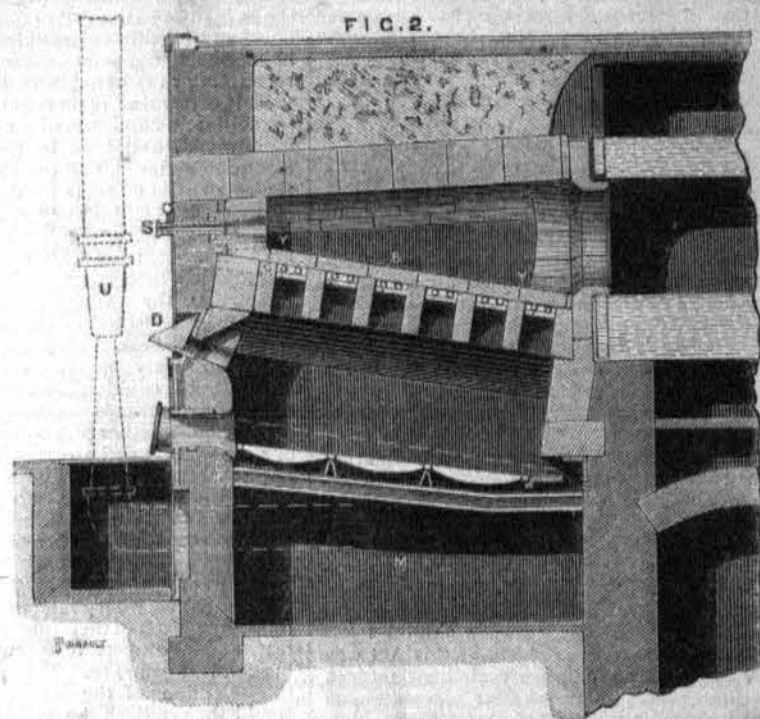
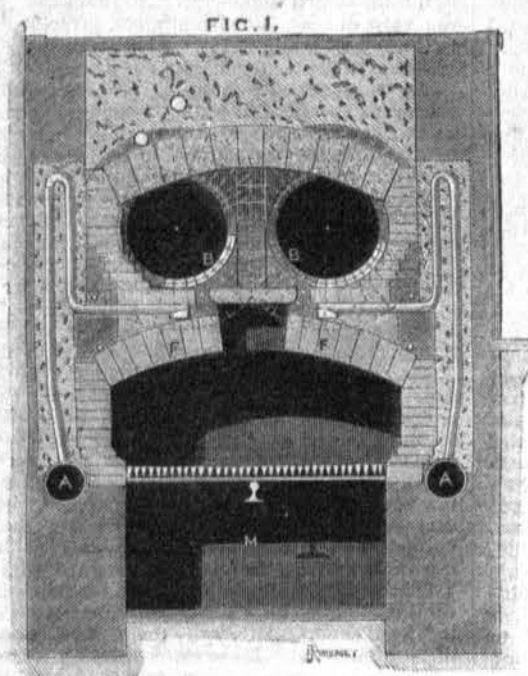
purchases for investment, things are not considered in a healthy condition, and a fall is expected. The Glasgow manufactured trade continues depressed, and what orders are received are at unremunerative rates. Indeed, with the exception of the shipbuilders, all descriptions of ironworkers complain of dull trade. The tone of the Middlesborough market on Tuesday was firm, following, as it invariably does, that of Glasgow and the proceedings were marked by a degree of hopefulness as regards the future. The finished-iron trade is in a fairly satisfactory condition. From the Tyne district there is not much to report. There is, however, a slight improvement in the price of pig-iron, and a decidedly more hopeful feeling among those engaged in the trade, although increased rates are not expected. But the rolling mills, foundries and forges are all in steady work, and shipbuilding is still carried on briskly. The activity of this last-named industry is stimulating the local engineering trades. There is a rather better feeling in the Durham pig-iron trade, doubtless, like that of Cleveland, in sympathy with the temporary condition of matters in Glasgow; but the finished branches continue hopelessly low, the only demand being for ship's plates, rates for which are stiffening. In the North-west, very little business is doing; but the list prices remain unaltered, while, although the furnaces in the district are all in full work, it is expected that when several large shipping orders now in hand are disposed of, there will be a decrease in the output. Steelmakers are still well employed on old orders, but no new business of any importance has recently come to hand. Several of the contracts for delivery this year are, however, very extensive. Merchant-steel is in considerable output; and there is great activity in the shipbuilding yards and the industries connected with them. The labour difficulty is cropping up in several parts of the district, and likely to cause considerable inconvenience. Although there has been very little doing at Manchester during the past week the pig-iron market has a healthier tone. There is, however, a disposition to blow out more of the Lancashire furnaces rather than submit to a farther reduction in prices. In the finished-iron trade prices continue weak with a downward tendency; but there are rather better reports from the foundry and engineering branches. The West Yorkshire iron manufacture is stated to be in even better case than it has recently been represented; and the influx of orders is taxing all the resources of producers. The crucible steel branches show great improvement, and both engineers and machinists are busily employed. On the other hand, the Sheffield pig-iron trade remains exceptionally dull; but both iron and steel plates, especially for shipbuilding, are in great and increasing demand. In the Barnsley district the blast-furnaces are kept going, but in some instances the output is in excess of the demand. In the other branches business is quiet. The local trades of Sheffield continue in a depressed condition, the file and sheep-shear makers being in the most fortunate position. The leading hardware manufactures of Birmingham still show little animation as regards home demand, the orders being few and of limited extent. The depression in the Australian market continues, but both from the United States and Canada orders are coming in somewhat freely; and there is a perceptible improvement in the demand from India. From the adjoining district of South Staffordshire complaints also come of the small and irregular character of the orders received and the lowness of prices. The supply of coal appears everywhere to be in excess of the demand, and prices consequently remain weak; in the important coal-mining district of South Yorkshire, the trade is said never to have been in such an unsatisfactory state.

THE BRUSSELS NATIONAL EXHIBITION.

FOLLOWING closely upon that in the Palais du Midi, the official national Exhibition, restricted to products and manufactures of Belgian origin, was inaugurated only one day later than that first appointed, viz., Wednesday last. A day had been erected in front of the arcade connecting the two permanent pavilions, for the accommodation of the Royal family, the high officials of State and foreign ministers, and to the left 1400 executives effectively rendered the patriotic cantata composed by M. P. Benoit. When this was concluded, the exhibitors in the various classes, accompanied by their collaborators and a certain number of workmen, bearing the insignia of their trades, marched past the King. The privileged visitors and season-ticket holders then poured into the building, but could in most cases only form an idea of what the Exhibition will be a few weeks hence. It is evident that, as might be expected, mining and metallurgy will be well represented, trophies of ore, pig-iron and finished bars, rails and plates, having a prominent place. Engines, pumps, machine tools, locomotives and rolling stock generally, including two types of tramway engine, agricultural implements and weaving are large classes; and many industrial processes illustrative of the national manufactures will be shown in actual working. The Machinery Hall, about 1500 feet long, is provided with a double line of shafting for driving

THE SIMON-HAUPT GAS-FIRED STEAM BOILER

AT THE LIEPNIK SUGAR WORKS, MORAVIA.



the machines in motion. The Société John Cockerill, the Société Marcinelle and Couillet, and, indeed, all the leading manufacturers, have imposing displays, and the Exhibition promises to be a success from a technical as well as from a financial point of view.

GAS-FIRED STEAM BOILERS.

WHEN we say that the perfect consumption of fuel is rarely if ever attained in practice with steam-boilers fired in the ordinary manner, we only state a fact which is well and greatly regretted. Nor do we do more when we observe that any feasible proposition for reducing the consumption of fuel is always hailed with satisfaction by those who study their own interests and their coal bills; and where are they who do not, except perhaps a few colliery owners who may be privileged, and consequently careless, in this respect? But even their privilege costs them something per annum, and if they would only realise this fact they would doubtless study economy a little, in common with other and less privileged steam-users.

It will be conceded that the best, and indeed the only, means of securing perfect combustion is first to distil off the gases contained in the fuel, and subsequently to burn them with the proper admixture of air, economy being further promoted by heating this air with the heat otherwise radiated or lost from the boiler or masonry. In this connection we now place before our readers particulars of the Simon-Haupt system of gas-fired steam-boilers, which is being introduced into England by Mr. Henry Simon, of 7, St. Peter's Square, Manchester. The gist of this invention consists in the production of combustible gases by the imperfect combustion of solid fuel in a generating chamber, the gases being immediately brought into intimate contact with a supply of heated air so as to effect their combustion under the boiler. The accompanying engravings represent the Simon-Haupt system as carried out in a double-flued Lancashire boiler at the Liepnik Sugar Works in Moravia, which has been fired with gas for a considerable time past—about 2 years—with very satisfactory results. Fig. 1 shows a longitudinal and fig. 2 a vertical section of this boiler.

It will be seen that the ash-pit, *M*, is closed. Air is blown in by one of Korting's blowers, *U*. The fire-bars, which form the bottom of the gas-generator, can, according to the fuel to be used, either be level or in steps. A door, *D*, closes the hole through which the fuel is introduced, and through which what stoking is necessary is done. Fire-brick arches, *F*, carry the burners, *B*, which consist of long slits, extending from *P* to *P'*, through which the gas generated from the fuel passes. The gas is met in an opposite direction by atmospheric air, drawn in by the draft of the chimney through the two larger tubes, *A*, and a row of smaller tubes embedded in the brickwork of the furnace. These latter branch off vertically from the former, and after rising for 5 or 6 feet, they bend back parallel to themselves, and then in a horizontal direction, leading under the gas-burner slit. Their object is to intercept and utilise to some extent the heat otherwise lost by

radiation through the walls of the fireplace by heating the atmospheric air which passes through them. The air drawn through the tubes, *A*, is heated to about 550° Fahr. before meeting the gas, the combustion of which it thus facilitates. The heated air, meeting the incandescent gas just under the burner, ignites and intensifies the flame, which then issues through the slits and goes through the boiler in an elongated mass. The length of flame is regulated by the admission of more or less air through the valves connected with the tubes, *A*. This long flame is the cause of the greatly-increased evaporative power of boilers fired in this way. Through the sight-holes, *S*, the flame can always easily be observed.

The lighting-up is effected in the following manner:—The door of the ash-pit is opened, and a fire is lighted on the grate in the ordinary way, and with the natural draught through the chimney. The grate is then gradually filled up with coal, until the whole generator is full of incandescent fuel. The arches and walls and the burner soon get red hot, and the gases issuing at the top are ignited by themselves. In cases where steam is already at hand, the blower can be used to accelerate this process. It is interesting to notice the gradual transformation of the ordinary direct fire into the indirect or gas fire. At first the chimney smokes considerably, even when the burner is already red hot, and notwithstanding plenty of atmospheric air arriving through the tubes, *A*, mingling with the gas under the burner. As soon, however, as the layer of fuel becomes thick enough, the formation of smoke in the fire itself ceases, and the formation of gas only takes place, the burning of which occasions no smoke at all. We understand that some fifty applications of this system have been made with very satisfactory results, notably at Brieg, in Upper Silesia, where there is an establishment for testing different qualities of coal. The establishment had originally two externally fired boilers of similar construction, and for the last twelve months the Simon-Haupt apparatus has been fitted to one of these. The result, as testified by the manager, Professor Nöggerath, director of the Royal Technical Government School, has been the following, viz.:—(1) That the apparatus can be used with good results both for coal of the highest or the lowest quality. (2) That in the gas-fired boiler an equal quality of coal produces per pound 1½ to 2 lb. more steam than in the other boiler. (3) That the gas-fired boiler evaporates about double the quantity of water evaporated in the other. Whilst the gas-fired boiler evaporated 22,000 lb. of water, the ordinarily-fired boiler only evaporated 11,000 lb. (4) That there is no smoke and less deposit of soot and ashes in the gas-fired boiler than in the other, the proportion being as 1 to 9.

DISCOVERY OF VALUABLE IRON ORE IN NEW SOUTH WALES.—Late news from Sydney announces the discovery of some valuable bands of ironstone lying close to the surface, and of considerable extent. One of these bands contains over 61 per cent. of iron, and another yields 3½ oz. of gold to the ton, besides several ounces of silver. The gold alone will thus fully pay for the working of the iron.

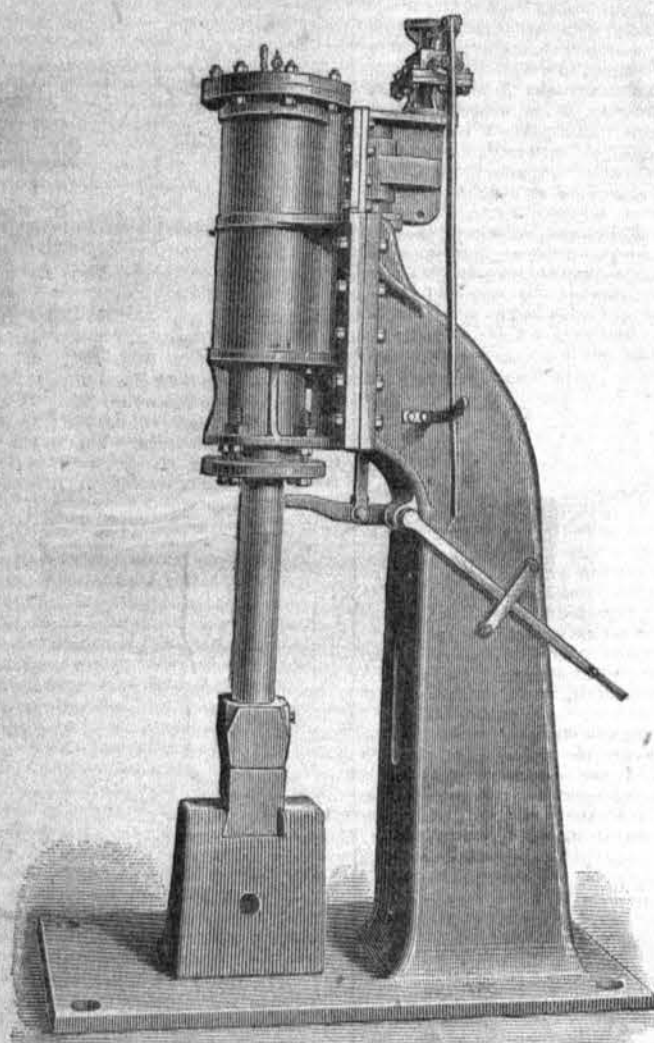
SMITHY STEAM-HAMMER.

IT must be apparent to the most casual observer that smithing by hand, being a process depending so much on the skill of the workman, cannot fail to be both costly and uncertain. There is, moreover, a large amount of drudgery connected with the process which can be far better performed by machinery, hence it is clear that no smith's shop should be without a steam-hammer, and as a matter of fact the considerations we have advanced have led those who aim at working with economy to largely employ steam hammers in their smithies. By this means the smaller articles are at once forged or stamped into shape in dies, and the larger ones operated upon in a manner quite impossible by mere manual power. We need not dilate upon the advantages of using steam-hammers, but at once direct attention to an excellent example of this class of machine which is illustrated in the accompanying engraving. It was exhibited, with others of various sizes, by its makers, Messrs. Davis and Primrose, of the Etna Ironworks, Leith, at the Sydney Exhibition, where it has been awarded the first prize for steam-hammers. The hammer is of the 5-cwt. size, and has a cylinder 11 inches diameter, with a 2½-inch stroke. The weight stated is only that of the piston-rod and hammer-face and is of course irrespective of steam-pressure on the piston. The pressure of steam acting on the top side of piston adds immensely to the force of the falling weight. Thus this hammer having an 11-inch cylinder and 2½-inch stroke the area of the cylinder is 95 square inches. Now, 40 lb. pressure per square inch on 95 inches of area adds 3800 lb. to the weight of the falling mass of metal—in this case 5 cwt., or 560 lb., giving a total of 4360 lb. falling 2 feet, equal to 8720 lb. of actual energy.

The hammer we have illustrated embodies many improvements in details that have been suggested by experience in the manufacture and use of steam-hammers. All the parts are carefully proportioned to the respective strains they have to bear. The valve casing is so placed as to be easily got at for repacking or examination of the valve, and is fixed to the cylinder by bolts passing through flanges. The piston and piston-rod are forged in one piece of best fagotted scrap-iron, or of steel, and the hammer face is of crucible cast-steel or of forged iron steel-faced; and the anvil is of cast steel. The anvil block is a separate casting resting on a foundation, independent of that supporting the sole plate and frame. In these hammers the steam stop-valves are of special design and very efficient in their action. The stop-valve handles are within easy reach of the attendants, the supply of steam is thus brought under immediate control, and when the hammer is stopped steam can be completely shut off without trouble. This is an important consideration; for it is generally found that where the stop-valve is not very accessible the attendant does not shut off the steam between heats, but allows a continuous waste of steam, of more or less amount, to take place greatly to the detriment of the slide valve and other parts. These hammers are all double-acting, and the valve gear is of simple construction, with but few parts.

SMITHY STEAM-HAMMER.

BY MESSRS. DAVIS AND PRIMROSE.



THE CRANSTON ROCK DRILL.

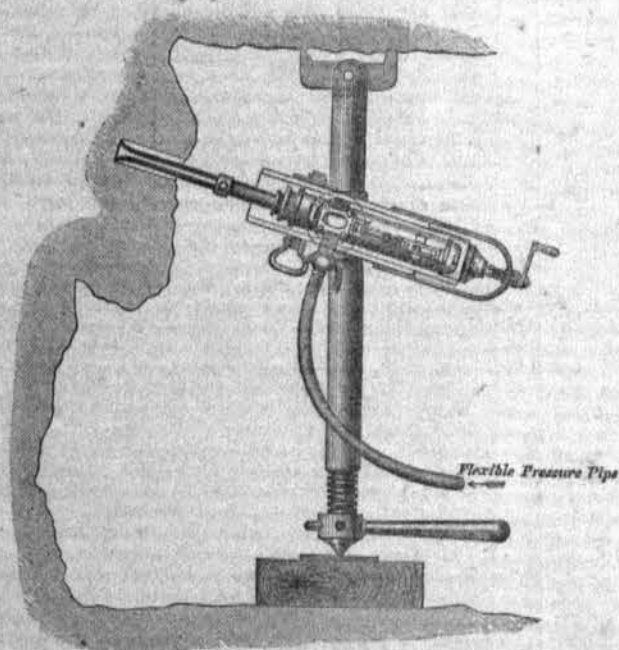


FIG. 1.

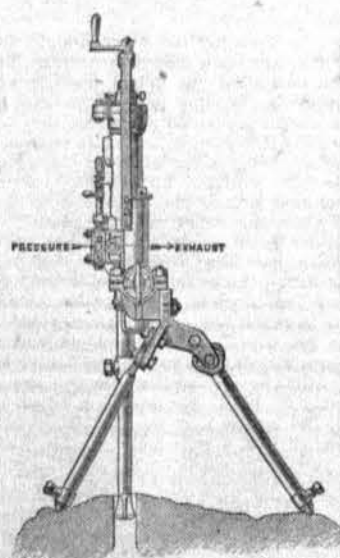


FIG. 2.

THE CRANSTON ROCK DRILL.

THERE are machines which, while they cannot lay claim to notice from their immediate novelty, are yet entitled to it by reason of their merits, and the success which, as a result of those merits, they have achieved in the field of everyday work. Information respecting such machines being at all times interesting to practical men, we now, on these grounds, bring before our readers the Cranston Rock Drill, which is illustrated in the accompanying engravings. Fig. 1 shows the drill carried on a

pedestal stand for driving headings, whilst fig. 2 shows it mounted on a tripod stand for ordinary work. It can be removed from one piece of work to another with very little trouble, the whole weight of the machine being only about 2 cwt. and in every way it is well adapted to the work it has been designed to perform. Being on the swivel principle, when fixed it can be made to work at any angle. The cylinder is made of gun metal, and a great advantage is that none of the working parts are exposed. The drill tool, which is of cast steel, is cross-lipped at the bottom, and is self-rotating; it can be readily replaced by

other tools of such length as the necessities of the work may require. In case of its becoming jammed it can be instantly extricated by the workman in charge, who has merely to rotate the drill tool by the feed-lever. The drill can be used for coal-cutting, and when it is so used, an arrangement which produces a slotting motion is used. The inventor has provided an air-compressing and hydraulic apparatus to be employed to drive the machine where steam cannot be obtained. Amongst the special features which recommend this handy rock-drill, Mr. Cranston gives prominence to the following:—It will bore a hole $2\frac{1}{2}$ inches in diameter at the rate of from 2 inches to 1 foot per minute. Through Aberdeen granite it will bore at the rate of from 2 to 6 inches per minute. The working parts of the machine are very simple and strong, and are not liable to get out of order. It can be worked by any pressure from 20 lb. to 120 lb. of steam or air, and will bore a hole 20 feet deep, the drilling tool being changed every 2 feet. The valve can be readily adjusted so as to regulate the force of the blow to the varying nature of the stone to be drilled and depth of hole required. Some very difficult work has been done by drills sent out by Mr. Cranston to the Eberhardt and Aurora Mining Company, and used in their mines in Nevada. The engineer of the company states that the drills have done excellent work. The total distance of the tunnel and drift is 6162 feet through the hardest kind of lime rock; not a foot has been run without the use of the machines for drilling. Mr. Cranston, whose address is 22, Grey Street, Newcastle-on-Tyne, is sending out to the gold mines of Brazil a large plant of rock-drilling and air-compressing machinery. He goes shortly on a visit to that country, with the object of fully testing the application of his apparatus to gold-mining.

OCCASIONAL NOTES.

CREMATION.

THIS new enthusiasm does not seem likely to burn itself out on the Continent, although the refusal of the late Government to legalise crematoria has apparently checked it in England. There is an active Cremation Society in Rome which has recently obtained permission to erect a crematorium in that city, and in the new cemetery about to be formed in Padua, arrangements will be made for burning the bodies of those who prefer it. The reformers who aim at curtailing the extravagances of modern funerals, were cremation the rule, might follow the example of Suk Ram Sing, who sent the relics of his father from Khelat-i-Ghilzai to Candahar for interment, packed in a small tin box. The Ram's parcel was unfortunately lost in transit, and the Dead Letter Department has not been able to discover its whereabouts. In the English Post Office that would not often occur; and funerals conducted through the Post Office would be as economical as the most advanced reformer could desire.

CIVIC TREASURES.

Magnificent as was the show of gold and silver plate belonging to the City Corporation and Guilds, exhibited at the conversazione on Friday night last, the vessels shown are said not to have comprised a tithe of those in the possession of these wealthy fraternities. The value of the precious metals of which these goblets, loving cups, salt-cellars, and other articles, are composed, is great, but greatly exceeded by the value of the workmanship. From the readiness with which the Companies have thus displayed the paraphernalia of their feasts, it may be hoped that when the Royal Commission of Inquiry enters upon its labours they will be as little reticent with regard to their lands and incomes. There is a general feeling among them that the expected investigation will be a very superficial affair, and that neither their property nor position is in any great danger; but to spread such an idea may be merely a device of the enemy, and in displaying their precious utensils at the Mansion House they may have been but imitating the weakness of King Hezekiah, who by vainly parading the treasures of the Temple, stimulated the successful cupidity of the hereditary enemy of his race.

THE ELECTRIC LIGHT IN MINES.

While in this country we have been talking and planning, the Americans have practically and satisfactorily solved the problem of lighting mines by electricity. The *Marquette Mining Journal* claims for the Cleveland Iron Mining Company the credit of first permanently introducing the electric light into mines in the United States. The special form is the Brush light, and the editor of the *Journal* describes the effect as fairly rivalling sunlight, giving full illumination to the working face, and making the roof and pillars visible from every direction. The lights are suspended on pulleys from high places in the roof, and the wires are left slack to enable the raising or lowering of the light without breaking the connection. The rope attached to each pulley is fastened at a convenient place in the floor, and the light can be raised to the roof or lowered to the floor without loss of time or trouble. They are so arranged as to be out of the reach of blasts when raised. There is no

part of the pit where the roof, the pillars and the slopes cannot be distinctly seen at one and the same time, thus greatly facilitating the work. In one pit four lamps are employed, and in another, a larger one, there are six. By the use of the electric light the life of the miner will be rendered not only safer but cheerful, he will be able to do more work and do it better; and the benefits it will confer on the iron miner will be increased manifold in the case of the collier.

ELECTRICITY V. GAS.

In two instances on Monday last, gas companies appeared before Committees of the House of Commons on bills for local improvements, which they considered militated against their interests. In both cases the opposition was fruitless. One of the measures opposed was the Preston Improvement Bill, in which provision is made for the lighting by electricity of certain public streets, places and parks in that town, and supplying motive power by electrical agency. The lighting scheme is creditable to the enterprise of the Preston Corporation, and Dr. Siemens, who explained it to the Committee, expressed a strong opinion in favour of its convenience and practicability. Within a radius of 800 yards, he stated, there were a market place, a corn exchange, a town hall, a clock-tower, and a free library, and to light these seventy-five small lights would be required for the streets and buildings, and twelve large lamps at from 46,000 candles to light the parks and open spaces. The engines would require to be of 82 actual and 30 nominal horse-power, and the consumption of coal would be from 2 to 2½ cwt. per hour. An expenditure of £9000 would suffice to supply the engine and necessary plant. The total cost of lighting would be 20s. per hour, which is 5s. each lamp below the cost of the existing gas-lamps. The street lamps would be lighted 3000 hours per year, and those in the parks about 900 hours. The cost of working the electric light would be only about half the cost of lighting the same places by gas. An area of 200 yards square would require a light of 6000 candles, costing 7d. per hour, the initial expense being £250.

THE SCHOOL BOARDS AND DEPORTMENT.

Honest and industrious, in the main, as the working classes of this country are, they are, at the same time, as a rule, more rude and discourteous in their intercourse with each other than the same class in any other nation in Europe; nor in this respect do their superiors always set them the best example. It is, therefore, satisfactory to find that the School Board of a Scotch seaport has, with the view of improving the manners as well as the minds of the rising generation, procured reports from the masters of its various schools on the deportment and general conduct of the children of the town, in and out of school. The masters, "while somewhat on the defensive, so far as the children of their own schools are concerned, and denying or questioning the allegation that the Greenock children are worse behaved than those of similar towns, generally concur in the opinion that there is great room for improvement." Scotch boys are especially difficult to manage; and the masters, no doubt truly, attribute a good deal of their faults of deportment to parental neglect. Among other causes, one of the masters blames hereditary instinct—the *perferendum ingenium Scotorum*, with the addition in Greenock of *mobile ingenium Cellarum*—penny literature, the early age at which boys begin to earn and handle money, the frequency and somewhat rough nature of electoral gatherings in the town, and penny dreadfuls, which last are a crying evil everywhere. The committee to whom the matter was entrusted by the Board suggest that the children should be taught habits of punctuality, good manners and language, obedience to duty, respect for others, and honour and truthfulness in word and act. They seem inclined to restrict the use of corporal punishment, although one of the teachers who found the boys very much given to fighting when he took charge of his school, succeeded in all but stopping it "by using some sharp remedies," which, probably, did not consist of moral suasion. The London School Board also seems to have considerable difficulty with refractory pupils; and has established an institution at Upton House for truants and others who cannot be made amenable to the ordinary discipline.

ON THE STRENGTH OF IRON IN COMPRESSION.*

By WIGHAM RICHARDSON.

I AM not quite sure whether I have any business to address this Institute on the above subject, seeing I have no new facts or data or experiments to lay before you, but I wish to express some doubts about generally received hypotheses and in so doing to invite discussion and an interchange of ideas. It is now nearly twenty-five years since Professor Eaton Hodgkinson made certain remarks in my hearing on the premises of University College, London, where he made his experiments, and it is on these remarks that I purpose to offer some considerations. Professor Hodgkinson, then, whose experiments are even now the generally accepted data for all deductions about the strength

of wrought iron in compression, said to his class, "Remember that although a piece of wrought iron 1½ inches long and ¾ inch diameter will crush with a load of something like 16 tons per square inch, we do not know, if the sectional area be increased, that the limit of crushing strength will be increased in the same proportion." This is what the professor told us, and yet I think I am correct in saying that notwithstanding this the usual practice of engineers has been to consider wrought iron as weaker in compression than in tension, whatever the section of the structure may be. I venture to ask—is this common sense? We know that a tall chimney may be built of bricks without crushing the lowest course of its brickwork, but if you were to saw out of a brick a little pillar, 1 inch square and 2½ inches high, such a little pillar would not support the proportion of the load due to it. It would crumble to pieces. In other words, 20 square inches of brick are more than twenty times as strong as 1 square inch. Perhaps a more striking illustration would be this: When any excavation is going on it is usual to leave here and there cones of the supersoil to mark the original height of the ground. These cones, if of small diameter, are most readily crushed; but if they are left so as to be for every foot of height 2 or 3 feet in diameter they will bear many tons weight with safety.

One of the most recent works on the strength of structures is that written for the Science Text Book series, by Mr. John Anderson, the well-known Director of the Woolwich Arsenal, and he thus describes the effect of crushing wrought-iron cylinders when the load is taken off before fracture:—"By increasing the stress upon these short cylinders of wrought iron or soft steel they are found to shorten gradually by bulging outwards in the middle. The effect of this change of form is to slightly stiffen the metal, and this affects the malleable or flowing property; unless the specimen is extremely soft it will soon show symptoms of slight fissures or cracks at the part which is bulging. To prevent this, the annealing process must be resorted to; and with care the pillar can be flattened down to a thin disc on gradually presenting a larger surface for the machine to act upon. Reckoning the intensity of the ultimate pressure from the original dimensions, a stress of upwards of 100 tons per square inch is necessary to actually flatten down wrought iron."

When Professor Hodgkinson was making his experiments he did not, so far as I know, try the annealing process, at least these cylinders which I saw tested were actually broken. They all broke in the same way; a bulging out at or below the middle, and then a kind of telescopic shutting up—the lower part an irregular cone, the upper part being hollow, see sketch, fig. 1.



FIG. 1.

In the experiments which I myself saw, the cone was always on the lower side, but it is not very clear to me why this should be the case. If you will look again at fig. 1, it is evident that if these small pillars had been hexagonal and several standing close together and held together, they would give each other much mutual support, and the initial bulging would be checked. If this be admitted, the difficulty of calculating the strength of any structure in compression is not lessened. It is easy to speak of so much per square inch if only the strength did not increase in a more rapid ratio than the section.

Although wrought iron is commonly supposed to be weaker in compression than in tension, perhaps none of us have ever seen a case in actual practice of wrought iron being crushed. In some cases it is difficult to conceive that pieces of machinery would break as they do if iron were really weaker in compression than in tension. For example, I remember seeing an eccentric-rod break in consequence of the slide valve seizing. The engine was making at least one revolution each second, and therefore there was a pulling and a crushing strain rapidly repeated. Notwithstanding this, the eccentric-rod, which was of excellent iron, had drawn out like a piece of dough or putty, and then broken. Mr. John McFarlane Gray, of the Board of Trade, wrote a most valuable report upon the breaking in two at sea of the paddle-wheel steamer *Mary*, built on the Clyde; and he demonstrated that the upper works gave way in compression and not in tension; but at the same time he showed that this was not by crushing-in the iron, but by a repeated bulging and straightening, whereby the honest iron was ultimately obliged to yield. I remember that a ship built on the Wear some ten or twelve years ago, when being towed down to the dock, struck her mast against the bridge, and it snapped off at the deck; but there was not any appearance of crushing when the fracture was examined. On another occasion, at works close to my own, the guy of the sheer legs gave way, and the legs, which were wrought-iron tubes, snapped in two; but, on the most careful examination of the broken pieces, no appearance of actual crushing could be detected.

The late Sir William Fairbairn, in his work on Iron Shipbuilding, gives (pp. 47-63) an excellent *resumé* of the elaborate experiments which were made on the strength of iron tubes at the time when the Menai Tubular Bridge was being designed. He gives a series of illustrations of the way in which these tubes gave way, which in every case was by bulging. Fig. 2 is a fair sample of these.

He also states that the strength of such columns varies as their widths multiplied by the cube of their thickness. Taking from his tabular list of circular tubes the strongest of them I find it was 10 feet long, 6½ inches diameter, ¾ inch thick, and that it broke with a pressure of 16 tons per square inch. Taking, then, Sir William's own rule, I understand that if the tube had been 1 inch thick instead of ¾ inch, it would have borne eight times as great a load, 8 being the cube of 2, for the doubled thickness. But eight times 16 tons

equals 128 tons, and dividing this by 2, since there would be double the sectional area, it would seem by the above rule that the iron would bear in compression $\frac{128}{2} = 64$ tons per square inch of section. And yet further on, (page 62), he says that in calculating the strongest possible

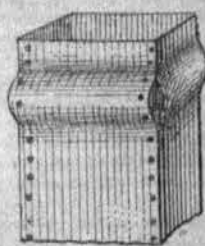


FIG. 2.

form we must not reckon upon more than 16 tons per square inch. I confess I have been quite unable to follow the deduction.

I have been told by a friend of mine, a Cambridge wrangler, that Professor Clerk Maxwell considered that both tensional and compressive fractures could be restored into shearing fractures. That we might imagine the iron broken as coming asunder, much as if two combs were stuck the one into the other, fig. 3. If this be the case, is it not



FIG. 3.

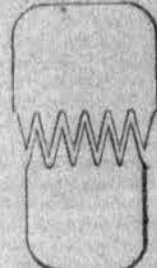


FIG. 4.

evident that, say a dozen comb-teeth must be (in tension) just about twelve times as strong as a single pair of comb-teeth, fig. 4. But, on the other hand, is it not equally clear that in compression the larger the number of such teeth the greater relatively must be the strength?

It is usual nowadays to speak of molecules, and the swinging or rotation of one molecule round another. Perhaps such phraseology is neither more nor less accurate than the old style of speaking of nature as abhorring a vacuum up to thirty-two feet. However, be that as it may, let us suppose these molecules to be held together by some attractive force which is comparable to magnetic attraction, or to magnetic repulsion, if you like that better. Now every schoolboy knows that he can more easily take the keeper off a magnet by sliding it than by pulling it straight off. Let us suppose, then, a series of molecules, fig. 5, and that a

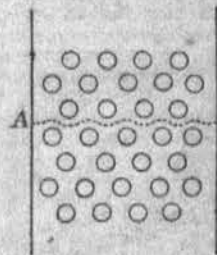


FIG. 5.

fracture takes place along the line A B. It is perhaps not unreasonable to picture to ourselves that if the fracture is effected by pulling asunder, i.e., by tension, that two individual molecules would separate in some such way as is indicated by the dotted arrow, fig. 6. If, on the other hand, the fracture is effected by compression that the molecules would follow (or strive to follow) the dotted arrows in fig. 7. In either case

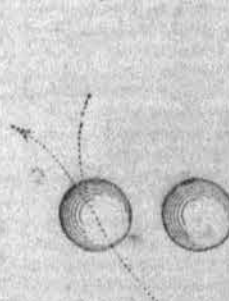


FIG. 6.

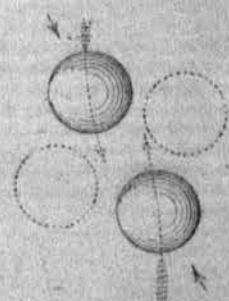


FIG. 7.

the supposition is in accordance with what is often spoken of as the angle of fracture. But it will be noticed that in comparison the molecule which strives to follow the dotted line will come against, or come foul of, the molecule (shown by a dotted circle) beyond, and that a series of such molecules will give each other mutual support, and a cumulatively increasing support. The deduction which I venture to submit from the foregoing reasoning is that it is inaccurate to speak of the compressive strength of iron as being 16 tons (or any other number of tons) per square inch; that

* Read before the Institute of Mining and Mechanical Engineers, Newcastle.

There are two other bridges in this district which, though hardly relevant to the subject of this paper, are well worthy of remark. I refer to the swing-bridge designed, I believe, by Mr. John F. Ure and Mr. Percy Westmacott, and the Byker Bridge, with its brick arches, the work of the late Mr. Hodgson. May I invite the members of this institute to study these various types of bridges, to reflect on the respective cost of the foundations, piers and abutments on the one hand, and of the superstructure on the other, and to consider how their ideas would be modified if once it were conceded that wrought iron, properly arranged, may be very much stronger in compression than in tension. And if, as it might seem, we have in wrought iron a material which, when properly arranged, has a greater solidity of resistance than even granite, with a special elasticity of its own, it is not, perhaps, beyond a reasonable flight of fancy to imagine that we may yet span rivers and ravines by structures as architecturally beautiful as true in construction, which shall last to future ages and be the admiration of our descendants.

(Continued from page 223.)

EXPERIMENTS SHOWING DEPENDENCE OF
APPARENT TENACITY OF CRUSHING
PRESSURE IN IRON PLATES.

Each set of Experiments in this Table is arranged in the order of the crushing pressures.

$$\frac{f_c}{f_0} = \frac{b}{d} = \frac{1}{0.8} = 1.25.$$

Diameter of Rivets.—In a joint there are three variable quantities to be determined—the thickness of the plate t , the pitch p , and the diameter of the rivet d . The three

* Reports to Research Committees of Mechanical Engineers.
+ By decrease of tenacity is here meant simply reduction of the ratio $\frac{\text{Breaking load}}{\text{Area of metal in joint}}$, whether that reduction is due to alteration of quality of material or to reduction of average strength in consequence of the stress being unequally distributed.

$$\frac{d}{t} = 0.635 \frac{f_c}{f_1}$$

Browne ..	$d = 2t$ (with double covers $1\frac{1}{2}t$)	(1)
Fairbairn ..	$d = 2t$ for plates less than $\frac{3}{8}$ in.	(2)
" ..	$d = 1\frac{1}{2}t$ for plates greater than $\frac{3}{8}$ in.	(3)
Lemaître ..	$d = 1.5t + 0.16$	(4)
Antoine (a) ..	$d = 1.1 \sqrt{t}$	(5)
Pöhlig (b) ..	$d = 2t$ for boiler riveting	(6)
" ..	$d = 3t$ for extra strong riveting	(7)
Redtenbacher (c) ..	$d = 1.5t$ to $2t$	(8)
Unwin (d) ..	$d = \frac{3}{8}t + 1.16$ to $\frac{3}{8}t + \frac{3}{8}$	(9)
" (e) ..	$d = 1.2 \sqrt{t}$	(10)

The following Table contains some data of the sizes of rivets used in practice, and the corresponding sizes given by some of these rules :—

Overlap and distance from Rivet to edge of Plate.—It is ordinarily stated that holes cannot safely be punched nearer

than one diameter from the edge of the plate; and this amount of overlap appears in most cases to afford strength to resist the tendency of the rivet to burst through the edge of the plate.

The precise distance to give security against the bursting of the edge of the plate cannot be determined theoretically, the condition of stress and loading being both complex. Most treatises on riveting assume that the rivet tends to shear the plate at the *a a*, *b b*, fig. 9. No experiment is known to the Reporter in which a plate has thus given way. In some experiments the fracture takes place along the lines *a b*, *c d*, *e f*, fig. 6a, simultaneously. This form of fracture, can, however, only occur in joints with a single rivet, and the fracture in this way perhaps indicates that, at the end rivet of a row, some extra metal should be allowed between the rivet and the side of the plate, or that the distance to the side of the plate should a little exceed the half pitch.

Except at the ends of the joint, the metal in front of each rivet is in the position of a bar encastré at each end, and transversely loaded. Treating the load as concentrated at the centre, and putting *l* = distance from centre of rivet to edge of plate, *f* = the greatest stress due to bending, we get for the relation between the shearing strength of the rivet and the resistance of the plate to cross-breaking*—

$$\frac{\pi}{4} d^2 f_s = \frac{1}{3} \frac{(2l-d)^2}{d} \frac{1}{f},$$

which gives

$$l = \sqrt{\frac{3\pi a^3 f_s}{16 f} + \frac{d^2}{2}}.$$

If we put *f* = the ordinary tearing resistance of the iron, we get for *l* a value a little less than that usual in practice. But it would probably be worth while to make a few direct experiments to determine the value of the constant in a formula of the form

$$l = c \sqrt{\frac{d^3}{f} + \frac{d}{2}}$$

which would ensure the width of overlap being sufficient to prevent cross-breaking. In such experiments it might probably be necessary to prevent the lateral spreading of the two parts into which the plate under the rivet divides, by clips embracing the joint tightly. This would make a joint with one rivet approximate to the condition of a portion of a longer joint.

IV. EXPERIMENTS ON RIVETED JOINTS.

Hitherto the discussion has been chiefly confined to data best determined by special experiments. It remains to discuss the data which can only be ascertained by experiments on different forms of riveted joints. What it is chiefly necessary to determine by such experiments is the relation of the tearing strength of the iron in the joint to the tenacity of the original plate, and to the shearing stress which the rivets will carry before giving way. It is by means of these relations that the pitch and strength of the joint have to be determined.

We may call the ratio of the tension on the joint to the tearing section of the plate at the place of fracture the *Apparent Tenacity* of the joint. Then that apparent tenacity is rendered less than the original tenacity of the iron—(1) by any injury done in drilling or punching; (2) by any irregularity of stress due to the way in which the rivets load or crush the plate; (3) by any irregularity of distribution of stress due to the bending of the joint as a whole under the action of the load. The apparent shearing resistance will be less than that determined by the special experiments above—(1) if the load is not equally divided amongst the rivets; (2) if any crushing of the rivet by the plate causes an increase of stress on part of the rivet section.

Let *f_s* be the apparent shearing resistance, and *Ω* the shearing section of the rivets in any given joint or length of joint. Let *f_t* be the apparent tearing resistance, and *Ω_t* the section of the plate through the rivet holes where the section is smallest. Then the strongest joint will be that for which

$$f_t \Omega_t = f_s \Omega_s.$$

If the diameter of the rivets is determined, either empirically or to secure a given limit of crushing pressure, then the equation just given determines the pitch of the riveting. The object of experiments on complete riveted joints is to determine the values of *f_t* and *f_s* for different kinds of joints. To determine these stresses two experiments are required, one on a joint which has given way by tearing, and one on a joint which has given way by shearing. One should be designed with an excess of tearing area, the other with an excess of shearing area, but in other respects they should be identical. Unfortunately this has seldom been done in the experiments which have been made.

1.—*Single-riveted Lap Joints of Iron*.—The annexed two tables contain all the reliable experiments which have been found on single-riveted lap joints of iron, broken by tearing or shearing. From these tables all experiments have been excluded in which the crushing pressure of the rivet on the plate was so great as obviously or probably to have affected in any considerable degree the apparent tenacity of the joint. Taking the different sets of experiments, the average values obtained are as set forth therein.

The mean stresses here found are not very discordant; but an examination of the detailed experiments, in which there are considerable variations, tends to lessen the value of the average results.

It appears that the apparent tenacity of the joint is at least 20 per cent. less than that of the original plate with punched joints, and 12 per cent. less with drilled joints. The shearing stress is 6 per cent. greater in punched holes than in drilled holes. But this result must be received with hesitation, because it is doubtful if the true diameter of the rivet has ever been determined in experiments with punched joints. With punched joints the tenacity of the plates is only 85 per cent. of the shearing resistance of the rivets,

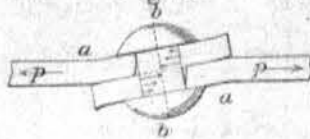
* The greatest bending moment for a beam encastré at the ends must lie between $\frac{1}{12} Wl$ and $\frac{1}{10} Wl$, where *W* is the total load on a rivet. Taking it at $\frac{1}{10} Wl$, and equating this to the moment of resistance of the section in front of the rivet, which is $\frac{1}{8} f t d^3$, we get the formula above.

per sq. in.; but with drilled joints the plates are stronger per unit of area than the rivets in the ratio of 1.07 : 1.

In regard to the difference of apparent tenacity in drilled and punched joints, it is hardly so great as experiments on the effect of punching and drilling indicate. But the loss of tenacity of 12 per cent. in drilled joints seem to show that there is considerable loss of strength, ascribable to bending and other causes, affecting both kinds of joint equally.

The reduction of tenacity in lap joints is commonly ascribed to the bending of the specimen when tested. It

Fig. 10.



should be noticed, however, that the bending occurs chiefly at the points *a a*, fig. 10, whilst the actual fracture occurs in

the plane *b b*. More probably, the reduction of strength is due to the way in which the pressure of the rivet is distributed on the plate. The probable distribution is roughly indicated by the relative lengths of the arrows in fig. 10. It will be seen that the bending and crushing of the plate tend to bring the resultant tension towards the inside edges of the sections of fracture, and thus virtually to reduce the strength. The wider the lap and the more rows of rivets, the less this action is likely to be, and the more nearly the tenacity of the joint will approach that of the plate. (See Appendix I.)

II. *Single-riveted Butt Joints of Iron*.—The experiments on these are less accordant than those on lap joints, and they are far less complete. The crushing pressures in Sir W. Fairbairn's experiments are higher than those of Mr. Brown's experiments. But while the former give an average tenacity of 22.38 tons, the latter give only 13.17 tons. No satisfactory general conclusions can be drawn from these experiments. The mean shearing resistance in two experiments is 20 tons, which is about the same as for lap joints.

SINGLE-RIVETED LAP JOINTS, BROKEN BY SHEARING.—IRON.

Mode of Riveting.	Holes made by.	Tenacity of Iron. Tons per sq. in.	Stress at Moment of Fracture in Tons per sq. in.			Efficiency of Joint. Per cent.	Remarks and Source of Experiments.
			Tensile.	Shearing.	Crushing.		
(?)
Hand	25.77	17.99	22.40	44	Sir W. Fairbairn.
..	22.00	11.97	17.78	38	B. B. Stoney.
..	22.00	14.75	19.90	46	..
..	22.00	15.10	18.63	46	..
..	17.75	17.90	50	..
..	20.90	18.30	55	..
Machine	19.53	..	Sir W. Fairbairn.
Hand	20.51	..	..
Machine	18.51	..	..
Hand	20.34	..	..
Hand	21.20	..	Countersunk.
Machine	19.58	..	..
(?)	26.70	20.8	23.8	37.35	Master Mechanics' Association (mean of 3).
Steam	22.25	19.48	18.44	50.4	Greig and Eyth.
..	19.63	18.61	50.8	..
Hydraulic	20.43	19.35	52.9	..
Steam	21.29	17.31	57.6	..

Authority.	Mode of Preparing Holes.	Mean Apparent Tenacity of Joint. Tons per sq. in.	Ratio of Mean Apparent Tenacity to Tenacity of Original Plate. Per cent.	Mean Shearing Resistance of Rivets. Tons per sq. in.	Ratio of Tenacity of Plate to Shearing Resistance of Rivets. Per cent.
Fairbairn	17.55	63.11	22.40	78.3
Hendry	17.96	..	..	..
Stoney	17.16	79.97	18.84	91.0
..	..	19.39	88.31	18.27	106.1
Fairbairn	20.41	..
..	19.47	..
Master Mechanics' Association	22.30	83.52	20.80	..
..
Greig and Eyth	16.80	75.50	..	..
..	..	19.75	88.70	18.43	107.1
Mean Result	18.35	76.77	20.55	84.6
..	..	19.57	88.50	19.24	100.6

SINGLE-RIVETED LAP JOINTS BROKEN BY TEARING.—IRON.

Mode of Riveting.	Holes made by.	Tenacity of Iron. Tons per sq. in.	Stress at Moment of Fracture in Tons per sq. in.			Efficiency of Joint. Per Cent.	Remarks and Source of Experiments.
			Tensile.	Shearing.	Crushing.		
Hand ..	Punch	25.77	16.37	18.33	32.74	46	Sir W. Fairbairn—Rivet heads broke off.
..	16.35	18.31	32.70	46	.. Rivet heads cracked.
Machine	19.95	14.90	26.63	44	..	..
(?)	..	20.15	14.13	25.89	(?)	..	Hendry.
..	..	15.31	16.23	25.45	..	..	..
..	..	15.65	15.38	21.43	..	..	..
..	..	20.74	13.19	24.12	..	..	..
(?)	..	21.11	15.59	26.13	(?)	..	Kirkaldy.
Hand	18.54	14.67	16.21	24.84	50	B. B. Stoney.
..	..	22.00	14.24	19.79	29.50	44	..
..	..	21.43	20.48	10.80	19.50	47	..
..	19.76	10.51	18.80	45	..
..	16.00	12.12	21.10	45	..
..	16.77	12.69	22.08	47	..
..	..	22.00	18.22	10.49	17.31	37	..
..	Drill	22.00	15.57	16.97	26.35	45	..
..	20.90	18.30	28.75	55	..
..	..	21.43	21.59	12.12	20.60	50	..
..	16.37	12.41	21.59	44	..
..	21.54	11.46	20.50	50	..
..	18.52	14.01	24.39	50	..
..	..	24.00	21.22	12.83	21.22	44	..
(?)	Punch	26.70	22.30	25.00	40.23	..	Master Mechanics' Association (Mean of 3).
Steam ..	Drill	22.25	19.48	18.44	26.50	50.4	Greig and Eyth.
..	16.80	14.89	21.38	40.6	..
Hand ..	Drill	..	17.96	17.00	24.48	46.5	..
Steam	19.63	18.61	26.77	50.8	..
Hydraulic	20.43	19.35	27.86	52.9	..
Steam	21.29	17.31	29.59	57.6	..

SINGLE-RIVETED BUTT JOINTS BROKEN BY TEARING.—IRON.

Mode of Riveting	Holes made by	Tenacity of Iron, Ton. per sq. in.	Stress at moment of fracture in tons per sq. in.			Efficiency of Joint, Per cent.	Remarks and Source of Experiments.
			Tensile.	Shearing	Crushing		
(?)	Punch ..	25.77	16.62	22.06	29.47	41	Sir W. Fairbairn; single cover.
(?)	" ..	"	26.13	17.34	46.25	60	Countersunk rivets, double covers.
(?)	" ..	"	21.70	15.08	38.50		" ..
(?)	" ..	"	25.09	16.66	44.51		" ..
Hand ..	Punch ..	Best Staffordshire Boiler Plate, tenacity 20-22 tons per sq. in.	12.86	8.73	41.67	Joints not prepared with view to efficiency.	Walter K. Browne; double cover.
" ..	" ..		13.19	9.23	42.73		" ..
" ..	" ..		12.85	8.49	41.82		" ..
" ..	" ..		12.66	8.05	41.01		" ..
" ..	" ..		13.15	8.93	42.61		" ..
" ..	" ..		12.69	8.26	40.70		" ..
" ..	" ..		13.39	8.44	42.94		" ..
" ..	" ..		14.20	9.70	46.30		" ..
" ..	" ..		14.25	9.39	46.25		" ..
" ..	" ..		18.42	17.44	25.11		" ..
Steam ..	Drill ..	22.25	24.24	11.48	33.83	44.6	Greig and Eyth; single cover.
" ..	" ..	"	"	"	"	62.7	" double covers.

SINGLE-RIVETED BUTT JOINTS BROKEN BY SHEARING.—IRON.

(?)	Punch ..	25.77	16.62	22.06	29.47	41	Sir W. Fairbairn; single cover.
(?)	" ..	(?)	13.87	17.92	20.06	..	David Kirkaldy; single cover.

(To be continued.)

NOTES ON THE SIEMENS DIRECT PROCESS.*

By A. L. HOLLEY, C.E., LL.D., New York City.

THERE is a growing demand for pure and cheap material for fine open-hearth steel; a material not only very free from phosphorus, but from carbon and silicon, so that it may be rapidly converted into steel. Iron and steel scrap are not trustworthy as to quality, and they are often dear. There are three methods of purifying cheap materials for the open hearth. (1) Mechanical puddling, as done at Creusot, which removes 90 per cent. of the phosphorus from the pig-iron. (2) Krupp's washing process (the conduct and results of which I fully described in a former paper), which eliminates 70 to 80 per cent. of the phosphorus and most of the sulphur and silicon from pig-iron. Neither of these processes would sufficiently purify, for very fine steel, those very impure pigs which are cheapest in many parts of the United States. (3) The process of producing directly from the ore an iron which is practically pure chemically, although mechanically mixed with the impurities of the ore. This is the oldest of iron processes; one form of it, the Catalan forge, employed to produce charcoal blooms, is still in use, but its great cost is rapidly throwing it out of competition.

Among the modern attempts to produce iron direct from the ore, on a large scale and at a cheap rate, several have been in various respects successful. Dr. Siemens' process of treating a ton and a half or more of ore and the coal to deoxidise it, in a rotating gas-furnace, and bringing out, in some four hours, a ball of chemically pure iron so soft that the fluid and impure slag may be squeezed out of it, is the most attractive and the most highly developed of all the modern direct processes. I have watched it, from time to time, since 1874, and have noted a steady improvement. It may now be said to have passed the experimental stage, although, like older processes, it must be adapted by practice to special materials. The cause which has been more potent than all others, including the defects of the best direct processes, to bring these processes into disrepute, is the wasteful treatment of the direct product. With one or two exceptions (when failure was due to other and obvious causes), the direct product has been made into wrought iron (weld iron). Even Dr. Siemens has, at Towcester, in England, and at Park, Bros. and Co.'s, in Pittsburg, set up his apparatus for this purpose. Is it likely that a commercial success would follow such conditions as these? Here is a red-hot ball of chemically pure iron, mixed with the unreduced refractory sand and clay of the ore. It is not so soft that all the dirt can be squeezed out, so it must be reheated till the materials it encloses are nearly melted. Then this pure iron mass, white-hot for oxygen, is pulled out into the open air, slowly hammered, piled, reheated and rehammered, till about half of it is changed to ore again. If, on the contrary, this ball of direct metal is simply squeezed to expel the bulk of the already fluid slag, which contains most of the phosphorus, and then quickly put under the bath in the open-hearth furnace, no more oxidation can occur. The iron being already hot, quickly dissolves, and the dirt being released, floats on the surface by difference of gravity. Hundreds of tons of direct metal made at Towcester have been sent to the open-hearth works at Landore, where it is quickly melted in the open-hearth bath, and made excellent steel, although the ores from which it was made contained about 2 per cent. of phosphorus. The apparatus or "rotator" (illustrated on the accompanying plate) consists of a revolving furnace, like a Danks furnace, lined with oxide of iron. Gas from producers and air from one pair of regenerators enters at one end of the furnace, burn and reverberate within it, and pass out at the same end into the other regenerator. There is a large charging and discharging door at the other end of the furnace. At Dr. Siemens' works at Towcester, the small rotator, 9½ feet long by 8½ feet in diameter, takes a charge of 30 cwt. of ore mixed with 8 cwt. of small coal. In about 2½ hours the reduction of the ore is completed; the slag is tapped off, and the heat and speed of rotation are increased to form the mass into an elongated ball, which is

hammered into a bloom. An average of forty-three consecutive charges at Towcester gave the following results:—

Iron in ore charged, pounds	1274
Coal, pound,	728
Time for operation, ..	3 hours, 12 minutes.
Blooms made,	1213
Loss, per cent.	12.6
Coal in producers per ton of blooms, tons,	2

The particles of iron forming the blooms, if perfectly separated from the slag, are practically pure, however impure the ore may be. The slag contains sometimes 6 per cent. of phosphoric acid, and 1 to 2 per cent of sulphur. The pure iron will alone remain in the open-hearth bath, although some few hundredths of phosphorus may be taken up from the slag at the highest temperature. The bars hammered from the direct Towcester ore blooms contained (eight analyses):—Maximum phosphorus, 0.08; minimum phosphorus, 0.019. The phosphorus in three blooms was 0.019, 0.046, 0.083, while the phosphorus in the ore averaged 2 per cent.

The first trial of the process in the United States was at Park, Bros. and Co.'s works, in Pittsburg, two years ago. There were no serious difficulties, except the oxidation referred to, in the manufacture of the balls into wrought iron. I am informed that this company intend to start the rotator again to make material for their new open-hearth furnaces. Within the last few months a large rotator, 11 feet long by 11 feet in diameter, has been started at Tyrone Forges, Pennsylvania, by Mr. Robert J. Anderson, of Pittsburg, to make material for his open-hearth furnaces. Although the operations have purposely been experimental, with various ores and lining materials, enough has been done to show that a product of excellent quality may be got from any ore; and that linings (necessarily oxide) may be adapted to any ore, although a very siliceous ore requires the use of so much lime that the repairs of linings are proportionately increased. In an average week's work at Tyrone, with Robinson ore and the highly siliceous Pennington ore, the mixture having about 50 per cent. of iron, the charges were: ore, 4000 lb.; reducing coal, 600 to 700 lb.; limestone, 250 lb.; scale and cinder, 800 lb. The yield of blooms was 1600 to 1700 lb. per charge, or 80 to 85 per cent. of the iron in the ore. The producer coal was 3800 lb. per ton of blooms. The week's work was nineteen operations, producing 14 tons of blooms. The cost of blooms, with ore averaging about \$3 and coal \$2.15, and with labour charged at the very high rate of \$10 per ton, was a little over \$25 per ton. Experimental labour is of course excessive, and in this case the men could have just as well run four furnaces as one. Labour should not exceed \$2.50 to \$3 per ton in a plant of four rotators. The output has been gradually increasing, and has reached five operations per twenty-four hours. The producer coal has also been gradually decreased. Of course, working costs can be only approximately determined from experimental costs, but it seems safe to say that blooms can be produced at a small advance over the cost of pig from the same ore. The cost of a plant of four rotators, ore-crushers, hammer or squeezer, &c., exclusive of building, is about \$40,000, and its output, with existing appliances only, in regular rather than in experimental work, is estimated at 125 tons per week. This looks at first like a small output, but it must be remembered that the entire blast-furnace plant is dispensed with. An obvious improvement, not in any way experimental, is about to be introduced. It is calcining the ores in any suitable kiln, and running them red hot into the rotator. As about half the time of the operation is now occupied in getting the charge up to a reducing temperature, it is obvious that the calcining—a cheap operation—will nearly double the output of a rotator plant. Charcoal blooms are at present the best material in the market for making fine open-hearth steel; they are used together with the smallest possible bath of Bessemer pig for the finest firebox plates. If Siemens direct blooms (even should they have more mechanical impurities) are not as good as charcoal blooms for open-hearth steel, the reason is not obvious. Such practice as there is seems to prove them equally good. As I have similarly stated in previous papers describing new processes, the object of these notes on the Siemens

process is, not to compare it commercially with other preparatory processes, but simply to state its existing status and the probable course and means of its further development.

THE PUDDLING PROCESS: PAST AND PRESENT.*

By PERCIVAL ROBERTS, JR., PHILADELPHIA.

IT may seem necessary to offer an apology for presenting for consideration a process which is conspicuous by its absence in the literature of the Institute, and which may be thought by some to belong to the past in metallurgy, and to have been already superseded. But the large capital invested in puddling calls for a careful consideration of the question whether the time has certainly arrived when the puddling furnace must be replaced by the converter and open-hearth furnace. May there not still be a place for puddled iron alongside of molten iron and steel, and is not the improvement of the puddling process itself worthy the attention of engineers equally with the Bessemer and open-hearth processes? The changes involved in the conversion of pig-iron into wrought iron are well understood and need only be briefly alluded to. The patent of Henry Cort bears the date of 1784. Since that time the improvements in the process have mainly consisted in the replacement of sand by iron bottoms by Samuel Baldwyn Rogers in 1818, and the still more recent substitution of iron oxide for the refractory materials used for the sides and bridge of the hearth, which distinguishes the wet or boiling process from the dry or puddling process. Chemically, the process consists in the removal of the metalloids from the pig-iron, a result effected mainly by the iron oxide. Silicon is first oxidised, then the phosphorus, and finally the carbon. The silicic and phosphoric acids produced pass into the cinder and the carbonic oxide burns as it escapes from the bath of metal. It is interesting in this connection to note the effect of temperature on the removal of the phosphorus from the iron. As is well known, no phosphorus is eliminated under the oxidising influences prevailing in the Bessemer converter, while from 70 to 80 per cent. is removed in puddling. But we find, if in working cold short irons the temperature of the furnace is much increased towards the end of the process, that a considerable amount of the phosphoric acid is deoxidised and phosphorus again combines with the iron. This reverse process is aided by a siliceous cinder arising either from the use of a very siliceous pig-iron, or of an oversiliceous ore for fix. The fact which has been known for some time that only a basic cinder can retain phosphoric acid has given rise to the "basic lining" which now attracts so much attention in the Bessemer process. For the conditions affecting the removal of phosphorus from pig iron I would refer to the careful and complete experiments of I. Lowthian Bell, in England. Notwithstanding the recent progress in the metallurgy of iron the puddling process is essentially what it was three-quarters of a century ago—laborious, crude and unsatisfactory. The attempts at improvement in the process may be classified under two heads: (1) economy of labour; and (2) economy of fuel. Increase of yield and improvement of quality are so intimately connected with both of these two classes that it is not easy to consider one apart from the other.

(1) ECONOMY OF LABOUR.—For the successful accomplishment of the operation of puddling it is necessary to bring the molten metal into contact with the solid oxides by agitation effected either by human or mechanical agency upon a stationary hearth, or by giving motion to the whole body of the furnace. One of the first attempts for lessening the labour of the puddler is recorded in a drawing at Dowlais which has been traced back to the year 1834. It is a reverberatory furnace with a revolving hearth, driven with a vertical shaft by bevel gearing. Whether this machine was ever used I do not know, but it is of interest as showing that most of subsequent improvements are not new in principle. Coming to more recent times, we have the Richardson process of blowing air into the molten bath through a tubular rabble. The advantages claimed for this method are that it hastens the boil, reduces the labour, and produces a tough metal of uniform and high quality. After the iron has come to a boil the rabble is withdrawn and the working continued in the ordinary manner. I believe this process has never been used in this country, and but sparingly in England. Morgan's puddling machine consists of a reverberatory furnace of the usual form which has an opening in the roof through which a vertical shaft is lowered with a horizontal arm. The shaft is set in motion by suitable machinery and the arm revolves in the furnace, doing away with the labour of the puddler and helper until the heat is ready for bailing, when the shaft and arm are withdrawn, the opening in the roof closed, and the bailing proceeded with in the usual manner. The wear and tear connected with this method must be enormous, and the results, I should think, not very satisfactory. Griffith's and Whitham's devices are similar in idea but different in mechanical details. Their object is to give an oscillating movement to a rabble of the ordinary shape by means of machinery, the puddler or helper merely guiding the rabble. The bailing is accomplished in all cases by hand labour. None of the above-mentioned improvements do away with the skilled workman but merely lessen the laborious work of the early stages of the heat which requires brute force rather than experience. In a work by Kohn upon the manufacture of iron and steel will be found more detailed statements concerning these processes. That any of them has proved satisfactory, is a question. One of the imperfections common to them all is the difficulty of keeping the raw iron from gathering in the crevices of the fix and settling on the bottom and in the corners of the furnace into which the rabble does not enter leaving the furnace at the conclusion of the heat in a very dirty condition. We all know the importance of a thorough working of iron in the jams of a furnace, as it is there that the metal begins to gather when coming to nature requiring careful working for good results. Another serious objection which may be advanced against these pro-

* Read at the New York Meeting of the American Institute of Mining Engineers, February, 1880.

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cesses is, that they require the same skilled workmen to operate them as are needed for the old style of hand puddling. No increase in the number of heats is obtained, for the men, instead of encouraging experiments, look upon them with great distrust as inimical to their best interests, and when a workman and his tools do not agree good results cannot be expected. About 1867 a change in the direction of improvement took place, and it was reserved for an American, Samuel Danks, to have the boldness to propose an entire revolution in the puddling process. The Danks furnace was the first rotary furnace to be put into successful operation, although its success was not assured until many improvements and alterations were made upon the original designs. In England this same idea was elaborated, and several machines were brought out differing in details. The one of most novel construction was the Godfrey-Howson furnace, which had but one opening into which the heat enters and the products of combustion escape, a blowpipe on a large scale being substituted for the ordinary fireplace. Later, in this country, we find a rotary furnace designed by the Edgemoor Iron Company of Wilmington, Delaware, worthy of mention from the fact that this company is at present equipping their works with these furnaces, which would seem to indicate great confidence upon the part of the proprietors in the success of the rotary process.

(2) ECONOMY OF FUEL.—In the utilisation of coal for puddling two methods are employed. The one in almost universal use, where coal is directly burned on the grate of the furnace, is irrational and wasteful. The other method, consisting in the conversion of the coal into combustible gases, which are burned on the hearth of the furnace, though more economical and rational, is but seldom used. The attempts which have been made to improve the old system may be divided into two classes: First, those having for their object the prevention of smoke by feeding the coal below the surface of the fire, which is always kept bright. The mechanical devices for accomplishing this object are found in the Frisbie and Sweet furnaces. The system has not come into general use. An objection in the case of coal-forming clinkers is, that the clinkers are forced to the top of the fire. Second, those having for their object the utilisation of the volatile matters of the coal by a partial coking of the coal before it reaches the fire. This is effected by the employment of a separate magazine in connection with the fireplace. The gases from the coal are caused to pass over the fire and are there burned. Of this variety of furnace may be mentioned the Wilson furnace, and of more recent date the Price furnace, which has given very good results. When we consider, however, the cost of introducing these improved furnaces, and the trouble and annoyance of teaching workmen to use them, it is evident that we might just as well go a step further and introduce the gas system in its entirety. The great advantages to be gained in the use of gas in puddling are well known. We may distinguish here two systems, the continuous-acting furnace, of which Swindell's furnace is an example, and the well-known Siemens regenerative furnace. Of the use of water-gas in the place of the ordinary generator-gas it is too soon to speak, but reference may be made in passing to the astonishing results said to have been obtained at Washington by the Gill process, with gas containing as high as 75 per cent. of combustible gases, which we take *cum grano salis*.

What, let us now ask, is the present state of the puddling process, and what relation does its welded product sustain to the fused product of the Bessemer converter and the Siemens furnace? Will steel supplant iron? In a paper on the "Separation of Phosphorus from Pig-Iron," read before the Iron and Steel Institute of Great Britain in 1878, by I. Lowthian Bell, occurs the following:—"The elimination of this metalloïd from pig-iron is, doubtless, a subject of great interest and importance to British smelters, having regard to the fact that nearly five-sixths of the metal obtained from their native ores contains so much of this impurity as to unfit it for the manufacture of steel, that form of iron which bids fair to supersede, in a great measure, the product of the puddling furnace." If phosphorus cannot be removed, the question is easily settled; the production of steel is a limited one; and in the future, as at present, it will be made from the highest grades of our pig-irons, and be used for certain special purposes, such as rails, &c., for which it has shown its great superiority over iron. But, no doubt, many will at once say phosphorus can be removed; the Thomas and Gilchrist process, with its basic lining, has overcome this difficulty. That phosphorus has been removed experimentally there can be no question; that it has been expelled successfully, from a commercial point of view, is open to doubt. Of the three processes established for its elimination, the Bell, the Krupp, and the Thomas and Gilchrist processes, the second has, from an economical standpoint, produced the best results. There are some points in regard to all of them which, in the published results of experiments, have not been very fully touched upon, though they are of great importance. Is the increased cost of working greater than the difference in price between inferior brands of pig-iron and those suitable for steel making? This is, of course, a secondary consideration if the demand for such pig exceeds the supply, but it will be of vital importance if the reverse is the case. Is the removal of phosphorus uniform, or does it vary, giving us results differing from day to day? What is the percentage of bad blooms made by these processes as compared with the usual method of working? How uniform is the quality of the final product as furnished to the consumer? It will, perhaps, be said that sufficient experience has not yet been obtained to answer these questions, but until they are disposed of we must be very cautious in accepting the announcement made by inventors or operators to the effect that success has been achieved. Granted that a method of dephosphorisation may be established upon a commercially successful basis (at present indications seem to point towards such a conclusion), what will be the resulting product, and how well will it be fitted for its intended uses? In advocating the use of high qualities of steel, and enumerating the advantages to be gained by employing it, the fact is frequently lost sight of that this superior metal is made from the highest grades of pig, obtained with the greatest care from the purest ores, and that the succeeding processes are worked out with the aid of the most improved plant. The metal is followed through

all details of manipulation with the most thorough inspection and rigid chemical and mechanical tests. Material thus obtained is compared with wrought iron made from anything and everything. No chemist mixes the charge or analyses the product, but a puddler is left to guard the interests at the most vital stage of the process. It is his aim to produce the greatest weight, with the least labour, in as short a time as possible, and with such work no one can blame him. It is not astonishing that under such conditions iron is so much inferior in its physical qualities to steel. Even taking the same grade of pig-metal for the manufacture of wrought iron as is now used for steel, the mild grades of the latter suitable for structural purposes will, no doubt, give higher results by mechanical tests, but the difference between the two will not be as great as many are apt to think. On the other hand, if in the future, by means of dephosphorising processes, we shall use all sorts of pig-iron for steel, shall we not introduce a dangerous element of uncertainty into its manufacture which we do not have to deal with at present? When it is considered how very slight a change in the percentage of some foreign substance may produce a considerable variation in the quality of steel, uniformity in a metal derived from such impure raw materials must be difficult to attain. The homogeneous nature of steel, as compared with the many-pieced structure of iron, is claimed as one of its advantages. Homogeneity in steel may be a cause of weakness, and the lack of homogeneity in iron a source of strength. A steel bloom, to all external appearance perfect, may be within entirely bad, either from piping in the moulds, or from other causes of a similar nature. Chemical analysis will not show this defect, and a bar produced from the same, although sound so far as can be seen, may fail in service suddenly and without warning. On the other hand, the possibility of a wholly bad iron bar diminishes just in proportion as the number of pieces in the pile from which it is made increases. For a material for structural purposes, the term uniformity should take the place of homogeneity. A material exposed to abrasion, such as a rail receives, requires the latter quality, but one subjected to strains of compression and extension, torsion and bending, wants uniformity more than any other property. If one bad member is contained in a structure, the strength and homogeneity of the whole is of no avail. For many purposes in construction, steel may be used to good advantage, notably for members liable to wear and parts running in bearings. But whenever it is applied in parts of varying outline, where sudden changes in form take place, planes of weakness are developed at all those points at anything like a corner occurs, unless large fillets are used and great care is taken. It must not be forgotten that the structures hitherto erected of steel have been, as it were, experimental, and have therefore been put up with the closest inspection and caution. If it should be generally adopted, this same care could not be exercised unless an entire revolution in existing modes of manufacture takes place. The rough handling which iron for structural use receives in manipulation would be fatal to steel. Existing plant and methods of working must be abolished, and workmen be educated in the proper handling of the new products. Looking upon the above objections as a few of the more important ones yet to be met with before a more general use of steel can take place, it will be apparent that its substitution for wrought iron will be very slow and gradual. The puddler and his furnace yet have many years before them. No one could regret it more than the writer. No other process in iron metallurgy requires so much work per ton of metal produced. It seems absurd to think that the labour of two men for ten hours is necessary to produce a ton of wrought iron, and that for one ton of pig-iron used one ton of coal is consumed! It is not worth while to consider those methods which aim merely to lighten but do not do away with the labour of the puddler. They may have some advantages, but they will never come into general use. What is needed is a method which is governed by intelligence, but which requires only ordinary labour for its working. The rotary furnace process is the only one which at present aims at this result, but its complete success is open to doubt. The wear and tear of the complicated mechanism and revolving surfaces is a source of expense, and the lining is composed of a material not well calculated to resist heat. The quality of the iron, however, is good, and counterbalances many of the attending disadvantages, although it will not, as was at one time hoped, answer for making bars without weld. It must be cut and piled as ordinary iron, or the work upon it will not suffice for good results. We are now in the midst of an epoch of uncertainty; a few years more and the success or failure of steel to supplant wrought iron will be established beyond a doubt. Its success depends upon the results which shall be obtained from the working of all grades of pig-iron; and its failure is certain if uniform quality cannot be produced. For the present, therefore, the system of puddling must continue as of old; but every iron-master, not only of this but of other countries, will most gladly welcome the process, whether it be of steel or of iron, which will do away with the weary toil of so many thousands, and usher in a brighter and a better era than could ever be accomplished by the puddling process as invented by Henry Cort.

NOTES ON THE ORDINARY LANCASHIRE BOILER.*

THE very extensive adoption of the Lancashire boiler throughout the United Kingdom has been sometimes attributed to the influence of this and the other boiler insurance or inspecting bodies having their headquarters in Manchester, and there can be no doubt that there is a natural tendency in the mind of an engineer to advocate the use of the boiler or engine with which he is most familiar. It is pretty evident, however, that the popularity of the Lancashire form of boiler has simply been due to the fact that it has proved itself to be the best adapted to meet the conditions as they have hitherto existed under which steam power has been generally required to be provided throughout the country. Where fuel and space require to be economised, as in the London district for example, and where good water can

be obtained, various modifications of the locomotive, marine and other compact boilers can be and are, used with advantage. The introduction of the surface condenser, which has for some time past been universally adopted for marine purposes, is now coming into vogue to some extent for land engines. Its application renders the steam user in a great measure independent of a pure supply of water for his boilers; and its introduction, coupled with the adoption of steam at higher pressures, will no doubt lead to the gradual displacement of the Lancashire boiler by forms better adapted to meet the new conditions.

The extreme simplicity of the boiler is one of its chief recommendations, but where several firms are to be called upon to tender for its construction, a detailed specification, giving full particulars of the whole of the mountings to be supplied, and the quality of iron or steel of which the various parts are to be made, should invariably be provided for the guidance of the boiler makers in tendering, otherwise the price quoted by different firms for what appears to be the same description of boiler becomes very misleading, as it is extremely easy for one manufacturer to underbid another by reduction in the thickness and quality of plates, or by the use of cheaper forms of construction, more especially in the riveting of the seams, the strength of which vary greatly, as will be seen in the table of particulars, appended.

The marked success of the modification of the Lancashire boiler, known as the "Galloway" boiler, in which the two furnaces join in a large combustion chamber, fitted with vertical water tubes, is due, apart from the very efficient heating surface presented by the water tubes, to the rapid circulation from the lower part of the boiler. Leaking or fracture of the seams of the shell from unequal expansion of the upper and lower parts of the boiler, one of the evils to which large circular boilers are always subject, is but rarely met with in this arrangement, and the introduction of water tubes in the ordinary Lancashire boiler possesses several advantages. Six tubes are fitted in each flue, and arranged to give sufficient space for a man to pass through the flues for cleaning, examination, or repairs. Not only is a more efficient circulation of the water thus ensured, but the flue is at the same time strengthened. In the practice of some of the best boiler-makers these tubes are welded in the flues, and where sound work can be depended upon the absence of riveted seams exposed to the flame possesses some advantages. But little practical importance can, however, be attached to any advantage thus obtained, and flues arranged in this way are more difficult to repair than where the tubes are riveted in.

The chief difficulties met with in the use of the Lancashire boiler arise, as is well understood by engineers, from the expansion of the flues, but in this matter as in many others, boiler makers are not agreed as to the best modes in which these difficulties should be provided against. The higher temperature of the upper part of the flue, most appreciable in cases where non-conducting matter either settles down on the plates, or is held in suspension in the water, leads in the first place to arching or hogging of the flue from its upper part having lengthened, and the result is leaking or gradual fracture of the circular seams of the flues or grooving of the end plates, or all these results may take place. The Bowling ring and flanged seam have been presumed to act as expansion joints, and if this were really the case, the furrowing or grooving of the end-plates might be expected to be wholly or partially provided against by their introduction. The Bowling ring, as now made of steel, 5-16 inch to 2-inch thick, can apparently be depended upon to act in this way. But the flanged seam, as generally made, has practically no elasticity with the flue in compression, and the result is that when worked under unfavourable conditions, the flange either rapidly fractures at the root, or the end plates of the boiler become grooved around the angle irons attaching the flues to the end-plates. The flanged seam is, however, extensively adopted, and generally with good results, by boiler-makers in every part of the country; but where overheating of the flue is to be anticipated, either from the use of bad water, or from the combustion being unduly forced, it is best to avoid it. The following example of grooving of the end plates of boilers where the flanged seams had been adopted in the flues may be quoted here.

Two boilers, one of the ordinary Lancashire form, known as No. 1, and other a boiler of the "Galloway" type known as No. 8, were put down at a colliery, No. 1 in 1875, and No. 8 in 1874. The boilers, when examined by one of our inspectors in September last, we found in a very dirty condition, not having been cleaned for some months. The water being bad, the natural result of this kind of treatment was shown in extensive grooving of the end-plates. The flues of No. 1 were fitted with flanged seams at every joint, and here the front end plate was grooved completely through over the right furnace for a length of 10 inches, the grooving being continued nearly through the plate for about one-third of the circumference of the furnace. The plate over the left furnace at the front end was nearly as bad, and the back end-plate was in the same condition. No. 8, which had been working a year longer than the other, was not in so bad a condition, the front end-plate only being grooved $\frac{1}{2}$ -inch to 5-16 inch deep, for about one-third of the circumference of the furnaces. One flanged seam only was provided in the furnace of this boiler, and, as both boilers were worked under exactly the same conditions, the example tends to show that increasing the number of the flanged seams, if it has any effect at all, only aggravates the evils due to the expansion of the flue.

Careful observation of a number of cases of bad, or only moderately good treatment will render it evident that whether the flue be plain, or stiffened by tee-iron hoops, Bowling rings, or flanged seams, elasticity of the end plates is most essential, and sooner or later a boiler will be liable to give trouble if not properly provided for. As generally fitted, the flues at the front end are attached to the plate, so that although a distance of about 8 inches of a "breathing space" is left between the flue angle iron and the gusset stays above the furnace, the water spaces at certain points between the flues and the shell are narrowed to such an extent and stiffened by the angle-irons that movement of the end-plate at this part becomes impossible. The result is, that in cases where the flue is liable to overheating, as from the causes before named, either the shell itself, gives way and grooves or furrows, or the side of the flue next the shell buckles, the seams begin to leak, and occasionally the flue assumes an oval form some feet from the end-plate. This

* Reprinted from the Annual Report of the Chief Engineer to the Boiler Insurance and Steam Power Company, Mr. McDougall.

struction of 12 new piers. The girders are to be 57 feet above high water, being 31 feet lower than the original bridge. The girders still standing are to be lowered considerably to suit the altered plans.

NAVAL ARCHITECTURE.

LAUNCHES.

ENGLISH.

Severn.—The Barrow Shipbuilding Company lately launched from their yard at Barrow, a steam-yacht built to the order of Earl Ducie. She was named the *Severn*, and is of the following dimensions:—Length between perpendiculars, 135 feet; breadth moulded, 22 feet; depth moulded, 12 feet 6 inches; registered tonnage, 314 B.M. Her engines are a pair of direct-acting inverted surface condensers, and she is expected to steam 11 knots per hour. She was launched with steam up, and steamed with her own power into the docks at Barrow.

SCOTCH.

Clydach.—On the 29th May, Messrs. Osbourne, Graham and Co. launched from their yard at Hylton an iron screw-steamer built to the order of a Cardiff firm, and of the following dimensions:—220 feet by 31 feet by 13 feet 4 inches to top of tanks, and she will class 100 A 1 at Lloyd's. She has been built on the cellular system of tanks for water ballast fore and aft, and will be provided with compound engines by the North-Eastern Marine Engineering Company of 100 nominal horse-power, and has been fitted with all the latest improvements and appliances for facilitating the loading and discharging of cargoes. On leaving the ways she was named the *Clydach*.

Courrier des Iles d'Hyeres.—On the 29th May, Messrs. D. Allan and Co., shipbuilders, Leith, launched from their yard a screw-steamer of 70 tons gross register, built to the order of M. Vaccaro, of Marseilles, intended for Government service between the naval port of Toulon and the Island of Hyeres. Her dimensions are:—Length, 88 feet; breadth, 16 feet, 6 inches; depth, 8 feet, 6 inches. Her engines of 25 horse-power, nominal, will be supplied by Messrs. Muir and Houston, Glasgow. She was named the *Courrier des Iles d'Hyeres*.

Cynthia.—On May 27th, Messrs. David and William Henderson and Co. launched from their Meadowside Works, Partick, a handsome iron screw-steamer of 2150 tons, and of the following dimensions:—Length, 320 feet; breadth, 36 feet 6 inches; depth, 26 feet hold. She has been built to the order of Messrs. Donaldson Brothers, 67, Great Clyde Street, and will form one of their Canadian and South American fleet of steamers. On leaving the ways she was named *Cynthia*. The *Cynthia* has been built under special survey, and will be furnished by her builders with compound machinery of 200 horse-power.

Glen Etive.—On May 26th there was launched from the shipbuilding yard of Messrs. T. B. Seath and Co., Rutherglen, a handsome little steamer intended to ply on Loch Etive, in connection with the new tourist route by the Oban Railway. Her dimensions are:—Length, 82 feet; breadth (moulded), 12 feet; depth (moulded), 6 feet; and she has a promenade deck 52 feet long, while the fore cabin is 18 feet, and the after-cabin 10 feet in length respectively. The vessel, as she left the ways, was named *Glen Etive*. The *Glen Etive* proceeds to Anderson Quay to receive her machinery and fittings, which are to be of the most improved description.

Greyhound.—On the 27th May there was launched from the yard of Messrs. Robert Duncan and Co., Port Glasgow, a screw-steamer, 162 by 22½ by 11; classed 100 A1, special survey, fitted with compound engines, of 60-horse power, by Messrs. Smith Brothers and Co.

Lecta.—On the 29th May there was launched from the shipbuilding yard of Messrs. Murdoch and Murray, Port Glasgow, a splendid steam-yacht for Mr. David Laidlaw, of Chasely, Skelmorlie, of the following dimensions:—100 feet by 14 feet by 8 feet 6 inches deep. As the vessel left the ways she was named *Lecta*. The vessel is fitted up in forward compartment with saloon, ladies' cabin, pantry, lavatories, and two state-rooms. The ladies' state-room is fitted with a bath, which can be filled from the sea and heated by steam from the boiler. All the fittings of the saloon and ladies' cabin are of the best description, being finished in white and gold, with Italian walnut sideboard and pilasters, and maple pillars with carved and gilt capitals and mouldings. The ladies' cabin is lighted with a handsome dome skylight with obscure glass, and the fittings are electro-plated. The saloon is entered by deck-house, which is fitted as a sitting-room for wet weather. All the deck fittings are of teak, and the after end of the deck-house is fitted up as a meat gallery, floored with encaustic tiles, where the cooking can be done either by fire or steam. The crew are accommodated aft of the engine compartment. The vessel was launched with boiler and engines on board. These consist of a pair of compound surface-condensing engines of 30-horse power nominal, the cylinders being 13 inches and 54 inch by 18 inch stroke, with working pressure of 80 pounds, and are supplied by the owner from his engine works, Alliance Foundry, Glasgow, and are a splendid specimen of marine engineering.

Leda.—On the 29th May, there was launched from the shipbuilding yard of Messrs. Murdoch and Murray, Port Glasgow, a steam-yacht for Mr. David Laidlaw, of Chasely, Skelmorlie, of the following dimensions:—100 feet by 14 feet by 8 feet 6 inches. As the vessel left the ways she was named the *Leda*. The vessel was launched with boilers and engines on board. These consist of a pair of compound surface-condensing engines of 30 horse-power nominal, the cylinders being 13 and 24 inches by 18 inches stroke with working pressure of 80 lb., and are supplied by the owner from his engine works, Alliance Foundry, Glasgow.

TRIAL TRIPS.

Albert Victor.—The new Channel steamer, *Albert Victor*, which was built for the Folkestone and Boulogne service of the South-Eastern Railway by Messrs. Samuda Brothers, made a preliminary trial trip on Saturday last, the 12th inst., when she fully realised the high results she was expected to

accomplish. The trial was made at the Maplin Sands, on the Government measured mile. The mean speed of her four runs was 18.698 knots, or 21½ statute miles.

Chancellor.—On May 28th the new saloon steamer *Chancellor*, built for the Lochlomond Steamboat Company by Mr. Robert Chambers, jun., shipbuilder, Dumbarton, and engined by Messrs. M. Paul and Co., engineers there, went down the Clyde on a trial trip. This vessel, which will take up the station between Helensburg, Greenock, Dunoon and Arrochar, connecting with the Lochlomond steamers, is 207 feet by 21 feet, 6 inches by 8 feet. She is built entirely of steel, having a saloon running nearly the entire length and breadth of the main deck, with a continuous promenade fore and aft. The vessel is supplied with diagonal engines of about 900 indicated horse-power, having two cylinders of 36 inches, with a stroke of 5 feet. The boiler, which is also of steel, is 14 feet in diameter and 13 feet 6 inches high. The *Chancellor* behaved most admirably. The engines worked well, and there was an absence of shaking and tremulous movement. The vessel started from Helensburg, and then ran across to Prince's Pier; from thence she sailed to Dunoon, and then ran down as far as the Cumbrae Lights. The speed attained was 16.9 knots per hour, which was regarded as very satisfactory.

Edith.—On the 29th ult. the steamship *Edith*, of Hull, had a trial trip. She was a screw steamship of 584 tons gross and 279 tons nett., built in 1864 by Messrs. Hendrickson and Co., of Renfrew, and was intended for blockade running. The conclusion of the American War, however, made her useless for this particular trade, and she was then purchased by Messrs. G. Lawson and Co., of Hull, for their service between Hull and Rotterdam. In this branch of commerce she has been since engaged, but her consumption of coal, and the space occupied by her engines, rendered some improvement indispensable, besides which the age of her boilers, and consequent deterioration, had materially reduced her rate of speed. In order to obviate these defects her owners placed her under the charge of Earle's Shipbuilding and Engineering Company (Limited), Hull, who have strengthened and refitted her, and designed and built her a new set of engines and boilers. The vessel left the Hull pier on the day mentioned, and proceeded down the Humber to run the measured mile off Withernsea. Four trials were made, which gave the following results—against the tide: 11.9 and 11.43 knots; with the tide, 12.7 knots and 15.84 knots, or a mean of 12.50 knots, or 14.393 miles per hour. The new engines are two pair of compound surface condensers of 120-horse power nominal, working up to 550 effective, and the consumption of coal will be reduced from 17 cwt. per hour to 8 cwt. These alterations have now made the *Edith* 562 tons gross, 315 tons net, and enabled her to carry 70 tons more cargo. She is propelled by two screws, which work entirely independent of each other.

Lake Manitoba.—On the 2nd June, the new steamer *Lake Manitoba*, belonging to the Canada Shipping Company, went on trial down the Firth of Clyde. The result was very satisfactory, the mean speed attained being 14 knots. The *Lake Manitoba* has been built by James and George Thompson, and is a sister ship to the *Lake Winnipeg* by same builders. She is 3500 tons and 400 horse-power, and is built of special strength and scantling for the Canadian cattle and produce trades.

Malemba.—On June 2nd, the new steel screw-steamer *Malemba*, which has been built by Messrs. John Elder and Co., Govan, to the order of the British and African Steam Navigation Company of Glasgow, went down the Firth of Clyde on her trial trip. This steamer is a sister ship to the *Coanza*, built by Messrs. Elder for the same company, and is of following dimensions:—Length between perpendiculars, 290 feet; breadth, 36 feet; depth of hold, 18 feet; tonnage, gross, 1520 tons. This vessel is designed to have large carrying capacity, combined with light draught of water, and is for that reason entirely built of steel. The engines, which are supplied by the same firm, are on their compound principle and on the trial gave a maximum speed of 12.76 knots, and an average speed of 12.56 knots, as against the contract speed of 11 knots.

Sahara.—On the 26th May the screw-steamer *Sahara*, a vessel of 30 tons burthen, built to the order of the Bedoum Steam Navigation Company (Limited), Liverpool, of which Messrs. W. and R. Thomson are the managing owners, made her trial trip over the measured mile at Whitby, when she attained an average speed of 11.28 knots, she being at the time in ballast trim. The machinery during the run worked with perfect smoothness, and the trial in all respects gave the greatest satisfaction to the owners, who were represented on the occasion by Mr. William Thomson and Mr. William Glover, the company's inspecting engineers, under whose superintendence the vessel and her machinery have been constructed.

St. Augustin.—The trial trip of the screw-steamer *St. Augustin*, built by Messrs. John Elder and Co. for the Compagnie Générale Transatlantique, took place on the 4th of June. After taking a party invited by the builders on board at Greenock, the *St. Augustin* proceeded to Skelmorlie, where she ran the measured mile. On the first run the steamer accomplished the distance in three minutes thirty-five seconds, showing 16 knots, with the tide; the second, against the tide, in four minutes four seconds; the third up, in three minutes forty-eight seconds; and the last in four minutes four seconds—giving on the four trials an average speed per hour of 15.35 knots. The *St. Augustin* is one of four ships entrusted to Messrs. John Elder and Co. by the French company. Her length between perpendiculars is 313 feet 6 inches; breadth, 33 feet 6 inches; and depth (moulded), 25 feet, with a gross tonnage of 1850. The engines are on the compound principle, with inverted cylinders and surface condensers, the high pressure being 42 inches diameter, and the low 80 inches, with a 4 feet stroke. At the time they worked very smoothly, the steam pressure being 75 lb. per square inch, vacuum 28 inches, and the revolutions per minute 78. The contract speed is 14 knots per hour, and, as has already been stated, she did 1.35 knots above that, giving an indicated horse-power of 2563 or 463 above the contract.

H.M.S. Iris.—After a successful cruise of six days for the adjustment of her brasses, which gave out during her measured mile trial last month, and after a continuous testing of her machinery, the quick despatch vessel, *Iris*, Captain E. H. Seymour, was again placed upon the mile in Stokes Bay on

Saturday last, the 12th inst., and as everything passed off with the greatest satisfaction, the trial may be regarded as final. The ship for the purposes of the trial, was under the command of Captain Wells, of the Portsmouth Steam Reserve, while the machinery was under the immediate superintendence of Mr. Charles Icely, who was assisted by Mr. A. Durston, of the Steam Department of the Dockyard, and Mr. Thompson, the chief engineer of the ship. The *Iris* was at her full load draught, being commissioned and ready for sea—viz., 17 feet 8 inches forward and 21 feet 9 inches aft. As the performances of the ship had been abundantly tested on previous occasions, the trial on Saturday was limited to four full-power runs on the measured mile, the results obtained in May not having been deemed perfectly satisfactory at the Admiralty. The horse-power developed during the trial was 317.84 horses beyond the contract power, while the mean of all the means gave a speed of practically 18 knots with all weights on board, or about only half a knot less than was realised during the trials undertaken when the ship was "flying light." Indeed, the substantial results have given a speed even beyond the estimate of the designers of the ship. During the first run the steam was scarcely up to the mark, but in the succeeding runs it was maintained at blowing-off pressure. There can be no question that had the first mile been discarded and a fifth run made, the result would have exhibited a speed of slightly over 18 knots. The mean pressure of steam in the boilers was 62.75 lb.; the mean vacuum in the condensers was 27.69 inches starboard and 27.62 inches port; the mean revolutions of both sets of engines were 94.77 per minute; and the mean pressures in the cylinders—starboard, 42.25 lb. high, and 11.45 lb. low; port, 40.15 high, and 12.025 low. The machinery, which is by Messrs. Maudslay and Co., worked in all respects satisfactorily. On the conclusion of the trial the *Iris* steamed into harbour, where her injured foremast will be replaced by a steel mast taken from the *Mercury*, and it is expected that she will leave for her station in the Mediterranean in about ten days.

DISASTERS AT SEA.—There were 15 British and foreign wrecks reported during the week ending Saturday last, making a total of 641 for the present year, or a decrease of 94 as compared with the corresponding period of last year. The approximate value of property lost was £580,000, including British, 420,000.

THE "ATALANTA."—A bottle was found on the coast of Massachusetts on June 16th, containing a paper, on which was written:—"April 17th. Training ship *Atalanta*. We are sinking. Longitude 26; latitude 32." Some other words followed, bearing the signature "John L. Hutchings." The missive is discredited by the Admiralty authorities, on the ground that by no possibility could the *Atalanta* have drifted anywhere near the locality indicated, having regard to the set of the currents and the winds prevailing in the Atlantic in the earlier months of the year.

NEW FAST STEAM CRUISERS.—Messrs. R. Napier and Son, shipbuilders, Glasgow, have been intrusted by the Admiralty with the construction of the hulls and machinery of the three fast steam cruisers of the *Iris* type about to be added to the Navy. The vessels, which will be named respectively the *Leander*, *Phaeton* and *Arethusa*, are to be built of steel and are designed to attain a high rate of speed. The displacement will be about 3750 tons, with very large coal capacity. The engines will be of horizontal compound type, working twin screws. The contract will extend over a period of two years.

THE LABOUR MARKET.—On Monday nearly all iron works along the West Cumberland coast were stopped, in consequence of turnacemen and other ironworkers having struck against a reduction of 20 per cent. Over 2000 men are out of work, and iron ore and coke was standing in waggons in abundance all along the line. Limekilns and ore pits are also affected. At a meeting at the Grand Hotel at Birmingham on Friday it was resolved to dissolve the Conciliation Board of the wrought iron trade, on account of disagreements as to how the difficulty should be met which had been raised by certain workmen underselling their labour 10 per cent. below the prices fixed by the board. On Monday at the majority of the nail warehouses in Sedgley and the adjoining districts the nailers were only allowed to take out iron to make common nails on condition that they would submit to a reduction of 10 per cent. in wages. The reduction has been enforced in consequence of underselling in the market. The operatives state that they cannot live at such low wages. After a strike of six or seven weeks the colliers employed at the Talke and Harcastle collieries, North Staffordshire, numbering about 1500, resumed work on Friday last, at a 10 per cent. reduction. The men's agent, Mr. W. Brown, has been paid off, and the union virtually broken up. The men have also been compelled to yield advantages in the mode of work which they successfully struck against some time ago. General reductions are being made throughout the district. Several collieries in the Leicestershire coalfield have now followed the example of neighbouring pits in giving notice for termination of contracts, preparatory to a reduction in wages. The colliers, about 1500 of whom are affected, are greatly averse to any reduction, and it is feared a strike will ensue. Great distress already prevails in some parts of the district owing to the scarcity of work. At a largely-attended meeting of Leicestershire colliers at Coalville, on Saturday, a resolution was passed expressive of a determination to resist the proposed 10 per cent. drop. On Wednesday the notices to the men expired, and all are leaving work, taking their tools. It is said that the men have been living for months in straitened circumstances, and further reductions will fall heavily upon them. About 3000 men and boys are thrown out of work. A meeting of the West Riding Colliery Owners' Association was held in Leeds on Tuesday, when the report of the accountants upon the result of their investigation of the books of seven representative firms for the purpose of arriving at a basis, for the sliding scale, was presented. There will be no change in the rate of miners' wages for the four months concluding with the end of August. The Maesteg Works of the Leynot and Tondou Coal and Iron Company have been closed, owing to the refusal of the furnacemen to continue work at the current rate of wages. Seven hundred men will be thrown idle.

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CORRESPONDENCE.

THE DEPHOSPHORISATION OF IRON.

To the Editor of **IRON**.

SIR,—If I recollect rightly, the quantity of mill scale used in the purification of phosphoric Northampton pig, under Mr. Pettitt's patent process, did not exceed the percentage made in steel rail mills and forges; therefore each maker need not go outside his own works for his dephosphorising material, or else to a limited extent only. I therefore fail to see the necessity of using salt, until it be proved that the supply of mill or forge scale is inadequate, or that the using of salt is attended with superior advantage as regards quality. Had Messrs. Bolckow and Vaughan tried Mr. Pettitt's patent at the expense of a few pounds, they would have attained a considerable amount of valuable knowledge, to say nothing of success; whereas, at the expense of a few thousands of pounds, they are apparently just where they were, when working on ordinary Bessemer pig. I hope Mr. Barnett will prove successful in convincing the steelmakers by the Bessemer process of the value of his patent, for his own sake. It is much easier to produce good results by using either salt or mill scale, than to convince a steelmaker and his scientific friends of the value of such process. Mr. Barnett must not infer that I wish to convey any doubt as to the perfect utility of his patent; but, having seen his claim for the value of salt alone, I felt constrained to make a claim for an invention which has done all that is needed in the dephosphorisation of impure pig-iron, and which has met with indifference only from those who were the most interested in testing it.

To make Mr. Pettitt's process a commercial success, it must be fairly tested on the large scale—not by a few cwt.; and it would be scarcely credible that in this enlightened age, Messrs. Bolckow and Vaughan, or any other makers, would allow a charge of bad iron and a few fittings stand in the way of investigation—merely to say nothing of accomplishing what they cannot properly do without Mr. Pettitt's or Mr. Barnett's process.—I am, &c.,
SHEFFIELD, May 14th, 1880. OBSERVER.

NOTICES OF BOOKS.

Chemistry, Inorganic and Organic, with Experiments. By CHARLES LOUDON BLOXAM. Fourth Edition. London: J. and A. Churchill. 1880.

THE issue of a fourth edition is hardly the occasion for a lengthened notice of any work, even though, as in this case, we have not previously brought it under our readers' notice. We should, however, omit both a duty and a pleasure if we neglected now to recommend "Bloxam's Chemistry" as an addition to the working library of all who need a handy treatise on the subject in a single volume. Larger and more complete works there are without question; but that there is no better one-volume manual of reference for the professional man, since Taylor's has gone out of print and out of date, we know by some years' experience. Its great merit consists in the clearness and copious illustration of the earlier portions, which give the reader an insight into the elements of the science, and in the very full descriptions of technical chemistry, under which fall the metallurgical part of the work, and such manufactures as those of glass, fictile-ware, gunpowder, soap, &c. The revision of the work has been carefully performed, though it needed no extensive corrections. We are bound, however, to note that the old statement is repeated as to the impossibility of making Bessemer steel from phosphoretic pig, and regret that Prof. Bloxam has not made at least a reference to Messrs. Thomas and Gilchrist's remarkable paper on the subject, published nearly two years ago.

The Recent Depression of Trade. By WALTER E. SMITH, B.A. London: Trübner and Co. Pp. 107.

MR. SMITH has written a sensible but not very strong essay on the economical phenomena of the past few years. It is gratifying to see general principles applied to particular cases with as much success as Mr. Smith has achieved, and we take no grudge against his work for having been the Oxford Cobden prize essay for 1879; but we have not been much refreshed by its perusal. Briefly stated, the reason adduced by the author for the decline of trade on the Continent since the Franco-Prussian war is the enormous loss, direct and indirect, caused by the military establishments kept up by Continental nations; while for England the causes assigned are the impoverishment of Continental customers owing to the war just mentioned, the collapse of the railway mania in America, the waste of English capital in foreign loans, the disturbance of trade created by international telegraphy. Unsound trading, reckless manufacture, the workman's unwillingness to put out his strength and skill, are all factors in the same unlucky result; which Mr. Smith sees no more practical means of conjuring away than hard work, free trade and honesty.

Guía del Inventor. Don Felix Prats, Madrid: Calle de Don Martin, 7. 8vo. Pp. 58.

THE original text of the Spanish patent law of 1878 is here reprinted, together with the regulations which have trade marks as their object, and a summary is also given of the patent law of all countries having one. A list of the patents taken out in Spain during 1879, which forms 30 pages of M. Prats' compilation, is useful, and not bulky.

A Description of the Differential Expansive Pumping Engine. By HENRY DAVEY, M.I.C.E., F.G.S., &c. London: Spon. 1880. Pp. 36 and 10 plates.

IN this little work is given an exposition, at once brief and clear, of the ingenious differential valve gear, designed by its author for the purpose of regulating the admission of steam to the cylinders of pumping engines, according to the variation of load. This is effected by an ingenious combination of levers described in the text and illustrated by lithographic drawings. A large number of practical formulae, none of them expressed in terms higher than those of a simple equation, and some notes useful to those concerned with pumps and pumping operations, give an additional value to Mr. Davey's sketch.

Switzerland Illustrated. In parts, 40 pp. each. Zurich: Orell Füssli and Co; London: Smith and Son.

THE Swiss firm which prints and publishes this collection of small local guide books has been prompted, no doubt, to its enterprise by the wish to spread the cost of the engravings over as wide an area as possible. We wish the publishers could have gone to the expense of having these books revised by a competent English scholar. Inaccuracies in language and inelegances in style in a French edition any firm that knew its business would be most careful to guard against. The respect the French have for their language would render unsaleable an edition faulty in these respects. However careless and à peu près the Englishman may be, we do not like to see his indifference speculated upon; and are barely reconciled to the text by the fine engravings which accompany it. "Were a Paris, of great travelling experience, but with his sense for natural beauty still unblemished, asked to give the golden apple to the fairest amongst landscapes, to which of these would he give the preference?" is the astounding conundrum with which one of the sections opens. And the price of each part is "1 sh."—sixpence is meant. The fundamental idea of having each district of Switzerland written up by a local hand, may seem at first sight good. But in fact it turns out differently, and Bädeler's "Switzerland" is worth a great number of these detached guides. Guide-books, evidently, can be "dry" or "sweet." Those who like the latter may invest their half shillings in the productions of the Zurich firm; those who prefer the former will stick to their Bädeler.

Directory to the Iron and Steel Works of the United States. Prepared and published by the American Iron and Steel Association. Corrected to March 15, 1880. Philadelphia, 1880. Pp. 184.

IN our issue for May 14, was contained a statement in brief of the present means of production of iron and steel existing in America. This statement was based on the résumé contained in the preface to the present valuable work, which gives in detail the information already furnished in mass.

Lists are respectively given of blast-furnaces, rolling mills and steel works, forges, bloomeries, each list being subdivided according to States, and contains details respecting each concern in each State. English readers who are fain to content themselves with Mr. Hunt's short and dry statistics would be glad to have for their own country information such as that of the following paragraph, taken at random.

"Wabash Iron Company, Terre Haute. Completed in January, 1874; 15 single puddling furnaces; 1 scrap furnace; 3 heating furnaces; and 3 trains of rolls (one 8, one 18 and one 20 inch); product, all kinds of bar and guide iron; annual capacity 6000 net tons. Brand, 'Wabash.' A. J. Crawford, President; J. P. Crawford, Secretary and Treasurer."

In this detailed manner all the works in the States are gone through, large and small, whether at work or standing still, and thus, with the editor's excellent arrangement, a very satisfactory Directory is put together. We conclude by extracting one little paragraph complementary to the list of forges in Tennessee:—"In the mountainous districts of Tennessee the forges are usually operated by farmers, who only make bar iron from ore whenever it is needed in their immediate neighbourhood. Each forge usually has two fires. Daily production about 250 lb. to the fire; much depends upon the water-power which drives the blast and hammer; in exceptional cases even 700 lb. a day being made."

Geodesy. By COL. A. R. CLARKE, C.B., R.E. Oxford: The Clarendon Press, 1880.

ALTHOUGH the subject of geodesy has in recent years become a very large one, until the appearance of the present work there was no treatise upon it in the English language, with the exception of Sir G. B. Airy's article on the Figure of the Earth in the "Encyclopedia Metropolitana." Sir G. B. Airy's article was exhaustive at the time it was published, and it is still valuable for many reasons, but since then many important works have appeared on the subject abroad, and both at home and abroad there have been many detached treatises and reports, scientific or official, prepared, which remain on the shelves of scientific or official libraries. The most important of these have been put under requisition by Col. Clarke, and the result has been a work in which the subject is fairly brought abreast of the time. In the first chapter there is a general description and history of geodetical operations, from the early attempts of Snellius to determine the radius of the earth, in which the principle of measurement by triangulation was first adopted. Half a century afterwards the triangulation from a point in the vicinity of Paris to Amiens, executed by Picard, enabled Newton to establish finally his doctrine of gravitation. The measurement of an arc at the equator and at the polar circle, under the auspices of the French Academy of Sciences, was the first great operation in geodesy, and led to important results. When the metric system was adopted by the French Constituent Assembly in 1791, an arc of the meridian from Dunkirk to Barcelona was measured in order to deduce the national standard of length; and the triangulation was subsequently extended by MM. Biot and Arago further along the Spanish coast. The Great Trigonometrical survey of India is next noticed, as are also the geodetic operations in this country, commenced by General Roy in the last century, and but recently completed. There is now a well-connected triangulation extending from Shetland to the island of Formentara off the Spanish coast. In the second chapter, spherical trigonometry and fundamental equations are dealt with, in the third the method of least squares is explained, and in chapter four the theory of the figure of the earth is discussed. In the subsequent chapters, distances, azimuths, geodetic lines, base lines and their measurement, instruments, calculations, and the figure of the earth, pendulum and pendulum observations, and numerous other geodetical points, are considered, and a few pages of notes and additions close the work.

Water Supply. By J. H. BALFOUR BROWNE, Barrister-at-Law. London: Macmillan and Co. 1880.

THE subject of this book, it must be admitted, is one of paramount importance. For purposes of cleanliness and for various other household and manufacturing uses, a copious supply of pure water is indispensable. Freedom from unwholesome ingredients is absolutely requisite where water is employed in cooking or as a beverage, and in that condition it is the natural and the best drink. Unfortunately it is seldom indeed that the water supply, either of sparse or populous neighbourhoods, is what it ought to be in respect of freedom from pollution. The existence of manufactories on the banks of our rivers, and the drainage from the sewers enlarged and contaminated manifold with the introduction of the wet system, have all tended to render a water supply from rivers dangerous, and the extension of the heavy manuring of agricultural lands has had a similar though slighter effect upon surface supplies collected from gathering grounds. The water drawn from shallow wells near houses ought never to be used for alimentary purposes. Water drawn from a gathering ground, whether impounded by dams constructed across a valley, or taken more immediately from a natural reservoir, such as Thirlmere or Loch Katrine, if the area of supply is clean moorland, is perhaps better than any, being infinitely purer than most river water, and softer than the still purer fluid pumped from deep wells. Care, however, should be taken that there are no drawbacks in the shape of mine washings or highly-manured tracts draining into the reservoir. The softness of this water is also very important to many manufacturing communities. Several chemists, however, strongly advocate rivers as a source of supply, holding that sufficient purification is given by the oxidising properties of the stream; but Dr. Frankland, no mean authority, decidedly prefers water from deep springs, such as those in the chalk from which a part of London is supplied. At the same time there cannot be a doubt that, as is shown by the reports of the metropolitan water examiner, the supply of several of the largest London companies is wholly unfit for potable purposes. The author goes at length into this part of the question, entering much into detail with respect both to its chemical and mechanical aspects, quoting a number of instances of poisoning from the infiltration of unhealthy sewage into well water, and showing, from the statistics of the cholera epidemic, that

the influence of pollution from sewage in the water of some of the London companies had an evident influence on the extension and virulence of that disease. The celebrated Lausen case is also adduced as showing how disease is spread by polluted water supply. In conclusion, Mr. Browne quotes Dr. Cayley as making Sir John Harrington, who, in the reign of Elizabeth, invented water-closets, responsible for most of the typhoid fever we suffer from, and asks, "Have not our physicians, in the wide confederacy of ignorance, insisted that those poisonous serpents, drains, and those other serpents, water-pipes, were salutary metal serpents, upon which we had only to look favourably and live; and have not we, believing them, taken these vipers into our households, and been smitten with sore diseases in all our joints?"

Metallurgy: Silver and Gold. Part I. By JOHN PERCY, M.D., F.R.S., F.G.S. London: John Murray, 1880. THE appearance of a fresh instalment of Dr. Percy's great work must always be regarded as an event in the unfortunately too sparse records of metallurgical literature. The volume before us embraces only the first part of the treatise on silver and gold; part of the second volume, however, is already in type, so that we may hope for its speedy appearance, and the completion of this branch of the *magnum opus* of English metallurgy. This first part, although filling a bulky volume of nearly 700 pages, does not even exhaust all that the author has to say about silver, and hardly touches on gold at all. The work has evidently, as will always be the case with a labour of love such as this, grown under its author's hands till it has considerably exceeded its projected limits. The present volume, following the plan always adopted by the author, commences with a very full account of the chemical properties of silver and its combinations with the non-metals. As an example of the elaborate detail which characterises the whole work, we may mention that the description of the formation and properties of chloride of silver alone occupies rather more than fifty pages. Throughout the book, where chemical symbols are used, both the old and new notations are given, which is very convenient. This preliminary matter is followed by a detailed account of the alloys of silver with other metals, more especially with copper. Under this head there is much curious information on the subject of the silver currency and silver plate, of which its users generally know very little. Thus we find that the mysterious series of marks stamped on plate conveys to the initiated not only the name of the maker and the quality of the standard, but the place of assay, the year of assay and the fact of the payment of duty. The name of the maker is indicated by his initials, the standard of 11 oz. 2 dwt. by a lion passant, and that of 11 oz. 10 dwt. by a lion's head erased (*i.e.*, without the body), except at Birmingham and Sheffield, and there by Britannia alone; the place of assay by heraldic arms, the year of assay by a letter which is used throughout the year, and is changed every year, and the payment of duty by the sovereign's head. The important subject of the imperfect homogeneity of alloys of silver and copper is fully treated in dealing with alloys. The assay of argentiferous ores and metallurgical products, with all the elaborate precautions used in the laboratory of the Royal School of Mines, is described in detail. Some further explanation of the chemical reactions involved in these operations might perhaps, however, have been given with advantage to the student. The assay of gold and silver bullion, coin and plate, both by the dry and wet methods, is described with the doctor's usual care and clearness. A very interesting account of the ingenious Chinese method of assaying silver bullion, furnished to the author by an old pupil from actual observation, finds its place here. In the section on the separation of silver from metallic copper by the lixiviation process and the separation of silver from gold, there is also an account of the method pursued in Japan for the lixiviation of argentiferous copper, which will be found interesting and worth study. This is another instance of a contribution from an old student, having been furnished by Mr. Godfrey, lately Mining Engineer-in-Chief to the Government of Japan, who appears to have largely in the assisted preparation of the present volume. Miller's chlorine process is fully explained, and a valuable report on it from the Royal Mint, Sydney, is given *in extenso*. This process, which, like many others, was proposed many years before its final adoption, will probably have a considerable development in the future.

As silver smelting, as ordinarily understood, is treated at great length in the author's former volume on the metallurgy of lead, he has contented himself in this with describing certain processes of a somewhat exceptional character. A very full and interesting description of the Silver Islet Mine in Lake Superior, finds a place here. When it is remembered how large a part the mercury process has played in the extraction of silver from its ores, the Mexican or Patio process—which for a seemingly rude and unscientific device is singularly effective—well deserves the full description it has received. Dr. Percy's view of the theoretical reactions which accompany it, is, however, held over to the next volume; which, indeed, is so constantly referred to that it is to be hoped that it will very speedily be published. A very full index adds considerably to the usefulness of the present volume.

There is so little to criticise in the execution by Dr. Percy of his self-imposed task, that it seems almost invidious even to mention some trifling defects in detail. We could have wished, however, that a somewhat more systematic course had been pursued in the arrangement of some of the contents, thus, instead of describing the different methods for the separation of gold and silver under the section treating of the separation of silver from metallic copper, it would, we should have thought, have found a more suitable place in the second volume; in several other cases, too, the arrangement seems rather arbitrary than systematic. In many places, also, the authorities quoted by Dr. Percy might, with advantage, have been drawn from those of more modern date; thus, in giving the composition of bones, an analysis by Berzelius is quoted, although in the following paragraph we are informed that the analysis is not correct. It would have been, perhaps, more to the purpose to have simply given an accurate one, such as is to be found in any modern textbook. We mention this trifle chiefly as indicating the somewhat archaic tendency which

pervades all the doctor's work, and not unfrequently impairs its practical value. Antiquity has for Dr. Percy an attraction which is sometimes permitted to unduly interfere with his sense of the technical value of his authorities. At the end of the book is inserted a reprint of Dr. Percy's very temperate and manly letter, explaining his motives for resigning his appointment at the Royal School of Mines—a resignation which seems to have been quite wantonly forced on him by official caprice. If it be true that every cloud has a silver lining, then the appearance of this volume so soon after that otherwise much-to-be-deplored event, and the author's promise in his preface of the speedy completion of the work, may well be regarded as the silver lining to this particular cloud, which at one time threatened seriously to interfere with the development of the best metallurgical instruction in England.

We feel sure that the hope expressed by Dr. Percy that he will still be furnished by his former students and friends with any information concerning what they have observed in metallurgical practice, will not be expressed in vain, and that they will as heretofore act as volunteer contributors to the perhaps most important technical work which has yet been produced in England. We may also perhaps express the hope here, that Dr. Percy will now be able to accelerate the appearance of the second edition of his "Iron and Steel," the first edition of which has not only been long out of print, but is now from the rapid progress of the metallurgy of these metals during the last decade quite out of date. We have already had occasion frequently to draw attention to the anomalous fact that England and America, the greatest iron-producing countries in the world, are at present without any authoritative and comprehensive treatise on the metallurgy of what is certainly a far more precious metal than either silver or gold, and we do not hesitate now to do so again.

NEW BOOKS.

Alphabetical Manual of Blow-pipe Analysis. By W. A. Ross. Crown 8vo. Trübner and Co.
Automatic Calculator (The), for cwt's., qrs., lbs., at per lb. By J. Sawyer. Crown 8vo. Bell.
Instructions to Surveyors of Ships. New edition. 8vo. Pewtress.
Manufacture (The) of Steel. By F. Overman. New edition. Crown 8vo. Trübner and Co.
Mathematical Examination Papers for the Royal Military College, Sandhurst; with Answers by W. F. Austin. 8vo. Stanford.
Old Stones: Geological Notes. By W. S. Symonds. New edition. 12mo. Simpkin and Co.
Pocketbook of Useful Formulae and Memoranda for Engineers. By G. L. Molesworth. 20th edition. 32mo. Spon.
Practice of Navigation and Nautical Astronomy. By W. C. Bergen. 5th edition. 8vo. Simpkin and Co.
Progress (The) of the World in Arts, Agriculture, Commerce, &c., since the Beginning of the Nineteenth Century. By W. G. Mulhall. Crown 8vo. Stanford.
Pyrology; or, Fire Chemistry. By W. A. Ross. New edition. 4to. Trübner and Co.
Textbooks of Art Education:—Classic and Italian Painting. Architecture: Gothic and Renaissance. Edited by E. J. Poynter. Crown 8vo. Low.

OBITUARY.

WE regret having to announce the death of Mr. Gent, of the firm of Kendall and Gent, engineers and machinists, of the Victoria Works, Salford, Manchester.

MR. WILLIAM SMITH DIXON, of Govan Hill, Lanarkshire, the leading partner of the firm of William Dixon and Co. (Limited), died in London on Wednesday at the age of 56, after having been in failing health for some time past. Mr. Dixon, who was born in 1824, was in the commission of the peace, and a deputy-lieutenant for the counties of Ayr and Lanark, and proprietor of large ironworks in Glasgow, and of extensive collieries in Blantyre, Lanarkshire.

WE have to record the death, at the early age of 40 years, of Mr. George Charles Dieckstahl, of the firm of Messrs. Seeborn and Dieckstahl, steel refiners and converters, &c., Dannemora Steel Works, Sheffield. Deceased was a native of Harburg, near Hamburg, and commenced his Sheffield experience in the employment of Messrs. Moss and Gamble, Franklin Works, Russell Street, remaining with that firm some eight years. Mr. Seeborn was then with Messrs. George Fisher and Co., file manufacturers and steel converters, Hoyle Street Works. Some years ago Mr. Seeborn and Mr. Dieckstahl resolved to go into partnership in the steel converting and file-making. They commenced business on Attercliffe Road, subsequently removed to Leadmill Road, and afterwards to their present premises, which are closely adjoining the Wicker.

FACTORY NOTES.

FAILURE OF A SOUTH YORKSHIRE COLLIERY PROPRIETOR.—On Friday last a petition for the liquidation of the affairs of E. Sutcliffe and Son, of the Havercroft Main Colliery, near Barnsley, was filed in the Barnsley County Court. The liabilities amount to between £8000 and £9000.

HEAVY FAILURE IN THE STAFFORDSHIRE IRON TRADE.—A petition for liquidation has been filed in the Oldbury County Court by Messrs. Duignan, Lewis and Co., of Walsall, on behalf of Mr. Joseph Jones, of West Bromwich, and the Church Lane Ironworks, Tipton, ironmaster. The liabilities are stated at about £16,000; the assets are not yet ascertained. Mr. Thomas S. Hatton, of Wolverhampton, is the receiver.

THE SYDNEY EXHIBITION.—Messrs. Brinsmead and Sons stand at the head of all the piano manufacturers who exhibited at this exhibition, having received two first-class

awards, with special certificate—for an upright instrument the first degree of merit, and for a grand piano-forte the same award with special mention for improvement in action. Messrs. S. Worssam and Co., of the Oakley Works, King's Road, Chelsea, have also received a high award for wood-working machinery.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending 12th June:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum, 10,660. Mercantile Marine, Building Materials, and other Collections, 5353. On Wednesday, Thursday and Friday (admission 6d.) from 10 a.m. till 6 p.m., Museum, 2526. Mercantile Marine, Building Materials, and other Collections, 695. Total, 19,234. Average of corresponding week in former years, 14,086. Total from the opening of the Museum, 19,053,508.

CREDITORS' MEETING.—A first meeting of the creditors of Messrs. J. J. Bowater and Sons, of the Bushfarm Ironworks, Greetes Green, West Bromwich, was held on Monday, Mr. Alfred Hickman in the chair. The statement submitted showed liabilities £16,219, and assets £1973. The debtors' solicitor stated that his clients had recently lost considerable sums consequent on the long depression in the iron trade. He was unable to offer a larger composition than 2s. to 2s. 6d. in the pound. A long discussion ensued; one of the debtors was examined at considerable length, and eventually it was resolved to wind-up the estate in liquidation.

PAINTER'S HYDROSTATIC PIPE JOINT.—We understand that this joint, of which we gave an illustrated description at page 111 of the current volume of IRON, has been selected for use in constructing the mains of gas and water works for a town in Canada, and a contract entered into through Mr. W. G. Fossick, of 86, Cannon Street, London, for 6½ miles of pipes to be laid this season. We have already expressed the opinion that engineers in the colonies would be likely to find this invention of especial service to them, and considering the economy claimed in both labour and materials, we think it would be well if the profession at home would investigate it a little more closely.

IMPORTANT SALE OF PLANT, MACHINERY, &c.—There is to be a three days' sale at Purton and Sharpness, Gloucestershire, commencing on the 29th inst., of the valuable plant, locomotive and portable engines, timber, materials, and other articles used by the Hamilton Windsor Iron Company in constructing the Severn Bridge. Among these are three saddle tank locomotives, in excellent working order; five portable steam engines, steam and other donkey pumps, two costly and superior air bells, suitable for sinking the largest iron cylinders; five barges, a number of iron and other boats, a quantity of cylinders, diving apparatus, 60,000 cubic feet of pitch pine, a large quantity of other timber, &c., comprising the entire plant employed in the undertaking, with the surplus materials, and constituting one of the most extensive sales of the kind that has ever taken place. Catalogues are in course of preparation, but an enumeration of the principal articles will be found in our advertising columns.

TINPLATE AND JAPANNED WARES.—Messrs. J. H. Hopkins and Sons, of Granville works, Birmingham, one of the leading firms in the local hardware trade, and a respectable house for tinplate and japanned wares, including pressed and stamped tinned hollow wares, have just introduced a new feature into their extensive manufacturing establishment by opening a capacious show-room for the exhibition to their customers of samples of their various manufactures. This room is tastefully fitted and skilfully arranged so as to admit of the inspection of specimens of all the goods which the firm manufactures. These are carefully grouped and classified, and the general effect is to impress a visitor with the extensive area of domestic and commercial requirements covered by the productions of the firm, and the very striking advance which has been made in the artistic treatment of even the most simple articles of everyday utility. Among the specialties in the class of tin and tinned goods are culinary utensils, made in one piece, thus avoiding the necessity for brazing and the possibility of attendant mischief, the use of nickel-plating for dish covers, and other block-tin goods, upon a system just perfected by the firm, which ensures the brilliant appearance of electroplate with the advantage of superior durability, and the production of pressed and stamped tinned hollow wares (chiefly for the export markets) of every dimension up to a diameter of 36 inches in one piece. Another department contains numerous samples of what is known as wrought-iron London braziers, a specialty of which Messrs. Hopkins are almost the sole manufacturers in the district. The show of japanned goods is large and varied, embracing numerous descriptions of baths, travelling trunks, nursery and camp washstands, toilet sets, coal vases, deed boxes, hand lamps, tea trays, letter boxes, and a whole host of *minutiae*. It is in this department more especially that the influence of the introduction of art principles, alike in form and decorative treatment, is strikingly manifested, the hand-painting of several classes of the articles enumerated being very meritorious in point of design and excellent as to ability in execution. The firm has secured the honour of two first-class awards for their special manufactures at the Sydney Exhibition. The new departure they have made in providing and furnishing an exhibition on a small scale within their own works for the convenience of intending purchasers is an evidence of the progressive spirit in which their business is conducted, while it affords to visitors generally a very clear idea of the rapidity with which our hardware manufacturers are adapting themselves to the altered circumstances surrounding modern commercial enterprise.

THE FRENCH PATENT LAW.—Messrs. Newton and Son, patent agents, recently brought under the notice of Lord Granville, in relation to the treaty of commerce now under negotiation, the fact that by the French Patent Law of 1844, the importation of articles patented in France is virtually prohibited, the penalty of importation by the patentee being the avoidance of his patent, adducing a striking instance of the prejudicial action of the law. His Lordship, in reply, promises to bear in mind the desirability of obtaining a modification of it in any commercial negotiations between this country and France.

IRON AND COAL TRADE REPORTS.

BARNSELY AND SOUTH YORKSHIRE—It is many years since the coal trade of this district was in such an unsatisfactory state as it is at the present time. During the week trade has declined rather than otherwise, and from what can be gathered at the time of writing the bulk of the contract for the supply of locomotive coal for the Midland Company has been placed in other hands than those who expected to have a share of it. The Manchester, Sheffield and Lincolnshire and some other companies' decisions have not been made known. It is stated that the prices at which the tenders were sent in were low and uniform, yet the owners have not succeeded. The demand for house coal is exceedingly quiet, the high rates to London greatly affecting the district coalowners, who under the existing circumstances are powerless to compete with seaborne coal. As intimated last week a movement is going on with regard to an alteration of the rates, but no decision has been made known. There is but a moderate tonnage sent by the Great Northern not only to London, but to other places where a large quantity of coal is usually sent. Some of the largest coal merchants in the eastern counties are doing less at the present time than they have done for years past. The steam-coal trade, although pretty lively, is nothing like equal to the district production. Last week a large tonnage was sent to Grimsby from some of the largest South Yorkshire collieries, and as a result the exports increased by 4704 tons over the previous week. On the other hand there was a slight decrease from Hull and Goole. With this state of things in view the coalowners are very anxious as to the passing of the Hull and Barnsley Railway Bill, and after the expression of opinion by the chairman on Monday it is being assumed that this measure will become law. On the other hand the Huddersfield East and South Junction Railway scheme was declared not proved on Tuesday, so that the anticipated line to Roystone, in order to carry the South Yorkshire coal to Huddersfield and the West Riding, is at an end. It is cheering, after all, to have to announce that the superiority of the gas-coal raised in the district has induced some of the gas companies in the Midland counties to place a large portion of their contracts here. The Nottingham gas company has distributed their favours to the Thorncliffe, Hoyland, Silkstone, Darley Main, Barrow Edmund's Main, Cooper's and the Barnsley Silkstone Collieries to the extent of 68,000 tons out of the 100,000 tons required. It is also stated that the Hoyland Silkstone Colliery has received a fair share of the contract for the Derby gas company, as have also other firms in the district. The business passing with the West Riding and other manufacturing districts is but moderate, and being near the end of the half-year, purchases are very moderate indeed. The coke trade, on the other hand, is fully as good as can be expected, considering the large output going on in the district. Several firms are in receipt of good orders for North Lincolnshire, where, although the furnaces are kept going, iron is being stocked. There is but little new to note, with respect to the labour market, the so-called dispute, at the Monk Bretton collieries, continues so far as the old hands are concerned. The company are still employing non-union hands and are pushing on with the erection of several houses, in order to accommodate a larger number. Those out of work are, for the most part, supported by public subscriptions, which are, however, on the decline. The men are complaining of the low wages which they are earning, whilst coalowners declare they are working at a loss. There is but little new to note with respect to the iron trade, which, on the whole, exhibits a slight decline. The blast-furnaces are kept going, but the output in some instances, is in excess of the demand. The local foundries are not over well off for orders, being to a great extent dependent on colliery and building operations, puddlers and mill men find plenty to make average time, so that the output of bar and merchant iron is not over large. A good tonnage of Bessemer steel rails, tires, &c., is being sent away weekly from the district works, whilst a good quantity of iron ore is being received from North Lincolnshire, for the use of the furnaces here. The working of the gannister beds on the Yorkshire moors, which of late years has opened up quite a new trade there, is largely continued.

BARROW-IN-FURNESS AND NORTH LANCASHIRE—Very little new business has been done in hematite pig-iron during the past week, the market remaining quiet, and buyers proceeding with that caution which has characterised their movements for some two or three months past. Prices, however, seem to have made a stand at the figures previously given, and there does not at present seem to be any indication of a further downward movement. The furnaces throughout the district are almost all in full work, but there are evidences that as soon as several large shipping orders have received attention, there will be a reduction in the number of furnaces in blast. This, however, will not, it is expected, begin to show itself till towards the close of the summer and autumn seasons. Some makers are still quoting 70s. per ton at works for Nos. 1, 2 and 3, Bessemer iron, but parcels have been disposed of at 62s. 6d. per ton, and forge iron is represented at about the same price. Steel makers are well employed, but no new business of any moment has recently come to hand. There is, however, the fact that at one works alone no less than 20,000 tons of steel has to be manufactured for delivery before October, and there are, as well, in hand large contracts for tramway and other rails for delivery this year. Merchant steel is in considerable output, and tires and axles are being manufactured in large quantities. Steel wire, bands, hoops, &c., find a good market, and makers are well supplied with contracts. Iron-shipbuilders are briskly employed, and they have contracts in hand which will enable them to maintain activity for some months to come. In the marine engineering department there is also activity, and throughout the district minor industries are very well employed. Iron ore sells fairly, but not in such quantities as was the case a few months ago. Prices remain at from 13s. 6d. to 15s. per ton at mines, the coal and coke trades are fairly employed. There is a steady consumption, but prices are weak. Shipping not so briskly employed as of late.

BIRMINGHAM—There is still very little animation in any of the leading branches of hardware manufacture in this district. The orders in the market are few in number and limited in extent, while the necessary keen competition to secure what little business is going has resulted in bringing down prices in some cases to a standard which is scarcely remunerative. So far as regards the export trade, the most prominent feature is perhaps the continued depression in the Australian markets. The last mail which came to hand on Friday, the 11th instant, was a most unsatisfactory one. Some of the best colonial firms had sent no orders whatever, and in other cases remittances were so sadly in arrears that merchants on the other side felt that they were not warranted in distributing the orders received. The New Zealand mail received on the previous day was an improvement on its immediate predecessors. United States orders are still of fair average amount, and Canada has been buying somewhat more freely, although money is still tight in the Dominion. There is a fair business doing with the Cape and also with Brazil. Indian orders continue to arrive on a scale which could scarcely have been expected, looking at the financial state of the country. They are mainly confined to railway material, galvanised iron, edge tools, wire nails and padlocks, but there is a perceptible improvement in the demand for English hardwares generally. France has been of late our best Continental customer, German manufacturers having been in successful competition with us in Southern Russia for machinery. A fair bulk of orders is in hand amongst the tube manufacturers of the district for Canada, Russia and some of the South American markets. A good line has recently been booked by one firm for Russia, namely, some 300 tons of wrought-iron tubing for the conveyance of mineral oil. In this branch of trade, however, stocks are heavy, and underselling has been rife of late, so that prices are much depressed. The home trade continues under the average of the season, and there is but little prospect of any tangible improvement until after the harvest. It is true that travellers' sheets from the Scotch towns and from the principal seaside resorts on the English and Welsh coasts, show a better demand amongst retailers in these localities for the usual season goods, but the orders are mostly for small lots and the articles of the cheapest description, bespeaking a poverty of consumptive demand. For builders' ironmongery there has been a little better request, and the same may be said with regard to cabinet brass-foundry. Gas-stoves are going off somewhat more freely, and there is a shade more activity in the call for electro-plated ware and German silver goods, the orders received running principally upon spoons, forks, and articles in general domestic use, with only a very moderate demand for the higher classes of ornamental articles. Affairs in the local chain and wrought-nail trades are complicated by labour difficulties. The dissolution of the newly-formed Conciliation Board, in the latter, leaves little hope of an early settlement of the pending differences. The makers of Brazil nails—a special branch in the hands of a limited number of employers—have also just announced another drop in prices of 3d. per thousand—the sixth reduction in a few years. The aggregate of these drops represents, it seems, a difference of 10s. per cwt. on the average week's work of a skilled nailer, bringing his weekly earnings down, on large and small work respectively, from 23s. and 25s. to 13s. and 15s. The men urge strongly that there is no necessity for the fall, as there is no foreign competition, and these nails cannot be made by machinery. But little improvement can be noted in the local iron trade. Merchants have been making more inquiries, it is true, but they are not prepared, it seems, to place orders, which they have on hand for the Indian and South American markets, until they can obtain some little farther concession from manufacturers. It is reported that for India some large orders will be distributed for galvanised iron when this additional advantage in price has been yielded. For the same class of iron there is a better request, too, for the Cape and some northern markets. A few of the best houses are fairly well employed finishing up old contracts, but the majority of the manufacturers of unmarked iron are either adding to stock or running their works short time, as there is but little doing in the home trade. At the Wolverhampton exchange on Wednesday there was but little business doing, but finished-iron makers were again negotiating purchases, and some sales of pig were effected—in one exceptional case a parcel of 1000 tons changing hands. The market was generally in buyers' favour. Coal was in very slack demand.

THURSDAY EVENING—Iron somewhat steadier. No appreciable increase in business, but less anxiety on part of makers to push sales was shown, and less underselling. Some little revival in demand for pig-iron, but only of lowest quality. Coal market weak and depressed. Mr. R. Chamberlain, president of South Staffordshire Iron Trade Wages Board, to-day gave his award in the arbitration on the wages question, fixing sliding scale in future as follows:—From 5th July next, average price of iron to be determined by inspection of books of agreed firms by agreed accountants during months of March, April and May; such average price forming basis for wages up to first Monday in October, when new average shall be determined in same manner on inspection of books for June, July and August; average prices to be ascertained in same way for each succeeding quarter. Quarters ending on Saturday, before first Monday in January, April, July and October. Puddlers' wages to be sixpence per ton in excess, or one shilling for each pound sterling per ton in selling price. Millmen's wages to be advanced or reduced in same way as heretofore. Sliding scale thus determined to continue in operation for six months' certain, determinable by notice from either side, of one month to terminate at close of a quarter.

CLEVELAND—There is a pretty general belief that the lowest price of pig-iron has been reached for the present so that those who can hold are not inclined to sell, and odd lots of weak holders are picked up at once by those who consider that prices will improve and can hold on. The consequence is that a decidedly firmer tone exists. On Tuesday, the market opened at 36s. 6d. but closed at 37s., the improvement in the Scotch market having also had a strong influence in producing the rise. Forge iron is now resuming its normal relative value to No. 3, and may be had for 36s. 6d. prompt. Shipments still keep up chiefly on the orders. Messrs. Connal's stock is increasing. On Tuesday, they had 88,000 tons as against 86,930 tons on the previous Tuesday,

They are receiving about 300 tons a day. The dread of further mischief from "differences" has now passed away. It is stated that about £120,000 have lately been lost in these "differences." It is expected that those merchants who have money to lose will be more cautious in their dealings with those who have not. The finished-iron trade is getting along quietly. There is an average amount of work, but chiefly on old orders. There is rather a dearth of new ones at present. There is a fair demand for plates, but that cannot be said of angles and bars. Plates £6 5s., angles £5 7s. 6d. Bars £5 5s., all less 2½ per cent. Puddled bars £3 5s. net. The demand for manufacturing coal is rather better, but steam-coal has rather fallen off. Coke 11s. to 12s. per ton delivered.

DERBYSHIRE—The position of the iron and coal trades of this important district, cannot be said to have materially changed since our last notice. The output of raw iron continues at about an average rate, but prices are not only lower but the demand is scarcely equal to what it was. There is only a quiet trade passing at the foundries and engineering shops, whilst the mills and forges are not fully employed. The coal trade on the whole is quieter than for some time past. It is true that some of the collieries are sending a large tonnage to London, but this is for the most part on account of contracts, which are held at low prices. The quantity of coal passing over the Midland line is pretty good considering the competition which prevails, but it is said the district coalowners have not fared over well with regard to gas-contracts, which have been pretty freely placed in South Yorkshire, although the tonnage rates by the Midland to some of the gas-works exceed 4s. per ton. From what can be gathered several collieries have obtained contracts for the supply of locomotive coal for the use of the Midland Company, but the prices have not transpired. Steam-coal, where a good quality is raised, is in fair request for shipment and smelting purposes, but there is but little doing in manufacturing fuel. The demand for coke is pretty good, and a fair output is being made weekly. Lead mining exhibits but little alteration, and there is no change in the labour market, other than complaints of low wages and small profits.

DURHAM—The iron trade of this district shows worse features taken as a whole. There has been, it is true, a rather better feeling in the pig-iron trade, but this cannot be regarded as other than temporary, and arising from the fluctuations of the moment, in sympathy chiefly with stronger rates at Glasgow. The under-current indicates a probable greater depression than has yet been reached, for the finished-iron trade which is at all times a primary factor in maintaining a healthy tone in pig-iron and stimulating the prices, has, in all except plates and angle iron, a very poor prospect. This is shown by the fact that the Darlington Iron Company lately stopped their Springfield Works and last week discharged a number of men at their other works. Men are also about to be discharged in the Auckland district. The demand for iron rails and bars is exceedingly slack. Happily, as already indicated, there is a good demand for ship plates; and as the great bulk of the producers are in this county, the district is to be congratulated on the fact. Steps are to be taken to revive the Wear Rolling Mills at Sunderland, and capital has been subscribed for the purchase of the works. The plate makers, finding that prices have been going down as they considered inordinately, have been holding a meeting, and, as a result thereof, we learn that not less than £6 10s. per ton will be accepted for plates delivered on the Tyne, where the bulk of this class of iron is consumed. Angles are £5 7s. 6d.; bars, £5 5s.; iron rails, £5 10s. to £5 15s. less 2½ per cent. The plate manufacturers, at the present prices of pig-iron, will be able to make a fair profit. The rates for pig-iron have not shown much change, though the tendency has been to stiffen. The present quotations are about 37s. No. 3, and 35s. 6d. No. 4 forge net, at works or f.o.b. Tees. The coal trade shows very little change. In this county the steam-coal trade has been quiet, but that is of a secondary character compared with other classes of coal, the business in steam-coal centring chiefly on the Tyne. Household coal has been quiet. Coke is also dull of sale and prices are low, 9s. to 10s. at the ovens for furnace sorts.

FOREST OF DEAN—Notwithstanding that we have arrived almost at midsummer, the Cinderford Valley Collieries are fairly well employed. This would in some degree be strengthened by the continued stoppage in West Dean, where there does not appear to be any remote prospect of restarting—the sale of a portion of the pit works having taken place on Saturday. Quotations just now are said to be lower than remembered since 1865. Were all things equal the position of proprietors would be more favourable than is the case. Increases in the rating have astonishingly arisen, some of the local collieries being burdened upwards of £1000 per annum. The calculation, however, is on the tonnage raised, and to some extent the colliery owners are protected. The reductions made by the assessment committee, alluded to last week, will, though inadequate, prove a welcome easement. The taxpayers of the Forest are unduly burdened, under the circumstances that the bulk of the surface, some 18,000, at least, acres, are exempted from rates, this misfortune arising from the fact that the Crown, the proprietary thereof, claims exemption. There is a strong growing movement having for its object the remedying of this condition of things, and under a combined effort the required relief might be secured. It is fairly certain that until some thing is done the inhabitants of the district will strenuously oppose every object, sanitary or educational, likely to add to their burdens. The Foxes Bridge Colliery Company deserve commendation and congratulation in regard to their spirit and enterprise, which has resulted in the solving of an important problem applying to the Cinderford Valley coalfield. An apprehension had prevailed that the upper measures terminated at the big "fault," which is known to extend from the north-east to the south-west points of the coalfield. After considerable labour and expense the "fault" has been cut through, and the measures discovered on the opposite side of full quality and thickness. Moreover, the coal-seams are free from water, which adds immense interest to their value. It may be added that this discovery will add several years to the existence of the Forest coalfield, as applying alone to the upper seams, the only ones yet practically touched; because, although proved by the firm named, will be within the areas of neighbouring

proprietors, and will be equally beneficial to them. It is stated that had the Foxes Bridge Colliery shafts been placed as the late Mr. Moses Teagus, of Forest renown, intended, they would have been directly upon the "fault," and the coal might have been won from the centre of the "field," instead of by "dippling"—the alternative course adopted. The crude iron trade is still without improvement, and stocks are growing. Local prices are apparently against sales when so much inferior iron is in the market. It appears to be a misfortune that local makers are indisposed to manufacture pig apart from their old brands of high-class iron; and it is equally a misfortune that, with the abundance of local ores and coal, the suspended furnaces continue silent. There have been a few orders received for wire, and tinplates are in fairly good demand. Mr. Chivers, at Hawkwell, is turning out first-class plates. At Lydney-on-Severn Mills, Messrs. Richard Thomas and Co. have this week posted notices to terminate contracts at the expiration of a month. It is locally presumed that the object is to reduce wages, the employees having been advanced during the upward movement of prices last year.

GLASGOW.—The warrant market has been subject to constant fluctuations during the past week, and is not at all in a healthy condition. The "bears" find themselves "cornered" through a scarcity of warrants produced by the large buying for investment which has been going on for some time past. It is generally expected that a drop will take place as soon as the more needy "bears" get covered, as investment buying cannot keep up prices long in the face of excessive production, increasing stocks and unsatisfactory trade prospects. Last week 1250 tons of pig-iron went to the United States, but no fresh orders are now coming from that quarter, and it is reported that some of the Scotch firms hold large stocks there which have been thrown on their hands by the consignees. On Thursday 46s. 6d. to 47s. 6d. cash was paid, and on Friday from 46s. 9d. to 45s. 9d. cash was accepted. On Monday opening at 45s. 8d. cash. Warrants were again found to be scarce and up to 46s. 9d. paid; next day business was done from 46s. 5d. to 47s. 4½d. cash, and on Wednesday the price fluctuated between 48s. 4½d. and 47s. 6d. cash. Closing sellers 47s. 9d. cash; buyers 47s. 7½d. Most of the brands of makers' iron have been advanced a little in price in sympathy with the rise in warrants, but very little is being sold. The shipments of pig-iron from Scotland last week were—Foreign, 7601 tons; coastwise, 4059 tons; total, 11,660 tons, against 6156 tons in the corresponding period of last year. The imports of Middlesborough pig-iron into Grangemouth last week were 7170 tons, against 7720 tons in the similar period of last year. The total imports of Middlesborough iron into Grangemouth till June 12, 1880, are 103,410 tons, against 108,632 tons till June 14, 1879, showing a decrease for this year of 5222 tons. About 1500 tons of pig-iron was sent into Connal and Co.'s warrant store during the past week, and the stock there now amounts to 446,372 tons. The manufactured iron trade is without any signs of improvement, orders are difficult to be got, and makers reckon that the prices at which they are obtained are quite unremunerative. The exports last week were moderate, the chief items being:—For India, machinery valued at £9536, cast-iron goods at £7035, malleable iron at £1913; for the Continent, machinery at £5943, malleable iron at £2090; and for Australia, galvanised iron at £1055, cast iron at £1301, and machinery at £1053. The shipbuilders are steadily pushing on with the work on hand. This week R. Napier and Sons have secured an order for three Government cruisers, which will be a welcome addition to the vessels already building on the Clyde. The engineers are dull, and most of the ironfounders are badly off for orders. The coal trade is quite inanimate, and shows no sign of reviving. The men are working for very small wages.

LANCASHIRE.—There is still only a very limited amount of business doing in the iron trade of this district, but there is a healthier tone in the market. There seems to be a returning feeling of confidence; merchants are not pressing sales so much as they were, dealers if anything showing a disposition to hold rather than make any advance to meet the wishes of buyers for forward delivery. Consumers are exhibiting more inclination to buy, and from the engineering and foundry branches of trade there are rather better reports. Lancashire makers of pig are still very short of orders, but there is a disposition to blow out more of the furnaces rather than reduce prices farther, as they are already so low that there is really no margin over the cost of production. For delivery into the Manchester district the quoted price is 47s. 6d. per ton, less 2½ per cent., for both foundry and pig-iron, but a little less than this would be taken if offers were made. In outside brands generally there has been a firmer tone, and the bulk of the iron which has been held in second-hands seems now to have been taken off the market. For Middlesborough iron, prices have shown an improvement of about 1s. per ton during the week, and for delivery equal to Manchester, the quotations have ranged from 45s. 4d. to 46s. 4d. per ton net cash. There are still some parcels of Lancashire and Derbyshire iron to be bought at about 46s. per ton, less 2½, delivered into this district, but makers, as a rule, are asking about 50s. to 51s. 6d. per ton less 2½. In the finished-iron trade there has not been the improvement which is noticeable in the new material, and prices have continued weak with a downward tendency. Finished-iron makers still complain of the difficulty experienced in securing specifications for contracts already booked. Many of them have several months' work on their books, but are without specifications to keep them going, and are compelled to press for orders at low figures to avoid stopping their mills. Lancashire bars delivered into the Manchester district are quoted at about £6 5s. per ton, Staffordshire at £6 5s. to £6 10s., whilst north-country bars can be bought at from £5 15s. to £5 17s. 6d. per ton, and hoops at about £7 5s. to £7 10s. per ton. The coal trade continues in a very depressed condition, and short time is pretty general at the pits throughout Lancashire. For all descriptions of round coal the demand is extremely dull. The better sorts for house-fire purposes are naturally only in limited request owing to the season of the year, and inferior classes for steam and iron-making purposes are in less demand, owing to a considerable falling off in the quantity going into consumption during the last few weeks. For engine classes of fuel a tolerably fair demand is maintained. So far as prices are concerned, round coals are easier, sellers having to give way

to secure orders, but burgy and slack are firm. Best coal at the pit is quoted at from 7s. 6d. to 8s. per ton, second 6s. to 6s. 6d., steam and forge coals 4s. 9d. to 5s. 3d., burgy 3s. 9d. to 4s. 3d., and slack 3s. 3d. to 3s. 9d. per ton. The shipping trade is in a very stagnant condition, with extremely low prices ruling in the market, steam-coal being offered at Garston at 6s. per ton, and at the high-level, Liverpool, at quite as low a figure. For coke there is now only a small demand with a tendency to lower prices.

LEEDS AND WEST YORKSHIRE.—The West Yorkshire iron manufacture is even brisker than previous reports were intended to convey that it was; and there could be no mistake in what has been said on previous occasions as to the vast improvement which set in about two months since. That improvement has gradually gone on expanding, and this week it is really taxing all the resources of more than one firm of ironmasters to meet the demands of consumers. Additional orders for cranks have been placed here since our last report, and boiler plate has sprung into extensive and urgent request. The difficulty at the forges is to proceed with the rolling of plates, so as to get—not the orders executed in time—but the mills at work without further delay. The fact is that managers have for a long time past studiously avoided having any stocks of "slabs" beforehand, and certainly not of such large slabs as are needed for the production of such extra-sized plates as are specially required at the present time. No doubt means will be devised whereby to overcome any difficulty in this respect, although the stress of business is such that in some instances seven-eighths of the puddling furnaces are preparing the raw material for axles only. There is no doubt that the orders already on the books for best Yorkshire iron are sufficient to give full employment for some weeks to come. The crucible steel-making branches of these forges are also in much better work than for a long time past has been the case—making ingots to be fashioned into axles. In the common iron trade there is a pretty good output going on, but there is no strong certainty as to its continuance. Locally, there is very little speculation in pig-iron, either Scotch, Cleveland or Lincolnshire. Consumers of merchant iron are only supplying themselves from hand to mouth. Some fair export orders for cut nails have come to hand. There are no fresh facts of importance to be recorded this week in connection with either engineers, tool-makers or machinists, but the first and the last named are assuredly the busiest. It is much to be lamented that the coal trade continues in a very sluggish condition. In carrying out the mutual agreement for a wages sliding scale it has been ascertained by the duly authorised accountants that for the next four months no increase of pay can be demanded by the colliers.

LONDON.—The metal market gives evidence of improvement, and prices are better generally. Pig-iron has changed hands at 48s., closing slightly easier. Manufactured not quite so bright. Copper remains steady at advanced rates. Tin has taken strides upwards, and a large business has been done at higher prices; foreign, £76 10s.; English ingots, £80. Lead better; English, £15 to £15 5s.; Spanish, £15. Tinplates good enquiries are about. Cokes, 16s. 6d.

NEWCASTLE AND THE TYNE DISTRICT.—There is little that is new to note this week with regard to the pig-iron trade of this neighbourhood. Prices have only improved a trifle, but there is a decidedly better feeling amongst those engaged in the trade, most of whom believe that prices will now be steady for a considerable time to come. No great rise is, however, thought to be possible in the course of the present year. Cleveland No. 3 pig is sold here at 37s per ton, and before it is in the hands of Tyne manufacturers it costs 2s. 6d. to 3s. per ton more for carriage; No. 4 forge runs about the same value. Ship plates are easier. They are quoted here £6 2s. 6d. to £6 10s. per ton, but sales have been made for considerably less by holders anxious to realise. Some sellers in this district have sent plates to the Clyde for £6 5s. per ton, and out of that they have had to pay a 12s. 6d. freight. Angles are to be obtained at £5 5s. to £5 7s. 6d. per ton, and bars at £5 5s. The rolling mills on the Tyne are fairly well employed, but mostly on old contracts. Foundries and forges are also in steady work. In the bolt and rivet branch of the iron industry there is at least steadiness, caused by the large amount of ironwork that is being executed at present when the prices are low. Shipbuilding is still carried on briskly, but new contracts are not plentiful, although prices are easy. The slight fall, however, is not looked upon as likely to be of long duration. Most of the building firms have work contracted for that will keep their yards in full employment till near the close of the year. In the past seven days there have been several launches on the Tyne. The vacant berths will be almost immediately filled. Our engine works are working steadily, without much pressure. The healthy condition of the local engineering trade is mostly to be attributed to the demand for marine engines consequent on the activity in the shipbuilding yards; but much satisfaction has been felt here since it was announced a few days ago that Messrs. R. Stephenson and Co. had received an order from the Great Northern Railway Company for about £30,000 worth of locomotives of various kinds. Another good sign is to be found in the fact that the firm of Sir W. G. Armstrong and Co. have just conceded an advance of wages, amounting to 1s. to 2s. per week, to the skilled workmen, in their engine and ordnance works at Elswick, the remuneration of the labourers being unaltered, as there is still an abundant supply of unskilled hands. There is nothing special to report in connection with our coal trade. Steam coals are still cheapening, the top price being little over 9s. per ton, and the pits are kept in full work, but with difficulty, for the loading turns are so short that steamers frequently come into the port light, and can leave again laden in considerably less than 24 hours. Gas, manufacturing and house coals are all extremely flat, and prices very low. For coke there is a better demand for export, but the inland trade is depressed. Best foundry sorts sell for 15s. to 16s. per ton, shipped; blast-furnace qualities are easy to buy at the ovens. In the past few days there has been rather more steadiness in the chemical market, but prices have not improved to any payable extent. The business in fire-bricks remains stagnant, although shipments are being made to the Continent in fair quantity on old contracts. The best brands are quoted 50s. per thousand for export, and 5s. less for the London trade; those of the Walbottle Company are 40s. to 42s. 6d.

NORTH STAFFORDSHIRE.—During the last few days there has been some slight improvement in the finished-iron trade, orders for the home market having come in rather more numerous, and the foreign trade being also somewhat busier. Most of the bar mills are going good time this week, and hoops are in fair demand, but the plate trade is quiet. Merchants, however, still fight shy of contracts for forward delivery, and content themselves with the supply of urgent wants. This is no doubt due largely to the continuing decline in prices, buyers anticipating increased concessions by delay. Crown bars are quoted at from £7 5s. to £7 15s. per ton, but these are nominal quotations, except with makers of well-known brands. The forges are pretty well off, but the pig-iron and ironstone trades are very dull. The supply of coal is considerably in excess of the demand, and prices in all three of the last-named branches are very low. Notice of reduction in wages of 10 per cent. was posted up at all the collieries in the district (except where wages had been already reduced) on Saturday, and will take effect at the expiration of a fortnight. The miners at Talke are again on strike, having found a fresh cause of difference with their employers. About 500 men are "playing" and living upon charity.

SHEFFIELD.—Pending the quarterly settlement, the iron trade remains exceptionally dull, and we cannot hear of any symptoms of revival. Business is really dull in the heavy branches, and holders of pig who desire to realise have to make concessions. We cannot hear of any large transactions which would form a basis of any new quotations, and the rates of last week must therefore be again given. In manufactured irons we notice that the large firms are still busy on boiler and ship plates, the latter selling especially freely. North-country houses have been ordering heavily, and there are signs of an improvement in the ship-plate department. Steel plates are coming into favour, and we notice that the Hull builders are asking for them for light corvettes. Shipbuilders are apparently having better times of it, but the fall in the iron trade increases keen competition, and makes buyers near in their figures. The Bessemer trade is very flat, and buyers are backward. Special lots of best billets have been sold this week at £7 15s. per ton, and ordinary makes at £6 15s., but 5s. above these rates is the nominal price in the trade. Coalmasters report trade as even worse than at the opening of the quarter, and quotations are as low as was the case in June, 1871. Best Silkestone has been sent out as low as 8s. per ton, and no doubt many of the collieries are being worked at a loss. Coke is again "down" in price, and the increase of 5s. per ton put on in January and February has disappeared. Complaints are general throughout the town as to the depression, which seems to be set in as rapidly as did the increase of trade at Christmas. File manufacturers appear to be best off for work, and sheep shear houses are fairly busy. Cutlery firms are sending out principally on foreign account, but we notice a severe decrease in the Australian demand. Country buyers are holding back until harvest prospects are more reliable, and the new Russian tariff is stopping what business we had in that direction. Business on the whole is only quiet.

SOUTH STAFFORDSHIRE.—There is no improvement in trade in South Staffordshire. Orders continue small and irregular, and the works and manufactures are mostly on short time. The chief matter of complaint is, however, the lowness of prices. The principal mails delivered since last report have been those from New Zealand and Australia. The former has brought a few merchants more than an average number of orders, but the latter being a bi-monthly delivery, is not of much value. Indian requirements are expressed with rather more freedom, but the prices specified are largely profitless. The home demand for hardware is dull, and some manufacturers are this week eager to get, if it were possible, orders which a fortnight ago they refused. This comes about mainly by reason of the small amount of work that is on the books for the operatives. The Scotch markets may be mentioned as the best home centre at the present time. They are buying encouragingly. As to individual industries it is to be reported that the wrought-iron tube trade is in an unsatisfactory condition. Making for stock is now being largely resorted to. Foreign orders are much below the average, but on Wednesday a Russian contract for 300 tons of tubes for oil-conveyance has just been placed. The japanners and tin-plate workers are slack, and the galvanisers could do considerably more business. Manufactured iron is in better proportionate request than pig-iron, at rates for common sorts, such as £6 for bars. Galvanising sheets are £7 15s.; boiler plates, official quotation, £9 10s. to £10.

WEST CUMBERLAND.—The iron industries of this district are in an unfortunate position this week. Most of the makers of iron, owing to the decline in demand and the fall in prices, have found it necessary to give notice to their men of a reduction in their earnings, generally speaking, to the extent of 20 per cent. This movement the men are opposing, owing, it is said, to their not having fully participated with the masters in the advantages and benefits which resulted from the advance in prices which was experienced during the last six months. Some of the men have struck work, and it is not known how soon a settlement may be arrived at; but many of the makers having large orders to complete will be awkwardly situated if their works have to stop any length of time. The market, if anything, is a shade weaker, although it is reported that several inquiries for terms of delivery of iron have been made during the past few days. Prices are not weaker, however, and last week's rates are maintained, although in some instances makers are declining to quote on any terms. The steel trade is busy, and a large tonnage of both steel rails, merchant steel, plates, &c., for ship and boiler purposes is being made. The shipbuilding trade is improving, some of the yards at whose works operations have for some time been suspended, having recommenced work. The finished-iron trade is not so well furnished with orders as was the case some time ago, but those works which are in operation are busy in producing bars and a variety of other goods in iron, and in iron and steel mixed; while it is intended in a short time to introduce the steel manufacture as a special department in old finished-iron works. Iron ore does not find so good a market as of late, but the mines are busily employed on old contracts. The production will doubtless, however, be reduced so soon as the furnaces which it is contemplated soon to blow out in the district cease to produce iron.

CONTINENTAL MINING AND METALLURGY.

THE general prospect seems to be one of a fair amount of business at sober and moderate prices, sufficient for a livelihood and reasonable profits, though not large enough to offer any temptation to speculators. The latter are being gradually edged out of the market, and its return to a wholesome condition is thereby facilitated.

FRANCE.

The French market, according to our contemporary *L'Ancr*, has not suffered further from external pressure, and the level to which prices have been brought by competition, home and foreign, is in no immediate danger of being further reduced. Frontier prices range from 215 fr. to 220 fr., and these fix a standard for minimum quotations. It is in regions most exposed to competition that rates have fallen, although there is as yet no decline of business in them. Acting on the maxim *Obsta principis*, northern and eastern forges have lowered their terms, in order that their customers may be fortified in time against any light-minded flirtation with cheap iron from Belgium. In the Centre, where the danger of solicitation is less, prices are firmer; and although the complaint was made last year that Centre customers had found their way to the north, we do not hear at present of any such infidelity. "Dephosphorisation and its probable consequences," says our contemporary, "are causing more talk than ever. Not long since the contract for rails concluded between the Eastern of France and the new De Wendel and Schneider Company was in every one's mouth. News now of a much larger affair has got about. Creusot is said to have contracted with the Western of France for the next ten years for a heavy supply of rails at 210 fr. (£8 6s. 6d.) per ton. Is that going to be the price of rails in times to come? Not long since Terrenoire contracted at 300 fr. (£11 18s.), and that we may look on as the current price for to-day."

The market of Paris is in a state of complete disorganisation. The defensive measures of the forgemasters of the Nord have been taken as a sign of weakening prices, and merchants are crowding in their goods with the usual result of scaring buyers. So far as there are any fixed rates at all they are 230 fr. for merchant irons, 240 fr. for beams, 280 fr. for plates; as fresh supplies cannot be obtained by merchants at less than 215 fr. to 220 fr., and 220 fr. to 225 fr., the above quotations may be taken as the lowest practicable for genuine business. They are, however, some 30 fr. below those current some three months ago, and the fall is less relished as it takes place not only at the busiest time of the year, but at a period of quite exceptional activity. It is very natural for merchants to ask themselves what prices will be when the building season is over, when the engineering works are again dull, and provincial communes, returning to their habitual frugality, resolve once more to postpone the erection of bridges and building of viaducts. For the present, the danger of a further fall does not seem to be great, provided only external competition be kept at a distance. The majority of the forges have business in hand to last them up to the end of the year, and have therefore no interest in forcing sales. Raw material may yet get a little cheaper, but its decline has already been discounted.

The Alfortville forge has been bought by M. Porcheron, who will re-organise it in accordance with the newest technical improvements.

Eastern pig-makers would be glad now of offers of 70 fr., or even 65 fr. Importation warrants for forge pig, now held at 15 fr., are certain to come down shortly, French pig being likely to suffer a fresh fall. Trade in the Ardennes is active, bolts, rivets and nails are in fair demand; coke irons are quoted at Nord prices, 220 fr. to 230 fr. In Haute-Marne, irons are firmer than in the Nord, and are quoted at 230 fr. to 250 fr., in no case going below 225 fr.; hoop irons are beginning to come into demand, quotations starting from 275 fr. Other branches of trade which have nothing to complain of are wire and Paris points and castings. For prompt delivery of castings full rates are asked, for autumn deliveries 5 per cent. discount is allowed.

The establishment of new iron works in Meurthe-et-Moselle is going on rapidly. A meeting of the shareholders of the Société métallurgique de Gorce, formed by notarial act on June 1st, with a capital of £120,000, was called for the 12th inst., to appoint officers, &c.; and the same date was fixed for a meeting of the shareholders of the *Acieries de Longwy*. This company has a share capital of 15,000,000 fr. (£600,000), divided into 30,000 shares of 500 fr. each. Its "acte déclaratif" is likewise dated June 1st.

An explosion of uncommon character took place on the 9th at the works of M. Desforges, at Marival Saint-Dizier. The furnace being in blast as usual a sudden explosion carried away the top of the furnace, and split it down to within thirty feet of the hearth. For a short time the furnace behaved like a very volcano, vomiting stones, ore, molten pig, and white-hot coke, and scattering its contents some 500 yards around. Ten persons were hurt. The accident is supposed to have had its origin in the boshes getting choked. The air of the blast not meeting with sufficient carbon to convert its oxygen into carbonic acid, formed an explosive compound with the carbonic oxide in the lower zone of the boshes—at least, this is what the papers say.

There is more than one article of news afloat concerning Creusot. A correspondent writes from the Loire to *La Métallurgie* as follows:—The proprietors of the Creusot works, stimulated by the example of the syndicate formed by De Wendel, Adelsward, Labbe, &c., wish to create a central dephosphorisation laboratory and rail-mill, at which the manufacture of rails in the Loire and Rhone would be centralised by syndication. The various syndicated works would renounce their private and individual manufacture of rails, would contribute to the construction and equipment of the great central mill, would carry thither for execution their own contracts, and take their share of the common profit. Where the works are to be erected is not yet fixed, and the news, it is frankly avowed, need confirmation. As for the big contract taken by Creusot, to which reference has already been made, it is for 100,000 tons of steel rails, 10,000 tons of which are to be delivered every year for the

next ten years, and an all-through rate is agreed to by Schneider and Co. and the Western of France, of £8 6s. 6d., as we have said. In the spring of 1879 Creusot contracted with the State railways at the same rate, strictly speaking a franc less, while Chatillon-Commentry got £9, and to-day's 210 fr. therefore, however sharply it contrasts with the 300 fr. of 1880, is not very violently discordant with the 209 fr. of 1879. Besides, "il se peut que dans tout cela le mot magique de déphosphorisation ait joué un grand rôle," which it was not perhaps doing in the Creusot specification of April of last year. The policy of the great French companies in holding over for so long the orders for rails they have been expected to give out is at last explained.

The project of amalgamating the Horme and Firminy concerns has been negatived. L'Horme is said to be negotiating now with the St. Etienne steel works.

Boiler-plate asked for by Buenos Ayres has been sold by Loire firms at 305 fr., 320 fr. being the official quotation. English forge pig has made its appearance at Lyons and Saint Etienne at 95 fr. (£3 15s. 6d.) all paid. The Pont Evêque works have started their coke ovens at Givors, and are about to set two smelting furnaces on blast.

The Minister of Public Works has issued a statistical account of the mineral trades of France for the three years, 1876, 1877 and 1878, and promises to issue similar accounts for the future annually. The output of coal in 1878 was 16,960,916 tons—substantially that of 1874. The *Bulletin de statistique*, also published by the Ministry, states that at the end of last March there were public works in course of erection at 109 different places in France, and that they had absorbed over £12,000,000. There were 29 canals being repaired, enlarged, or built, among them water-ways in the Nord and Pas-de-Calais, designed to assist in the circulation of French coal, and there were 49 different ports in course of improvement. What had been done in railways is not given.

M. Hélois, of Colombes (Seine), has sent to the Paris Society of Arts two samples of copper wire containing a platinum core. In one of the samples the platinum is a thirtieth of a millimetre thick; in the other, a hundredth of a millimetre.

Mr. Moissant informs the Academy of Sciences that by passing chlorine over oxide of chromium he gets the chromo-chloric acid which Mr. Peligot first obtained in another way.

The new Compagnie générale d'éclairage électrique gave, on June 10th, a demonstration of effects obtained by means of the Jamin apparatus. The general tenor of the reports of the experiments was that no great advance was shown over extant systems of electric lighting.

The Marival blast-furnace made about 80 tons of pig a day. The explosion occurred at the moment of tapping, and both the elder and younger M. Desforges have been seriously injured. The works employ between 200 and 300 hands, who will be thrown out of occupation for six or eight weeks.

The proprietors of the Lille Engineering Works, not being able to come to terms with their men, have locked them out.

BELGIUM.—No fresh fall in prices is reported from Belgium, where the range is extremely wide. Many firms have their orderbooks full, and quote the old rates of 140 fr. and 150 fr. for irons, and 200 fr. for plates; other houses would be glad of contracts at 135 fr. or less; and pig is reported to have changed hands at 55 fr. On the whole, however, the market is thought to be in a better condition a current of small orders keeping constantly flowing, and the hesitation of the market being such as precedes a rise rather than a fall. Some furnaces at Charleroi will probably be put out of blast in consequence of the difficulty experienced by the owners in getting ironstone at the low rates necessitated by competition. The import duty charged on foreign pig does not counterbalance the disabilities under which the native article labours, while the rolling mills are unnecessarily hampered in their purchases of raw material. In a recent competition for bent axles for locomotives, Belgian firms were distanced by German; a Wilden house tendered 135 fr. and 145 fr.; Hoesch, of Dortmund, tendered 144 fr.; and Cockerill, 151 fr.

From a return made to the Parliament of Belgium, we find that the proportion of iron rails to steel on the Belgium, State railways, at the end of 1878, was as 5 to 3, that the Hilt longrines need constant attention to keep them in order, that the Serries and Battig longrines are virtually a failure, and that metallic cross-sleepers have not been long enough under trial to yield definite results. The use of iron for telegraph posts was not found to pay.

Some eighty members of the Liège Mining Engineers' Association visited Düsseldorf in a body on Saturday last, spending the following day with great satisfaction in the exhibition, and being hospitably entertained by their German confères at a banquet in the evening. On the Monday the excursionists visited the collieries and engineering works near Düsseldorf and in the after part of the day left for home, exceedingly pleased with their visit. At the Brussels exhibition the show of castings made by M. Requête of Liège, is said to be of very exceptional merit and interest and to be a proof of what can be done for purposes of use and ornament, with cast iron, kept strictly within its province.

Vaillant-Cavmaune, of Liège, publishes a technico-historical novel by M. Eugène Bondroit, called "Les Armuriers." The work is in a single volume, and gives a complete view of the organisation of the arms manufacture of Liège.

The London correspondent of the *Côte libre* sends to his journal, under date June 9th, full details of the remarkable trials recently made at Leeds with Fox's corrugated flues.

An explosion of fire-damp has occurred at Dour, at the Grande-Bouillon colliery, destroying eight men.

GERMANY.—From Siegerland, where the present depression has been greatest, we learn that there are hopes of the lowest point having been reached. There is not much business doing, but prices have found their level, and are firmer. At Düsseldorf a gleam of better times has shone for a brief period—a good many orders have come in for merchant irons. Pig is offered in excess by speculators anxious to realise, but for new contracts prices are not likely to weaken, if we take into account the firmness shown by fuel. At Dortmund the pig-makers are harassed by the competition

of foreign pig, especially English. The furnaces, however, are much better off for business than in Siegen. The representatives of the crude iron trade met on the 7th inst. in Düsseldorf to discuss the general situation, and propose, if possible, ways and means for its improvement. The eastern branch of the German Iron Trade Association had not long since resolved at a meeting held by it in Kattowitz, to reduce make so as to bring their operations back to the level of 1879, the make of which year it was agreed to accept as a standard. In both Eastern and Western Germany the example of the Westphalian coal trade is of influence, as showing, if not proving, that a diminution of supply is accompanied by a wholesome invigoration of prices. Circulars accordingly have been sent out to owners of mills in Rhineland and Westphalia, containing the outline of an agreement for the restriction of make, to become legally binding on all contracting parties, and putting them under the penalty of £1 per ton for every ton of iron manufactured in excess of the conventional quantity. Should the agreement be accepted in Western Germany its provisions would possibly be extended to Silesia and Lorraine. Some of the points contained in this self-denying ordinance are as follows:—(1) A committee will be appointed, which will name inspectors; the inspectors to have the right of entry into works at all times. (2) Lists will be compiled of mills, with details of their plant. (3) No additions to be made to reheated furnaces; the number of days they are to be at work will be fixed month by month. (4) Closed days to be the same for all works. (5) Export business may be carried on during a close time, on payment of a fine of 10s. per ton. (6) Local committees of inspection to be formed. (7) Meeting of forgemasters to be held every month at Düsseldorf. (8) Work to be transferred from one mill to another, if there is any excess of business. (9) A fine of £1 per ton to be levied on excess production, on information given by local committee. (10) Agreement to hold good for one year.

During the last week the condition of the western mills, the rail mills especially, has been tolerably good. The smaller mills were not fully employed, even during the temporary revival, and are now glad to take surplus work from large concerns at almost any price. But Krupp, the Bochum Works, the Dortmund Union, Phönix Gate-hoffnungshütte, and generally the large concerns, have good contracts which will last out the year, and are under no temptation to cut up the market. It is very doubtful if such works will listen to the proposals made in the foregoing circular. The Dortmund Union is working at its full strength in every department—blast-furnaces, bar and plate mills—and is turning out weekly some 500 tons of finished goods. The company can get from its pits at Bredelar and elsewhere as much as 100 trucks per day of excellent ironstone, and is able to smelt cheaply in consequence of the nearness of its supply of fuel.

In a meeting held on the 11th inst., the coalowners of Westphalia resolved to prolong over 1881 the agreement for restriction of output already entered into for 1880. Curiously enough, statistics show that the output is still rising.

AUSTRIA.—The condition of the market of Austria, which producers have succeeded in getting entirely into their own hands, and subject to their own dictation, by a very general and strict agreement among themselves, is far from satisfactory. A correspondent of *Glückauf* reports on this commercial phenomenon as follows:—"During the past four weeks the dulness of the Austrian market has grown greater, in spite of every effort made by the syndicated works to get business into their hands. The present range of prices, artificial and disproportionate as they are, cannot be much longer maintained; their unreality is perfectly well-known to consumers, who are already forced, by the excessive import duties, to pay more for iron and steel than they care to. The natural consequence of such an unhealthy condition of things is that nobody buys who can help it, and large consumers—the railways and engineering works—are content to wait till something occurs to force the hand of the syndicate. Building operations are also very much restricted. Builders see the prices of foreign columns and girders, and are little pleased to throw their money away upon syndicated goods. Engineering firms are made helpless, and cannot ask selling prices for their machinery. The terms of every specification for railway material are dictated by the syndicate, and as railway managers cannot buy rails abroad, they have to pay 30 or 40 per cent. more than they would in Germany, and 100 per cent. more than English prices. This course of procedure has an exceedingly bad effect on the guaranteed railways and those who are taxed to keep them up. In spite of all their exactions there are few ironworks which are prosperous, and not a few are heavily in debt.

The sudden demand on export account in January and February appears to have done more harm than good. It did not last long enough to repay the outlay made to meet it. There are some expectations, however, still cherished in Austria, that America will soon again be buying white pig and ferro-manganese.

SPAIN.—Crucible steel, made from Spanish iron exclusively and Spanish coke, is stated by *La Gaceta Industrial* to be made to the extent of some hundreds of tons a year at Trubia. The quality of the metal made is stated to be unexceptionable, and the problem has thus been solved of Spain supplying herself with high-class steels.

PORTUGAL.—Since April 23rd coal has been rendered subject to an import duty of 1s. 6d. per ton, levied on the weight shown in the bills of lading. A drawback of 9d. is allowed for coal imported for the use of steamers, native or foreign coke is to pay 3s. per ton. If the weights down in the ship's papers is not thought exact by the authorities, the cargo must be weighed at their order.

ACCORDING to the *Philadelphia Ledger*, one of the immediate causes of the failure of the Reading Railway and Coal and Iron Companies is that during the late high prices for iron the management acquired title to two additional mills, and contracted on both sides of the Atlantic for old iron at high prices in quantity sufficient to supply three mills for the whole of 1880. The fall in prices of iron and coal, and the diminution in demand, leaves a loss of 15 dols. per ton on these contracts. With its credit thus impaired the Company was unable to borrow money to make up these losses.

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 2303 to No. 2412, being the entries from June 8th, to June 14th.

NEW APPLICATIONS.

- Air Compressing Engines.—S. Griffiths, Wrexham. [2397]
 Air Engines.—A communication.—H. J. P. Mills, London. [2398]
 Apparatus for Making Paper Bags, &c.—R. Woods, Manchester. [2400]
 Appliances for Holding Thread.—A communication.—H. G. Grant, Manchester. [2407]
 Attaching Knobs to Spindles.—H. Ferrer, Baisall Heath, Wrexham. [2407]
 Bolts for Driving Machinery.—M. Gandy, Liverpool. [2407]
 Binding Apparatus.—D. A. Tackel, Manchester. [2406]
 Binding Letters, &c.—T. Birbeck and J. E. Miller, Sunderland. [2410]
 Bottle Holders and Stoppers.—T. White, Birmingham. [2401]
 Boot, &c., Fastener.—O. McConnell Chamberlain, London. [2404]
 Breechloading Ordnance.—J. Neddham, Chiswick Mill. [2371]
 Brickmaking.—A. Woodhouse, Bridgewater, Somersetshire. [2411]
 Candle Extinguisher.—C. Truter, Wellington, New Zealand. [2391]
 Carriage Springs.—A communication.—J. H. Johnson, Lincoln's Inn Fields, London. [2406]
 Checking Fares.—A. R. Burman, Seacombe, and W. H. Gambell, Liverpool. [2404]
 Coffee Roasting Apparatus.—P. Pearson, Manchester. [2403]
 Coloured Glass Windows.—A communication.—W. Morgan-Brown, London. [2402]
 Coloured Plaster or Cement.—A communication.—A. M. Clark, London. [2409]
 Condensing Steam Engine.—A communication.—J. G. Wilson, Manchester. [2408]
 Copying Plans, &c.—A communication.—W. P. Thompson, London. [2405]
 Cooking, &c.—J. Hall, London. [2408]
 Diving Bell, &c.—A communication.—W. R. Lake, London. [2412]
 Dredging and Excavating.—T. Hodge, Kingston-upon-Hull, Yorkshire. [2410]
 Electric Telegraphs.—Sir C. T. Bright, London. [2407]
 Engine Governors.—A communication.—H. J. Hadden, London. [2405]
 Exhausters for Gases or Liquids.—A communication.—J. A. R. Hildebrandt, Manchester. [2406]
 Feeding Animals.—W. Griffiths, Shrewsbury. [2407]
 Fire-arms.—E. Nagant, Liege, Belgium. [2407]
 Fire-arms.—C. E. Leake, Staines, Middlesex. [2407]
 Furnaces for Refuse.—B. D. Hestley, Blackburn. [2407]
 Gas Motors.—R. Phelps, Birmingham. [2404]
 Gas Motor Engines.—H. Robinson, Manchester. [2404]
 Improved Bedding for Animals.—D. Gausson, Broughton Hall, Leek, Gloucestershire. [2408]
 Improvements in Flats.—C. A. Drake, London. [2404]
 Improvements in Mariners' Compass.—D. McGregor, Liverpool. [2402]
 Improvements in Rails.—H. A. Fletcher, Lowca Engine Works, near W. H. H. H. [2404]
 Interaction of Gases with Water.—J. Storer, Glasgow. [2403]
 Invalid Bedsteads.—H. J. Dalton, London. [2403]
 Knife and Peeler.—B. D. Hestley, Blackburn. [2407]
 Lacing Hooks or Buds.—A communication.—W. R. Lake, London. [2412]
 Ladies' Dress Suspenders.—W. W. Twigg and W. C. Williamson, Birmingham. [2400]
 Letter Copying Apparatus.—S. A. Cochrane, Dublin. [2403]
 Locomotive Engines.—A communication.—W. R. Lake, London. [2412]
 Looms.—W. Taylor, Golear, near Huddersfield. [2406]
 Lubricating Apparatus.—J. A. Hopkinson and J. Hopkinson, Huddersfield. [2409]
 Lubricating Mechanism.—A communication.—G. E. Vaughan, London. [2408]
 Machine or Lubricating Oils.—A communication.—E. Poole, London. [2408]
 Manure from Animal Substances.—A communication.—W. R. Lake, London. [2412]
 Masks for the Face or Head.—T. Foster, Streatham, and J. Leighton, London. [2404]
 Meat Preserving.—A communication.—E. A. Dufrene, Paris. [2405]
 Metal Founders' Blacking and Lubricant.—J. S. Sawrey and A. Patterson, Ulverston, Lancashire. [2406]
 Metal Heels of Boots.—J. W. Jones and E. K. Bridger, London. [2405]
 Metal Hurdles.—W. Bailey, Wolverhampton. [2404]
 Metallic Alloys.—Partly his own invention and partly a communication.—G. A. Dick, London. [2406]
 Mustard and other Condiments.—H. Shaw and W. Spencer, Birmingham. [2410]
 Ornamenting Surfaces.—A communication.—G. L. Balfour, London. [2406]
 Packing Machinery.—W. A. G. Schönherr, London. [2405]
 Paper-making.—A communication.—A. M. Clark, London. [2412]
 Paper-making.—A communication.—W. Morgan-Brown, London. [2402]
 Paper-making Machinery.—J. Hird, Bishopston, Gloucestershire. [2407]
 Paper Manufacture.—J. Robertson, Polton, Middlethorpe. [2406]
 Permanent Way.—A communication.—F. C. Glaser, Berlin. [2407]
 Potato Raising Machines.—W. H. Sleep, Creethole, Cornwall. [2406]
 Pottery.—C. H. Wood, Sheffield. [2406]
 Preparing Pottery Clay, &c.—W. Boulton, Burslem, Staffordshire. [2406]
 Preventing Sewer Gas Entering Buildings.—A communication.—A. M. Clark, London. [2412]
 Preventing Twisting of Cables.—J. A. Boxer, Greenhithe, Kent. [2407]
 Pumping a Mixture of Steam and Water.—R. M. Marchant, London. [2406]
 Railway Signalling Apparatus.—Partly his own invention and partly a communication.—G. K. Winter, Chiswick. [2410]
 Railway Switches and Crossings.—W. F. Reynolds, Fleet Street, London. [2407]
 Range Finders.—H. Monod, London. [2407]
 Reaping Machines.—A communication.—C. D. Abel, Southampton Buildings, London. [2405]
 Refrigerating Apparatus.—A communication.—H. A. Dufrene, Paris. [2405]
 Rivets.—A communication.—W. R. Lake, London. [2412]
 Safety of Grain Ships.—P. Clarke, South Shields. [2405]
 Sample Cases for Travellers.—A. J. Eli and P. Haig, London. [2406]
 Securing Box Lids.—A communication.—E. A. Brydger, Berlin, Germany. [2405]
 Ship Construction and Propulsion.—A communication.—H. E. Newton, London. [2405]
 Siltaires.—W. W. Twigg and W. C. Williamson, Birmingham. [2400]
 Sowing Machinery.—A communication.—W. R. Lake, London. [2412]
 Steam Engine Governor.—J. T. Abell, London. [2408]
 Steam Engine Indicators.—L. Baye, Bergen, Norway. [2409]
 Steam Generators.—A communication.—J. C. Meuburn, Fleet Street, London. [2408]
 Stocking Manufacture.—L. Woodward, Nottingham. [2406]
 Stopping Bottles.—J. R. Varley, London. [2406]
 Substitute for Malt.—J. R. Plunkett, Dublin. [2403]
 Switch Signal and Apparatus.—J. S. Williams, Glasgow. [2405]
 Torpedoes.—J. B. Alphonse, Greenwich. [2406]
 Transferring Pictures.—A communication.—P. O'Halloran, London. [2406]
 Transmission of Sound.—R. H. Courtenay, London. [2404]
 Trapping Waterclosets.—A communication.—P. M. Justice, London. [2408]
 Tricycles.—J. Barling, Leeds. [2400]
 Umbrellas.—H. Shaw and W. Spencer, Birmingham. [2410]
 Umbrellas.—J. Forster, Vienna. [2401]

- Valves, &c., for Waterclosets.—J. Smeaton, London. [2355]
 Varnishes.—J. B. Freeman, Tottenham. [2392]
 Varying the Height of Seats, Tables, &c.—W. Davies, Leeds. [2391]
 Vegetable Paring Apparatus.—H. Brandes, Hamburg. [2397]
 Velocipedes.—A communication.—W. R. Lake, London. [2412]
 Ventilation.—T. H. Thompson, Manchester. [2392]
 Ventilation of Waterproof Clothing.—J. Neville, London. [2343]
 Vices.—F. W. Oefermann, Sienberg, near Voerde, Prussia. [2402]
 Washing Machine.—A. J. Forbes, Conon Bridge, Ross. [2308]
 Waterproofing.—A communication.—W. R. Lake, London. [2377]
 Water Tap.—C. Burgess, Small Heath, Birmingham. [2404]
 Water Wheels.—A communication.—F. H. F. Engel, Hamburg, Germany. [2408]
 Wire Heddles for Looms.—A communication.—H. E. Newton, London. [2397]
 Wool-Combing Apparatus.—A communication.—J. H. Johnson, London. [2410]
 Wool-Combing Apparatus.—A communication.—J. H. Johnson, London. [2411]
 Yarn Twisting Apparatus.—J. King, jun., Manchester. [2351]

ABSTRACTS OF METALLURGICAL SPECIFICATIONS

PUBLISHED DURING THE WEEK ENDING JUNE 12, 1880.

(Prepared by PHILIP M. JUSTICE, 14, Southampton Buildings, W.C.)

Casting Pipes.—4508 (1879). *Palmer, Compton and Chambers.*—The socket ring on which the portion of the core for the interior of the socket is produced is made to form part of the bed plate of the moulding apparatus. The core tube on which the mould for the body of the pipe is formed is faced true and rests on the faced end of the socket ring and is held in position by a central spindle or other device.

Cobalt and Nickel.—4509 (1879). *J. M. Carey.*—Provisional only. The powdered ore is digested in hydrochloric acid. The solution is boiled and sufficient carbonate of soda to form a precipitate is added. The precipitate is digested in sulphuric acid and the solution thus formed is boiled and sulphide of iron added. The filtrate will be found to contain solutions of cobalt, nickel, and of alkaline salts. Ammonia sulphide or sulphide with oxide of cobalt is added, and after boiling and filtering, the cobalt is precipitated from the filtrate by means of zinc dust. To recover the nickel the precipitate in which it is contained is roasted to expel the sulphur, the residue is dissolved in sulphuric acid, and the nickel is then precipitated by the use of zinc dust.

Steel and Iron.—4528 (1879). *Manico.*—Communicated by L. Boblique. For dephosphorisation, alumina, either free or combined with soda, lime, barytes, magnesia, or with oxides of iron are employed. Preference is given to ferruginous alumina (bauxite), which, when puddling, is employed in the proportion of from 5 to 8 per cent.

Utilisation of Slag.—4620 (1879). *A. Cooper.*—The calcareous slag produced when treating pig-iron in basic-lined converters is added to the pig-iron, being melted in the cupola for treatment in the line lined converters in the proportion of from 3 to 5 parts of slag to 100 parts of pig. The slag may be also used in blast-furnaces with silicious iron ores or a mixture of ores and puddlers' tap cinder. By the use of the slags the use of limestone as a fluxing material in the cupola or blast-furnace is rendered unnecessary and it is claimed that the iron produced is highly suitable for treatment by the Thomas and Gilchrist modification of the Bessemer process.

COMMERCIAL.

NEW COMPANIES.

ALDRINGTON ESTATE WATER COMPANY, LIMITED.—On the 2nd inst., this company was registered, with a capital of £85,000 in £10 shares, to erect waterworks and to supply fresh and sea water to the Aldington Estate and neighbourhood, in the parishes of Aldington and Portland, county of Sussex.

BULTFONTEIN MINING COMPANY, LIMITED.—Upon terms of an agreement of 1st ult. this company proposes to purchase from Messrs. Ochs Brothers, of 83, Hatton Garden, diamond merchants, 524 land claims situate in the Bultfontein Mine, in Grigoland West, South Africa. The company was registered 4th inst., with a capital of £80,000, divided into 3000 shares of £20 each, 500 A shares of £10 each, and 3000 B shares of £5 each. It proposes to work the mines for diamonds, precious stones, and other substances.

CHISHAM GAS AND COKE COMPANY, LIMITED.—This company was originally constituted by provisional registration on the 1st of July, 1876, and completely registered by deed of settlement on the 17th of August, 1877. On the 25th of October, 1876, was incorporated under the 1862 Act, and in accordance with a resolution passed at a general meeting of its shareholders, held on the 25th ult., was incorporated and inst., as a limited company, under the Acts 1862 to 1879. The nominal capital is £580,000 divided into 100,000 shares (all of which are allotted and fully paid up), 200 £5 shares, and 600 £10 shares.

"CLYDE" STEAMSHIP COMPANY, LIMITED.—Registered 7th inst. with a capital of £15,000 in 775 shares of £20 each, to purchase from Mr. William Ferch, of Cardiff, the steamship *Clyde*. **DIRECT PHOTO, LITHO, AND METALLO-GROVE PRINTING COMPANY, LIMITED.**—On the 8th inst., this company was registered with a capital of £400 in £20 shares, to acquire the right to work the invention of August Henschel relating to a process for direct photographing and engraving on stone or metal; and to produce and develop pictorial or graphic illustrations of nature and works of art and science, and to cause a successful retention of original firmness of execution and sharpness of outline, together with fine simile reproduction of half tones, and the rendering of the plate or stone completely ready for multiple copies within 24 hours. Power is also taken to carry on the businesses of topographers, photographers, and engravers.

JOHN KING, LIMITED.—Registered 3rd inst., with a capital of £5000 in £5 shares, to take over the goodwill and assets of Mr. John King, of 1, Villars Street, Liverpool, and to carry on the business of a heating, ventilating, and hot water apparatus manufacturer and kindred businesses.

SAN PABLO (CHILE) COPPER MINING COMPANY, LIMITED.—This is a reconstruction of an existing company of the same name (in liquidation). It was registered 8th inst. with a capital of £75,000 in £25 shares.

SKINNINGOVER IRON COMPANY, LIMITED.—This company, with a capital of £30,000, in £100 shares, proposes to purchase and work certain blast-furnaces, ironworks, mines, lands, and premises, situate at Skinningover, in the North Riding of York, lately belonging to the Loftus Iron Company, Limited.

STAFFORDSHIRE ROLLING STOCK COMPANY, LIMITED.—Registered and inst. with a capital of £100,000 in £5 shares, to take over the business and assets of Messrs. Arnold and Garside, of the Cliff Vale Works, Stoke-upon-Trent.

STYRELAND SHIPBUILDING COMPANY, LIMITED.—This is the conversion to a company of the shipbuilding business carried on by Mr. Robert Foster (formerly of the firm of Mounsey and Foster), at South Dock, Sunderland. It was registered 5th inst., with a capital of £100,000 in £100 shares.

UNITED TELEPHONE COMPANY, LIMITED.—This company was registered 3rd inst., with a capital of £50,000 in £5 shares, to carry out an agreement of the 13th ult. (unregistered), between the Telephone Company, Limited, of the first part, the Edison Telephone Company, of London, Limited, of the second part, and Richard Lake Harrison, on behalf of this company, of the third part. Power is taken to acquire patents or monopolies relating to telephones and telephonic apparatus.

WREXAL GORON LEAD MINING COMPANY, LIMITED.—This company proposes to acquire and work mining property mentioned in an unregistered agreement of 27th ult., between George Beckingsale

and Jesse Smith, but of which no particulars are given in the memorandum and articles of association. It was incorporated and inst., with a capital of £15,000 in £5 shares.

SOUTH WALES COAL SHIPMENTS, MAY, 1880.

SUMMARY of foreign coal shipments from Cardiff, Newport, Swansea and Llanelly, during the month of May, 1880:—

	Tons.		Tons.
Aden ..	5,047	Malta ..	39,779
Africa, W.C. ..	1,524	Manila ..	2,726
Alexandria ..	4,977	Maranham ..	546
Algiers ..	1,820	Marseilles ..	1,449
Alicante ..	1,512	Martinique ..	3,440
Amsterdam ..	2,347	Mataro ..	803
Anjer ..	1,938	Messina ..	3,119
Antwerp ..	1,500	Monte Video ..	10,653
Bahia ..	3,485	Naples ..	2,761
Barbadoes ..	399	Nantes ..	2,532
Barcelona ..	15,858	Odessa ..	5,994
Bayonne ..	1,088	Oran ..	200
Bergen ..	785	Palermo ..	1,663
Bilbao ..	3,769	Palma ..	543
Bombay ..	9,250	Pernambuco ..	2,100
Bordeaux ..	9,232	Philippeville ..	34
Boulogne ..	500	Pireus ..	2,650
Brest ..	1,401	Port Said ..	36,732
Brindisi ..	2,750	Rangoon ..	2,001
Buenos Ayres ..	2,498	Riga ..	431
Cadiz ..	3,745	Rio de Janeiro ..	6,664
Caen ..	6,070	Rio Grande do Sul ..	1,145
Ceylon ..	10,856	Rivero ..	440
Callao ..	1,025	Rochfort ..	6,697
Cape de Verds ..	8,039	Rouen ..	21,760
Cape Town ..	4,334	Salonica ..	367
Carloforte ..	3,728	Santander ..	623
Carthagena ..	1,269	Santiago ..	254
Charente ..	877	Santos ..	851
Christiania ..	1,094	Savona ..	7,459
Constantinople ..	17,229	Seville ..	2,073
Copenhagen ..	945	Singapore ..	16,800
Coquimbo ..	1,135	Smyrna ..	494
Cronstadt ..	7,196	Stettin ..	950
Dieppe ..	11,874	St. Lucia ..	310
Fecamp ..	855	St. Malo ..	6,312
Galatz and Danube ..	1,401	St. Nazaire ..	30,658
Genoa ..	20,629	Stockholm ..	1,763
Gibraltar ..	23,556	St. Thomas ..	1,080
Hamburg ..	670	Sulina ..	1,593
Havana ..	4,116	Syria ..	1,310
Havre ..	13,135	Tarragona ..	2,100
Hong Kong ..	14,470	Teneriffe ..	864
Jamaica ..	304	Trieste ..	1,375
Java ..	10,082	Trouville ..	1,710
La Rochelle ..	8,411	Valencia ..	150
Leghorn ..	810	Valparaiso ..	2,271
Lisbon ..	9,487	Vigo ..	1,866
Madeira ..	8,141	Zanzibar ..	481
Malaga ..	1,043		

RATES OF FREIGHT.

JUNE 17.

THE current rates for coal and iron for sailing ships are:—

	Newcastle Cardiff, or Sunderland, Swansea.	Newport, Cardiff, or Swansea.
Acapulco ..	16 0	16 0
Alexandria ..	16 0	16 0
Alicante ..	16 0	16 0
Ancona ..	16 0	16 0
Aden ..	16 0	16 0
Ascension ..	16 0	16 0
Athens ..	16 0	16 0
Batavia ..	16 0	16 0
Bombay ..	16 0	16 0
Bahia ..	16 0	16 0
Barbadoes ..	16 0	16 0
Barcelona ..	16 0	16 0
Beyrout ..	16 0	16 0
Boston ..	16 0	16 0
Brindisi ..	16 0	16 0
Buenos Ayres ..	16 0	16 0
Bermuda ..	16 0	16 0
Bussorah ..	16 0	16 0
Calcutta ..	16 0	16 0
Callao ..	16 0	16 0
Cape Good Hope ..	16 0	16 0
Cape de Verds ..	16 0	16 0
Cadiz ..	16 0	16 0
Capri ..	16 0	16 0
Cardenas ..	16 0	16 0
Cienfuegos ..	16 0	16 0
Cocoonada ..	16 0	16 0
Civita Vecchia ..	16 0	16 0
Colombo ..	16 0	16 0
Colon ..	16 0	16 0
Constantinople ..	16 0	16 0
Corfu ..	16 0	16 0
Demerara ..	16 0	16 0
Payal ..	16 0	16 0
Fiume ..	16 0	16 0
Fernando Po ..	16 0	16 0
Galle ..	16 0	16 0
Guadaloupe ..	16 0	16 0
Genoa ..	16 0	16 0
Gibraltar ..	16 0	16 0
Galatz ..	16 0	16 0
Grand Canary ..	16 0	16 0
Havana ..	16 0	16 0
Hong Kong ..	16 0	16 0
Hugo ..	16 0	16 0
Iquique ..	16 0	16 0
Jamaica ..	16 0	16 0
Java ..	16 0	16 0
Kobe ..	16 0	16 0
Kurachoe ..	16 0	16 0
Lisbon ..	16 0	16 0
Leghorn ..	16 0	16 0
Malta ..	16 0	16 0
Manila ..	16 0	16 0
Madras ..	16 0	16 0
Madras ..	16 0	16 0
Manzanillo ..	16 0	16 0
Marseilles ..	16 0	16 0
Matanzas ..	16 0	16 0
Mexico ..	16 0	16 0
Montevideo ..	16 0	16 0
Montreal ..	16 0	16 0
Muscat ..	16 0	16 0
New Orleans ..	16 0	16 0
Nagasaki ..	16 0	16 0
Naples ..	16 0	16 0
Nantes ..	16 0	16 0
Nassau ..	16 0	16 0
Norfolk ..	16 0	16 0
Odessa ..	16 0	16 0
Oporto ..	16 0	16 0
Panama ..	16 0	16 0
Paraguay ..	16 0	16 0
Padang ..	16 0	16 0
Port-au-Prince ..	16 0	16 0
Porto Rico ..	16 0	16 0
Port Said ..	16 0	16 0
Reunion ..	16 0	16 0
Rio Grande do Sul ..	16 0	16 0
Rio Janeiro ..	16 0	16 0
Rosario ..	16 0	16 0
Seychelles ..	16 0	16 0
Singapore ..	16 0	16 0
Saigon ..	16 0	16 0
Shanghai ..	16 0	16 0
San Sebastian ..	16 0	16 0
San Francisco ..	16 0	16 0
St. Catherine's ..	16 0	16 0
St. Paul de Loando ..	16 0	16 0
St. Thomas ..	16 0	16 0
St. Helena ..	16 0	16 0
St. Jago de Cuba ..	16 0	16 0
St. Lucia ..	16 0	16 0
Santos ..	16 0	16 0
Savona ..	16 0	16 0
Seville ..	16 0	16 0
Smyrna ..	16 0	16 0
Specia ..	16 0	16 0
Syria ..	16 0	16 0
Sierra Leone ..	16 0	16 0
Sebastopol ..	16 0	16 0
Taganrog ..	16 0	16 0
Tarragona ..	16 0	16 0
Teneriffe ..	16 0	16 0
Tientsin ..	16 0	16 0
Trieste ..	16 0	16 0
Trincomalee ..	16 0	16 0
Trinidad ..	16 0	16 0
Valencia ..	16 0	16 0
Valparaiso ..	16 0	16 0
Venice ..	16 0	16 0
Yokohama ..	16 0	16 0
Zanzibar ..	16 0	16 0

LONDON PRICE LIST OF METALS,
ORES, OILS, CHEMICALS, &c.[FOR THE PRESENT AND PAST WEEK.]
Metal Market, City, Thursday Afternoon, 4 P.M.

(June 17, 1880.)

METALS AND ORES.

	JUNE 10.	JUNE 17.
COPPER (per ton)—		
Chili, for 90 per cent.	55 1/2	57 1/2
Wallaroo	70 0/	71 0/
Burra Burra	70 0/	69 0/
English Tough	60 0/	61 0/
English Pig best	62 0/	63 0/
Sheets sheathing and rod	68 0/	67 0/
Bottoms	72 0/	73 0/
Ore per unit	0 11 1/2	0 11 1/2
PHOSPHOR BRONZE		
Special Bearing Metal (p. tn)	112 0/	112 0/
Other alloys (per ton)	120 0/	120 0/
TIN (per ton)—		
Straits (Cash)	69 0/	70 10/
Do. for arr.	—	—
Billiton	—	—
Banca	—	—
English Ingots	24 0/	25 0/
Do. Bars	25 0/	26 0/
Do. Refined	77 0/	78 0/
Australian	69 0/	70 10/
TIN PLATES, per box, I.C.		
Do. f.o.b. London	9 10/	9 10/
I.C. do.	0 21/	0 21/
I.C. charcoal	0 21/	0 21/
I.C.	0 27/	0 32/
LEAD (per ton)—		
Soft English pig	14 10/	15 0/
Do. W.B.	—	—
Spanish soft	14 10/	14 15/
Do. with silver	—	—
Sheet milled	16 0/	16 0/
Red lead	17 10/	17 10/
White	22 0/	22 0/
Patent shot	19 0/	19 0/
ZINC (per ton)—from No. 9 Gauge.		
Sheets, rolled	22 0/	22 0/
Do. foreign	23 10/	22 10/
SPLITTER (per ton)—		
Silvian, com.	18 0/	18 0/
Rhenish	—	—
English	—	—
QUICKSILVER, bot.	6 7 1/2	6 7 1/2
ANTIMONY ORE (per ton)—		
Australian	11 10/	11 10/
Spanish	14 10/	14 10/
French Star	69 0/	69 0/
REGULUS—		
Crude (per cwt.)	1 14/	1 14/
NICKEL (per lb.)	0 3 1/2	0 3 1/2
BRASS (per lb.)—		
Sheets, 28 x 24	0 0 8/	0 0 8/
Tubes	0 0 11/	0 0 11/
Wire	0 0 8 1/2	0 0 8 1/2
Yellow metal	0 0 6/	0 0 6/
Asbestos (per lb.)	0 0 3/	0 0 3/
PLUMBAGO (per ton)—		
Ceylon lump	0 17 1/2	0 17 1/2
Do. chip	0 10 6/	0 10 6/
Do. dust	8 6/	8 6/
COALS (per ton)—		
East Hattlepool	1 2/	1 2/
Lambton	1 4/	1 4/
Tees	1 4/	1 4/
Hartley	1 2/	1 2/
Hetton	1 4/	1 4/
Hawthorn	1 3/	1 3/
Tunstall	1 2/	1 2/

OILS, CHEMICALS, &c.

	JUNE 10.	JUNE 17.
OILS (per ton)—		
Olive, Malaga	44 10/	41 0/
Do. Gioja	42 0/	41 0/
Do. Levant	42 0/	41 0/
Do. Mogador	—	—
Do. Tunis	—	—
Do. Seville	44 10/	41 0/
Do. Sicily	45 0/	41 0/
Seal, pale	20 0/	20 0/
Seal, yellow	27 0/	27 0/
Seal, brown	25 0/	25 0/
Sperm head	70 0/	70 0/
Cod	26 0/	26 10/
Whale, pale	20 10/	20 10/
Do. yellow	25 10/	25 10/
Do. brown	20 0/	20 0/
E.I. Fish	—	—
Rapeseed, English, pale	30 15/	30 10/
Do. brown	27 15/	27 10/
Foreign Pale	—	—
Ground nut and Gingelly	—	—
Madras	30 10/	31 0/
Palma oil, fine	31 0/	31 0/
Palma nut oil	31 10/	31 10/
Linseed oil	26 15/	26 10/
Cotton seed oil	25 10/	25 10/
Lard	40 0/	41 0/
Cocanut, Ceylon	35 0/	35 0/
Do. Ceylon	32 10/	32 10/
Mauritius	37 10/	37 10/
C. Price & Co.'s patent engine oil (per gal.)	0 3 6/	0 3 6/
OIL CAKE (per ton)—		
Linseed, Ludn.	10 0/	10 10/
American bl.	10 0/	10 10/
Do. bags	9 2 1/2	9 2 1/2
Marseilles	9 5/	9 5/
Rape, English	5 0/	5 0/
Do. Foreign	—	—
Green Cotton	6 6 1/2	6 6 1/2
TALLOW—P.Y.C.		
S.American Beef	34 10/	34 10/
Do. Sheep	32 10/	32 10/
Australian Beef	30 10/	30 10/
Do. Sheep	35 10/	35 10/
Rough Town Fat	14 0/	14 0/
PETROLEUM—		
Fine (per gal.)	0 0 5 1/2	0 0 5 1/2
Do. spirit	0 0 6/	0 0 6/
TURPENTINE—Spirit—		
French	—	—
American casks	1 15/	1 15/
WHALEFIN (per ton)—		
Davis' Straits	1000 0/	1000 0/
Arctic	950 0/	950 0/
Southern	500 0/	500 0/
BRIMSTONE (per ton)—		
Rough, 20s Ind.	7 0/	7 0/
Do. 10s Ind.	5 7 1/2	5 10/
Roll	8 15/	8 15/

	JUNE 10.	JUNE 17.
SULPHUR, Flour (per cwt.)	0 15 9/	0 15 9/
Acid, (per lb.)	—	—
Acetic, fine	0 0 2 1/2	0 0 2 1/2
Do. common (per gal.)	0 1 5/	0 1 5/
Citric	0 0 7 1/2	0 0 7 1/2
Muriatic fine (per cwt.)	0 4/	0 4/
Do. common	0 4/	0 4/
Nitric	0 0 4 1/2	0 0 4 1/2
Oxalic (per lb.)	0 0 4/	0 0 4/
Sulphuric, concentrated	0 1/	0 1/
Do. Brown	0 0 6 1/2	0 0 6 1/2
Tartaric Crystal	—	—
Do. Pulv.	0 1 8 1/2	0 1 8 1/2
AMMONIA—		
Carbonate, per lb.	0 0 6 1/2	0 0 6 1/2
Sulphate, White & grey (per ton)	0 17 1/2	0 18 10/
ARSENIC—White Lump (per ton)	21 10/	21 10/
Powdered, do.	0 10/	0 10/
Bleaching powder	0 6 1/2	0 6 1/2
BORAX, Kid., do.	2 15/	2 15/
COPPERAS (ton)	2 10/	2 15/
Bi-SULPHIDE CARBON (per ton)	24 10/	26 0/
PORTLAND CEMENT—		
1st quality, in cks 400 lb. gross, inc. cks, f.o.b.	—	—
Thames, per csk.	0 9/	0 9/
Do. in sks, 200 lb. net (per ton)	2 0/	2 0/
Sacks extra, 1/6 each.	—	—
Charlton White Paint (per cwt.)	1 12/	1 12/
Calley's Torbay Paint, Brown	0 30/	0 30/
Do. Red	0 34/	0 34/
HYPOPHOSPHITES (per lb.)—		
Iron	0 0 3/	0 0 3/
Lime	0 0 3/	0 0 3/
Magnesia	0 0 9/	0 0 9/
Manganese	0 0 9/	0 0 9/
Soda	0 0 3/	0 0 3/
LEAD (per cwt.)—		
Acetate, best	1 10/	1 10/
Nitrate	1 15/	1 15/
Red (per cwt.)	0 10 6/	0 10 6/
White	1 4/	1 4/
LITHARGE (per cwt.)	0 18/	0 18/
LIME (per ton)—		
Acetate, Grey, 85 %	21 0/	21 0/
Do. Brown 70 %	14 0/	14 0/
POTASH—		
Bichromate (lb.)	0 0 5 1/2	0 0 5 1/2
Chlorate (pr. lb.)	0 0 6 1/2	0 0 6 1/2
Muriate, 80 % ton	6 15/	6 15/
Pruss. Red (lb.)	0 1 8/	0 1 8/
Do. Yel. lb.	0 0 11/	0 0 11/
Sulphate, 80 % (per ton)	9 10/	9 10/
SALT PETER (per cwt.)—		
Engl. reind. kgs.	1 7/	1 7/
Do. barrels	1 7/	1 7/
Do. Bengal	0 19 6/	0 19 6/
SODA—		
Ash, deg.	0 0 11 15-16	0 0 11 15-16
Bicarb. (per cwt.)	0 10 9/	0 10 9/
Caustic, 60 % to 72 %	0 10/	0 10/
Nitrate (per ton)	14 0/	14 5/
Crystals (per ton)	3 6 1/2	3 5/

* Per ton extra in London, Staffordshire, 15s.; Scotch, 10s.; Lancashire, 15s.; Welsh, 10s.

LONDON PRICE LIST OF IRON.

[FOR THE PRESENT AND PAST WEEK.]

(June 17, 1880.)

	JUNE 10.	JUNE 17.
IRON, per ton		
(at works)*		
Bars, Welsh, common	5 15/	5 15/
Do. Best	6 5/	6 5/
Scotch, Common	7 10/	7 0/
Do. Best	7 10/	7 0/
South Stafford, common	7 5/	7 0/
Do. Best	8 0/	8 0/
Sheets, singles, Cleveland	9 10/	9 10/
Staffordshire	10 10/	10 10/
Do. doubles, Staffordshire	12 0/	11 0/
Do. Lattens, Staffordshire	13 10/	12 10/
Plates, Ship, Stafford	9 10/	9 0/
Do. Scotch	7 10/	7 10/
Do. Boiler, Stafford	8 10/	8 5/
Hoops, Stafford	7 10/	7 5/
Nail Rods, Stafford	7 10/	7 10/
Swedish in Lond.	12 0/	12 0/
Anglo Iron, Welsh	—	—
Do. Stafford	8 0/	8 0/
Pud. Bars, Welsh	—	—
Do. Stafford	5 10/	5 10/
Do. Scotch	—	—
Rails, Welsh	6 0/	5 5/
Do. Stafford	7 10/	7 0/
North England	0 0/	5 5/
Light Rails, Welsh	7 0/	7 0/
Do. Stafford	8 0/	7 0/
Pig Iron at Glasgow		
Scotch warrants	2 6/	2 6/
Do. No. 1	2 10/	2 10/
Cleveland, Tyne or Tees	1 17 6/	1 17 6/
Indian Charcoal, London	—	—
Wrought Iron Girders (riveted up)	18 0/	18 0/
Boils and Nuts	16 0/	16 0/
Fish Bolts	16 0/	16 0/
Washers	17 10/	17 10/
Rivets	15 0/	15 0/
Spikes	10 0/	10 0/
SWEDISH IRON—		
f.o.b. Gottenburg, nett cash.		
Pig	10 10/	11 0/
Do. hammered	11 10/	11 10/
Billets	11 10/	11 10/
Horse Nail Rods	—	—
BELGIAN IRON—		
f.o.b. Antwerp, less 2 1/2 per cent.	6 0/	6 0/
Bars and Silt Rods, common	—	—
Best	—	—
Best Best	—	—
Hammered	—	—
Puddled Steel	—	—
Bessemer	—	—
Hoops	—	—
Rails	—	—
Roll Girders	—	—

	JUNE 10.	JUNE 17.
STEEL—		
Best cast	40 0/	40 0/
Do. dbl. shear	45 0/	45 0/
Do. single do.	35 0/	35 0/
English spring med. quality	15 0/	15 0/
Blister	30 0/	30 0/
Swedish keg	10 0/	10 0/
Milan	20 0/	20 0/
Bessemer rails	7 0/	7 0/
SCRAP (per ton)—		
Old rails for remanufacture	3 5/	3 5/
Ditto range or bridge	3 2 1/2	3 2 1/2
Engineers' scrap	3 5/	3 5/
Light scrap	2 0/	2 0/
Scrap metal	1 10/	1 10/
Old steel scrap	3 13/	3 13/
WIRE—		
Best best drawn killed		
gal. tel. Nos. 0 to 6	16 10/	16 10/
Do. 7 & 8	17 0/	17 0/
Do. 9	18 0/	18 0/
Do. 10	18 10/	18 10/
Do. 11	19 0/	19 0/
Do. 12	19 10/	19 10/
Roll black fencing wire		
(per ton) 1 to 4	11 10/	11 10/
Do. 5	12 0/	12 0/
Do. 6	12 10/	12 10/
Do. 7	13 0/	13 0/
Bright Iron Wire (Charcoal wire, 4s. 6d. per bundle extra) per bundle		
of 63 lb. 0 to 6	0 12 6/	0 12 6/
Do. 7 to 8	0 13 0/	0 13 0/
Galvanised, 80s. per ton extra		
Best best annealed drawn fencing wire, per ton		
0 to 6	16 10/	16 10/
Do. 7	17 0/	17 0/
Do. 8	17 10/	17 10/
CASTINGS (per ton) at works—		
Girders	6 10/	6 10/
Chairs	4 10/	4 10/
Floor plates	5 10/	5 10/
Pipes, 1 1/2 in.	6 10/	6 10/
Do. 3 in.	6 10/	6 10/
Do. 4 in.	6 10/	6 10/
Do. 6 in.	6 10/	6 10/
Do. 8 in.	6 10/	6 10/
Do. 10 in.	6 10/	6 10/
Do. 12 in.	6 10/	6 10/
Bolts and Nuts	17 10/	17 10/
Fish Bolts	18 10/	18 10/
Spikes	17 10/	17 10/
Kivets	14 10/	14 10/
Washers	19 10/	19 10/

PARTNERSHIPS DISSOLVED.

T. Brown, J. Armstrong and G. Brewer, Mansion-house-Chambers, Queen Victoria Street, engineers; as regards J. Armstrong—Arthur and Coyne, Newport, Monmouthshire, Durham, Engineering Works—Adams and Grindle, Birmingham, coach ironmongers—Chapel-en-le-Frith Coal Company, Chapel-en-le-Frith, Derbyshire, coal-dealers—F. Pearn, S. Pearn and A. C. Wells, West Gorton, near Manchester, engineers—T. Lowe and J. Holland, jun., Warrington, brass founders—D. North, R. Allen and R. H. North, Wolverhampton, iron merchants; so far as regards D. North—J. Jones and Son, Bankside, Southwark, iron merchants.

DIARY OF FORTHCOMING SALES.

NOTICES OF SALES OF ENGINES, PLANT, AND MACHINERY
IMPLEMENTS, MINES AND COLLIERIES.

For Particulars of entries see Advertisements at end of
Paper.

PLACES OF SALE. PROPERTY FOR SALE.

On Great Northern. Engineering Business.
Dumbarton. Dennystown Forge Works.
Cardiff. Bute Ironworks.
Burton-on-Trent. Mill and Plant.
Purton & Sharpness. Plant, Engines, Timber, &c.

OPEN CONTRACTS.
London. Iron Buoys.

BOILER INSPECTION IN FRANCE.—It is stated that the systematic inspection of boilers, especially in the north of France, has been attended with the happiest results. The French Government has recognised as "of public utility" the Steam Users' Association of the Nord, which was founded in 1873. Its objects are the prevention of explosions and other accidents, and the dissemination of useful information as to the generation of steam, together with remarkable facts and discoveries relating to economy of fuel. The board of management consists of twelve members, elected at the annual general meeting, and its staff comprises an engineer-in-chief, three other engineers, four inspectors, three draftsmen, and an accountant and treasurer. The engineers are selected from among the old pupils of the Ecole Polytechnique and the Institut Industriel du Nord, the inspectors from the first-class engineers on railways and the best pupils at the Ecole d'Arts et Metiers et Châlons. Two inspections are annually made on the premises of members. The first is confined to the external parts of the boiler and its appurtenances, the engineer at the same time giving such useful hints to the engine tender as may seem necessary. The second is a more minute examination, inside and out, and a written report is afterwards presented to the responsible manager. The number of boilers under inspection has increased from 526 to 1108, belonging to 328 establishments, and with the following results:—

	1873-4.	1876-7.
Steam gauges in good condition	40 per cent.	92 per cent.
Safety valves in good condition	63 "	88 "
Boilers with glass tubes	29 "	78 "
Number of boilers with old-fashioned water gauges	65 "	4 "

Only two accidents have occurred since 1873. In one case the owner of the boiler had just joined the association, and his premises had not been thoroughly inspected, while in the other the manufacturer had objected to that course, and thus rendered himself liable to expulsion from the society.

LATEST STOCK EXCHANGE PRICES.

BRITISH MINES.

Authorised Issue.	Share	When x d or x in.	Div.	NAME.	Paid.	Closing quotations. Thursday night.	Business done. Thursday.
12,000	5	—	nil.	Ashton, Limited	all	2 — 2	
10,240	—	2 Feb.	8/	Devon Great Consols, Limited	1	0 — 10 pm	10 1/2
6,144	—	16 Oct. 72	2/	East Caradon. Liskeard	3.11.6	10 — 2	13
1,000	—	30 Oct. 74	—	East Lovell. Helston	4.0.9	—	
14,000	—	15 April	8/	Great Laxey, Limited	all	18 — 19	
18,000	1	30 Nov. 75	1/	Hingston Downs Consols, Limited	9/	3 — 1	1
9,000	—	14 Jan. 70	2/	Marke Valley, Liskeard	22.0	20 — 3 1/2	dis
40,000	4	27 Feb.	2/	Mwynny Iron Ore, Limited	3 1/2	2 — 2 1/2	dis
8,600	—	—	nil.	Prince of Wales. Calstock	—	80 — 100	
512	—	15 April	4/	South Caradon. Liskeard	1	0 — 10 1/2	
6,173	—	20 April	15/	South Conderrow. Camborne	6.5.6	15 — 17 1/2	
12,500	—	1 April	15/	South Wheal Frances. Redruth	7.12.4	10 — 12 1/2	3 1/2
12,000	6	20 Dec. 76	5/	Tankerville, Limited	all	10 — 12 1/2	
6,000	—	14 June 77	5/	Tin Croft. Redruth	10 1/2	10 — 12 1/2	
15,000	4 1/2	15 Jan.	10/	Van, Limited	all	17 — 10	
6,000	—	—	nil.	West Bassett. Redruth	6.10.0	10 1/2 — 18 1/2	
2,000	—	14 Feb. 78	10/	West Chiverton. Perranzabuloe	10 1/2	—	
500	—	—	nil.	West Seton. Camborne	55.15.0	17 — 21	
512	—	—	nil.	Wheal Bassett. Redruth	6 1/2	3 — 4	
5,179	—	—	nil.	Wheal Grenville. Camborne	15.12.0	8 1/2 — 9 1/2	

COLONIAL AND FOREIGN MINES.

35,000	2	1 April	1/	Alamillos, Limited	all	1 — 1 1/2	1
6,000	1	17 May 76	1/	Almada & Tirato Consolidated Silver Mining Limited	all	2 — 3	
20,000	20	31 July 78	—	Australian	7	1 1/2 — 2 1/2	
20,000	20	—	nil.	Australian United Gold, Limited	all	—	
10,000	50	—	—	Bilbao Iron Ore, Limited	all	10 — 24	
82,500	4	—	—	Canadian Copper and Sulphur, Limited	all	1 1/2 — 1 1/2	1 1/2
20,000	4	17 March	17/6	Cape Copper, Limited	7	39 — 41	
13,350	10	30 Nov. 76	nil.	Chicago Silver, Limited	all	—	
68,827	10	—	nil.	Chontales Consolidated, Limited	all	nil.	
61,000	2	12 Feb. 75	4/	Colorado United Mining, Limited	all	1 1/2 — 2 1/2	
10,000	5	3 May 77	—	Copiapó Limited	all	8 — 9	
92,618	1	12 April 72	nil.	Don Pedro, North del Rey, Limited	all	—	
27,528	1	17 Jan. 77	nil.	Eberhardt and Aurora, Limited	all	2 — 3	
100,000	10	—	nil.	Eschequer Gold and Silver Mining, Limited	all	—	
30,000	1	31 July 73	5/	Flagstaff, Limited	all	—	2.13.16
25,000	10	1 April	5/	Fortuna, Limited	all	4 — 5	
55,000	2	13 Feb. 79	1/	Frontino and Bolivia Gold, Limited	all	3 — 4	
27,490	2	15 May	4/	General Mining Association, Limited	all	30 — 4	
100,000	8	—	nil.	I.X.L. Gold and Silver Mining, Limited	all	—	
20,000	5	31 July 73	2	Last Chance Silver Mining of Utah	all	—	
15,000	1	1 April	8/	Linares, Limited	all	5 — 6	
165,000	3	15 July 75	1/	London and California, Limited	all	4 — 4 1/2	1
60,000	5	—	nil.	New Quebrada, Limited	all	3 — 4 1/2	4
20,000	5	—	nil.	New Zealand Kapanga Gold, Limited	all	—	
200,000	5	—	nil.	Nouveau Monde Gold Mining	all	—	1.04.15-16.13.16.3
50,000	1	—	nil.	Panulicillo Copper, Limited	all	3 1/2 — 4 1/2	4 1/2
80,000	2	—	nil.	Pastorena United Gold, Limited	all	3.10 — 5.10	
10,000	3	15 Dec.	10/9	Pontgibaud Silver Lead Mining & Smelting	all	18 — 20	
100,000	20	13 Feb.	1/4	Port Philip, Limited	all	—	
54,000	2	—	7/6	Richmond Consolidated Mining Company, Limited	all	15 — 15 1/2	15 1/2
1,858,880/	100	2 Jan.	5 p.c.	Rio Tinto, Lim. s p. et. Mort. Deb. (Spanish Coupon Bonds)	all	04 — 06	0 1/2
225,000	10	29 April	10/	Do. Shares	all	1 1/2 — 1 1/2	1 1/2
100,000	10	—	nil.	Rosa Grande, Limited	all	1.10 — 3.10	
25,300	10	—	nil.	Ruby and Dunderberg Consldt. Min. Lim.	all	8 — 8 1/2	8 1/2
120,000	1	28 Nov.	1/6	Scottish Australian, Limited	all	1 1/2 — 2	
80,000	1	—	1/9	Do. New	all	—	15-16
125,500	2	15 April	1/	Sierra Buttes Gold Mining, Limited	all	1 1/2 — 1 1/2	
140,025	2	—	3/	Do. Plumas Eureka, 1872	all	2 1/2 — 2 1/2	
50,000	2	—	—	S.E. Wynaad Estates and Gold Mining, Lim	all	1 1/2 — 2 1/2	2.1 15-16
100,000	1	—	—	South Indian Gold Mining, Limited	all	1 1/2 — 2 1/2	1 1/2
253,000/	Stock	31 Dec.	25 p.c.	St. John del Rey, Limited	100	220 — 2 1/2	
68,330	10	27 June	37/	Tharsis Sulphur and Copper, Lim.	all	30 — 31	
31,000	10	—	25/	Do.	all	7	
43,174	—	—	nil.	United Mexican, Limited	29.5.2 1/2	1 1/2 — 2 1/2	dis
10,000	70	16 Dec.	1/6	Vancouver Coal, Limited	all	3 — 4	
75,000	1	—	nil.	Vorke Peninsula, Limited	all	—	
40,000	1	13 July	—	Do. Preference	all	—	

COAL, COPPER, IRON, &c., COMPANIES.

6,391	100	1 April	2.5	Bolckow Vaughan, Limited "A"	all	120 — 125	
18,000	100	—	2.17.1	Do "A"	all	60	12 — 7 pm
27,000	10	30 March 76	nil.	Chillington Iron, Limited	all	4 — 5	
14,000	20	12 March 74	nil.	Darlington Iron Company, Limited	15	—	
74,475	23	30 Dec. 74	20/	Ebbw Vale Steel, Iron & Coal, Limited	20	1 1/2 — 2 1/2	dis
70,000	3	27 Feb.	1/	English and Australian Copper, Limited	20	1 1/2 — 2 1/2	1 1/2
20,000	10	29 Jan. 75	nil.	Huntington Copper and Sulphur, Lim.	9 1/2	—	
2,000,000/	100	3 May	6 p.c.	Lehigh & Wilkes Barre Coal & Mort. 6 p.c.	all	91 — 100	
10,000	10	—	nil.	Steel. guar. by Cent. Rail Co. of N. J.	all	8 1/2 — 7 1/2	dis
22,000	10	1 April	—	Lydney and Wignool Iron Ore, Limited	5 1/2	—	
5,000	100	—	nil.	Muntz's Metal, Limited	5 1/2	—	
10,000	3	31 July 77	2 1/2 p.c.	Nantyglo & Blaenau Iron Works "Pref"	all	25 — 30	dis
15,000	10	—	—	Limited	all	3 1/2 — 1 1/2	dis
12,000	20	28 Aug. 74	nil.	Nerbudda Coal and Iron, Limited	2 1/2	1 1/2 — 2 1/2	5-16
12,000	20	30 June 75	nil.	New British Iron	17	1 1/2 — 2 1/2	
10,000	50	12 March 75	nil.	Newport Abercarn Black Vein Steam Coal, Limited	all	6 1/2 — 7 1/2	
10,000	15	—	nil.	New Sharncliffe Collieries, Lim. Pref.	all	3 1/2 — 4 1/2	dis
108,330/	100	—	—	Pelsall Coal and Iron, Limited	17 1/2	—	
14,060	25	15 Dec.	12/	Rhymney Iron, Limited	all	2 1/2 — 2 1/2	2 1/2
				Do. New	all	6 1/2 — 7 1/2	
				Do. 7 p.c. Deb., Regist. 1890	all	—	
				Do. 7 p.c. to Bearer, 1890	all	—	
				West Cumberland Iron and Steel, Lim.	20	8 — 6	dis

A NEW TELEMETER.—A new optical instrument for ascertaining the distance to inaccessible objects of known size, or inversely of measuring inaccessible objects at a known distance, has lately been invented by Dr. Landolt, assistant director of the Ophthalmological Laboratory of the Sorbonne, Paris. The instrument is, in fact, a telemeter, and generally resembles the heliometer in principle, but differs therefrom in the fact that the mensuration is obtained by doubling the image of the object. As this is effected by simpler means than in the heliometer, the instrument is more readily applied to practical purposes, and should be found useful in a flying survey for railway purposes, exploring new countries, and military operations. The instrument consists of a disc, varying from two to three inches in diameter, according to its range, graduated to a scale of 360 degrees, with circular vernier, moved by rack work, and provided with a small telescope. By its means the diameter of a rod at the top of a lofty building can be gauged correctly to a hundredth part of a millimetre, as accurately, in fact, as by a pair of calipers. Moreover, the distance, or the measurement of an inaccessible object in motion, can be ascertained with exactitude.

SCIENCE EXAMINATIONS.—A correspondent writes: "It is proposed to hold, on the 24th inst., a meeting in London of those interested in the welfare of the science classes of the country to protest against the inordinate

difficulty of some of the papers, notably those of acoustics light and heat, and theoretical mechanics, set in the late May examinations of South Kensington. It is only by great effort that students, especially of the artisan class, are induced to continue their studies in science; and when they discover that they have to encounter such tests as those adverted to above, they will in too many instances be dispirited, and discontinue their studies."

TELEGRAPHIC FACILITIES.—Although the great majority of telegraph offices close at eight p.m., most of these are in direct telegraphic communication with "always open" offices, such as exist wherever daily newspapers are published, any postmaster is permitted, on receiving 2s. extra fee, to send a message after ordinary closing hours; but hitherto some previous notice of an intention to do this has been necessary. Acting upon representations made to them, the postal authorities have just issued a circular to "always open" offices, directing that attention shall be given precisely at each hour and half hour to all the receiving instruments in the office. It will thus be practicable henceforth to send messages from most of the smaller towns to any of the chief centres of population at any hour of the night, or on Sundays, providing the postmaster or clerk at the country office can be found and satisfied. This arrangement will be of great practical value, especially in view of the importance of promptly obtaining medical aid, or help for fire or wrecks.

SCOTCH PIG-IRON.

ANNEXED is a weekly statement of the shipments during this and the previous three years:—

Week end.	1880	1879	1878	1877
Jan. 3 ..	6677	4655	2441	3454
10 ..	6680	6069	6085	6500
17 ..	12,288	6291	4532	5141
24 ..	7566	6331	6170	7040
31 ..	13,383	4969	6550	5297
Feb. 7 ..	14,190	6130	5637	6183
14 ..	10,612	7272	5722	5839
21 ..	15,152	8996	5124	6559
28 ..	12,603	8318	7836	8630
March 6 ..	17,968	13,910	6816	8048
13 ..	20,985	10,743	8662	7280
20 ..	20,987	11,167	7725	9312
27 ..	23,598	9,463	11,499	10,246
April 3 ..	15,722	12,653	7448	9071
10 ..	18,309	12,913	9441	10,721
17 ..	15,784	13,228	9513	10,020
24 ..	10,279	11,795	8,382	13,390
May 1 ..	17,749	12,923	8,853	11,915
8 ..	14,799	13,135	9,348	12,392
15 ..	13,123	9,919	7,820	11,547
22 ..	11,036	11,415	10,742	10,566
29 ..	12,819	15,434	7,362	8,237
June 5 ..	13,193	8,402	7,008	7,733
12 ..	11,660	6,156	10,310	10,738
Total ..	346,276	232,187	281,026	204,179

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 merchants' and factors' 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.

June 17, 1880.

The hardware trade is fast settling down to the low prices of last year, in sympathy with the fall in the iron trade. Heavy goods especially have during the last and present month felt the re-action, and although up to the present time few lists have been sent out, owing to the unsettled state of the markets, prices have been gradually coming down. Since our last, new lists have been sent out by many manufacturers, all containing considerable reductions. First comes screws, and in these it would appear as if the amalgamation of the leading firms lately is not going to cause that monopoly which was anticipated, as the price of these is now reduced by a firm who recently bought up one of the other screw manufacturers not in the amalgamation, and as they are a powerful proprietorship the "Limited Company" will not have it all their own way, and have begun by putting the discount to 65 per cent., instead of 60 per cent., a very considerable reduction. Bolts and nails are declared down 40s. per ton on heavy bolts sold by weight, and the list of those sold by the gross is reduced 5 per cent. Small makers have been coming down for some time, and there therefore is little alteration for them to make. Malleable hobs and other nails are reduced 1s. 6d. per cwt., making 2 lb. hobs and 1 1/2-inch slate nails now 20s. 6d. to 21s. at works. Discount off patent wire tacks is increased 2 1/2 per cent. Paris pointes are reduced 2s. per cwt., brass lock furniture is increased in discount 2 1/2 per cent., and other items in brassfoundry are being reduced. Brass chair nails are increased in discount 5 per cent. House-bells are considerably reduced, common bells being now quoted as low as 9 1/2d. per lb. All the patent wrought iron hinge-makers have now reduced their discounts all round 2 1/2 per cent. The makers of the light gaseliers having done this a fortnight ago. Bedstead-makers are now reducing their iron beds 7 1/2 per cent., and 5 in ordinary brass ones. This is not general in the trade, only here and there on ordinary beds, the better qualities not being altered. Frying-pans are being offered lower, and increased discounts are being offered. Plate-locks are reduced over 5 per cent. on the net, the discount being increased 2 1/2 per cent. Norfolk and Suffolk latches are increased in discount 2 1/2 per cent., equal to over 10 per cent. on the net, the discounts on these being so high, Norfolk being now quoted 8 1/2 per cent. the common sort. Heavy washers are reduced 1s. per cwt., making the price now 11s. at the works. These reductions bring quotations down to what they were before the late rise, and will no doubt have the effect of now enticing out those orders which have been withheld on account of the downward fluctuations of the late gradual decline.

ABRIDGED LIST.

Axles, 15 to 25; coach ironwork, 10 to 15; coach and waggon springs, 15 to 20; Augers, 10 to 20. Axes.—Ship carpenters, 1/3 to 1/2 per lb.; Kent and house carpenters, 1/3 to 1/2; ditto, steel polished, 1/3 to 1/2; felling axes, 1/4 to 1/2; polished, 1/4 to 1/2; bright

ANDREW AND JAMES STEWART,

OFFICES: 41, OSWALD STREET, GLASGOW.

CLYDE TUBE WORKS, GLASGOW AND COATBRIDGE.

MANUFACTURERS OF

LAP-WELDED IRON BOILER TUBES.

As supplied to the English, French, and Dutch Admiralties, and the principal Railways and Engineers at home and abroad.

WROUGHT IRON WELDED TUBES AND FITTINGS,

Borings and Artesian Tubes, Perkins' Hot Water Tubes, Tubes closed at one end for Field Boilers, and all other descriptions of Tubing.

LOCOMOTIVE IRON AND STEEL TUBES

OF VERY SUPERIOR QUALITY.

PRICES ON APPLICATION.

CAST IRON PIPES.

**THE CLYDE RIVET WORKS CO., GLASGOW.**

Ship-Boiler Girder Rivets, Railway Spikes, Screws, Screw Bolts, Nuts,

BEST MATERIALS AND WORKMANSHIP. MODERATE PRICES.

PROMPT DELIVERIES OF ALL HOME AND EXPORT ORDERS.

B. M. RENTON,

Iron and Steel Merchant, Savile Street, Sheffield,

HAS ALWAYS A LARGE STOCK OF

BESSEMER RAIL ENDS

AND

OLD BESSEMER DH RAILS

For Sale in all parts of the country, also Bessemer Billets and Blooms of any size and for all purposes, Old Steel Tyres, either whole or broken, Old Springs, Old Files, Cut Bessemer Scrap and Spring Ends for remelting, English and German Spiegeleisen, Swedish and Russian Steel Iron and Box Ends, Swedish Nail Rods and Bundling Iron.

THE LONDON PORTLAND CEMENT COMPANY (LIMITED),

NORTHFLEET, KENT.

Chief Office—123, BISHOPSGATE STREET, WITHIN.

MANUFACTURE CEMENT WITH SPECIAL REFERENCE TO ITS DESTINATION, WHETHER FOR HYDRAULIC WORKS UNDER GUARANTEED TEST, or for PLASTERERS' and GENERAL PURPOSES.

and blue solid steel, 7 to 8; American felling or wedge Axes, steel polished, 1 to 1 1/4 per lb.; common Anvils, 84 lb. and upwards, 18/6 to 20/ per cwt.; best warranted, 22/ to 24/; ditto, and ends warranted not to break off, 27/ to 35/.

Basins, shallow galvanised, 10 inch, 7 to 7 1/2 per doz.; deep Basins, galvanised, 12 inch, 10/6 to 12/6 per doz.; Bastard Bellows, 42 1/2 to 50 1/2; Best extra nailed Bastard, 37 1/2 to 45 1/2; Best improved long Bristol, 35 to 40 1/2; casters' or moulders', best extra nailed, 12 inch, 30/ per doz. net; common Smiths' Bellows, 45 to 50 1/2; Best warranted, extra leather double-nailed, 30 to 40 1/2; with movable pipe for shipment 2 1/2 less discount. Bed screws, 6 and 7-16 and 1 inch, 10/6 to 11/6 per gross for London black heads; London heads with bright turned collar, 6 and 7-16 and 1 inch nuts, 12/6 to 13/6; Black welded heads, 9/3 to 10/3; common slit heads, 6 and 7-16 and 1 inch, 9/3 to 10/3; Bright turned notched heads, 6 and 7-16 and 1 inch, 10/6 to 11/6; black notched heads, 10/6 to 11/6 per gross; Brass head nails, 40 to 42 1/2; star head, 35 to 40 1/2; Brass plated countersunk head, 25 to 30 1/2; Blacksmiths' tongs, 20/ to 25/ per cwt.; real fine wrought Box Irons, 20 to 25 1/2; fine cast, 42 1/2 to 60 1/2; middle cast, 42 1/2 to 60 1/2; charcoal box Irons—Victoria, 45 to 50 1/2; ordinary charcoal box Irons, 55 to 70 1/2; Bolts—Straight tower; solid end tower, 67 1/2 to 70 1/2; Best solid tower, 65 to 67 1/2; solid end barrel brass knob, 62 1/2 to 65 1/2; jappanned Scotch tower bolts, 47 1/2 to 52 1/2; painters' brushes, 45 to 65 1/2; Best, 10 to 40 1/2; light galvanised Buckets, 12 inch, 38 lb. to the doz., 10/ per doz. net; Blind cord, list price 6 1/2; Brass chain Bending, 30 to 35 1/2; Brass and plate coach heading, 30 to 35 1/2; ashpun moulding, 20 to 30 1/2; Bottle jacks—Linwood's, 15 to 20 1/2; Salter's, 30 to 35 1/2; Nicholas's, 15 to 20 1/2; common painted Beams, 35 1/2 to 65 1/2; Bright round end beams, 40 1/2 to 55 1/2; Bright box end beams, 40 to 55 1/2; deep Copper scales, 45 to 65 1/2; Steelyards, 40 to 60 1/2; pocket steelyards, best counter weighing machines, Avery or other best make, 25 to 30 1/2; common, with round copper scale, 7 lb., 3 to 5 1/2; 14 lb., 3/6 to 5/6; 28 lb., 5/ to 8/ each; net; Bedsteads, cheap stump, 6 feet by 3 feet 6 in., 7/6 to 9/6 each; cheap French, 6 feet by 3 feet 6 in., 8/6 to 10/6 each, 7/6 to 9/6 for every 6 inches. Brass—Rolled brass, 2 to 12 inches wide, to 30 W.G., 7/6 to 10/6 per lb.; Brass sheets, 24 by 48 in., 8 lb. and upwards or 27 W.G., 8/6 to 10/6 per lb.; House bells, brass rough, 10 1/2 to 11/6 per lb.; turned edge, 1/10 to 1/12; turned, and lacquered on edge, 1/7 to 2/ per lb.; cattle and sheep bells, with brass loops, 1/3 to 1/4 per lb.; clock bells, 1/8 to 1/9; ship and turret bells best, 1/4 to 1/5 Battery kettles, 150/ per cwt.; composition sheathing and slating nails, 10 1/2 to 10 per lb.; Brass Escutcheon pins, 8 by 10 inch, W.G., 10 to 10 1/2; Brass jelly pans, with balls, 1/10 to 1/10 1/2; without balls, 1/11 to 1/11 1/2 per lb.; Maslin kettles, cast, 4 to 10 inch, 10 1/2 to 110 per lb.; Pinpoints, 1/2 to 1/3; Brass Rivets for boots, 12 to 17, W.G., 7/6 to 10 1/2 per lb.; Brass Shoe Bills, 1/10 to 1/11 per lb.; Brass Scale pans, 1/10 to 1/10; Brass Toddy kettles, 15 to 20 1/2; Brass Tubes, plain rough, 1 inch and above, 10 1/2 to 10 1/2 per lb.; Locomotive and marine boiler tubes, seam less from 1 1/2 to 4 inch outside diameter, to 14, W.G., 7/12 to 10 1/2.

Copper.—Copper boat nails, wrought 1 1/2 by 10 inch, W.G., and upwards, 10 to 11 per lb.; Copper boat Roves, 4 inch and upwards 1 1/2 to 1 1/2 per lb.; Copper Brads and bills, same price as tacks. Light round covered rivets, 1/10 to 1/11; loaded, 1/7 to 1/8 1/2; oval Copper kettles, bare rivets, 2/2 to 2/3 per lb.; oval bare rivets raised down, 2/4 to 2/5 per lb.; Copper Rivets and washers, 1 1/2 to 1/1 per lb.; Copper Blasting nails, cut, 1 to 1 1/2 inch and upwards, 11 to 11 1/2 per lb.; Copper Scale pans, 1/10 to 1/11 per lb.; cut Copper Nails and tacks, 1 inch and upwards, 11 1/2 to 12 per lb.; wrought Copper nails and tacks, 1 1/2 to 1 1/4 per lb.; Copper Wire, 0 to 20 W.G., 1/4 to 1/10. Brass cupboard turn, 45 to 52 1/2; Chair webbing, No. 9, 4/5; No. 4 1/2, 4/11; No. 4, 4/6 per gross of 60 yards; Carpet rings 1/10 to 1/10 per gross; Cornice poles, 2 1/2 inch, brass best burnished 4/6 per foot, 25 to 35 1/2, 3/4 covered; brass poles, 1 1/2 per foot, 25 to 35, imitation mahogany cornice poles with ends and rings complete, 2 1/2 inch, 1/1 per foot; light birch ditto, 1/1 to 1/1 1/2 per foot; real mahogany, 2 1/2 to 2 1/2 per foot; cornice pole rings, brass, 2 1/2 inch, light, 2/9; middle, 3/7; strong, 4/2 per doz., 20 to 30 1/2; wood cornice pole rings, 2 1/2 inch, imitation mahogany, 16 to 18 per gross net; light birch, 17 to 19; real mahogany, 22 to 25 per gross net; machine

made wire Chain, single link, iron, 42 1/2 to 47 1/2; double link, iron, 37 1/2 to 42 1/2; single link, brass, 37 1/2 to 47 1/2; registered double link, brass, 32 1/2 to 37 1/2; close link brass Chain, 5 to 10 1/2 brass oval lamp Chain, 22 1/2 to 27 1/2; brass Clock Chain, 22 1/2 to 27 1/2; jappanned pillar Chains, 1 yard, 16 by 6, 8/8 to 7/6 per doz.; jappanned manger, 1 1/2 yard 16 by 6, 8/8 to 9/6; jappanned rack, 1 yard, 18 by 6, 5/6 to 6/6; jappanned dog, 1 1/2 yards, 12 by 7, 6/6 to 7/6; 2 yards, 14 by 6, 11 to 12 1/2; Cowtoss, a 2-in. or Derbyshire, 7/6 to 8/6; open ring, 7/6 to 9/6; close ring, 6/6 to 7/6 per doz.; jappanned watering chains, 14 by 6, 4/6 to 5/6; tinned watering chains, 4/6 to 5/6; bullock chains, 1 1/2 inch hook at each end, 15/6 to 17/6 backbands, 16 to 17 1/2; short link Chain, plain or twisted, 1 inch, 15/6 to 17 1/2; 1 1/2 inch, 13/6 to 15 1/2; 1 inch, 13 to 15 per cwt.; Cart and plough traces, 18/6 to 19/6 per cwt. Chesthandles, improved jappanned, 25 to 27 1/2; broad plate, strong and extra strong, 15 to 55 1/2, according to strength; railway Cotterpins, 55 to 60 1/2; Brass Curtain rings, 45 to 50 1/2; Brass Chair nails, 45 to 50 1/2; square box Coffee mills, 25 to 50 1/2; Common post Coffee mills, 20 to 30 1/2; best brass bushed mills, 40 to 45 1/2; London mills, 35 to 40 1/2; registered Coffin turniture, 45 1/2; Common, 20 1/2.

Door springs, X, 75 to 80 1/2; XX, 70 to 72 1/2; XXX, 65 to 67 1/2; XXXX, 55 to 60 1/2; brass circular and iron circular, 55 to 60 1/2; brass relance, 10 to 15 1/2; climax, 5 to 10 1/2; universal, 50 to 60 1/2; paragon, 10 to 15 1/2; smith's, 10 to 15 1/2; O'Connor's patent lever hinge springs, 15 to 15 1/2; O'Connor's vertical spring hinge door springs, 15 to 25 1/2; Gerish's spring hinges, iron, 20 to 25 1/2; brass, 30 to 35 1/2; jappanned Door chains, 30 to 60 1/2.

Fires, 25 to 50 1/2; Frying pans, best, 55 to 60 1/2 common, 45 to 50 1/2; kitchen Fireirons, in sets, 10 to 12 per lb.; tongs only, 10 to 12; poker only, 15 to 16 per lb. Fish hooks, 30 to 35 1/2, best; common, 50 to 55 1/2; light kitchen Fenders, 5 inch assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 28 to 29 per doz.; bright fronts, 31/6 to 34/; Manchester pattern kitchen Fenders, 5 feet 1 inch top, black front, 2 feet 9 inches to 3 feet 3 inches, 37/6 to 41/6 per doz.; 3 feet 3 inches to 3 feet 9 inches, 42/6 to 46/6. Cut wire Fencing staples, 0 to 6, 22 to 24 per cwt.

Gridirons, London pattern, fluted, 62 1/2 to 65 1/2; light ditto, 61 1/2 to 64 1/2; hanging round bar, 50 1/2 to 55 1/2; double, 37 1/2 to 42 1/2; round bar 1 1/2 per bar, 57 1/2 to 62 1/2; best fluted bar, 55 to 62 1/2; flat bar, 57 1/2 to 62 1/2; common flat bar, 57 1/2 to 62 1/2; common Gridirons, 11, 1/10 and 1/2 per bar, 65 to 70 1/2; Goffering tongs, two prongs, 5/6 to 6/6 per doz.; Gimblets, 10 to 15 1/2.

Holdfasts, jappanned, 20 to 21 per cwt. Hammers, plate-layers' keying, 3 1/2 to 3 1/2; miners', 27/6 to 28/6; sledge, 27/6 to 28/6; stone sledge, 27/6 to 28/6; stone, hand, 28/6 to 30/6; stone-masons' hand, 2 to 6 lb., 28/6 to 30/6; pin maul, 2 to 6 lb., 35 to 37 per cwt.; sledge hammers, 6 lb. and upwards, 28/6 to 30/6 per cwt.; riveting hand-hammers, 28/6 to 30/6; miners', not steered, 22 to 24 per cwt.; common Kent hand hammers, 20 to 50 1/2; patent hammers and staples, 20 to 25 1/2. Cast hinges, polished joint light patent tariff joints, 200, 45 to 50 1/2; 133, 47 1/2 to 47 1/2; 504, 35 to 40 1/2; polished joint, best best butts, best best, 45 to 50 1/2 ditto light tariff, broad butts, 45 to 50 1/2; best heavy, broad butts, 30 to 35 1/2; Patent Hinges, edge butts, light, 60 to 65 1/2; strong, 40 to 50 1/2; patent Scotch butts, 52 1/2 to 57 1/2; same off broad and narrow. Patent table, bed and back-flap hinges, 50 to 52 1/2; extra strong bed hinges, 42 1/2 to 55 1/2; patent chest, 45 to 50 1/2; patent strap, 45 to 55 1/2. H Hinges, 40 to 55 1/2; H Hinges, 40 to 55 1/2; jappanned and garnett hinges, double washed, light and strong, 35 to 40 1/2; best best patent London or Lancashire tees, 55 to 60 1/2; patent light jappanned Scotch tees, 57 1/2 to 62 1/2; light patent hooks and hinges on plate and to drive, 20 to 25 1/2; weighty patent hooks and hinges, weighty Gothic, 24 to 26; scolloped edges, not jappanned, 22 to 24 1/2; Scotch jappanned, Tees double washed, 20/6 to 23/6; Gothic Scotch jappanned, Tees 23/ to 28/; Gothic Scotch, Tees self colour, 17/6 to 25/6. Wrought hinges, common and best, 35 to 40 1/2; best best, 30 to 35 1/2; heavy wrought hinges, common black, 14 to 16 per cwt.; common bright, 16 to 18; filed edges, 17 to 19; jappanned Gothic fancy, 16 to 20 per cwt. common bright, broad eye, 19 to 22; jappanned broad eye fancy, 21 to 22 1/2; best bright, 22 to 24; best broad eye, 23 to 25 1/2; best self-colour frog hooks, 25 to 30 per cwt.; Lancashire hinges wrought, 30 to 35 1/2; Pinned hinges, common, 62 1/2 to 65 1/2; best, 57 1/2 to

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GRANVILLE WORKS,
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57 1/2; common brass butt hinges, 1 1/2 inch sanded, 15 to 18 per gross, pairs net; very light, 1 1/2 inch, 9/6 to 12 per gross, pairs net; horseshoe, fullered fore, 18/6 to 20/6; fullered hind, 19 to 21/6; stamped, fore, 18/6 to 20/6; hind, 18/6 to 20/6. Hollowware, 40 to 45 1/2; common to best, enamelled, 15 to 20 1/2, delivered in Liverpool, London.

Ironfoundry, general.—Ash grates, 11 to 12 1/2, air bricks, 2/6 to 3/6, half, single, 3/6 to 4/3, double, 4/3 to 7/1; bars and bearers, 9/6 to 10/6 per cwt.; barrow wheels, 10/6 to 11/6; bake pans, 9/6 to 10/6; cart bushes, 11/6 to 13/6; camp ovens, 12 to 14 1/2; cooking stoves, 12/6 to 13/6; cugs for blocks, 17 to 18 1/2; cellar grating, 10/6 to 12/6; clock weights, 9 to 11 1/2; Dutch stoves, 11 to 13 1/2; dumbbells, common, 9 to 11 1/2; best best jappanned, 19 to 21 1/2; frying pans, cast handles, 12/6 to 14/6; frying pans with wrought handles, 10 to 18; furnaces, up to fifty gallons, 3/3 to 4/4; galvanised furnaces up to fifty gallons, 1/0 to 1/1 per gallon; furnace doors, 12 to 14 1/2; furnace grates, 9/6 to 11/6; forge backs, 19/6 to 13/6; heaters for box Irons, 8/6 to 10/6; heaters for urns, 10 to 11 1/2; jack wheels, 18 to 20 1/2; oven doors and frames, 12 to 14 1/2; pots, three legged, Danish, plumbers' and Negro, 10 to 12 1/2; plumb bobs, 13/6 to 15/6; pudding pans, 13/6 to 15/6; pump spouts, 14 to 16 1/2; sash weights, 8/6 to 9/6 ditto, with pulleys, 11 to 13 1/2; shoe anvils, 11/6 to 12/6; slippers 12/6 to 13/6; Italian Irons, 35 to 40 1/2.

Knitting pins, iron, 1/4 to 5 per lb.; steel knitting pins, 15 to 24 W.G., 1 to 2/6 per lb.; brass knitting pins 1 1/4 to 1/6 per lb.; keys and banks, 50 to 55 1/2; extra strong plate, 30 to 32 1/2; extra strong Banbury, pin'd keys, 30 to 35 1/2; brass shutter knobs, 55 to 60 1/2; brass cupboard turns, 55 to 60 1/2; brass drawer knobs, 53 to 60 1/2; brass ash pan knobs, 55 to 60 1/2; brass range knobs, 40 to 45 1/2; kettle ears, 77 1/2 to 80.

Lock furniture, brass, 60 to 65 1/2; buffaloes, 25 to 30 1/2; china lock furniture, 37 1/2 to 42 1/2; ebony lock furniture, 24-inch, Wilkes' spindles, 15 to 18 per dozen sets; sham ditto, 8 to 9 per dozen sets; Norfolk latches, common, best, 77 1/2 to 80 1/2 common. Suffolk latches, 72 1/2 to 75 1/2; best Suffolk latches, 45 to 55 1/2; tinned struck ladle bowls, 4-inch, 15/6 to 16/6; 4 1/2-inch, 18/6 to 20/6; 5-inch 21 to 25 per gross set.

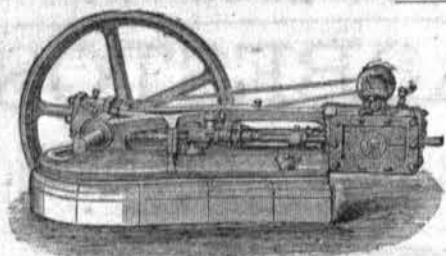
Netting, wire, galvanised, 57 1/2 to 62 1/2, delivered Cast nails—lath, 10/6 to 11/6 per cwt.; cast wall nails 9/6 to 12 per cwt.; cast headed bills, 4 by 8 ounce, 15 to 16 1/2; fine round cast bills, 8-inch, 14 to 16 1/2; strong round cast bills, 8-inch, 13 to 16 1/2; cast slate pegs, 13 to 17 1/2; cast garden loops, 15 to 17 per cwt., all at works. Patent wrought nails, 40 to 42 1/2 per thousand and 35 to 37 1/2 those sold as weighty by the cwt.; patent machine-made horse nails, 25 to 30 1/2; cut-galls, clasp, clout or rose nails, 3 inch and upwards, 9/6 to 11 per cwt. cut lath nails, 1 inch and upwards, 12/6 to 13 1/2; cut flooring brads, 2 1/2 inch and upwards, 9/3 to 10/6; fine cut tacks, 3 inch, 34 to 37 per cwt.; 1 inch 30/6; 1 inch, 20/6 to 27/6 per cwt.; fine cut joiners' brads, or strong, 1 1/2 inch, 15 to 17 1/2; 2 inch, 14 to 16/6; 2 1/2 inch, 14 to 16/6; 3 inch, 13 to 14/6 per cwt.; cut shoe bills, strong, or 12 W.G., 18/6 to 14/6 per cwt.; middle, or 14 W.G., 12 to 14 1/2; fine, or 15 W.G., 14/6 to 15/6; fine cut tacks, per packet, 8 to 8 1/2; fine cut brads, per packet, 65 to 67 1/2; wrought nails, long count, 15 to 20 1/2; wrought nails, May, 1826 list, 20 to 22 1/2; best countersunk clout nails 1 inch, 35/6 to 37/6; 2 inch, 26 to 27/6; 2 1/2 inch, 22 to 25/6; best best countersunk and half-countersunk horse nails, fine best; Swedish charcoal iron, 17/6 to 19/6 list prices: wrought rose or decal-head spikes, 4 inch, 15/6 to 16/6; 5 inch, 15/6 to 16/6; 6 inch, 15 to 16 1/2; fine, 16 to 17 per cwt. extra; galvanised, 7 to 8 per cwt. extra; wrought rose nails for India, 2 inch, 10 lb., 21/6 to 22/6; 2 1/2 inch,

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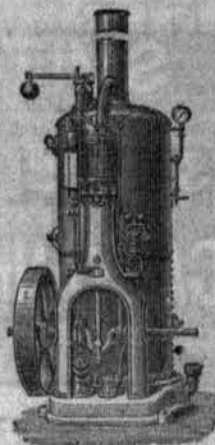
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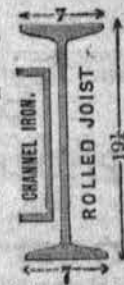
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8 x 4	2 1/2 x 3 1/2	8 x 3 = 10lbs.	5 x 3 = 13lbs.	7 x 2 = 14lbs.	9 1/2 x 3 1/2 = 24lbs.	12 x 6 = 42lbs.	6 x 6 = 12 x 3
6 x 6	2 1/2 x 3 1/2	3 x 1 1/2 = 5 "	5 x 4 1/2 = 23 "	7 x 3 1/2 = 20 "	9 1/2 x 4 1/2 = 29 "	12 x 6 = 42lbs.	4 x 4 1/2 = 9 1/2 x 3 1/2
6 x 6	2 1/2 x 3 1/2	4 x 1 1/2 = 7 "	6 x 2 = 11 "	8 x 4 = 22 "	10 x 4 1/2 = 32 "	14 x 6 = 60 "	5 x 3 = 9 1/2 x 3 1/2
6 x 6	2 1/2 x 3 1/2	4 x 3 = 12 "	6 x 3 = 16 "	8 x 5 = 25 "	10 x 5 = 36 "	16 x 6 = 62 "	3 x 3 = 8 x 3 1/2
4 x 3	1 1/2 x 1 1/2	6 x 2 = 8 "	6 x 5 = 29 "	8 x 6 = 34 "	10 x 6 = 54 "	18 x 6 1/2 = 82 "	2 1/2 x 2 1/2 = 6 x 3 1/2
4 x 4	1 x 1					19 1/2 x 7 = 100 "	2 x 2 = 4 1/2 x 2 1/2
							1 1/2 x 1 1/2 = 2 1/2 x 1

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13 lb., 20 to 21; 3 inch, 20 lb., 19 to 20; malleable nails, coffin
nails, black, 35 to 40; white lacquered and gilt, 25 to 30; 30
sacking; moulders' nails and chaplets, 1 1/2 inch to 3 inch,
28 to 30; bright nuggets, 28 to 30; tile pegs, 15 to 16 per
cwt.; bright nails, 4 to 12 extra; tinned nails, 12 to 13 extra;
galvanised nails, 10 to 12 extra; nuts, square forged, untapped,
1/2 inch, 10 to 12 per gross; 3/4 inch, 25 to 30 per cwt.; 1/2 inch, 23 to 24
per cwt.; square forged nuts, tapped, 1/2 inch, 1/3 to 1/4 per gross; 3/4
inch, 30 to 32; 1 inch, 27 to 29; forged hexagon, untapped, 1/2
inch, 17 to 20; 3/4 inch, 32 to 34; 1 inch, 27 to 29; forged hexagon,
tapped, 1/2 inch, 22 to 24; 3/4 inch, 30 to 32; 1 inch, 31 to 33; machine-
made nuts, square untapped, 1/2 inch, 20 to 22; 3/4 inch, 18 to 20; 1
inch, 18 to 20; square tapped, 1/2 inch, 25 to 26; 3/4 inch, 27 to 29;
1 inch, 24 to 26; machine-made hexagon nuts, untapped, 1/2 inch,
22 to 24; 3/4 inch, 25 to 27; 1 inch, 27 to 29; hexagon tapped, 1/2
inch, 30 to 32; 3/4 inch, 30 to 32; 1 inch, 28 to 30.

Odd sizes, tinned and black, 20 to 25; list; Paris pointers
best English, 1 1/2 inch, 15 to 16; foreign, 15; planos, 25 to 30; iron
axle pulleys, 1 1/2 inch, 15 to 16; brass face axle pulleys, 28 to 40
per gross; B. & W. and wheel, 48 to 60 per gross; brass escutcheon
pins, 1/2 inch to 1 1/2 W. G., 1/2 to 1 1/2 per lb.; bright gimps pins, 1/2 to 1 1/2
W. G., 1/2 to 1 1/2 per lb.; black, 7 to 10; brass 1/2 to 1 1/2 per lb.
Japanned cut gimps pins, 1/2 inch, 7 to 8 per lb.; tinned, 8 to 10
per lb.; cut cog or coffin pins, japanned, 1/2 inch, 7 to 8; tinned, 7
to 8; brass pin pointers, 1/4 to 1/6; plate looks, fine 58 to 57 1/2;
strong, 42 to 47 1/2; Lancashire plate looks, 30 to 35; pewter measures,
30 to 35.

Riddles, 30 to 35; Rivets, iron boot rivets, 1/4 to 1/2 per lb.
patent machine-made Rivets, 30 to 35; wrought iron Rivets, 30
to 35; round or panhead boiler Rivets, 1/2 inch, 27 to 29; 3/4 inch,
18 to 19; 1 inch, 17 to 18; 1 1/2 inch, 16 to 17. Delivered in London or
Liverpool; machine-made wire Rivets, 1/2 inch, 14 to 15; 3/4 inch, 15 to 16 per cwt.
Rakes, light garden Rakes 50 to 60; light solid end Rakes, 47 1/2
to 50; bolstered teeth garden Rakes, 50; solid end bolstered teeth
garden Rakes, 40 to 45.

Spades and Shovels, common, 52 1/2 to 55; second, 35 to 40; best
30 to 35; best strong country Shovels, 25 to 30; best hammered
Spades and Shovels, 5 to 10; Ship Scrapers, black steel blades,
45 to 50; bright, 42 to 47 1/2; cast-steel black, 42 to 47 1/2; bright,
37 to 42 1/2; best cast-steel black, 35 to 40; bright, 30 to 35; iron
Wood Screws, 6 1/2; brass wood Screws, 60 to 65; copper, 35 to
45; Stove Screws, 50 to 52 1/2; dowel Screws, 60 to 65; brass
headlock Screws, 40 to 47 1/2; gilt, silvered and plated head Screws,
40 to 45; jute Sash cord, 52 1/2 to 57 1/2; flax Sash-cord, 25 to 30;
best flax, 5 to 10; super flax, 7 1/2 to 12 1/2; extra super flax Sash-
cord, 5 to 10; patent steel ribbon Sash-line, 25 to 35; copper
Sash-chain, 52 1/2 to 57 1/2; zinc Sash-chain, 47 1/2 to 52 1/2; iron pre-
pared, 40 to 45; copper Sash-cord, 15 to 20; Bad irons, common,
9 1/2 to 11 per cwt.; best japanned, 13 1/2 to 14 1/2; best best japanned,
17 to 19 per cwt.; Shoe heels, York, No. 1, 3/5 to 3/8; No. 2, 4/5
to 4/3; No. 3, 8 to 8 1/2 per gross net; Dundee hot turned, 5/6 to 6/3;
bright-edge imperial or solid Scotch, 9/6 to 10/1; bright York 6 1/2 lb.,
8 to 8 1/2; bright solid, 6/6 to 7/1; toe plates, 9/6 to 10/1 per gross.
Stair rods, turned ends, 75 to 80; solid fancy ends, 60 to 65;
cased tube, 30 to 35; patent solid ornamental, 35 to 40. Sofa
Springs, coppered, 8 by 6 inches, 25 to 27 per gross; 9 by 7 in.,
21/6 to 23/6; 7 by 7 inches, 17/6 to 19/6 per gross; galvanised
Waterloo Scoops and hods, 17/6 per doz.; japanned
Waterloo Scoops and hods, 10 inch, 15 to 16; japanned Scoops and
hods, light, 10 inch, 15 to 16 per doz.; Shutter bars, common
spring, broad and double, 75 to 77 1/2; Scotch iron drop, 77 1/2 to 80;
brass drop, 70 to 72 1/2; brass drop and catch, 67 1/2 to 70; registered
brass spring box shutter bars, 52 1/2 to 62 1/2; double-handed brass
spring box, 57 1/2 to 65; Saddlers' tools, 5 to 12; Stocks and

Dies for smiths' use, 35 to 40; ditto for engineers, 10 to 20; Steel
toys, 10 to 30.

Traps, bow spring, sham Dorset and real Dorset rabbit traps, 45
to 65; list prices; common traps, 1 inch, 5/6 to 8/ per doz. net; run
traps, 2 1/2 inch, 4/ to 8/6 per doz.; bird traps, 3/6 to 4/ per doz.;
wolf and other double flat spring, common bridge, 1/2; axle bridge, 1/4
per lb., 40 to 45; hawk or pole traps, 54 to 50; wrought mole traps
japanned, 2/6 to 3/6; galvanised, 3/6 to 4/6. Tin plates, 1 C., 25 to
26. Timmen's machines and tools, 57; brass Bell Tube, 1/2 inch
and upwards, 1/2 to 1 1/2 per lb.; copper Bell Tube, 1/2 to 1 1/4 per lb.;
zinc Bell Tube, 45 to 50; list; Patent cased Tube, 45 to 50; cut to
lengths, 40 to 45; burnished and lacquered brass tube, 30 to 35;
polished and lacquered twisted brass tube, 30 to 35; patent taper
iron tube, 30 to 35; patent cased taper iron tube, 30 to 35;
parallel iron braced tube, 30 to 35; twisted iron parallel tube, 30
to 35; patent cased twisted iron parallel tube, 30 to 35; iron
Gas Tubes, 70 to 72 1/2; fittings, 22 1/2 to 25; iron Water Tubes,
60 to 65; fittings, 62 1/2 to 64 1/2; iron Steam Tubes, 52 1/2 to 55;
fittings, 55 to 57 1/2; galvanised iron Gas Tubes, 57 1/2 to 60; fittings,
60 to 65; lap-welded Boiler Tubes, 60 to 62 1/2; delivered in
London, Liverpool or Glasgow; table catches, 36 to 40; ditto, im-
proved brass follow, 20 to 25; wrought japanned Tea Kettles, 50
to 60; galvanised Turnipskips, 21 inches, light, 25 to 26 per doz.

Vices, common black, 30 to 34 per cwt.; common bright, 40 to
42 per cwt.; black staples vices, solid box black, 42 to 48; bright, 47 to
47 1/2; solid box, black staple, with spherical washer, 40 to 45; bright 47
to 55.

Washers, light iron, 72 1/2; heavy washers, 13 to 16 lb., W.G.,
20/6 to 17 per cwt.; 1 inch thick, 1/2 per cwt. extra; 5-16 inch, 5/1;
1 inch 4/1; shock bright washers, 3/10 to 3/5 per cwt. extra; Wall Hooks,
23 to 25 per cwt.; Washing tubs, galvanised oval, 22 inch, 19/
to 30; 24 inch, 24 to 35; round, 22 inch, 38 to 40; Water bowls,
hammered, list price, 50 to 62 1/2; light seamed 9 inch, 8 per
dozen; light wired 9 inch, stamped, 17 to 12; Wove wire list
price, iron, copper and brass, 45 to 50; iron Wire, bright, 0 to 6,
12/6 to 13/6 per cwt.; galvanised, 10/6 to 12/6; fine galvanised iron
wire, No. 23, 5/ to 5/3 per stone 14 lb.; annealed tinned wire No.
25, 3/9 to 4/ per stone 14 lb.; cut tinned bottling wire, No. 22, 4/8 to
5/ per stone 14 lb.; bright or annealed fine wire, 23, 5/4 to 5/6 per stone
14 lb. net; cast steel wire, 0 to 6, 10/6 per lb.; 10 to 20; metallic
horticultural wire, 6 to 14, 7/5 to 6/3 per lb.; No. 15, 3/4 to 7/6; 16 to
20, 7/5 to 6/3; in 1 lb. rings, 1 1/2 inch diameter, 7/8 per lb. extra;
prepared bright fencing Wire, 0 to 6, 12/6 to 13/ per cwt.;
annealed drawn fencing wire, 0 to 6, 11/ to 11/6; annealed
drawn galvanised, 0 to 6, 15/6 to 16/1. Bright or annealed steel, 0 to
6, round or oval 13/9 to 14/6 per cwt.; black rolled, 11 to 41, 9/6 to 11/6
per cwt.; galvanised rolled, 1 to 4, 12/9 to 13/6 per cwt.

THE CHEMICAL, MINERAL AND METAL TRADES.

CHEMICALS.—The course of business during the week has
been such as to indicate a somewhat increased feeling of
confidence among buyers. This has been noticeable principally
in the home trade, where consumers are apparently
accepting the assumption that, as prices have had such a
pronounced fall, and have now for some two or three weeks

remained almost unmoved, the chances are in favour of an
advance. As a result there is an increase of inquiry, and it
is less difficult to successfully negotiate transactions. The
increase is as yet small, but the improved symptom is worthy
of note, and contrasts favourably with the condition of
opinion hitherto. At the same time it is by no means easy
to arrange contracts on equitable terms, and the principal
of the business being done in addition to the ordinary is on
account of stock. The export branch does not as yet indicate
any favourable change. Bleaching powder is selling more
freely at current prices, from which sellers do not seem likely
to depart. Soda crystals are firmer and in better request.
Ash is steady. Sulphate of copper is very active, and makers
are heavily sold. Acids are rather drooping. Arsenic is in
good demand at full rates. Acetate of lime is still plentiful
and rather easier.

MINERALS.—All classes of minerals continue to be
seriously affected by the depression in commerce generally.
Stocks are heavy and consumers well bought, so that large
transactions are the exception. Sellers, in the desire to
make business, are in keen competition, to the detriment of
values. Copper ores are weak. A sale took place at
Swansea on the 8th inst., when one 1497 tons were sold,
realising £7782 1s. Iron ore still retreats, and there is no
small difficulty about the deliveries ex contracts made
during the late inflation. The production is being sensibly
diminished, but the demand has fallen away too largely for
this to arrest the downward course of values. Brimstone
is moderately steady, but without more than a limited
quantity changing hands. Manganese is offered more
freely, but at full rates. China clay and umbers are in slow
request.

METALS.—The condition of the pig-iron trade during
the week has to some extent been better, inasmuch as
prices have shown more disposition to make a stand against
decrease, while at the same time the demand for inland
consumption, and also for the Continent, has been some-
what brisker. In Cleveland the business done has been
more satisfactory, as much as 36s. 9d. being obtained for
No. 3 for prompt delivery, while other qualities are steady.
Forward business, however, is at a discount, notwithstanding
sellers' willingness to accept almost current rates. The
position at the same time is felt to be unsafe, and we shall not
be surprised if weakness again intervenes. Glasgow war-
rants are for the moment tolerably firm. Lancashire iron
is unchanged. Tin has again receded, and is neglected.
Copper is fairly active. Lead remains unchanged, but very
little business being done.

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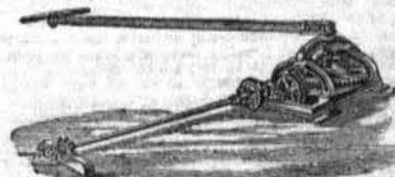
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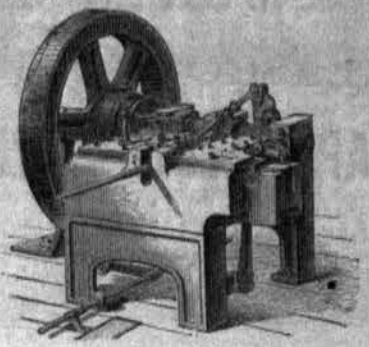
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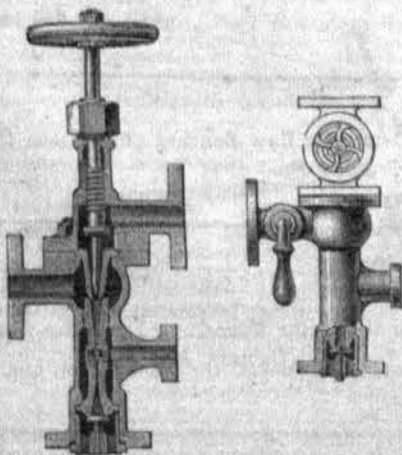
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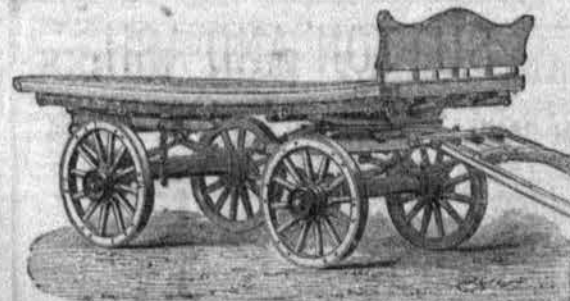
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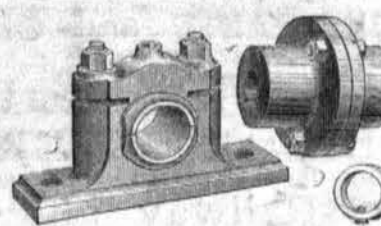
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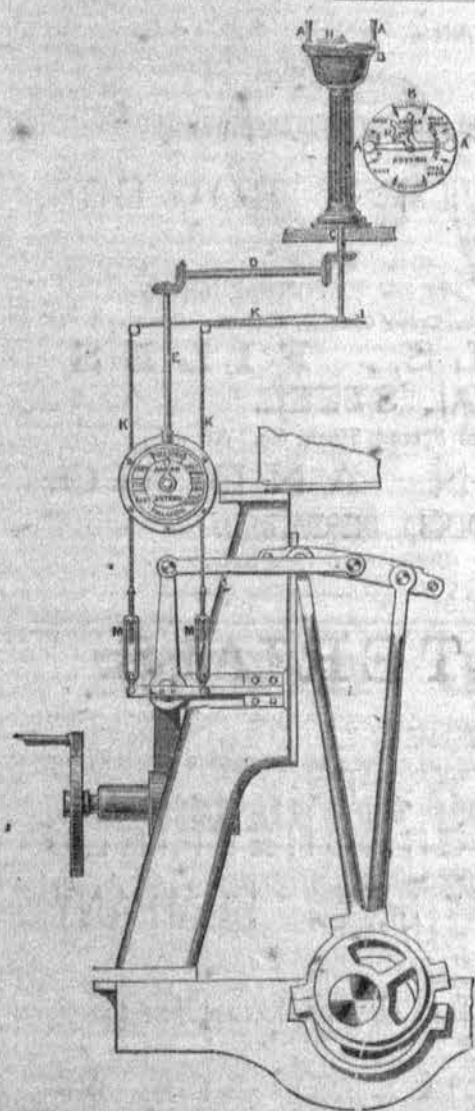


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PLUMMER BLOCK, each	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
COUPLINGS, pair	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
LOOSE COLLARS, each	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
SHAFTING, sup. qual. feet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

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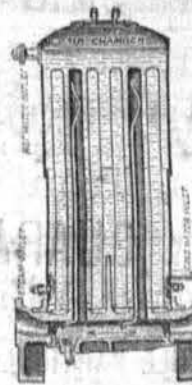
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(Proprietors, J. B. ORR & CO.),
MANUFACTURERS OF

NON-POISONOUS PAINTS FOR ALL PURPOSES

INCLUDING;

"CHARLTON WHITE,"

A Complete Substitute for all White Pigments Hitherto in Use.

SILICATE OIL PAINT and CHARLTON ENAMEL PAINT,

UNEQUALLED AS PRESERVATIVES OF

EXPOSED IRONWORK OF EVERY DESCRIPTION.

AND EXTENSIVELY USED AT HOME AND ABROAD ON

Girders, Bridges, Iron Ships, Railway and Mining Plant, &c., &c.

QUALITY GUARANTEED. 5 CWT. CARRIAGE FREE.

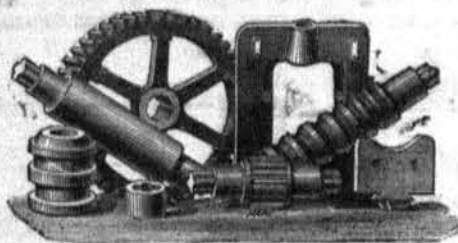
Marine Paints, Varnishes, Japans, Oil and all Painting Requisites.

FULL PARTICULARS ON APPLICATION TO THE OFFICES OF THE COMPANY,

LONDON, LIVERPOOL, AND GLASGOW.

Chief Office and Works, CHARLTON, LONDON, S.E.

BAYLISS, JONES & BAYLISS,
Manufacturers of



PATENT

Machine-Moulded Wheels,

GRAIN ROLLS and all kinds of

MILL & FORGE CASTINGS.

Pots and Pans for Annealing and Chemical Purposes,
Columns and Girders, Engineers' and Colliery Castings,
&c., &c.

FISH BOLTS, SPIKES,

And all kinds of

RAILWAY AND TRAMWAY FASTENINGS.

Tubular and Solid Bar Fencing, Iron Hurdles,
Gates, &c., &c.

VICTORIA WORKS, WOLVERHAMPTON,

AND

3, Crooked Lane, King William St., London, E.C.

BICKFORD'S PATENT SAFETY FUSE

FOR CONVEYING FIRE TO THE CHARGE IN BLASTING
ROCKS, &c.,

OBTAINED THE PRIZE MEDALS AT THE "ROYAL EXHIBITION" OF 1851; AT THE "INTERNATIONAL EXHIBITIONS" OF 1862 & 1874, IN LONDON; AT THE "IMPERIAL EXHIBITION," HELD IN PARIS, 1855; AT THE "INTERNATIONAL EXHIBITION," HELD IN DUBLIN, 1865; AT THE "EXPOSITION UNIVERSELLE," HELD IN PARIS, 1867; AT THE "GREAT INDUSTRIAL EXHIBITION," ALTONA, IN 1869; AT THE "EXPOSITION NACIONAL ARGENTINA" IN CORDOVA, S. AMERICA, IN 1872, AND (TWO MEDALS) AT THE "UNIVERSAL EXHIBITION" IN VIENNA, 1873, &c.

BICKFORD, SMITH & CO.,
TUCKINGMILL, CORNWALL,

AND

ST. HELEN'S JUNCTION, LANCASHIRE

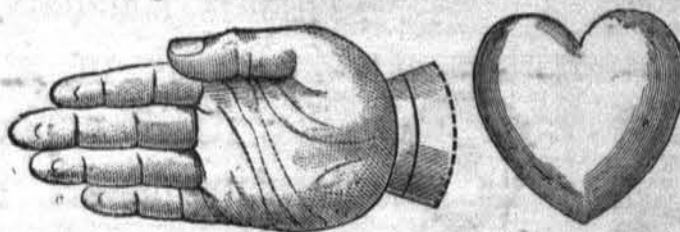
MANUFACTURERS AND ORIGINAL PATENTERS OF

PATENT SAFETY FUSES,

Having been informed that the name of their firm has been attached to Fuses not of their manufacture, beg to call the attention of the Trade and Public to the following announcement:—

Every Coil of Fuse manufactured by BICKFORD, SMITH & Co. has Two Separate Threads passing through the Column of Gunpowder, and they claim such Two Separate Threads as exclusively their TRADE MARK.

CORPORATE MARK.



Granted according to Act of Parliament, 1777, by the Cutlers' Company, Sheffield.

TOOLS, STEELS, FILES,
R. MUSHET'S SPECIAL STEEL.

Railway Springs, Steel Castings, Shear and Spring Steel, &c., &c.

SAMUEL OSBORN AND CO.

CLYDE STEEL AND IRON WORKS, SHEFFIELD.

LONDON: 16, PHILPOT LANE, E.C.; BOSTON (U.S.): 10, OLIVER STREET;

MONTREAL: 470, ST. PAUL STREET; BERLIN: 48, NEUE FRIEDERICH'S STRASSE.

BEVERLEY AND ATKINS

ENGINEERS, MACHINISTS AND GENERAL MERCHANTS,

Special Tool Works

STANLEY STREET, WICKER, SHEFFIELD.

BEVERLEY'S PATENT LATHES.

ADVANTAGES:

1. Enormous Belt Power. 2. Enormous Strength. 3. Extreme Simplicity. 4. Small ground space they occupy on account of no back shaft being required. 5. The Belt can be driven to or from the Cone at any angle. 6. They are Slide Surfacing and Screw Cutting, and all the motions are fixed so as to work right or left hand without changing the wheels or wearing the Screw. 7. Will do 50 per cent. more work than any other Lathes of ordinary make and same size are capable of doing.

For further Particulars and Estimates, apply to the Sole Makers.

MAKERS OF

Beverley's Patent Self-contained Radial Drills, Slot Drilling Machines, Wall Drills, Improved Jaw Chucks, and every description of Machine Tools.

AN INSPECTION INVITED.

TESTIMONIAL.

Sheffield, January 17th, 1879.

GENTLEMEN, We have great pleasure in informing you that the Eleven Patent Lathes you have supplied us with have now been at work for some time, and we find they are turning off at least from 30 to 40 per cent. more work than ordinary Lathes of the same sized centres would do; this we attribute to the large Cone Pulleys and extra Belt power which you get by your improvements. Another important advantage which your Lathes possess, is the small space they occupy, which to us is specially valuable, being so cramped for room. We have four of these Patent Lathes standing back to back, and they occupy no more room than would be taken up by three ordinary Lathes of the same size. They are really splendid Tools, and the superior manner in which they are got up does you very great credit, and we feel confident that these Lathes, when more generally known, will be largely adopted.

To Messrs. BEVERLEY & TERRY, Sheffield.

Yours, very truly, HYDES & WIGFULL (Limited).

May be seen at our LONDON AGENTS, F. ORME & CO., Machinery and Tool Warehouse, St. Andrew's Street, Holborn Viaduct, E.C.

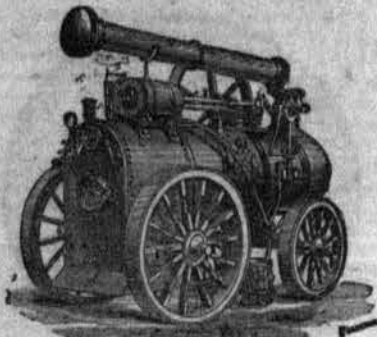
JUNE 18, 1880.

IRON.

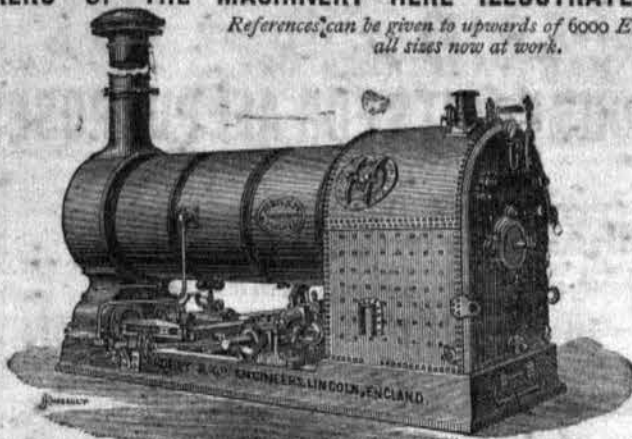
XI.

ROBEY AND CO., ENGINEERS, LINCOLN, SOLE MANUFACTURERS OF THE MACHINERY HERE ILLUSTRATED.

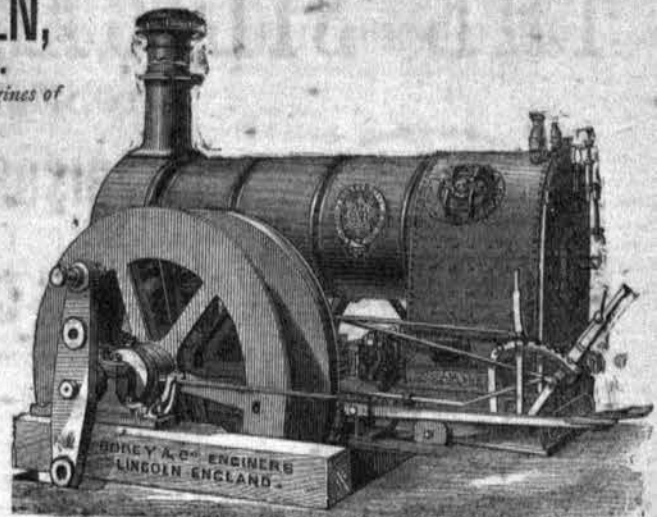
References can be given to upwards of 6000 Engines of all sizes now at work.



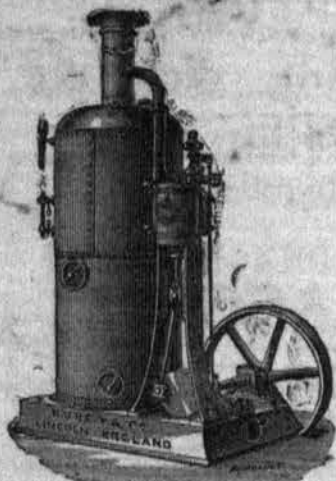
Superior Portable Engines, 4 to 60 h.p.



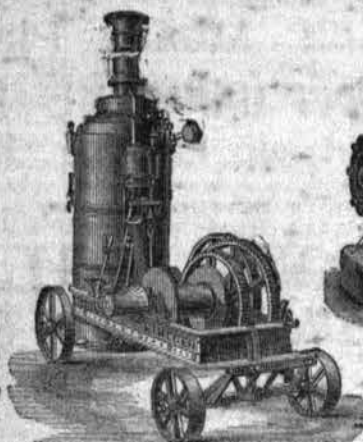
The Patent "Robey" Fixed Engine, 4 to 50 h.p.



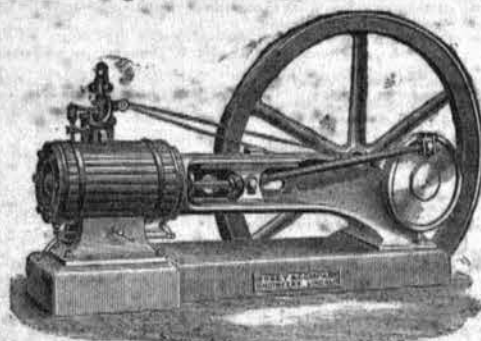
Patent "Robey" Mining Engine, 4 to 200 h.p.



Vertical Engines, 1 1/2 to 16 h.p.



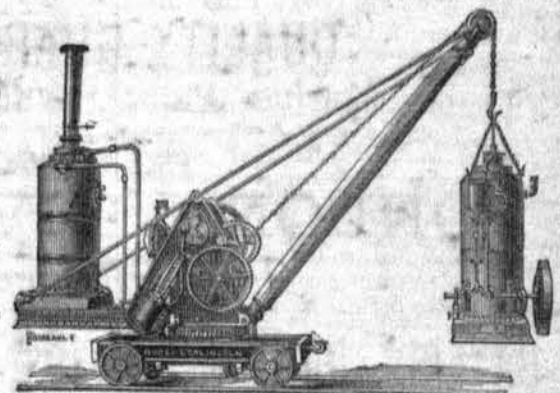
Improved Barrow Hoist.



Horizontal Fixed Engines, 4 to 60 h.p.

**ROBEY & CO.,
ENGINEERS,
LINCOLN, ENGLAND.**

Catalogues, Prices and Photographs on Application.



Improved Steam Travelling Crane.



VALVE SPRING



SCHAEFFER GAUGE

GEORGE SALTER & CO., West Bromwich.

Manufacturers of SPRING BALANCES,

Roasting Jacks, Sad Irons,

Bourdon's, Schaeffer's and Silvester's

PRESSURE GAUGES

COLLIERY SIGNAL BELLS, RASTRICK'S TUBE SCRAPER,

Conical, Spiral, & all kinds of Coiled Springs

MADE TO ORDER.



NEW OLIVER SPRING



BOURDON GAUGE



LOOSE HANDED SAD



VALVE SPRING



KELLY'S DOOR SPRING



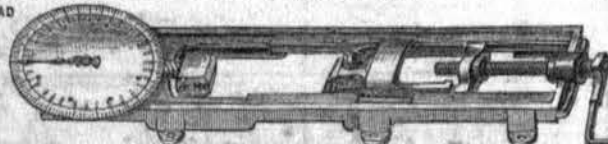
COLLIERY BALANCE
UP TO 1 TON



SILVESTER'S PATENT SAD



CONICAL SPRING

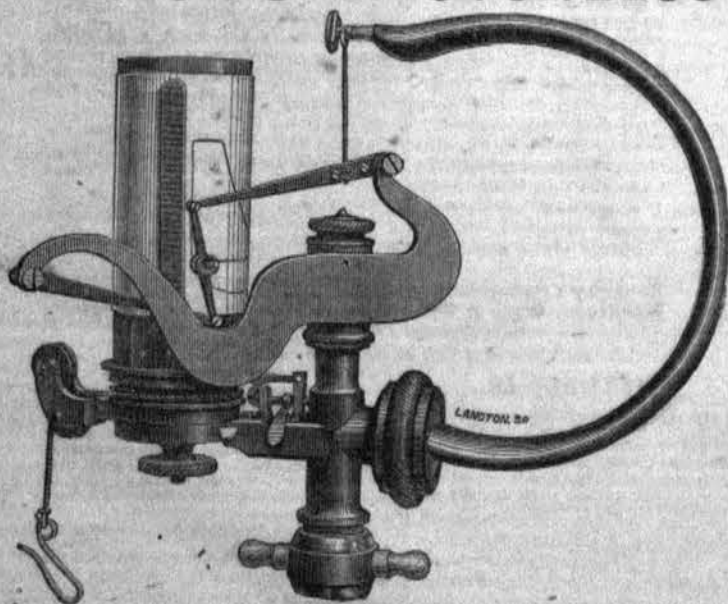


WIRE TESTER ANY PRESSURE UP TO 2 TONS

GOODS SUPPLIED THROUGH MERCHANTS AND FACTORS.

KENYON'S PISTONLESS STEAM ENGINE INDICATOR.

*Secured by Royal Letters Patent, No. 1278,
Dated April 1st, 1878.*



SOME ADVANTAGES:

Having no piston it has no friction to overcome, and cannot be fouled by grit or silty steam.

Is more sensitive and reliable than a Piston Indicator.

Can easily be tested on a reliable test pump.

SOLE MAKERS:

ISAAC STOREY AND SONS,

CATHEDRAL YARD, MANCHESTER:

And at LITTLE PETER STREET.

TWO SILVER MEDALS, PARIS, 1878.
THE CHILIAN MEDAL, SANTIAGO, 1875.

THE GLENBOIG STAR FIREBRICK WORKS,

NEAR COATHBRIDGE, N.B.

JAS. DUNNACHIE,

2, West Regent Street, Glasgow.

CONTRACTOR TO HER MAJESTY'S GOVERNMENT.

Manufacturers of Fire Bricks for Steel, Iron, Brass, Gas, Chemical and Glass Furnaces, Copper, casting, calcining and refining furnaces. The special bricks for the Siemens regenerative gas-furnace (this is the brand recommended by Dr. C. W. Siemens), Bessemer tuyeres, runners, plugs and stoppers. German tubes. Gabbister of highest quality, ground fireclay. No other firebrick combines such a high degree of infusibility with the perfect absence of cracking and splitting up under sudden cooling.

Each brick bears the registered Trade Mark.

TRADE MARK
STAR WORKS
D MARK
GLENBOIG

Quotations, Illustrated Catalogues, &c., on application.
Shipping ports, Glasgow, Grangemouth, Leith, Granton, Boness, &c.
London Agents: Messrs. Doulton and Co., Lambeth Pottery, and Crown Wharf, Victoria Park E.

Wheatley Kirk, Price and

GOULTY, ESTABLISHED 1860.
MECHANICAL VALUERS, AUCTIONEERS
AND ARBITRATORS.
Head Office—Albert Square, Manchester.

Partnerships. — Gentlemen

(Practical Engineers) desirous of entering established Engineering concerns, are invited to communicate with the undersigned, who have numerous bona fide establishments open to admit such. References are given and required.—**WHEATLEY KIRK, PRICE AND GOULTY**, Albert Square, Manchester.

Engineering Firms of Good

REPUTATION, open to admit partners, or desirous of selling outright, are requested to communicate with the undersigned, who have numerous clients open for such.—**WHEATLEY KIRK, PRICE AND GOULTY**, Albert Square, Manchester.

IN LIQUIDATION.

To be Sold by Private

TREATY, as a going concern, on the Great Northern Line of Railway, a well-established ENGINEERING BUSINESS, comprising the following branches, viz:—
The Manufacture of Stationary Engines and Boilers.

Portable and Combined do.
Agricultural Implements of all classes.
And especially the Manufacture of Wrought Iron Cranks, for which a complete Plant of Patent Machinery has been put down; also General Iron Founding with all the Appliances for carrying on and extending a first-class trade.

The Machinery and Tools are by well-known makers, and the new Buildings are erected upon land secured on a 999 years' lease.
Full particulars can be obtained from Mr. Isaac Jenks, of Wolverhampton; Mr. Thomas Leman, Accountant, Nottingham; or Messrs. Cover, Fowler and Langley, Solicitors, Wolverhampton.

Dennystown Forge Works,

DUMBARTON.

For Sale, by Public Roup, within the Faculty Hall, St. George's Place, Glasgow, on WEDNESDAY, the 14th day of July, 1880, at Two o'clock, Afternoon (unless previously disposed of privately), in consequence of the death of one of the Partners, and the expiry of the Contract of Copartnership.

The WELL-KNOWN DENNSTOWN FORGE WORKS, which have been established upwards of 25 years, and have enjoyed a large share of public support.

They are situated in Dumbarton on the bank of the river Leven, bounded on the east by the North British Railway (from which there is a branch into the works), and on the west by the Leven, where there is a private quay.

The ground extends to 4 acres 10 poles or thereby, at the moderate Rent-duty of £30 8s. 4d. The value of the Ground has largely increased since the date of the feu.

The Plant is extensive and valuable. There are Seven Steam Engines, large and small; Sixteen Machines in Lathes, Slotters, and Turning Machines, &c.; Nine Steam Hammers, with 15 cwt. to 10 tons; 18 Vertical Boilers. There are numerous, and of the most improved and powerful description, the Furnaces and other appliances complete and ample.

These Works are well situated for the receipt of the Raw Material and the despatch of the finished Forgings, having connection by rail to all parts of the Country, as well as by water with the various Shipbuilding and Engineering Yards on the Leven and the Clyde.

In the locality there is a large demand for Forgings, while the situation of the Works at all times commands a superior class of Workmen, both skilled and labouring. The Works are now in full employment, and will be continued so for the entry of a purchaser.

UPSET PRICE, £10,000.

Mr. MAIR, at the Works, will show parties over the Premises, and give all necessary information, and further particulars may also be had from JAMES KITCHIE, MACLEAN AND CO., Writers, 175, Hope Street, Glasgow, who are in possession of the Title Deeds, Inventories and Valuations, and the Articles of Roup.

Glasgow, 5th June, 1880.

AERONAUTICAL SOCIETY OF GREAT

BRITAIN.

The Annual General Meet-

ING at the Society of Arts, MONDAY,

June 21, 8 p.m.; models, papers and discussion.

Admission by a member, or by addressing

FRED W. FREAR, Hon. Sec.

1, Maidenstone Hill, Blackheath, S.E.

RUTE IRON WORKS, CARDIFF.

Important Sale of Engineers' Tools.

Messrs. Fuller, Horsey,

SONS and Co. are instructed by the Proprietors (consequent upon a dissolution of their partnership) to SELL, by AUCTION, on the premises, Rute Ironworks, Cardiff, on WEDNESDAY, June 24th, and following days, at 12 precisely each day, in lots, the PLANT, Machinery, Stores and Stock (the plant is of modern description, chiefly by Buckton, Smith, Beacock and Tannett; Collier; De Bergues; Craig and Donald; Maudslay Brothers, and others), including five screw-cutting, surfacing and boring lathes from 8 to 24 inches centre, twelve vertical and horizontal drilling machines, three multiple drilling machines from twenty to sixty spindles, slotting and shaping machines, two planing machines, three plate planing machines, Smith and Coventry's screwing machines, a powerful steam riveting machine by Cook, three powerful punching and shearing machines will punch up to 1½ inches through 1½-inch plate, a powerful double-angle iron shearing machine with steam engine attached, two circular saws for cutting iron, bending and straightening machines, three wrought-iron stools, two fans, two over-head travellers (six and eight tons), with gantries, two Wellington travellers (of three and twelve tons), by Stothert and Pitt, two horizontal steam engines of 20 and 35 horse-power respectively, three Cornish boilers, loam mill, saw bench and pattern makers' lathes, 15-ton weighing bridge, two Pooley's weighing machines, three Tangye's Hydraulic Jacks up to 30 tons, 40 tons foundry boxes, five tons pig-iron, five tons wrought and cast scrap, 10 tons new bar iron, three tons steel engineers' smiths' and boiler-makers' tools, an assortment of general stores, chains, ropes, blocks and falls, &c., crabs, 200 loads wood blocking and timber, 200 dry pine boards, timber whips and trolleys, leather bands, Office furniture, and numerous other effects. May be viewed two days preceding and mornings of sale, and catalogues had on the premises, and of Messrs. Fuller, Horsey, Sons and Co., 11, Billiter Square, London, E.C.

Note.—The extensive Premises to be Sold. Held from the Marquis of Bute for an unexpired term of about 88 years, at a very low ground-rent.

TO ENGINEERS AND OTHERS.

This Corporation, being desirous of receiving TENDERS for the MANUFACTURE and DELIVERY at the Trinity Wharf, Blackwall, of sundry IRON BUOYS of stated dimensions and descriptions, Notice is hereby given that the Drawings may be inspected and the Forms of Tender and Specification obtained on application at the Store Department at this House on any day between the hours of 10 a.m. and 4 p.m. Tenders, sealed, and marked outside "Tender for Iron Buoy," must be addressed to the Secretary and delivered at this House on MONDAY, the 22nd inst., and no Tender can be entertained that is not made on the Form provided. The Corporation does not pledge itself to accept the lowest Tender.

By order,
ROBIN ALLEN, Secretary.
Trinity House, London, 24th June, 1880.

Burton-on-Trent.—For Sale,

by PRIVATE TREATY, a LEASEHOLD, compact and valuable large FOUR-STORIED MILL, situated at Burton-on-Trent, on the banks of the river Trent, with extensive newly-erected MACHINERY and PLANT therein, lately used as chemical, barytes, paint, and colour works, worked by water power derived from the river Trent, a never-failing source. Together with the dwelling-houses, two cottages, gardens, and several pieces of meadow land, thereto belonging, the whole containing 84, 37, 34p., and being held for the term of 21 years, computed from the 10th of October, 1875, at the annual rent of £251 5s. Two additional wheels and a small outlay would bring up the power to 50-horse, and there is ample space and accommodation for the addition of extra works, such as the manufacture of flour, chemicals, crushed bones, or vitriol, &c., and capable of doing an extensive trade. The premises are well situated for freight or carriage, either by railway or canal.—For further particulars, and permission to view, apply to Mr. A. J. FLINT, Solicitor, 42, Foul Street, Derby.

Patents.—"Patent Law in

PLAIN ENGLISH." By W. P. THOMPSON, C.E., 8th Edition. British portion, 6d.; all countries, 2s. 6d.

Published by W. P. THOMPSON and Co., Patent Solicitors and Negotiators for the Sale of Patents in all countries, 323, High Holborn, London, and 6, Lord Street, Liverpool. "It is the handiest synopsis of the subject we have seen, and we commend it to the notice of every intending patentee."—Iron.

AVIS IMPORTANT.

Le Journal "Iron" (de Fer)

Le traité de toutes les matières relatives au Commerce et à la fabrication du fer. Il donne les prix-courants des spécialités de Birmingham, Sheffield et districts voisins. Les colonnes en sont ouvertes aux rapports scientifiques et commerciaux publiés sur les métaux et sur la quincaillerie de tous les pays du monde. On y trouvera des comptes rendus et des appréciations étendues sur la fabrication du fer et sur toutes matières ayant rapport à la métallurgie, aux hauts-fourneaux, etc., ainsi que des descriptions variées sur les diverses usines. Le Journal "de Fer" ayant une circulation considérable parmi les manufacturiers, négociants et exportateurs des deux continents, est de la plus haute importance pour tous ceux qui ont à insérer des annonces industrielles ou métallurgiques.

Le Journal se publie tous les Vendredis.

Le prix du numéro est de 60 c. et le coût de l'abonnement est de 38 f. par an, frais de port compris.

On est prié d'adresser toutes communications au Directeur du Journal, No. 101, Fleet Street, London, E.C.

NOTICES.

ORES, MINERALS & METALS,

IMPORT AND EXPORT.

The only house in America giving Special Attention to Manganese and Manganiferous Iron Ores.

ADDRESS:

WILLIAM D. MARVEL,

NEW YORK.

Telegrams: "Marvel, New York."

PURTON AND SHARPNESS,

GLOUCESTERSHIRE.

IMPORTANT THREE DAYS' SALE OF THE

VALUABLE PLANT, LOCOMOTIVE AND PORTABLE ENGINES, TIMBER, MATERIALS AND OTHER ARTICLES

Used by the Hamilton Wind or Iron Company, Limited, in Constructing the Severn Bridge.

MESSRS. STEPHENSON, ALEXANDER AND CO., are instructed to SELL by AUCTION, at the above Places, commencing on TUESDAY, June 29th, at 11.30 a.m., and continuing daily until the whole is Sold, the valuable

PLANT, MACHINERY, TIMBER, MATERIALS,

&c., &c., used at these Works, the following being some of the principal Lots:—

THREE SADDLE TANK LOCOMOTIVE STEAM ENGINES,

Recently overhauled and in excellent working order,

FIVE PORTABLE STEAM ENGINES,

By Barrow and Stewart and other excellent Makers,

TWO VERTICAL BLOWING ENGINES,

TWO Costly and Superior AIR BELLS, 5 feet diameter, suitable for Sinking Cylinders in the Construction of the largest Iron Bridges in the World,

FIVE STEAM AND OTHER DONKEY PUMPS,

TWO TON STEAM CRANE,

TWO 20 TON GANTRY JENNIES, SIX GOLIATH AND OTHER GANTRIES and JENNIES,

PUNCHING and SHEARING MACHINE, 20 Single, Double and Treble Purchase Crab Winches of various descriptions, 12 Screw and Hydraulic Lifting Jacks of strengths varying in power from 1 to 20 tons,

LIME MILL, by Clayton and Shuttleworth, With fittings and appliances complete, in excellent condition, 600 fathoms of five-eighth Chain, 20 Tons of various size Chain, TWO SCOWS, 33 feet and 72 feet long, strongly built, fitted with Sisons and White's Patent Endless Chain Pile Drivers and Engines,

FIVE BARGES,

With Gear Fittings and Appliances complete,

TWO PATENT IRON LIFEBOATS,

24 and 28 feet by 6 and 8 feet beams,

FOUR COPPER FASTENED BOATS,

13, 21 and 35 feet by 4, 5 and 7 feet beam, with Sails, Kedge Anchors, Chains and Oars complete,

FIVE VARIOUS SIZE BOATS,

Of useful dimensions,

Between 20 and 30 Tons of New Nuts and Bolts,

SEVEN SURPLUS 10-foot IRON CYLINDERS,

SIXTY TONS OF WROUGHT SCRAP IRON,

FIFTY TONS OF SHORT RAILS,

Several Contractors' Earth Waggon, 4 feet 8½ inch Gauge,

CORRUGATED IRON AND WOODEN BUILDINGS, OFFICES, &c.,

Three Sets of SIEBE and GORMAN'S DIVING APPARATUS and DRESSES,

Divers' and Submarine Tools,

CENTRIFUGAL AND OTHER PUMPS,

2000 SPRUCE DEALS,

60,000 CUBIC FEET OF PITCH PINE IN BULK,

Of superior growth, in excellent condition.

Easy of transit by rail or water,

100 VARIOUS SHEAVE IRON PULLEY AND SNATCH BLOCKS,

Large and varied assortment of Smiths' Tools,

30 LADDERS, from 9 to 40 feet in length.

Iron and Wooden Skips, Trolleys, &c.,

Fitters' Tools, Hearths, Circular Billows,

Drilling Stands, Ratchet Braces, Drills,

SHEAR LEGS, DERRICK POLES, ROPES,

Brass, Piping, Sheet, Bar and other Iron, &c., &c., and the whole of the Plant and Effects used in the construction of the Severn Bridge.

Catalogues are in course of preparation, and may be obtained of the Auctioneers at their Cardiff Offices, the principal Hotels at Lydney, Sharpness, Berkeley, Gloucester and Bristol, on and after the 19th of June.

Galvanised Ironwork

Tanks, &c.

PORTOUS & CRAWFORD,

ANDERSON GALVANISING WORKS,

24, ELLIOT STREET, GLASGOW.

In the matter of the Companies Acts, 15 & 16, 1867, and 1877, and in the matter of Thomas Harrison and Company, Limited. In Liquidation.

The Creditors of the above

named Company are required on or before the 10th day of July, 1880, to send their names and addresses, and the particulars of their debts and claims; and the nature and particulars of any securities held by them (if any), and the names and addresses of their Solicitors (if any), to Robert Stanley Blease, Liquidator of the said Company, at the Office of Messrs. J. S. and R. B. Blease and Sons, Accountants, 25, Castle Street, in the City of Liverpool, or in default thereof they will be excluded from any participation in the assets of the Company, it being intended to make a distribution thereof immediately after the said 10th of July, 1880, and the said Robert Stanley Blease will not be liable for any debt or claim of which he shall not then have had notice.

Dated this ninth day of June, 1880.

ROBERT S. BLEASE, Liquidator.

DIAMOND BORING.

ARTESIAN WELLS bored STRAIGHT and TRUE—Large and small diameters—easy to line and put down Pumps—Tenders given for Wells, Pumping Machinery, and Engines, complete. PROSPECTING FOR MINERALS to any depth—The only system by which a true section of the strata can be obtained from the cylindrical cores taken out.

Total boring by this system in Great Britain to end of last year, 104,000 feet.

For terms apply to JOHN VIVIAN, C.E., Whitehaven, Cumberland.

JOHN BELLAMY,

BYNG STREET, MILLWALL, LONDON, E.

MANUFACTURER OF

WROUGHT IRON TANKS AND CISTERNS.

Cattle, Sheep, and Pig Troughs, Cart Bodies, Corn, Flour, and Sack Bins, Funnels, Shoots, Hoppers, Boilers, and every Description of Wrought Iron work either painted or galvanised.

The only BELLAMY in the Trade.

No connection with any other house trading under this name.

DER PRACTISCHE

Maschinen-Constructeur.

Zeitschrift für Maschinen- und Mühlenbau, Ingenieur- und Fabrikanten.

Unter Mitwirkung bewährter Ingenieure und anderer Fachmänner aus dem In- und Auslande her gegeben von

Wilhelm Heinrich Uhlend.

Civil-Ingenieur und Patent-Anwalt in Leipzig.

Verlag von BAUMGARTNER'S BUCHHANDLUNG in Leipzig.

Inhalt des 11. Heftes: Regulator für hydraulischen Motoren. Ueber das Wasserröhren-Kessel-System und dessen praktische Anwendung. Unkrautauslese und Getreidesortiermaschine von Ingenieur Krüger. Mühlenstein-Stellzeuge. Patent-Präzisions-Sägemaschine. Pulsometer und Ejector in Wasserstationen. Raderfräsmaschinen mit Patent-Theilapparat. Der Stahl für Schiffbau und Maschinenconstructionen. Das Zukunft. Kessel-Speisewasser-Filter. Wick's logotypische Seilmaschine.

Der "Practische Maschinen-Constructeur" erscheint in halbjährlichen Heften und kostet pro Quartal (6 Hefte mit Holzschritten und 24 autograph. Tafeln, sowie vielen Skizzenblättern) 6 Mark 75 Pfg. Einzelne Hefte werden nicht abgegeben! In London bei Herrn Williams und Norgate, 14, Henrietta Street, Covent Garden.

New Edition.

"How to Make Money by

PATENTS." Free, by post, 14 stamps.

BARLOW and YOUNG, Patent Agents and Consulting Engineers, 23, Southampton Buildings, W.C.

A SILVER MEDAL, PARIS, 1878.

For Excellence of Quality,

WAS AWARDED TO

THE GLENBOIG FIRE CLAY

COMPANY,

ESTABLISHED 1836.

Office: 68, BATH STREET,

GLASGOW.

MANUFACTURERS OF FIRE BRICKS FOR

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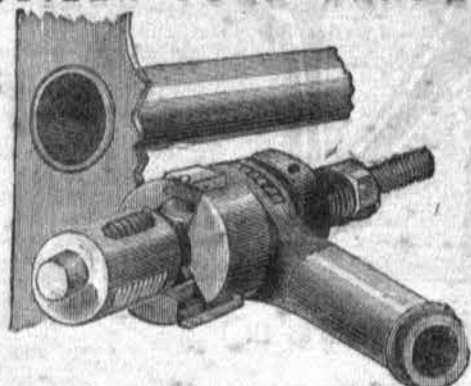
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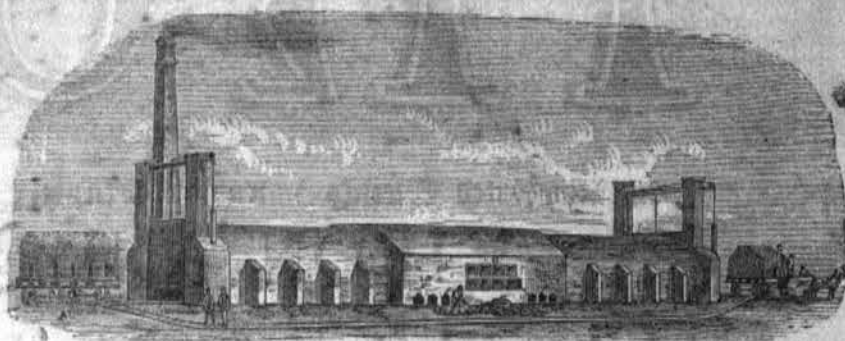
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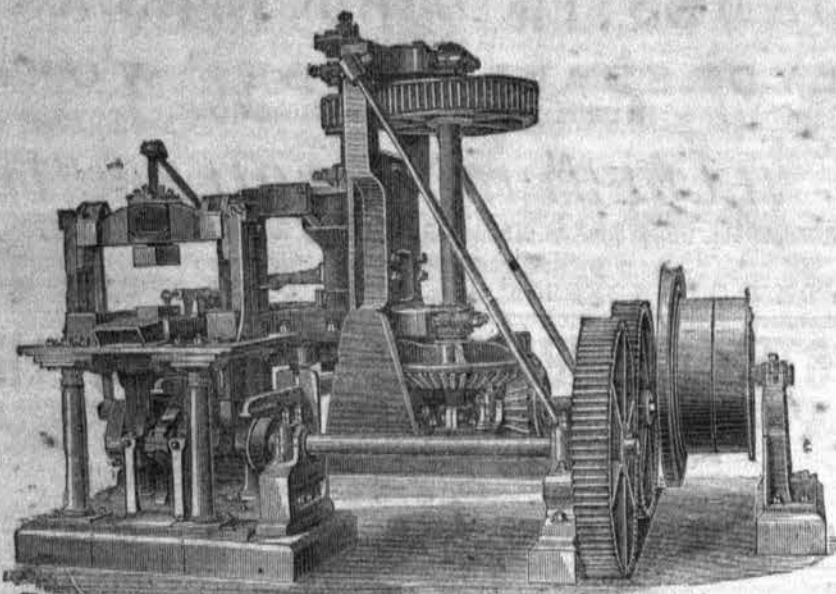
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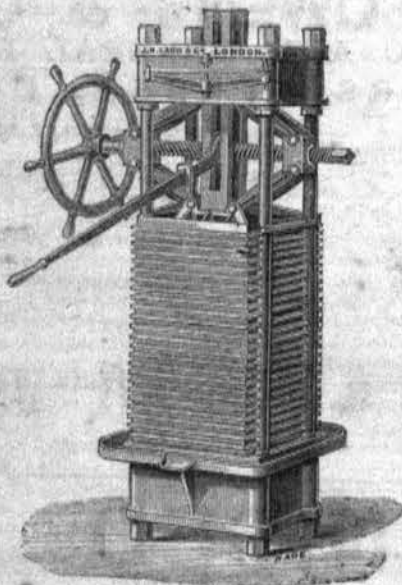
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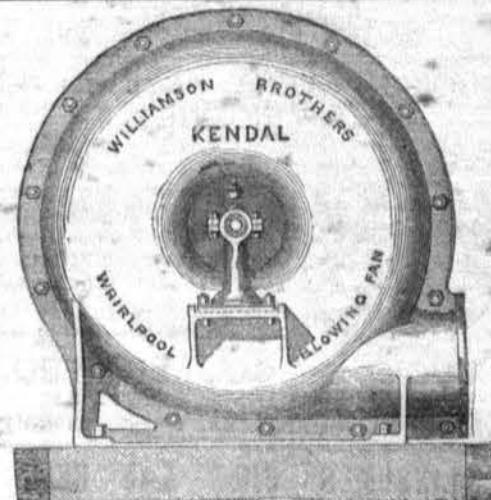
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STEEL RAILS, FORGINGS, PLATES & CASTINGS.

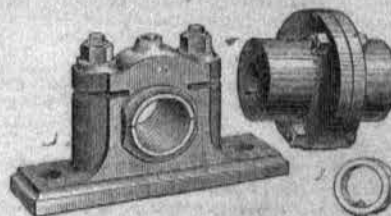


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As shown below or in halves,
made any diameter or width.

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add 10 per cent. to following prices:

LEADING SIZES AND PRICES, TURNED AND BORED.												
Diameter in inches	6	8	10	12	15	18	21	24	28	32	36	42
Width, ditto	2	2	2	3	3	3	3	4	4	4	5	5
Price, shillings	8	9	10	11	14	17	20	25	32	38	45	55
Do. Plain do.	5	6	7	8	10	13	16	20	25	30	38	45

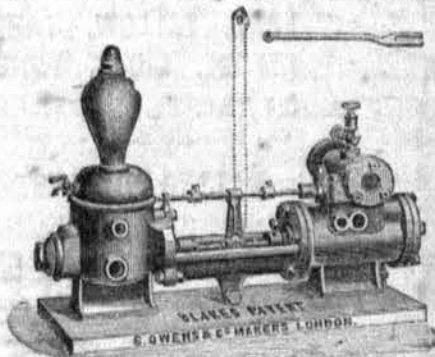


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Bore, in inches to standard	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
PLUMMER BLOCK, each	6	8	10	12	14	16	18	20	22	24	26	28
COUPLINGS, pair	8	10	12	14	16	18	20	22	24	26	28	30
LOOSE COLLARS, each	2	3	4	5	6	7	8	9	10	11	12	13
SHAFTING, sup. qual. foot	1	1	1	1	1	1	1	1	1	1	1	1

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Air, and for a variety of other purposes. They are simple and
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"That a pump clack faced with Vulcanised Fibre one half inch thick, was put into work January 13th, 1879, and was taken out July 3rd, 1879, having been in work 171 days. During this time the pump made 741,827 strokes, and raised 74,182,700 gallons. The clacks were previously used with leather facings; these only lasted in work about 40 days; when faced with gutta percha, they last in work about 150 days, but gutta percha is 5s. per lb., whereas the fibre is only 2s."

The HARD is a Substitute for Metals, Ivory, Vulcanite, Ebony, &c., and is used for Journal Bearings and Bushes, Condenser Ferrules, Railway Fish-plate Washers, Pneumatic Carriers, Electric Machines, &c.

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"I esteem it very highly, and use larger quantities of it than Vulcanised Rubber, and, in its present condition, find it very satisfactory."

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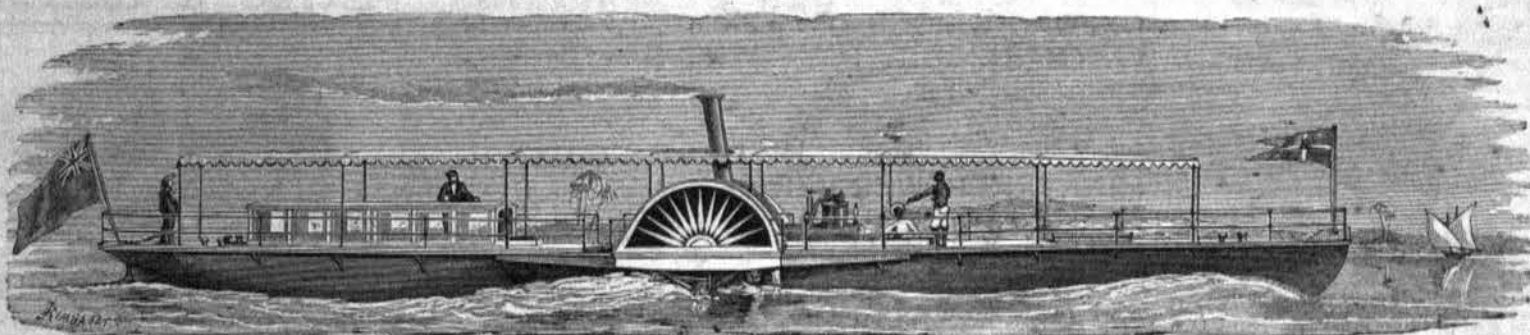
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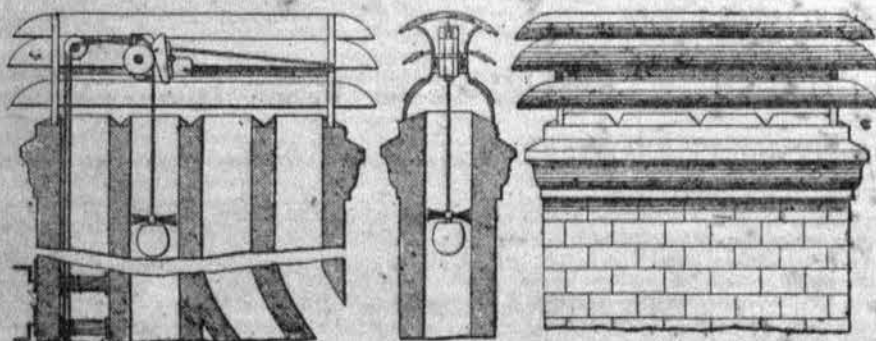
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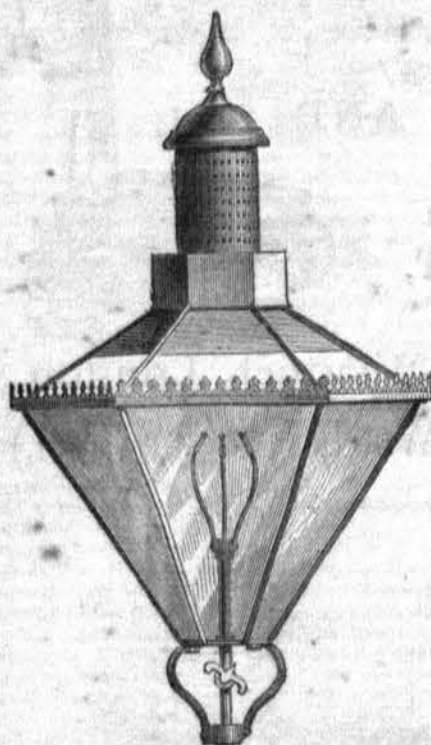
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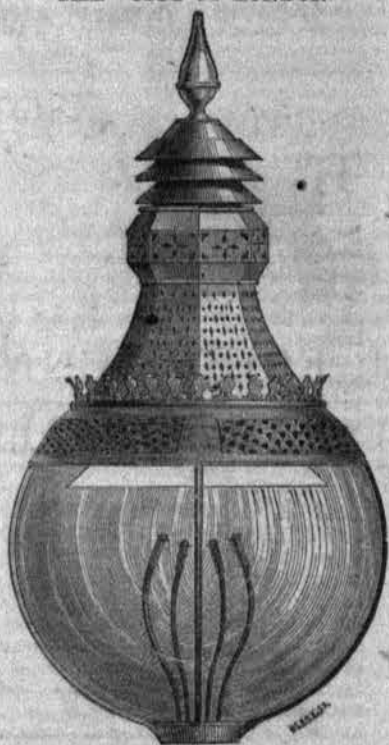
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Patent Flat-Flame Combination Burner
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I beg to call your attention to the fact that the Flat-Flame Burners and Lanterns of high Illuminating Power lately erected in front of the **HOUSES OF PARLIAMENT** (The "Westminster," 150 Candles Illuminating Power), opposite the **TREASURY, WHITEHALL** (The "Westminster," 150 Candles Illuminating Power), **CHARING CROSS** (The "Westminster," 150 Candles Illuminating Power), **HAMILTON PLACE** (The "Lambeth," 50 Candles Illuminating Power), and **GROSVENOR GARDENS, St. George's Vestry, Hanover Square** (The "Lambeth," 50 Candles Illuminating Power), **OXFORD CIRCUS** (The "Lambeth," 36 Candles Illuminating Power), **FINSBURY PAVEMENT** (The "City of London," 50 Candles Illuminating Power), &c., are my registered patterns, and constructed on the same principle as those recently exhibited at the **Birmingham Trial**, where the **HIGHEST RESULT IN ILLUMINATING POWER PER CUBIC FOOT WITH FLAT FLAMES** was obtained by my Burners of this class (see "Journal of Gas Lighting," March 16th).

THE FACT THAT OVER 1500 OF MY LARGE BURNERS AND LANTERNS HAVE BEEN SUPPLIED TO MUNICIPAL AUTHORITIES AND GAS COMPANIES IN ENGLAND ALONE, WITHIN A VERY SHORT TIME, SPEAKS SIGNIFICANTLY OF THE EXCELLENCE OF THIS SYSTEM AND THE REAL MERITS IT HAS BEEN PROVED TO POSSESS.

My Argand Burners and Lanterns are in use by the following in the Metropolis:

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St. George's Vestry,
St. Mary's (Rotherhithe) Vestry,
Lewisham Board of Works,
St. Giles' Board of Works,
Whitechapel Board of Works,
Great Eastern Railway,

Great Northern Railway,
London, Brighton and South Coast Railway
(Victoria and London Bridge Stations),
Metropolitan Railway,
Columbia Market, London.

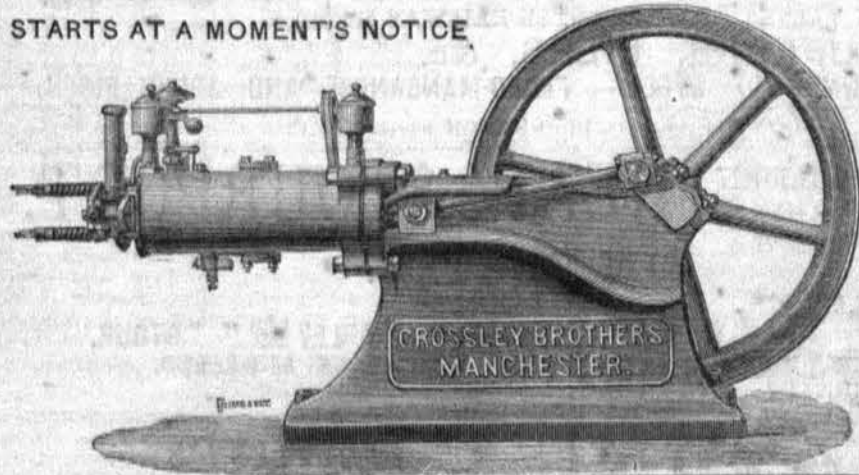
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OVER 2,500 ALREADY DELIVERED.

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No Glands to pack, or Water-Gauges and Steam-Gauges to watch.

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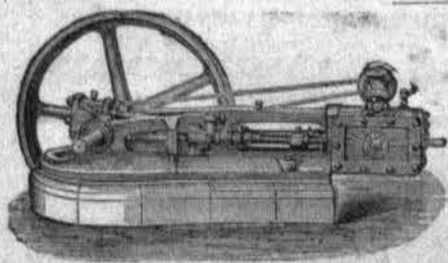
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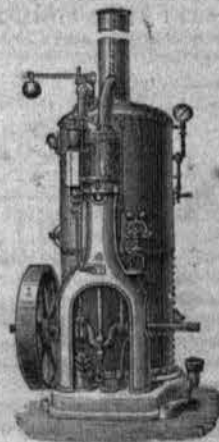
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LONDON, FRIDAY, JUNE 25, 1880.

THE ROYAL ALBERT DOCK.

THE works of this important undertaking, which has hitherto been known as the Victoria Dock Extension, have at length been brought to a successful issue, and the Dock was formally opened yesterday by Their Royal Highnesses the Duke and Duchess of Connaught, as representatives of Her Majesty the Queen. The ceremonial was of an imposing character, and was attended by a large circle of distinguished visitors, who, with the Royal party, were conveyed from London to the Royal Albert Dock in thirteen steamers. We have from time to time published progress reports of these gigantic works, in which we have described them more or less in detail. We therefore propose on the present occasion to confine ourselves to a general description. We need hardly remind our readers that the object of the extension is to afford greater accommodation for vessels than the old docks could give, and to save a long round for ships through Woolwich and Bugsby Reaches to the present entrance of the docks. The saving in distance will be about 3½ miles, as there will be an entrance at Galleon's Reach, the water-way of which will admit of the largest vessels entering and leaving the docks. The new works are about 1½ miles long, and include, first, the connection with the old docks, beyond which is a basin having 72 acres of water area, with graving docks annexed on the south side. Near the junction of the new with the old docks, formerly ran the North Woolwich branch of the Great Eastern Railway, which was for a time diverted, but has been restored to its former line of route, but not to its former level, as it passes through a tunnel 43 feet below that level. The railway traffic was diverted through it on the 23rd of June last year. This tunnel has an incline of 1 in 50 from either end to the central point where it passes under the dock; and it has 25 feet 6 inches of water over it. The main basin is 6500 feet long and 490 feet wide, with a minimum depth of 27 feet of water. Beyond the main basin is an entrance basin 9 acres in extent, which alone is just equal to the area of the present St. Katharine Docks. The entrance lock is 750 feet long over all, by 80 feet wide, and has a depth of 30 feet on the outer and inner sill. It is constructed in concrete, brick and stone, with the necessary gates and sluices and channels for the entrance, regulation and exit of water. Beyond the entrance gate are a couple of open-timber jetties, each extending 300 feet into the river. The old and new docks are three miles in length and have an aggregate length of about eight miles of quay, including the jetties in the old dock.

The concrete walls, nearly four miles in length, surrounding the docks, are built up in solid concrete on the gravel, and are 18 feet wide at the base, benched up to 7 feet wide at the top and 33 feet high. The magnificent entrance lock, with its hydraulic machinery, is a fine piece of workmanship. It has three pairs of wrought-iron gates made and erected by Messrs. Brassey and Co., of Birkenhead, and presents a massive and imposing appearance. The swing bridge, 90 feet span, which carries the Woolwich Manor Way across the extension, has been constructed by Messrs. Westwood, Baillie and Co., of Poplar. The engine-house and apparatus for providing power for the hydraulic machinery with which the dock is liberally furnished is another important work. The construction of the railway tunnel was a work of no small magnitude. The tunnel itself is 1800 feet in length, the portion where it passes directly under the passage connecting the new and old docks being in double archways similar in section to the Thames Tunnel. The open cuttings leading to the tunnel at either end are constructed with concrete walls kept asunder by flying arches of concrete. The works at this passage include a massive skew swing bridge, 180 feet long by 48 feet wide, carrying a double line of railway and a carriage way in addition across the passage, 80 feet wide, and at a height of 12 feet above Trinity high water.

There are also two extensive graving docks, which are wholly constructed of concrete, and which are 410 and 500 feet long respectively, with 22 feet of water on the sills at Trinity high water. The pumps for emptying these docks are by Messrs. Watts. The caissons for the entrances were made at Messrs. Westwood and Baillie's, who have also erected the magnificent line of wrought-iron sheds some 6000 feet long and 120 feet wide, on the North Quay of the extension.

The works are a mile and three quarters in length, and the time occupied in their construction has been about four and three quarter years, and they will cost, when completed, nearly a million of money. The excavations extend over 100 acres, and amount to 3,500,000 cubic yards, the concrete walls and dry

docks to 500,000 cubic yards, the brickwork to 55,000 cubic yards, the stonework to 46,000 cubic feet, the timber to 200,000 cubic feet, while the wrought iron used in the gates, caissons, sheds, bridges and works generally, exclusive of all the hydraulic machinery amounts to over 4500 tons. Upwards of twenty millions of bricks and 79,000 tons of Portland cement have been brought on the ground, whilst 1700 men, eighty horses, seventy locomotive and other engines, with an aggregate of 500 horse-power, 600 earth-waggons and three steam navvies have been daily employed on the works, of which Mr. Rendel is the engineer-in-chief, and Mr. Andros the resident engineer. Messrs. Lucas and Aird are the contractors, their agent being Mr. W. Colson. The dock is to be illuminated by the electric light on the Siemens system. The lights will be each of 6000 candle-power and are to be mounted on iron columns 80 feet high placed all over the quays. The electric current will be generated by four steam-engines placed at various points in the dock.

The opening ceremony was, as we have stated of a very imposing character. Their Royal Highnesses the Duke and Duchess of Connaught left the Speaker's stairs, Westminster, about twelve o'clock yesterday morning in the steamer *Victoria*, Mr. George H. Chambers, the Chairman of the London and St. Katharine Dock Company (to whom the new dock belongs), Mr. James Brand, the Deputy Chairman; Mr. W. Hamilton Crake, the treasurer; Lieut.-Colonel Martindale, C.B., the General Manager; and Mr. Rendel, C.E., the Engineer of the Works, and their ladies, were in attendance, and the band of the Royal Engineers played on board. Twelve other steamers conveyed the directors of the company and their friends; members of the Government and both Houses of Parliament, proprietors of the company; the contractors for the works and their friends; the representatives of the great Shipping and Railway Companies; and merchants, shipowners, and others interested in dock business. The twelve steamers followed the *Victoria* down the river, until they were off Woolwich, where the Royal party was transferred to the Trinity steam-yacht *Vestal*. While that was being done the other steamers entered into and lined the basin of the new dock on either side. The *Vestal* then entered the lock under a Royal salute, which was fired by the 3rd Essex Artillery Volunteer corps. She then steamed through the basin between the lines of steamers, and entered the dock under a second Royal salute fired from the south side of the dock by the London (City) Artillery, the bands playing the National Anthem. The *Vestal* was then moored along side the north quay, and the directors of the company, the local clergy, the contractors, the resident engineer, the contractors' agent, and the officers commanding the regiments on duty, the guard of honour, and saluting batteries, went on board. An address was then presented to their Royal Highnesses by the Chairman of the company, and replied to by his Royal Highness the Duke of Connaught. After a prayer by the Bishop of St. Alban's, his Royal Highness named the present Victoria Dock the Royal Victoria Dock; the Victoria Dock Extension, the Royal Albert Dock; and the docks as a whole, the Royal Victoria and Albert Docks, in accordance with the permission of Her Majesty. A salute of twenty-one guns was then fired, and the bands played Rule Britannia. The directors were then presented to their Royal Highnesses, as were also Messrs. Lucas and Aird, Mr. Andros, Mr. Colson, and the officers commanding the regiments on duty, the guard of honour, and the saluting batteries.

After the presentations their Royal Highnesses landed, the guard of honour and band being furnished by the 26th Middlesex Rifle Volunteers. The party then proceeded to luncheon, to which nearly 4500 guests sat down in one building, and the band of the Royal Engineers played in the hall during luncheon. After the usual loyal and other toasts, the Royal party and general company re-embarked, the *Vestal* leading, and the other steamers following. A salute of twenty-one guns was fired as their Royal Highnesses left, the bands playing the National Anthem. A salute of twenty-one guns was also fired as their Royal Highnesses passed the jetties, the bands there also playing the National Anthem. Upon leaving the dock, the *Victoria* followed the *Vestal*, and was followed by the remainder of the steamers. On arriving off Woolwich the Royal party was transferred to the *Victoria*. The whole of the steamers then returned to London.

It will thus be seen that the ceremony was a most interesting and imposing one, and being so, was well in keeping with the character of the undertaking thus loyally inaugurated, which is the finest of its kind in the world. Whether we regard the design and arrangement or the construction of these gigantic works we can only find occasion to compliment those who have taken part in bringing them to their present successful issue. The London and St. Katharine Dock Company are to be congratulated no less upon the acquisition of such a valuable property than upon having secured the services of the gentlemen to whom we have referred, in creating that property out of the barren waste of marsh land where, five years ago, silence reigned almost supreme; but where the entry and exit of fleets of the largest ships built will henceforth introduce the daily hum and bustle of busy dock-life.

OUR TRADE SUMMARY.

IN nearly all the great centres of the trade the depression in pig-iron continues, with, in some cases, declining prices, and with few signs of speedy improvement. The only striking exception is the West Yorkshire manufacture of best iron, which has markedly improved of late in face of all the retrogression elsewhere. In Glasgow the warrant market has been more lively, but entirely from speculative causes, and the temporary improvement there has, as usual, been felt at Middlesborough. The labour difficulty is also acting detrimentally upon trade, especially in the West Cumberland district, the staple industry of which has been completely paralysed by a strike so extensive as to occasion the damping down of nearly all the furnaces. There was great excitement in the Glasgow warrant market during all the past week, with a large business at constantly varying prices; closing on Wednesday, buyers 47s. 9d. cash, and sellers 47s. 9d. one month fixed and 47s. 10d. cash. There has also been a general advance of several shillings per ton in makers' iron, and rather more done in manufactured, but with an ultimate drop in prices. With the exception of the shipbuilders, who are still busy on old orders, the other departments are very slack. Great firmness has characterised the Middlesborough market during the week, in sympathy with the state of things in Glasgow, and both founders and finished-iron manufacturers are doing a fair amount of business. On the other hand the iron trade of the Tyne district has been extremely depressed, many of the hands making holiday; but the cheapness of the raw material has sent business to the engine works, large orders having been recently received both for marine and locomotive engines. The shipyards also are well employed on, for the most part, good payable specifications. Much the same state of affairs is reported from Durham as regards crude iron; but the shipbuilding industry as well as the engineering establishments may be described as moderately well off. There is no improvement in the hematite trade of the north-west, although in the Barrow district the output is well maintained, owing to many large deliveries being still uncompleted. Shipbuilders and engineers are briskly employed, the latter holding orders likely to keep them so for several months to come. The almost universal strike of the West Cumberland iron-workers has completely stopped the trade in that district. There was only a quiet market at Manchester on Tuesday. There is little local demand there for iron at present, and few purchases are being made in anticipation. In the South Lancashire finished-iron department also there is little that is satisfactory to chronicle. From Derbyshire and North Lincolnshire our reports are to a similar effect, but in the former there is little diminution of output. There has been a slight improvement in the North Staffordshire finished trade, and the demand for plates is moderately good. In the southern division the production of pig is largely in excess of the consumption. In South Yorkshire the output is still being kept up, but prices are weaker and stocks accumulating; and though the mills and forges are fairly well employed, the foundries are doing very little. The iron mills in the Sheffield district, which, during the past half-year, are understood to have been doing a very remunerative trade, are now for the most part running on old orders. In the Bessemer department the downward movement of prices continues; but the ship-plate department is very busy and more is doing in boiler irons. The staple trades of Sheffield are again very flat. It is estimated that business has fallen off fifty per cent. during the last month. In the local trades of Birmingham there is also very little doing, but a somewhat better prospect in the immediate future. The condition of the kindred industries in the Wolverhampton district is much the same. The coal trade is every where reported slack, with no sign of improvement.

THE INSTITUTION OF CIVIL ENGINEERS.

THE annual *conversazione* of the Institution of Civil Engineers was held on Wednesday evening last, when the President of the Institution, Mr. W. H. Barlow and Mrs. Barlow received a large and distinguished circle of ladies and gentlemen. The *conversazione* took place in the South Kensington Museum by permission of the Lords of the Committee of Council on Education. The reception was appropriately held in the court which contains the collection of ancient and modern ironwork, from whence the guests proceeded to the south and north courts. In the chapel on the north side of the latter court, the string band of the Royal Artillery was stationed, and performed a selection of music and part songs during the evening. The picture galleries were also thrown open to the visitors, and included the Sheepshanks collection, and the national collection of water-colour drawings. The south court was lighted with the Brush electric light, which has been adopted by the authorities as the means of illumination there. It was highly effective, and attracted considerable attention. It has only recently been applied, and the machinery has hardly got into regular smooth working order, the helving

being new, and there being other little hindrances to thoroughly steady burning. But notwithstanding all this, the light emitted was exceedingly satisfactory. Refreshments were served during the evening, and the gathering proved a brilliant and successful as well as a most enjoyable affair.

THE DÜSSELDORF EXHIBITION.—II.

By Dr. A. GÜRLT, of Bonn.

COMING from the principal entrance-hall, through the exhibition of fine arts and art manufactures, gaily decorated, and resplendent with colour, one receives an almost solemn impression by entering the mining department, where the eye is struck first by those huge obelisks of black, shining coal, which mark the boundary of this department, being real sections through the thickness of the seam Blucher in the coal mine of Dudweiler, near Saarbrücken. Large blocks of coal, representing sections of seams in some of the principal Westphalian collieries are arranged along the walls; and specimens of smaller size, together with samples of washed coals, are laid out upon tables, in order to show the different qualities of the various coal-beds. Everybody sees at once, that coal-mining evidently plays a great part in the industrial life of these provinces, and we therefore propose to have a brief glance at its history, following it up from the coal basin of the Ruhr to that of Aix-la-Chapelle, and that of Saarbrücken.

Coal-mining, no doubt, ranks now first in the basin of the Ruhr, or of Westphalia, but it has only gradually reached its present importance. We find, however, coals mentioned as early as 1302 in the chronicles of the town of Dortmund, and in the region of Essen they are first known by authenticated documents in 1317. The earliest working and winning of coal took place on the slopes of the Ruhr valley, where numerous seams crop out, and could be easily reached by shallow diggings or short adit levels. The oldest mine, which is still in existence, is the Hagenbeck Colliery, near Essen, which even before 1575 had certain covenants and rules, which are still preserved; while the mine Sälzer and Neuack is mentioned in 1623, Schölerpad in 1678, and Bröckling in 1682. In about the year 1600, miners from Liège, in Belgium, where coal-mining had existed since about 1200, were called by the town of Dortmund to introduce there the improvements of their craft. As hardly any manufactures existed in these regions up to the beginning of this century, the demand for coals was not large and the output of the coal-mines inconsiderable; Holland, however, was a good and steady customer for coal at an early date, as the rivers Ruhr and Rhine gave an easy means of carriage. In the neighbourhood of Essen, 127 small collieries were at work and 44 lay idle in 1802, the total output being about 135,000 tons of coal while in 1829 the output had increased to 180,000 tons, and that of the whole district may be computed at about 300,000 tons. When Belgium became independent in 1830, the demand of the coal market of Holland increased considerably, but coal-mining could only make rapid strides after the opening of the Cologne-Minden and Steele-Vohwinkel Railways in 1847, and that of Oberhausen-Ruhrort in 1848, which brought the greater part of the collieries into direct connection with the Rhine. A wise legislation in 1852 also freed the mines from many fetters, with regard to management and fiscal dues, so that, while the production of Westphalia in 1852 had only been 1,900,000 tons, it had in 1879 reached the respectable figure of 20,000,000 tons, in raising which, 80,000 men and 1700 steam-engines, of 140,000 horse-power, were employed. The coal-measures of Westphalia rest upon Devonian millstone grit and are folded up into four troughs, stretching from west to east, and separated from each other by three arches or anticlinal bends, which lift the deepest coal-seams nearest up to the surface or are partially without coal, when the millstone grit rises as high. The four troughs are called those of Witten, Bochum, Essen and Duisburg; they increase in width and depth from south to north in this succession, and in the largest of them, that of Duisburg or Dortmund, a total of 90 valuable coal-seams, with a joint thickness of 286 feet of coal is at present known, imbedded in a total thickness of the coal-measures of 9023 feet, or the workable coal takes the place of 3 per cent of the whole formation. The upper surface of the coal-measures has a gradual dip towards north, and although it crops out in the Ruhr valley and the southern part of Westphalia, it becomes covered by the Cretaceous formation north of a line which can be drawn from Duisburg to Essen, Bochum, Dortmund and further east, while only a small part of the Duisburg trough, particularly near the valley of the Rhine, is also covered by the Tertiary strata. Some parts of the Cretaceous rocks are highly water-bearing; all mines which work below them have consequently to deal with water, which causes very often considerable difficulties in the sinking of shafts. These difficulties increase generally towards north with the thickness of the super-imposed Cretaceous strata. Owing to these local circumstances the technical development of the art of mining has adopted peculiar features with regard to sinking, winding,

pumping and ventilating, as will be seen directly. It may here be mentioned, however, that the first pumping steam-engine of this district was erected in 1803 by J. Dinnendahl, of Steele, at the Wohlgemüth Colliery, near Kupferdreh, to which followed for the mine Sälzer and Neuack a 40-inch pumping-engine in 1806, and a 15-inch winding-engine in 1809.

Coal-mining in the basin of Aix-la-Chapelle is said to have commenced in 1113 with the discovery of coal near Herzogenrath. It is, however, certain that it was in existence long before 1300, as the town-books of Aix-la-Chapelle make mention in 1333 of coal-miners, or "fossorés carbonum," as municipal servants who worked the coal in the coal-mountain, or "koelberg," of Kohlscheidt near that town. In 1602 certain rules and regulations were issued by the magistrates for observation by these miners. Eastward of Aix-la-Chapelle coal-mines were also worked near Eschweiler as early as 1492, and pumps driven by water-wheels had been introduced in 1597 and 1616; while a large pump for the drainage of the upper seams in the trough of Eschweiler, called the "Herrenkunst (masters' artifice), or Plattkohlskunst (named after a coal-seam), was erected there about 1700, replaced in 1791 by the first steam-pumping engine in the district. After the French conquest the mines were confiscated and farmed out, until in 1832 the leaseholders became proprietors. The amount of coal raised in the Aix-la-Chapelle basin was in 1817 only about 115,000, and in 1852 1,000,000 tons. This basin is divided in two large troughs, the strata of which crop out on the south and south-west, while they dip towards north-east; they are called those of the Inde and the Worm, both small rivers, which flow through them. The eastern, or Inde trough, is dissected by a large fault, called "Münstergewand," which towards the north has the local name "Feldbiss"; it dislocates the strata considerably, and throws them 251 metres downwards and 146 metres northwards; similar other large faults, which reach a thickness of 52 metres, and are filled with water and sand—for instance, that called "Sandgewand"—dissect furthermore this trough, which contains 46 workable seams, causing no small difficulties to all mining operations. The Worm trough is cut by the fault "Feldbiss," and contains 45 seams, which are in a singular way folded up and broken at sharp angles, of which one side has always a steep dip, and is called "Rechte," while the other side lies flat and is called "Platte." The coal-measures are in both, so far as they do not come up to the surface, covered with water-bearing Tertiary strata, which at mine Maria, near Hönigen, are 43 at mine Anna, near Alsdorf, 74 to 90, and at Niveststein reach over 175 metres in thickness, thus being a cause of considerable trouble and difficulty.

Looking now at the coal basin of the Saar valley, we find there coal diggings as early as the fifteenth century; coals are then mentioned in a document of the year 1529, when the domain of Saarbrücken distinctly reserves its right upon the production and use of coals, which declaration was repeated in 1549 by the Palatine Wolfgang von Weldens, who mentions the coal-seams of Sulzbach and Saarbrücken. An ordinance for the coal-diggings of Sulzbach and Dudweiler was promulgated in 1556, which reforms an ordinance, that is no more extant, and has for its purpose the regulation of the workings which seem to have been carried on rather roughly by the various communities. About the end of the 17th and beginning of the 18th century, coal-mines are mentioned near Neunkirchen, Wellesweiler, Burbach, Friedrichsthal, Illingen and Schwalbach. Very great abuses seem, however, to have existed there, when, in 1754, Prince Wilhelm Heinrich of Nassau-Saarbrücken took possession of the mines and had them regulated by trained miners; he also tried to increase the consumption of coal by using it for lime-burning, glass-making and the smelting of iron. We find, indeed, the first attempt to work a blast-furnace with coke, made here at Fischbach about 1768. Until 1795 the annual production of these mines was hardly more than 2500 or 3000 tons a year; they were then worked on account of the French republic and yielded 50,000 tons of coal in 1795, and 80,000 tons in 1815. After the peace of 1815, this valuable mining property fell to the crown of Prussia, and under the management of Prussian mining officials the production of the Saarbrücken mines increased slowly in 1830 to 200,000, and in 1850 to 600,000 tons. After the coal-basin of the Saar was better opened up by new canals, by the canalisation of the river Saar, and by railways, the annual output increased rapidly in 1852 from 14 mines with 6000 miners to 750,000 tons, and 1879 with 21,500 men to 4,475,000 tons. Besides the Government mines, coals were also raised in private mines—in Prussia 85,270, in Lorraine 431,000 and in the Royal Bavarian mines 147,470 tons; so that the total production of the Saar basin in 1879 reached the respectable figure of 5,139,000 tons, the coal being to a considerable extent sold in Alsace-Lorraine, Switzerland and France. The mines have not to deal with any great difficulties; the seams do not lie deep, they are thick, and not covered by water-bearing strata, and though they are dislocated by numerous faults, the disturbances caused by them are easily overcome. Until 1838 all mines were levels worked by adit only, the first deep-level mine was since then begun, but at present all the large Government mines have become deep mines. The Saar basin comprises 164

coal-seams with a total thickness of 360 feet, enclosed in a thickness of coal-bearing rocks of 3200 metres; that is, the coal-seams occupy 3.39 per cent. of the coal-measures of this district.

The three coal-basins which are represented at the Exhibition had therefore, in 1879, an output of 20,000,000 tons at the Ruhr, 5,139,000 at the Saar, and 1,000,000 near Aix-la-Chapelle, together more than 26 millions of tons; to which are still to be added the production of the smaller coal-mines at Ibbenbüren and Obernkirchen, and of the Tertiary brown coal or lignite mines upon the Vorgebirge near Bonn, and on the Westerwald, to the amount of 150,000 tons.

If we take a glance at the geological and mining maps, which are exhibited in this section, we have first of all to notice the large geological map of Rhineland and Westphalia by Dr. H. von Dechen, of Bonn, which has appeared in 34 sections, in the years 1855 to 1865, and of which a second revised edition is under preparation. This map is accompanied by a general map on a small scale, which appeared in 1866, and of which the second edition is to come out shortly. These maps reflect the general geological features of the whole district which is represented at the Exhibition.

The several maps of the coal-fields and the numerous sectional drawings of coal-basins, only serve as an amplification of special parts of this map; they are, however, of the first importance for the interest of the coal-mining districts generally. We notice first the large map of the Ruhr coal-basin, which made its first appearance in 1868, and is now to be revised and re-edited by Dr. Schultz, of Bochum, in 43 plates, on the scale of 1:10,000, while numerous large diagrams are to illustrate special cases on the scale of 1:5000. Ten plates of the new map are exhibited, together with 11 plates with diagrams by the "Westphälische Bergwerks-Schaftskasse," an institution founded in 1864 by the colliery owners of the district for the purpose of furthering scientific undertakings of common interest, particularly the editing of special mining maps, as well as the education of a proper mining staff in mining schools, of which we will say a word hereafter. This admirable map is furthermore illustrated by three large sections through the coal-basin, which ornament the walls, as well as nearly 60 sections through as many collieries, which are exhibited by the "Coalowners' Association for the Promotion of Mining Interests in Westphalia," to which belong no fewer than 100 coal-mines, which raise by far the greatest amount of the 20 millions of tons mentioned above. Other maps give an idea of the economical importance of the collieries of the district, among which we notice a large map, which shows the boundaries of all the collieries on the surface, and is so shaded that the darkest portions have the largest production per annum, those left white none yet, or none any more; while others show the ratio of consumption of coal in neighbouring countries, and at home of the gradual increase of the output, of the amount of money paid by the works into the fund of the "Provident Miners' Union," or "Knappschaft," &c. The Aix-la-Chapelle coal-basin is represented by a similar map of the coal-fields, edited by Honigmann, with several large sections through the basin in various directions, as also through some special mines, which show the great faults mentioned above; these are exhibited by the "Mine Union Company of the Worm district," the "Aachen-Höngen Coal Company," and the "Eschweiler Coal Company." The coal-basin of the Saar is illustrated by large-scale sections shown by the Board of Directors or "Bergwerksdirection" of Saarbrücken. From there may be seen how the coal-measures are thrown downwards west of a great dislocation, which runs from Dudweiler to St. Ingbert.

In Group XIX. of the Exhibition, the Educational Department, we find drawings and compositions of their pupils exhibited by the mining schools of Bardenberg, Siegen, Dillenburg, Wetzlar, Saarbrücken, Essen and Bochum. The latter appears to have reached a very high degree of efficiency, and in two classes it teaches 108 pupils, who all belong to the working population, and generally had to pass through one of the ten preparatory schools. These mining schools teach their pupils gratis, after they have passed an examination, which has shown them fit to comprehend the lectures, and they have done very much in educating a reliable staff of captains and foremen to the great benefit of the mines, in which they are engaged.

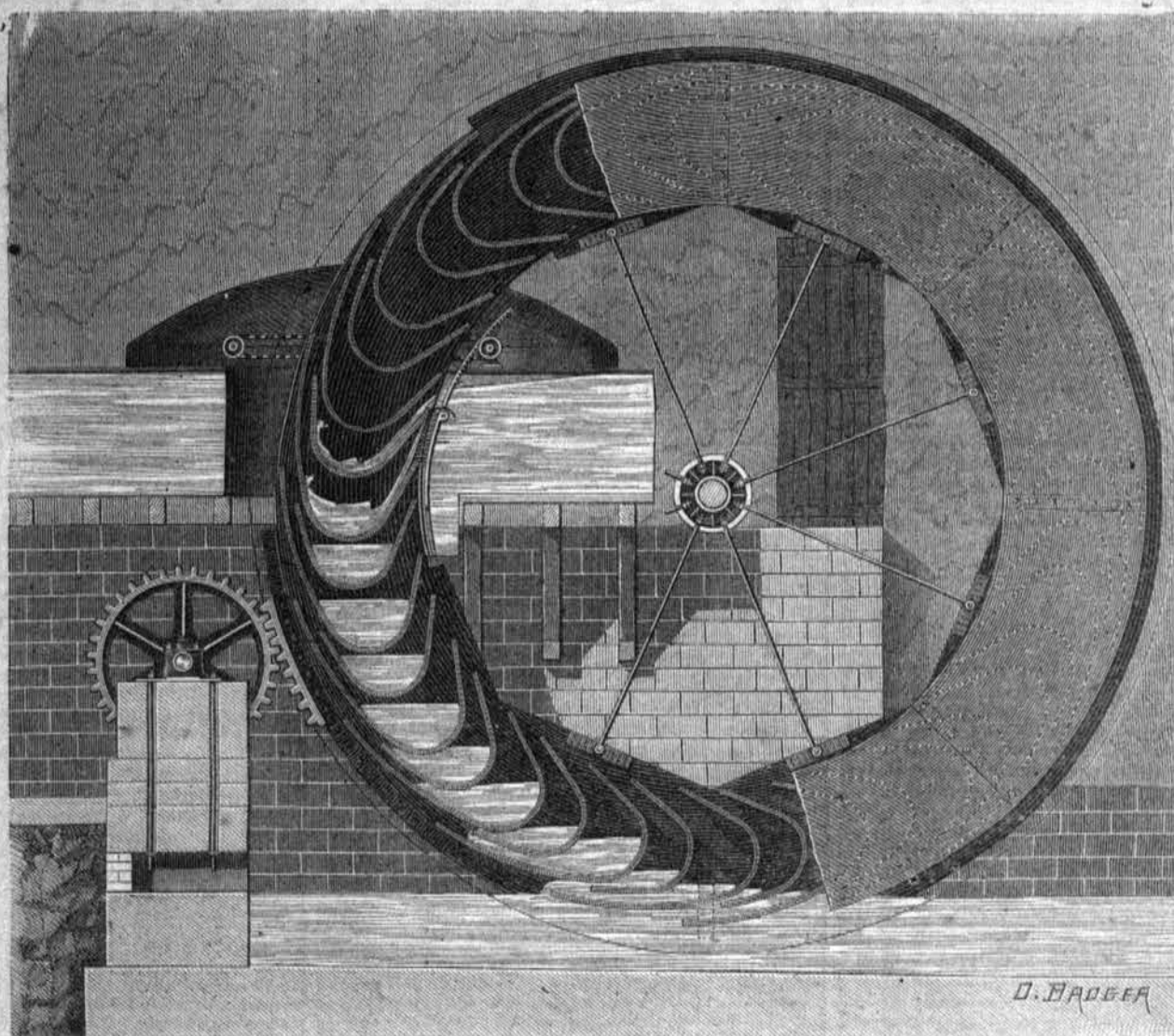
THE JAMIN ELECTRIC LAMP.

WE recently noticed the impending introduction of the Jamin electric light into England from France, and we gave a few leading particulars, promising further details shortly. This promise we are now able to fulfil, and append an illustration and a description of this lamp. It is mounted on a slate base, which is fixed in globes or lanterns, according to the requirements. To the base is appended a brass gutter, H H H, broad, but very thin, so as to prevent shadows. At the top is another similar gutter, G, made of soft iron, and which attracts, when magnetised, a movable piece or armature, E F. The alternating current of a Gramme machine

WATER-WHEEL WITH INTERNAL ADMISSION.

BY MM. HAUVEL ET PANNIER.

(For description, see page 462.)

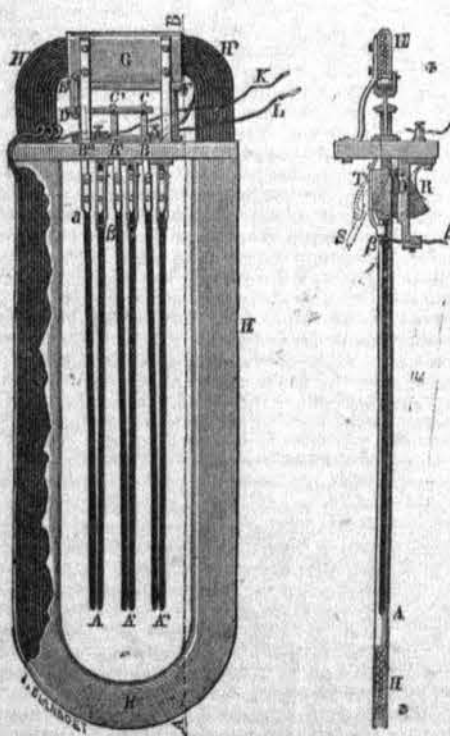


is caused to circulate in a thin insulated copper wire, wound round the gutters some fifteen or twenty times and constituting, therefore, the directing circuit. In the midst of this frame, and in the same plane, are placed the candles, or pairs of carbon pencils between which the voltaic arc will spread. Three candles are thus placed in the lamp which can, however, contain a larger number of them. Each carbon pencil is introduced into a brass socket, which holds it, by means of a spring, in a vertical position, with the point downwards. There is no insulating material between the carbons. The carbons of the right side, B A, are fixed and vertical; those of the left side hang freely from the joints, B B' B'', the summits of their supports being connected by means of a bar, C C', which gives them a common motion. The armature, E, F, is attached to this bar by means of a lever, E D, and pushes it towards the left side by virtue of its own weight; the carbon pencils are thus brought close together, until one comes to touch another, (it will generally be in the longest or in that in which the points are the closest). It is this candle which will become ignited.

The electric current, after following the directing circuit, reaches the three movable carbon pencils at the same time, and can return by any of the three fixed ones. It chooses those which are in contact, and lights them. The magnetisation instantly takes place, and the armature, E, F, is attracted, separating the three pairs of carbon pencils at the same time; two remaining cold and the arc burning in the third pair. The arc will exist as long as there is some material to burn, and is maintained, by the action of the directing circuit, at the points, where it is constantly attracted back should any outside cause momentarily displace it. When the current ceases passing, the armature falls, a new contact is re-established at the carbon points, which, relighting as before, are again caused to separate as in the first instance. The re-lighting or switching is therefore automatic and instantaneous, and can be effected and renewed at will.

When one candle is consumed, another must take its place. To this end the fixed socket is provided with a joint which allows of the fixed pencil to swing in a plane perpendicular to the directing frame plane (see section.) A spring, R, has a tendency

to push it away and it is maintained in its position by means of a bent copper wire, B, which can slide in a support in which it is pressed firmly by a spring. When the candle is burnt to the wire, the latter is melted, and the socket springs away in the position S T, putting the light out; but the voltaic



arc instantly spreads between another pair of carbons and the light is thus perfectly continuous in its action. This takes place every two hours, and the copper wire can be pulled forward and bent and re-used over and over again. If, for any reason whatever, one of the lamps becomes extinguished, or if one or

more are extinguished on purpose, the eight or nine others situated in the same circuit are not affected. This is due to an arrangement said to be perfectly practical in its action, and it is also stated that should an accident occur to one lamp, it, in the first place, opens a secondary circuit through which the current passes instead of in the lamp; and secondly, it introduces into the circuit a resistance equal to the lamp so that there is no alteration in the remaining lights.

The following advantages are claimed for the Jamin lamp:—It can be re-lighted and put out as often as desired without any interference with the lamp or the carbons. The consumed carbons are switched automatically, and in a very simple manner. Having no insulating material between the carbons, the colour of the light is not subject to variation. The carbons are not submitted to any manufacturing process, but are used as they are. The cost is thus considerably reduced, and, in fact, it is proposed to offer the public the Jamin candle, which lasts two hours, at one penny, that is to say, that the cost of the light per candle, will be one halfpenny per hour. M. Jamin claims to maintain as many as 24 lights with a Gramme machine hitherto called "four light," and with an 8 indicated horse-power engine. The leading wire used is of the smallest description, even for long distances, so that it will be seen that, the motive power and the battery power required being so small, the candle so cheap, and the fittings so simple, the Jamin light promises to prove very economical. The light burning in a downward direction illuminates the ground instead of the sky, and is much more intense than when it is burning upwards. When the light is burning upwards, the arc has a tendency to leave the carbon points, and it does not heat them; when, on the contrary, it is burning downwards, the arc and the flame, which in the Jamin system accompanies it in a more remarkable manner than in any other system of candles, envelopes the points, keeps them at a very high temperature, exaggerating thereby their brilliancy and preventing their cooling. We should add that the Jamin system is being introduced by Mr. J. A. Berly, C.E., (engineer to and agent for the Compagnie Générale d'Eclairage Electrique of Paris), of No. 16, New Bridge Street, Blackfriars, London.

WATER-WHEEL WITH INTERNAL ADMISSION.

THE principle of admitting water into the buckets of water-wheels from the inside instead of the outside, was known to the Romans; but, though possessing some advantages over the ordinary arrangement, it does not appear to have gained much ground, chiefly on account of faulty design and construction. In France, Thiville erected a clumsy motor of this description so far back as 1827, and later on Millot introduced his sluices for regulating the flow of water into the buckets, which were of inordinate size. His buckets were of cast iron, provided with a shoe for receiving the radial arms; but as the weight of the water was taken by the flat of the cast iron plates, the latter frequently gave way. The small space afforded for the exit of the water at the periphery of the wheel, excluded this arrangement from adoption for large streams, because the buckets were not entirely emptied until after leaving the surface of the water. Moreover, the slow speed led to heavy shafts and expensive foundations, so that these wheels eventually came into disrepute.

MM. Hauvel et Pannier, civil engineers, Paris, have turned their attention to remedying the defects of this type of water-wheel. By keeping the edge of each alternate bucket slightly within the circle described by the remainder, they afford plenty of room for the escape of the water after doing its work, while no appreciable loss ensues from any anticipated delivery of the water, since it falls into the next bucket. As the sectional area of outflow is thus doubled, this system, as improved, may be applied to large bodies of water without giving the wheel an excessive breadth. The cast-iron shoes of the Millot wheels are replaced by T irons and rods tied to the rims, and connected to the boss by simple rods in tension; while the middle rim has toothed segments bolted on outside, so as to form an external cog-wheel. In this way a heavy shaft is no longer needed and a relatively high speed is obtained from the commencement.

The annexed engraving represents a wheel of this improved arrangement, that has superseded an overshot wheel, without change of direction of the motion and with a gain of 100 per cent. of power. The wheel, constructed entirely of wrought iron, is 16 feet 5 inches in internal diameter and 9 feet 2 inches wide, the depth of rim carrying the buckets being 2 feet 7 inches. The power developed, at 42 revolutions a minute, is 20 horse-power, the pinion being in the proportion of 1:5. The available fall is 9 feet 10 inches, and the delivery of water in a normal state of working, 137 gallons per sec. This works out to a power of 25 horses, so that the efficiency of the wheel is 80 per cent. of its theoretical duty.

OCCASIONAL NOTES.

BICYCLE PROPULSION.

THE evolution of the bicycle from the old velocipede was a marvellous stride in advance; and if there be truth in the report that an "eminent American mechanic" has successfully applied compressed air to the tricycle, we may expect to see the realisation of the scenes represented by the caricaturists when railways were first proposed, and railways and tramways alike superseded to a certain extent. By means, we are told, of compressed air, the reservoir of which constitutes the seat of the tricycle, the machine can, it is said, be propelled at the rate of twenty-five miles an hour; and the inventor proposes to erect stations at which the tricyclist may renew his supply of pneumatic force. The report may be a canard, like many wonderful stories that originate in the same quarter; but the application of mechanical propulsion to velocipedes appears, on the face of it, at least more feasible than to ballooning.

THE PROPOSED SUNDAY EXCURSION AT DUSSELDORF.

The official programme of the Iron and Steel Institute at Düsseldorf included an excursion on the Rhine on Sunday, the 29th of August; but as soon as the fact became known, the Lord's Day Observance Society appealed to the Institute to decline an invitation so diametrically opposed to the feelings of the large class of Englishmen who object to public recreation on the first day of the week. The Council has since requested the German Iron Trade kindly to withdraw all that relates to the day in question from the outline programmes; but the *Glasgow Herald* says that, though it may not have official countenance, it is still thought that a Sunday excursion on the Rhine may take place. The Continental public are inclined to exaggerate the restrictions of an English Sunday; but, supposing the Scotch journal to be correct in its somewhat cynical forecast, they may not be prepared to find Englishmen acting in the spirit of the nautical proverb that the institution does not exist south of the line.

THE ELECTRIC LIGHT IN FACTORIES.

Our American cousins appear to be in advance of us in the lighting-up of factories by the electric light as well as of mines. According to a report

from the Washington Legation one company in Ohio has sold over a thousand Brush lights for use in rolling mills, machine shops, and other industrial establishments, thereby displacing over 20,000 gas burners. In one of the mills thus supplied the light has been used for nearly a year, night and day. The managers speak in the highest terms of the success of the experiment. There has not, they say, during all that time been a moment's delay from, or a dollar's worth of repairs on, any of the machines or lamps. The light is strong and steady, clear and white, universally liked, and there is more work got through, and that better done, than under the old gas light. It is satisfactory also to find that there is less complaint of trouble to the eyes than there used to be with gas, and the air is as good in the night as in the day time, and noticeably cooler. The annual saving at the mill in question in lighting under the electric as compared with the old system is put at about £2500.

RAILWAY BRIDGES.

The fearful catastrophe on the Tay must have impressed itself permanently on the minds of timid persons who may have to pass rivers by railway bridges, and this feeling will be accentuated by the recent and similar accident near Hereford, where a train, fortunately in this case only a goods train, was precipitated into a brook, at the bottom of which the engine buried itself; while the carriages, smashed to atoms as they rushed over each other, were crushed together; the engine tender and the debris of ten trucks being compressed into a space some thirty feet long and twenty high. Had the train been a passenger one, the result of this smash is too horrible to contemplate. And but a short time before the structure gave way an excursion train carrying some six hundred persons passed over in safety. What lends additional importance to these accidents is the doubt whether there are not many railway bridges all over the country in a condition far from secure. The bridge on the Hereford and Brecon line gave way in all probability by reason of its foundations having been undermined by floods. But there is good reason to believe that many others, which have never been renewed or even strengthened since they were built more than a score of years ago, are not to be depended upon, and some are known to be positively dangerous. The powers of the Board of Trade are very extensive in certain directions, but the inspection of railway bridges is without their statutory duties. It rests with the railway companies, and they are believed to perform it in a somewhat perfunctory manner.

FEVER TRAPS.

At the recent meeting of the Health Conference held under the auspices of the Society of Arts, Mr. Rawlinson, remarking that house drainage was at the root of all sanitary reform, stated that Earl Spencer's house at St. James's was, until his lordship took the drains in hand, in about the worst condition of any in London, there being several large cesspools in the basement, and the stable drains as full as they could be, but that it was now the best drained house in London or elsewhere. Mr. Rawlinson added that formerly Windsor Castle had fifty-one cesspools within its basement. It is well understood that the valuable life of the Prince Consort was sacrificed to this barbarous state of matters; and the Heir to the Crown narrowly escaped from an identical danger. When the Board of Health first occupied Gwydyr House in 1848, it had nine cesspools in it. Mr. Rawlinson also stated—that what is not generally known—that at the present moment thousands of houses in London have cesspools in the basement which ought to have been removed when the sewerage was laid, but which remain a source of deadly peril to the inmates. With a careful attention to drainage, much, if not all, the evils of the wet system would be obviated. In Earl Spencer's case, the health of the inmates of the house has been evidently improved; and the effect on those of the stable has been no less marked. It is plain that until cesspools—those domestic fever-traps—are extirpated, tree-planting, widening of streets, even the construction of a deep main sewerage, can only be considered, sanitarily, as a mere washing of the outside of the cup and platter.

POPULAR EDUCATION.

It is a pity that certain persons holding positions of influence in the State cannot be convinced of what the more clear-sighted among the employing classes now understand—that something more than the mere elements of a literary education are necessary as a basis for the sound technical training which must be generally applied if England is to hold her own in the world's workshop. The French Government have recently resolved to teach the principles of agriculture to all the children of the national schools, agriculture being the staple industry of France; yet the House of Lords the other day by a considerable majority, resolved that English children as far as State help goes, shall be confined to what the Alderman called the three R's. In opposing the resolution, the Duke of Argyll showed how far the long-established educational system of Scotland, imperfect in many respects though it be, is removed from the class education desiderated by Lord Norton, who moved it. There the higher branches are not

merely permissive but compulsory, and the best possible social results follow from the fact that in the Scotch parish schools almost all classes are united. In these institutions the children of all classes are represented; from the pauper up to almost the highest social grade, their children sit side by side, and some of the poorest of these pupils have thus been able to elevate themselves to the highest positions in the Law, the Church and the State. None of the evils feared by the supporters of the motion had, said his grace, been experienced, but, on the contrary, the vitality of the schools had been immensely improved. There can be no doubt of the fact, and the reason is not far to seek. It might have been added that besides the advantage of giving everybody a fair start in life, this mixing of classes at school has the very best effect in welding together the divers, and in some respects antagonistic sections of which society is composed, and thus giving a unity to the body politic which is much more evident in the northern than in the southern kingdom.

SCIENCE AND ART.

* THE SOCIETY OF ENGINEERS.—Arrangements have been made for the members and associates of the society to visit the South Metropolitan Gas Works, Old Kent Road, by permission of Mr. George Livesey; and afterwards to visit the Crystal Palace District Gas Company's Works, Lower Sydenham, by permission of Mr. Charles Gandon, on Tuesday, the 29th inst.

THE ELECTRIC LIGHT ON THE EMBANKMENT.—The Metropolitan Board of Works is about to extend the contract for the lighting by electricity of the Thames Embankment and Waterloo Bridge. The experiment has proved a great success, and a further development of this new system of lighting will be heartily welcomed. In order to carry out the extension the light will be discontinued for a week.

INDUSTRIAL EXHIBITION AT THE EAST END.—An Industrial and Fine Art Exhibition, under the patronage of the Lord Mayor and Sheriffs of London, &c., will be opened on the 30th inst., at the Bow and Bromley Institute. Prizes ranging from two to five guineas are offered for competition in each of the following classes:—Mechanical, artistic, general, fabrics and fancy work; and also for work done by young persons under eighteen years of age.

LIFE OF STEEL RAILS.—The first engineer of the Rhenish Railway, which has the longest experience in steel rails, has made a calculation, according to which the average duration of steel rails, where twenty-four trains pass over them every day, is thirty years, whilst that of iron rails, with a traffic of seventeen trains, is eleven years. Steel rails, according to this calculation, last four times as long as iron rails, although they are but one-third more expensive.

NEW BRITISH ARCTIC EXPEDITION.—The Central Committee, 107, Fleet Street, London, has arranged to hold an exhibition of materials and apparatus used, or proposed to be used, in Arctic explorations, during the fortnight commencing Thursday, the 1st of July, at the Alexandra Palace. Articles eligible for exhibition are machinery, apparatus, implements, utensils, fittings, clothing, food, nautical instruments, boats, sledges, weapons, sanitary appliances, used, or proposed to be used, in Arctic explorations; diagrams, pictures, and photographs relative to the same; relics of former expeditions; illustrations of Arctic life, &c. Exhibits of any inventions for propelling balloons, or deflecting their course, will be acceptable.

MEETINGS FOR THE WEEK.

SATURDAY, JUNE 26.

PHYSICAL SOCIETY.—1 p.m. 1. Dr. Hallowell Stewart, on a Modification of Bunsen's Colorimeter. 2. Professor Guthrie and Mr. C. V. Boys, on Magneto-Electric Induction. 3. Dr. W. Huggins, Exhibition of Star Spectra. 4. Dr. J. H. Gladstone, on the Refraction Equivalents of Isomeric Bodies.

MONDAY, JUNE 28.

ROYAL UNITED SERVICE INSTITUTION.—8.30 p.m. Mr. T. Nordenfeldt, on Nordenfeldt Guns.

WEDNESDAY, JUNE 30.

STATISTICAL SOCIETY.—1 p.m. Anniversary Meeting. SOCIETY OF ARTS.—1 p.m. Anniversary (instead of the 23rd). BOW AND BROMLEY INSTITUTE.—3 p.m. Industrial and Fine Art Exhibition. Opening Address by the Lord Mayor.

THURSDAY, JULY 1.

NOTTINGHAMSHIRE AGRICULTURAL SOCIETY.—Annual Meeting at Nottingham. (Three days).

FRIDAY, JULY 2.

GEOLOGISTS' ASSOCIATION.—3 p.m. THIRSK AGRICULTURAL SHOW.

NAVAL ARCHITECTURE.

DISASTERS AT SEA.—There were 13 British and foreign wrecks reported during the week ending Saturday last, making a total of 659 for the present year, or a decrease of 94 as compared with the corresponding period of last year. The approximate value of property lost was £575,000, including British £420,000.

PROJECTED SHIP CANAL THROUGH FRANCE.—A French military officer has brought forward a plan for the construction of a ship canal between Marseilles and Dunkirk. His idea is to complete the facilities offered to navigation by the Suez Canal, and at the same time to develop the internal resources of France, and add to her present strategical means of defence. The technical difficulties, according to scientists, are not insurmountable. The only question remaining to be solved is that of the expense, and the promoter has undertaken to carry out the preliminary survey at his own risk.

THE "ANTHRACITE."—The secretary of the Perkins Engine Company writes us, stating that the steam-yacht *Anthracite*, which is engaged on the Perkins' High-Pressure system, has just taken in coals at St. John's, Newfoundland,

and that Captain Davis reports per wire all well. We are glad to learn that this little vessel, of only 70 tons gross, has nearly reached her destination and that all goes well with her. A full description of the *Anthracite* will be found at page 385 of our present volume. Since receiving the foregoing, the following very satisfactory news of the *Anthracite* has come to hand via New York:—"From New York. *Anthracite* arrived at St. John's, New Brunswick, yesterday. Eighteen days from London. Is coming on to New York. Weather has been unusually boisterous. Captain and officers abundantly satisfied with results of voyage." The *Anthracite*, we believe, the smallest steamer that ever crossed the Atlantic.

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OFFICIAL NOTICE.

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

To ensure insertion, Advertisements should reach the Publisher not later than Thursday morning.

Communications on literary subjects and books for review are to be forwarded to the EDITOR. Anonymous correspondence will be wholly disregarded, and the return of rejected MSS. cannot be guaranteed.

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CORRESPONDENCE.

THE DEPHOSPHORISATION OF IRON.

To the Editor of IRON.

SIR,—In reply to a remark by "Observer," I beg to say that the proper use of salt is attended with such advantages, both in regard to quality and cost, that it has practically no competitor. When everything may have been used which promises any benefit, the use of salt also will still further improve whatever quality may have been reached. And when nothing else will serve the object sought, salt will remove any and every difficulty that may be in the way. I do not suppose there are any who throw their mill scale away, nor is it by any means a drug.—I am, &c., JAMES BARNETT.

27, Healey Street, Kentish Town, 23rd June, 1880

FACTORY NOTES.

THE TIN TRADE.—On Tuesday the Cornish smelters advanced the list standards £2 per ton. The standards now are:—Common, 78s.; refined, 79s. per cwt. This makes a total advance in the standards of £10 per ton since the 14th inst.

MEETING OF CREDITORS.—A meeting was held at Sheffield, on Tuesday, of the creditors of George Highfield, of the Moorhead Steel and Wire Mills in that town. The total liabilities of the debtor amounted to £3398 3s. 3d., and his assets to £1549 3s. 4d. Liquidation by arrangement was granted, with a trustee and committee of inspection.

NEW SHIPBUILDING COMPANY.—The shipbuilding and repairing works of Mr. Robert Foster, South Dock, Sunderland, have been transferred to the Sunderland Shipbuilding Company, which will carry them on in future, Mr. Foster having been engaged to conduct the business as managing director.

TINPLATE AND JAPANNED HARDWARES.—In our notice last week of the new show-rooms of Messrs. Hopkins and Sons, of the Granville Street Works, Birmingham, by a typographical error the firm in question was referred to as a "respectable" in the place of a "representative" one, the former appellation, as the context would show, being wholly inappropriate.

FAILURE AT MIDDLESBOROUGH.—Mr. R. Hill, of the Star Rolling Mills and Newport Wireworks, Middlesborough, has filed his petition. The liabilities are set down at £42,000, the secured creditors being set down at £23,500, and the unsecured creditors representing £18,500. The assets, which consist of the works and book debts, &c., are estimated at £40,500. The works cost £28,500, but if they were to be realised they would not bring that amount.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending 19th June:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum, 13,510. Mercantile Marine, Building Materials, and other Collections, 5827. On Wednesday, Thursday and Friday (admission 6d.) from 10 a.m. till 6 p.m., Museum, 2448. Mercantile Marine, Building Materials, and other Collections, 490. Total, 22,275. Average of corresponding week in former years, 17,471. Total from the opening of the Museum, 19,075,783.

IRONSTONE IN TEESDALE.—A consignment of one thousand tons of ironstone is being sent from Middleton-in-Teesdale to Messrs. Bolckow and Vaughan's ironworks at Witton Park. The ore is from Dirt Pit, leading into Etersgill, about four miles from Middleton. It is understood that the quantity stipulated will be sufficient with which to charge one furnace, and, should the results prove favourable, more orders will doubtless be placed. The order is being executed by Mr. Thomas Greeves. Pending the result of the experiment, much interest is manifested in the enterprise.

THE WALSHALL BOILER EXPLOSION.—The adjourned inquest as to the deaths of the twenty-five persons killed by the boiler explosion at Walsall was resumed on Monday. The boiler-maker and the millwright employed by the firm repudiated responsibility for the condition of the boiler which exploded. Mr. Hugh Bewlay, Birmingham, assigned excessive external pressure as the cause of the disaster; and the Boiler Insurance Company's inspector, in his evidence, stated in November he easily drove his hammer through the bottom of the boiler, and was assured that new plates should be put in. The inquiry was adjourned until to-day.

THE EAST YORKSHIRE CART AND WAGON COMPANY.—We understand that Mr. Joseph Bernays, C.E., of 96, Newgate Street, London, has resigned his appointment as sole representative of the Bristol Wagon Works Company (for their road vehicles and agricultural implements), and has accepted a similar position with the East Yorkshire Cart and Wagon Company, Beverley, for the whole of their manufactures. This company manufacture all classes of vehicles for ordinary trade and agricultural purposes, and are advantageously situated for timber, iron of first-class quality, cheap labour and convenience of shipment.

THE ATTOCK BRIDGE.—In the House of Commons, on Monday in reply to Mr. Onslow, who asked a question relative to the ironwork of the bridge across the river Attock, the Marquis of Hartington said,—The firms employed to make the ironwork for the Attock bridge are as follow:—For the girders (steel and wrought iron), Messrs. Westwood Baillie and Co., of London; for the piers (wrought iron), Messrs. Handyside and Co., of Derby. These firms were not, it is believed, in any way concerned in supplying ironwork for the Tay bridge. All the materials of which the Attock bridgework is constructed are carefully tested, in accordance with a strict specification based on the most recent experience, by Government inspectors. The bridge is being made of steel and wrought iron. No cast iron is employed.

JOHN BROWN AND CO. (LIMITED).—The report of the directors of this company was issued to the shareholders on Monday. Including the balance from last year of £20,447 10s. 6d., the amount available for dividend after payment of interest on debentures and preference shares is £56,244 11s. 8d., out of which the directors recommend a dividend of 5 per cent., carrying forward a balance of £21,973 15s. The directors express their great satisfaction with the results of the tests of the company's compound steel and iron plates, made under the Chairman's (Mr. Ellis) patent, and look forward to considerable orders being received shortly, in addition to those in hand. The directors notice the extraordinary rise in prices that occurred in the latter part of last year, and the severe reaction that has since ensued. At the same time they state that the prevailing opinion is in favour of an early improvement, owing to consumers of manufactured goods not being overstocked.

SALE AT WELBECK.—The *Sheffield Telegraph* says that the five days' sale of the surplus stock of sawn timber, iron, machinery, &c., at Welbeck Abbey, ended on Saturday. From it some idea may be formed of the vast building enterprise of the late Duke of Portland, who some few years ago employed from 1200 and 1400 men on the estate at Welbeck—joiners, bricklayers, masons, plumbers, plasterers, painters, mechanics, artists, navvies, and a host of carters and labourers. His grace kept three or four, if not more, traction engines at work, removing materials to and from Welbeck, and in addition to the vast quantity of material consumed on the works, the surplus stock consisted of some 20,000 of English oak planking, in addition to large quantities of beech, lime, poplar, larch, sycamore, spruce, ash, sweet chestnut, and elm, in plank and tree; 500 feet of beautifully marked brown oak, 3000 oak spokes, &c., 10,000 tarred oak and deal road pitching blocks, twenty tons of coal tar, 2000 feet of pine boards, building materials, navy planking, &c. The iron consisted of two tons of iron tramway rails, 200 metal flange and truck wheels, 100 tons of scrap iron, with a large quantity of smith's anvils, vices, metal windows, pulley blocks, &c., new wrought-iron girder bridge, 24 horse-power horizontal steam engine, punching and shearing machines, road waggon, vans, steam travelling crane, double-purchase builders' cranes, plane and boring machines, centrifugal and other pumps, patent brick-making machines, clay-grinding machines, several vertical steam boilers, iron crabs, asphaltising cauldrons. The sale brought thousands of people to Welbeck during the week, numbers of whom took the opportunity of looking over the place, and one and all expressed their astonishment at the princely outlay of the late duke.

IRON AND COAL TRADE REPORTS.

BARNESLEY AND SOUTH YORKSHIRE.—The great event of the week has been the expected reduction of the tonnage rates for carrying coal to London. From what can be gathered it seems that the hopes of the district coal-owners are again doomed to disappointment. Advice received from London representatives for some of the collieries state that the negotiations which have been pending with the railway companies interested have dropped through. This announcement has taken the coalowners by surprise, as they were led to believe that the Great Northern Company, which carries most of the coal to London from South Yorkshire, were favourable to the reduction, having fallen from the head of the list into a third or fourth rate power so far as the conveyance of coal is concerned. The returns for the first five months of 1879 show that there was a falling off to the extent of 87,184 tons as compared with the same period of the previous year. It is said that the reduction of the rates was opposed by a powerful company which has a large coalfield of its own. The matter seems to have taken the coalowners by surprise, and unless something is done they will be unable to compete with seaborne coal. The demand for house-coal is still very moderate, and old customers who have been the habit of taking a good tonnage of both Silkstone and Barnsley house-coal are waning off. Not only is the London trade very moderate, but there is but little doing with the Eastern counties and other places. Many collieries are working short time and are losing money so much so that a readjustment of wages is talked of. This course is under the consideration of the men employed at the Norfolk pit, belonging to Messrs. Newton, Chambers and Co., who are asking the men employed in one part of the pit to submit to a reduction of threepence per ton to be given to the men employed in the other part where the coal is harder to get. There is rather more doing in steam-coal, and the whole of the fifteen collieries belonging to the South Yorkshire Steam Coal-owners' Association are sending a large tonnage to Hull. This has had the effect of increasing the shipments, so that last week there was an increase to the extent of over 2400 tons. The business doing with Grimsby is also large, and the shipments there also showed an increase of over 1100 tons. There is no change to note, with respect to the demand for gas-coal, and since our last notice several rather large contracts have been placed at lower rates than prevailed last year. Locomotive coal continues in fair request but prices for this as well as all other kinds of fuel are low. The contracts already placed are said to be very weak and some anxiety is felt with regard to this, seeing that some of the pits depend upon these contracts for finding their men work. The coke trade is still pretty lively and a large tonnage is being sent away to North Lincolnshire and other places.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—There is a quiet demand for all descriptions of hematite pig-iron, and sales show no improvement in either extent or number. The output of iron is well maintained, as makers in many instances have still to complete large deliveries, but it is looked upon as practically impossible to maintain the present production in face of the weakening demand; but it is obvious that up to the close of the shipping season there will be no considerable diminution in the tonnage of iron manufactured, inasmuch as not only have large orders to be completed to foreign countries, but, although the demand is at present inconsiderable, other contracts will undoubtedly be booked, if present indications are to be taken as a guide, which will require attention before October. The lowering tendency of prices is likely to bring about a similar state of things as regards workmen's wages, but notices have not yet been given to this effect by makers of iron. The shipbuilding trade is briskly employed and engineers are in receipt of orders which are likely to keep them well employed for some months to come. Indeed, shipbuilders and engineers are likely to be the most active of any persons employed in the trade of this district during the ensuing winter. There is a large output of iron, inasmuch as the furnaces are all well employed, but orders for ore are not so numerous as they have been.

BIRMINGHAM.—The local hardware trades are still wanting in activity, although there is some little improvement in tone, with a tendency to further progress in a satisfactory direction so soon as retailers become satisfied as to the stability of current prices. At present a want of confidence on this point induces them to restrict purchases to absolute necessities. Orders for export have recently exhibited a little more animation, chiefly so far as regards the South American markets, Mexico, and the West Indies. With Canada there is a trifle less doing; but the trade with South Africa is steady, and some very fair lines have been received from India and New Zealand. In the edge-tool branch one local firm has booked orders for some 8000 picks for the Cape and 7000 hoes for India. Hollow ware manufacturers complain of a scarcity of business, the result, it is believed, of a general feeling on the part alike of merchants and of retail dealers that some reduction in prices is demanded and must soon be conceded. Makers' stocks are heavy, and production is being curtailed, few houses now working more than four days weekly, while in many cases three days a week is far more usual. Brazil, Canada, and the Cape have been recently the best markets for tin-plated hollow ware; but even to these the shipments are now on a very limited scale, while with our Australian colonies scarcely anything is doing. Metallic bedstead manufacturers report the receipt of better orders from Brazil and the Spanish West Indies, and are also doing a fairly steady trade with the Cape. The demand at home, too, for medium qualities of goods, and also for the very cheapest makes, has manifested a slight improvement due mainly to the request from seaside towns which is usually felt just at this season of the year. Colonial orders have been small, and confined chiefly to the lower classes of bedsteads. The leading London firms have heavy stocks on hand, and no special animation is expected in this department of the trade, until after the close of the harvest and the commencement of the autumn season. Iron safe manufacturers have been tolerably busy, and so have gas-stove manufacturers. Tin-plate workers and japanners have had but little to do, the home demand particularly being remarkably slack. For stamped goods, however, especially open ware of large sizes,

there has been a brisk request for export, and while baths are not sold so well as is usual at this season, travelling trunks have gone off with greater freedom. The tube trade generally is quiet, although some local firms have booked fair export orders recently for India, Russia, and the Cape, as well as others of lesser extent for Australia and Cyprus. Gas-tubing generally is reported to be in somewhat better request than was the case a week or two since. Boiler tubes do not move so freely, makers finding it difficult to compete with Glasgow firms who get their raw material at a lesser cost. Pig-iron has continued slightly more active, the lower qualities being more in request, while business has been quiet so far as wrought-iron is concerned, with indications of weakness. On Wolverhampton Exchange on Wednesday there was a better attendance than has been usual lately, and the pig-iron market was less depressed. Native pig was held somewhat more firmly than foreign brands generally, but for hematites there was a better enquiry than for some weeks past. Sheet-makers were reported more fully engaged. The subject of the new sliding slide for wages was freely discussed, the belief being expressed that the result of the accountants' examination of the books of the selected firms would be to establish the current rate of 8s. 6d. per ton for puddlers' wages from now until September. This, it was held, would place ironmasters in a worse position than during the late heavy depression, when also the price of raw material was lower than at present.

THURSDAY EVENING.—Condition of trade, as shown by reports on 'Change to-day, still weak and unsatisfactory. Prices, particularly of unmarked iron, have a downward tendency. Nominally, marked bars are still £8, and unmarked £6 5s.; but as transactions in the latter have been effected at fully £1 below this rate, quotations cannot be accepted as reliable where specifications of magnitude are concerned, though makers are firm as regards small quantities. In sympathy with spelter, galvanised iron is a little easier.

CLEVELAND.—The pig-iron market has been very firm since last market day, and up till Monday, 39s. has been paid for No. 3. This was mainly owing to the firmness of the Scotch market, so that when the Glasgow market loosened somewhat, Cleveland at once followed suit. On Tuesday, the market opened at 39s., but soon fell to 38s. 9d., and closed at 38s. 6d. Warrants are scarce, and fetch from 39s. 6d. to 40s. They are chiefly in the hands of investors holding on for a rise. Makers are not over anxious to sell, and ask 40s. for No. 3. On Tuesday, there were 88,585 tons of Cleveland iron in Messrs. Connal and Co's warrant stores. Between 200 and 300 tons are being added daily; the deliveries are fair. Shipments are maintained both to Scotland and the Continent. Ironfounders are somewhat busier, especially in railway chair making. The finished-iron works have a fair amount of business. Iron rails are in rather better demand. The steel works at Aston are busy, the doubling of their steel rolling plant is progressing. Prices for finished iron have advanced; ship plates, £6 7s. 6d.; common bars, £5 7s. 6d.; angles, £5 10s.; rails, £5 5s.; with the usual discount; puddle bars, £4. The coal trade is rather quiet. Coke, a shade stiffer; 11s. 6d. delivered. Altogether, business is rather steadier.

DERBYSHIRE.—The iron trade in this district is not so good as it was a few months ago. The make of pig-iron has rather outstripped the demand, and prices of late having declined, prospects are less cheering than they were. The operatives at Butterley and Codnor Park Ironworks have no cause to complain. The blast-furnaces are kept fairly going, and are fed for the most part with ironstone from Northamptonshire, which provides a fair amount of traffic for the Midland Railway Company. The coal trade varies a good deal, but on the whole it is much quieter than it was. From Clay Cross, Langley Mill, and other important colliery districts, there is a fair tonnage of house-coal forwarded to the metropolis, but many of the pits which have to depend on land sale and local orders are not near so well off. The Boythorpe Colliery agents at Chesterfield are quoting best Silkstone at 7s. 6d., handpicked Tupton at 6s., Cobells, 5s., screened nuts, 4s. 6d., and screened slack, 3s. 4d. per ton at their depot in Chesterfield. There is rather more doing in steam qualities for shipment, but prices are very low. Those collieries raising a good class of locomotive coal are fairly off for orders, and it is rumoured that a fair sprinkling of the Midland contracts have found their way into the district with which the company have direct communication. Manufacturing fuel is in but moderate request, and there is a tolerably good demand for coke for smelting and other purposes.

DURHAM.—The iron and coal trades show, many think, improving symptoms. It is to be feared, however, that the effect will be merely temporary, and that the prices will go back again, as indeed they have already commenced to do. The Scotch prices of pig-metal have operated on the North of England trade, and pig-iron on Monday was about 2s. in excess of the prices paid a week before. Since the Scotch market has gone back, however, rates have been lower, and No. 3 can be purchased at 38s. to 38s. 6d., or even less, forge-iron at about 6d. below No. 3. This, however, is not such an important pig-iron as manufactured iron centre, the bulk of the finished-iron production of the North of England being within the confines of this county, between the Tees and the Tyne. There has been a tendency with the manufactured iron trade, to show a stiffening tendency in the rates, in sympathy with pig-iron, but there is no great change from the prices given last week. Ship-plates at £6 7s. 6d.; bars, £5 7s. 6d.; angles, £5 7s. 6d. to £5 10s.; iron rails (heavy sections), £5 5s.; light ditto, £5 10s. to £5 12s. 6d. There has been some little inquiry for light rails, but generally the iron rail trade is very quiet, although the works producing this class of iron have managed to keep their mills going. The largest of these—the Darlington Iron Company, (Limited), are first calling up £2 per share, which will make £17 paid, the shares being £20 each. The plate trade is ordinarily represented as brisk. There is, however, the fact that within the last fortnight, two plate mills and two forges have been stopped by Messrs. Bolckow, Vaughan and Co., in the Auckland district. At the other works in different parts of this country full time is the rule, and the shipbuilding yards have all the vessels on the stocks that they can accommodate. The railway and other locomotive and engineering establishments, are pretty brisk. The freshening in the pig-iron trade this week cause some to anticipate that there may be a

gradual improvement in the trade. As yet, however, there is very little to support such a view. Household coals very dull. Foundry coke has been rather more inquired after for special work. Steam coal has hardly been so brisk in demand. Prices 9s. to 9s. 6d. f.o.b. for best quality, less 2½ per cent. Coke for furnace use 9s. to 10s. at the ovens.

FOREST OF DEAN.—The house-coal industry is only maintained by concessions, and quotations are stated to be as uncertain as they are unsatisfactory. Prices were scarcely ever so low as they now are, one leading firm in the Cinderford Valley supplying the country trade with their best coal at 8s. 6d. per ton. On Tuesday tenders were received by the local union authority for the quarter's deliveries at Westbury. That of Mr. Chivers was accepted at 11s. 6d. per ton. There is a fairly good enquiry for steam-coals, but quotations are unimproved. The colliery proprietors are supporting efforts which are being made with a view to extend the local rating to Crown properties—woodlands and royalties. It would be useless to disguise the fact that the Forest is considerably prejudiced because of the exemption in question, which throws the burdens upon the colliery and other private properties, some of the former proprietors having to pay upwards of a thousand per annum to the rates alone. A second movement has for its object the provision of pumping stations by the Crown, in order that the deep-coal measures may be won. It is urged the Crown should undertake these works, in which case both the lower coal and iron ore might be then won. Several single-handed enterprises have been undertaken to win the deep coal, but the majority of them collapsed after the outlay of large sums. Such an undertaking is becoming imperative upon the Crown, if the Forest is to continue for any length of time as an iron and coal field. At present, it is a misfortune that the Crown are the proprietors of the Forest, because, were the district held by a private owner, facilities—in all reasonable probabilities—would be offered to secure a profitable development of the minerals. An effort is being made by the majority of the mine proprietors to remove the local Crown offices from Coleford to Newnham-on-Severn. It is urged that the latter place is more conveniently situated on the main line of railway, and the Crown offices, removed thither, would be more conveniently placed, in the case of capitalists regarding information on the subject of mines, &c.

GLASGOW.—The warrant market was excited during the past week and a large business at constantly varying prices. The "bears," finding they would have great difficulty in supplying themselves with warrants, began to buy largely, which reached a climax on Monday forenoon, when there was quite a rush to buy, caused in some measure by reports of a great advance in the prices of copper and tin. Since then prices have been drooping, it being evident that the wants of the more needy "bears" have now been satisfied, and the statistical position of the trade does not warrant any advance in prices at present. On Thursday 47s. 6½d. to 48s. cash and 47s. ½d. to 47s. 10½d. a month were paid, improving on the following day from 48s. to 49s. cash. On Monday opening at 48s. 6d., it rapidly rose to 49s. 11d. cash and one month, then fell to 49s. 2d., closing with buyers at 49s. 6d. cash. On Tuesday there was a smart reaction from 49s. 1½d. to 48s., and on Wednesday the price fluctuated between 47s. 10½d. and 47s. 3d. cash; closing buyers 47s. 9d. cash, and sellers 47s. 9d. one month fixed and 47s. 10d. cash. A number of the makers have been doing a fair business during the week, and all the brands have been advanced several shillings per ton. Several parcels have been bought on Canadian account, and one or two small lots for the United States. The shipments of pig-iron from Scotland last week were foreign 6127 tons, coastwise 3380 tons, total 9507 tons, against 7278 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 4340 tons, against 6784 tons in the similar period of last year. The total imports into Grangemouth till June 19th, 1880, are 107,750 tons, against 115,416 tons till June 21st, 1879, showing a decrease for this year of 7666 tons. About 1320 tons of iron have been sent in Connal and Co.'s store during the past week, and the stock there is now 447,694 tons. Rather more has been doing in the manufactured-iron trade during the past week, the spurt in pig-iron having led to the placing of a number of orders which had previously been held in abeyance, and buyers were also offering better prices, but have now withdrawn, and as some of the works have but few orders on hand, they are again willing to take very low prices. The exports last week were small, the chief items being, for the East, machinery valued at £5270, cast iron at £2001, malleable and galvanised iron at £1515; for the Continent, sewing machines at £3941, cast iron at £818; and for Canada, malleable iron at £1431.

LANCASHIRE.—Although the steadier tone noticed last week in the iron trade of this district is generally maintained, and some of the outside brands, principally north-country irons, coming into the market are firmer, there is still no material accession of new business, and there was only a quiet market at Manchester on Tuesday. Consumers generally are at present in want of but little iron, and they do not yet appear to have regained sufficient confidence to buy largely in anticipation. Finished-iron makers especially, owing to the unsatisfactory position in which they have been placed by the withholding of specifications on the part of their customers, are not only buying little or no forge iron, but in a great many cases have been unable to take deliveries of the iron already bought. A considerable quantity of iron has, however, been purchased in this market during the last few days by middlemen, where orders could be booked for delivery over the remainder of the year. Local makers of pig-iron have been enabled, by the higher prices now being asked for some of the outside brands, to secure a little more business during the past week; but the output is still far in excess of the demand, and a considerable quantity of iron is now going down into stock. The nominal quotation for delivery into the Manchester district remains at 47s. 6d. per ton, less 2½ per cent., although less money than this would be taken. For Lincolnshire irons delivered into this district the selling prices remain at about 46s. 6d. to 45s. per ton, and Derbyshire 50s. to 52s. delivered equal to Manchester, less 2½ for foundry, and 44s. 6d. to 45s. for forge, with more money being asked by some firms, but there is little or nothing doing, and as large stocks are accumulating most of the Lincolnshire smelters are making arrangements for blowing-out furnaces;

one firm are reducing their make one half, and others are preparing to take a similar course. In Middlesbrough iron, delivered equal to Manchester, quotations for G.M.B.'s, now average about 46s. 10d. to 47s. 4d. per ton net cash, with some makers asking 1s. per ton above this; but these figures operate against business, as local makes of better quality can be bought for less money. There is no material change to notice in the finished-iron trade. Very few of the forges are fully employed, and the new orders coming in are not sufficient to replace those being worked off, although some makers report a slight improvement in the number of enquiries. The principal makers in this district have not altered their quotations from last week, and the average quotation for Lancashire bars delivered into the Manchester district may be given at from £6 5s. to £6 10s. per ton, but there is so much pressing for orders that in many cases prices are a matter of arrangement according to specifications. There is still no improvement whatever in the coal trade of this district; if anything, the market week after week gradually assumes a worse position, owing to the keen competition going on in all descriptions of round coal, the production of which is very much in excess of any present requirements. The better classes of round coal are now very bad to sell, and the leading firms in the Manchester district are at the close of this month reducing their delivery rates 10d. to 1s. 8d. per ton. For the gas-coal contracts, which in many cases will be concluded next month, tenders are being sent in not only at extremely low figures, but for long-forward deliveries. The lower classes of round coal for steam and forge purposes are difficult to move, and prices are exceedingly low. Engine classes of fuel, although now scarce, continue in fair demand at low rates. The average prices at the pit mouth are about as under:—Best coal, 7s. 6d. to 8s.; seconds, 5s. 9d. to 6s. 6d.; common, 4s. 6d. to 5s.; burgy, 3s. 9d. to 4s. 3d.; and slack, 3s. 3d. to 3s. 9d. per ton. The shipping trade is extremely dull, with very low prices still ruling.

LEEDS AND WEST YORKSHIRE.—The West Yorkshire iron manufacturers continue to have ample employment. What the future may have in store for them it would be idle to attempt to prognosticate. The object of a report like this is understood by the contributor to be to make a record of things as they exist, and not to attempt to penetrate into the mysteries of the days to come. Therefore he can guarantee as facts that the manufacture of best Yorkshire iron is proceeding at a brisk rate; that there is likely to be good work for all connected with it for some weeks to come; and that the orders in the books, which emanate from the Government, from railway companies, from shipbuilders, and from practical engineers, exceed in number and weight and money's worth all the experience of our ironmasters for five years past. Of course, if there be no additions to them, much of the present activity must soon subside, but the large firms of this neighbourhood, if they despise anything, it is to have attached to them the least suspicion that it is possible that they could under any stress of circumstances become croakers. They are at all times and under all circumstances confident in the knowledge that the world produces and recognises no iron superior to theirs; and that so long as the public safety has to be consulted both by land and sea the utilisation of the best Yorkshire iron is indispensable. The prices obtained by them are scarcely at all capricious, as is the case in all other branches of the trade; and even now after all kinds of pig-metal coming from other localities have been scarcely saleable at all at any price, the value of best Yorkshire manufactured iron has stood firm with a tenacity which seems most extraordinary to those who do not understand the peculiar and unrivalled excellence of the black-bed ironstone, indigenous exclusively to this district. In the common iron trade there is a brisker inquiry now than the Scotch and Cleveland quotations are undergoing a strong reaction. In a week or two, it will probably be seen that merchants' stocks have been cleared out at extremely bare profits, but that the future holds out quite a different prospect for consumers.

LONDON.—There has been considerable animation in the metal market during the week, although some descriptions of manufactures have ruled decidedly dull. Pig-iron having taken the lead, and fluctuated between 46s. 6d. and 49s., closes firm at 48s. 6d., rather sellers. Copper: a large quantity has changed hands at from £59 10s. to £62. closing at £61 10s. forward. Tin: much activity has taken place in this metal, only the least encouragement being necessary to reveal its firm position. This encouragement has been given by pig-iron improvement, and new quote for foreign tin £83 10s. with firm market and decidedly more buyers than sellers. Lead: better, £15 10s., £15 15s., English Pigs. Spanish: £15 5s. Quicksilver: £6 15s. Tinplates: dull.

NEWCASTLE AND THE TYNE DISTRICT.—Extreme dullness is the characteristic of our local iron trade this week. Most of the works, both by the sides of the Tyne and in the more inland ironmaking neighbourhoods, are idle, Newcastle Races having more attraction to the workmen for the time being than the blast-furnace, the rolling-mill, or the forge. Prices of iron here remain about the same as at Middlesbrough, with the extra freight, but as it is a holiday week little or nothing is being done. Some very easy offers of ship-plates and angle-iron are reported; but, in the stagnant condition of business, it would be as well to avoid quotations for this week. The engine-works are mostly busy, from the large orders received lately both for locomotive and marine engines; and no doubt much of this briskness is due to the low prices of the raw material. Steam-coal is lower by about 3d. per ton in the last week, and there is a probability that 8s. 6d. per ton will before autumn be the price for the very best steam-coals. The secondary sorts can be obtained now at 7s. 6d. to 8s. per ton, with immediate shipment. Gas and manufacturing coals rule dull, with a tendency to come down still further in quotations. Some of the collieries indeed are not paying the owners a farthing of interest; they are quite content if they can steer clear of loss. The house-coal trade is at present very dull. Business in the chemical trade is improving, yet some articles are sold below cost price. The tendency, however, is believed to be genuine, and not due to speculation. Soda ash, 48 to 52 per cent. brings 1½d. net; refined alkali, 52 per cent., 1½d less 3½ per cent. Soda crystals have made the greatest improvement, the price now being £3 2s. 6d., less 1½ per cent. In the lead and copper works there is plenty of work being done, in spite of the

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recent adverse turn of prices. Cement works also are in full swing, and good prices are got. In the fire-brick business there is a languid feeling which will not be got rid of during the present summer, the export orders being well gone through. For second-class bricks 37s. 6d. would be accepted readily, and the very best may be had for 45s. or little more, with the inducement of immediate shipment.

NORTH LINCOLNSHIRE.—Since our last notice relating to the state of trade in this district a change has come over the scene, and, like other iron-producing localities business is quieter, and the prospects of the district are not over cheering. Prices of pig-iron are much weaker than they were a few months ago. The various firms in the district are busy completing their old contracts, and do not seem over anxious to book new ones at the present rates. The North Lincolnshire Iron Company, who started two additional furnaces when the extra demand set in, has blown one out, but they propose enlarging its capacity during the time it is idle. The Lincolnshire Iron Smelting Company intimated to their men that they were about to reduce their furnaces, but the order was afterwards countermanded, to the delight of the men. At the Trent Works but slow progress is being made with the erection of their two new furnaces, and this cannot be wondered at when the state of trade is taken into account. In all probability the furnaces will not be erected until late in the year. The Frodingham Iron Company are erecting two heating stoves, which it is understood will effect a great saving in the consumption of coke. The stoves are intended to work the spare furnaces when completed. The furnaces belonging to the other district firms are being worked, but in the event of trade declining it is to be feared that other furnaces will be blown out. There is as yet a good demand for ironstone, not only for home requirements but also for distant furnaces.

NORTH STAFFORDSHIRE.—The last few days have brought a slight improvement in the finished-iron trade, and the consequences are seen in a somewhat better tone in the local market. The increase of orders comes mainly from colonial dealers, and the home market continues quiet, while the foreign markets are the reverse and animated. The mills employed on heavy sections are pretty well off for orders, and the bar mills are fairly occupied for the time. The demand for plates is moderately good, especially for the better qualities used in boiler-making, and orders for ship-plates are also coming in. Prices, however, are by no means steady, and many complaints are made of underselling. The forges are not so well worked as a few weeks back. The pig-iron and ironstone markets show little change. The coal trade remains dull, and even with a much reduced output the supply is greatly in excess of the demand. Prices are very low, and in many cases unremunerative.

SHEFFIELD.—The past week has been anything but a busy one, and the wave of stagnation which set in at Whitsuntide, has, if anything, increased. Commercial men on all sides are grumbling and there appears but few evidences of any improvement. Ironworkers are now accepting the reduced rates which have been laid down in the Staffordshire trade and the cost of production is thus reduced. Coal is likewise cheaper and iron is being sent out at the lowest possible cost. Rates are not at present remunerative for manufacturing descriptions. The reports which are coming to hand from the mills show that during the past six months a very remunerative trade has been done, and though the period of activity has only been a short one a considerable amount of profit has been made. The iron mills are now for the most part running on old orders, and Messrs. John Brown and Co. have sufficient work on hand to last for a couple of months, and keep certain of their hands busy. This company has just declared a dividend of five per cent. We notice that in the Bessemer department there is still a downward movement in prices. This week best billets have been on offer as low as £6 5s. per ton, and holders believe that rates will still further recede. There is, however, a feeling that within a couple of months there will be a revival of trade, and evidences of this are to hand, because of enquiries from all parts. The ship-plate department is very busy, and more is doing in boiler irons. In the heavy trades, makers are generally slack of work, and prices are downward, with a stiff competition. The last revival in business has caused a large amount of over-speculation, but it has been beneficial in this respect, that it has cleared out a large quantity of manufacturers' stocks which for a week past had been unsaleable.

SOUTH STAFFORDSHIRE.—The near approach of the end of the quarter is operating in the withholding of the distribution of orders for hardware. To that extent, therefore, business is less satisfactory this week than last. The Brazilian mail delivered this week has brought more than an average number of orders to a few merchant houses. On Buenos Ayres account, however, orders for cultivating tools and other hardware are being countermanded because of the war out there. It is much hoped by manufacturers that the conflict will be of short duration. Traders regard with satisfaction the decision to which the Wolverhampton Chamber of Commerce have come upon the French Tariff. This body has determined to recommend that the new duties ought to be *ad valorem* and not above 10 per cent., as any higher tariff would practically exclude from France hardware made hereabouts. Finished-iron is in only limited request at prices based upon £8 for best branded bars and £6 for common sorts. Sheets are £7 10s. as a minimum. Pig-iron is being produced largely in excess of consumption.

WEST CUMBERLAND.—The strike of ironworkers in this district has completely paralysed the whole of the industrial concerns which are engaged in the staple trade, and as most of the works have had to damp down their furnaces the whole of the district presents a scene of the greatest inanimation. There is no probability of a settlement at an early date of the difficulty; but it is obvious it cannot be of long duration inasmuch as the continued decline of trade makes the position of workmen worse and worse each succeeding week. Makers are to some extent in an unfortunate position, because the stoppage of their works is delaying deliveries; but it is affirmed on good authority that there is no pressure for deliveries, at least such as to require the immediate attention of ironmakers although most of these deliveries have to be completed before the close of the shipping season. The demand experienced for iron is small, a few transactions are recorded, but they

are of an unimportant character, and the general tendency seems to be in the direction of a decreased output. It is stated at several of the works furnaces are about to be blown out. The outlook is anything but cheerful, and it is probable the demand will remain quiet for some time, for the inquiries from America, the Continent, and other countries to which the iron of this district is usually sent, are all limited in character, and they point out that so far as the trade of the immediate future is concerned it will probably be small.

CONTINENTAL MINING AND METALLURGY.

FRANCE.

"DOWN with imports!" is the war-cry of the French iron trade at the present moment, according to our brisk cotemporary of Saint-Dizier. Makers in the north and east have no choice left to them but to repel, as well as they may, the present invasion of pigs and irons. Only for this reason have those makers decided to execute a strategic movement to the rear, and only on the coasts and frontiers, and in points in easy communication with them, has such a movement been executed at all. Where the distance is great enough to make the expense of carriage a factor in the total cost, irons maintain their front. Thus, while quotations in the north and east have receded to 210 fr., at Lyons and in the South generally, they remain at 250 fr. and 260 fr.; the Loire forges quote 240 fr. and 250 fr.; Decazeville, 240 fr. and 245 fr.; Fraisans, 230 fr. and 235 fr.; the Champagne forges, 220 fr. For ourselves, we see nothing very new in the variations of price pointed out by our cotemporary; at points where importation is profitable prices always will be lower than at inland centres. But it remains certain that France is consuming a large amount of irons and mild steels, and that there is a solid base to her present trade, whatever may be its fluctuations at the surface. At Paris, rates are unsettled, buyers wishing to have it believed that last year's prices are on their way back, while sellers remain confident in their ability to hold out to the end of the year. If the forges have not sufficient work to keep all their plant going they will throw part of it out of use rather than allow too keen an edge to be put on competition. At the present moment every ironmaking department of France is fully occupied, and the Nord mills are especially full. Restriction of output is very much in the habit of the French, and it is therefore not at all improbable that a shrinkage in prices will be really followed by a shrinkage in make. Paris prices are quoted as nominally 230 fr. for merchant irons and 240 fr. for beams, but great difficulties are experienced in negotiating business. Beams, columns, piping and so on are being consumed in large quantities in Paris, as is shown by the weight of the irons and castings brought through the city barriers during the first four months of the present year. This weight was for irons 11,934 tons, being 5052 more than in the corresponding period of last year; and for castings 9685 tons, being 3571 tons more than last year.

The Nord is under the thumb of Belgium, which really dictates Nord prices. At present the standard rate is 200 fr., and great efforts will be made to maintain it. In Haute-Marne 230 fr. appears in price lists, but business is done on lower terms, and makers are beginning to lose heart. The position of makers who have contracted forward for supplies of raw material becomes embarrassing in presence of a fall in the price of finished goods; but evidently the wisest thing for other people to do is to buy their pig now in the cheapest market. It is strange that our cotemporaries in the French press never tender this or any similar advice, while they do say things which, *mutato nomine*, would certainly sound ridiculous in their own ears. Suppose English papers were to say, "Down with bondons! down with French clocks! down with wooden shoes generally!" Would not our neighbours of Outre-Manche, who have so keen a sense of the ridiculous, find such English papers amusing? "Guerre aux importateurs!" "England," grumbles one of our cotemporaries, "inundates us with pig-metal; Belgium and Germany are sending irons and steels, in quantities which are merely fabulous." The Eastern Chainmakers' Syndicate has revived its price-list, which has held good since last February, making some general reductions at the rate of about 10 per cent. Wire rods keep up their price, the manufacture being confined to a small number of mills, already tolerably well provided with orders, and undesirable of being embarrassed by too much to do in the dry season. In the Ardennes, makers are harassed by the Belgian forges, who can place irons in north-eastern France at 200 fr. duty and carriage paid; while the current prices for French irons in the same district are 205 fr. and 210 fr. More than which, the shapes and dimensions best liked in the workshops of the Ardennes are made up and sent across the frontier. Belts, rivets and nails are doing well. A Charleville house has just sent out a price list quoting 210 fr. for split irons for nut-making, 215 fr. for iron for common hardware purposes, 220 fr. for beams, 225 fr. for angles, 270 fr. for hoop iron, and so on. The Brévilly Ironworks have been sold for £38,400 to the Société des aciéries de Longwy. At these ironworks merchant irons, plate, wire and points have been manufactured. The plant is said to be very complete and in excellent order, and to comprise hydraulic and steam power up to 700 horses. The works stand on the river Chiers, and the canalisation of this river puts them into connection with the Longwy steelworks.

The eyes of the makers of foundry pig in Meurthe-et-Moselle are fixed on Middlesborough. From Longwy and from Nancy ardent wishes are offered up for the prosperity of the Cleveland Iron trade. When English No. 3 stands at 36s. or 37s. at the Middlesborough Exchange it is to be had at the principal ports of import in France at 75 fr. duty paid; but if Longwy makers, for example, wished to sell at Lille, they could not do so at less than 80 fr. Their task in keeping their own market to themselves is therefore confessed to be a very harassing one, and hence their very sincere grief when English pig falls to any low figure. Forge pig is not more easy to negotiate than foundry; 70 fr.

is supposed to be its price. *L'Ancre* has only heard of one transaction in it during the past month; this was at the rate of 69 fr. 50 at the works which were near Nancy. Foundry pig fluctuates from 78 fr. to 80 fr. at Longwy, to 80 fr. to 83 fr. at Nancy. Warrants are still held at 15 fr. for forge, they are expected to fall shortly to 10 fr.; for foundry they are quoted 18 fr. 50 to 19 fr. 50. *La Metallurgie* repeats the news of the joint action of MM. de Wendel, of Hayange, and Schneider, of Creusot, in the erection at Franchepré, near Jœuf, in the department of Meurthe-et-Moselle, of large works, part of the business of which will be steel-making. The foundations of the new works have been excavated, the masonry is to be put down at once, the whole establishment to be erect and complete before this year is ended. The railway connecting the new works (which are planned to accommodate a working population of at least 2000) with the Moyeuve Forge is already finished.

Another repetition of news is that made by *L'Ancre* concerning the 100,000 tons contract for steel rails between Creusot and the Western of France. Our cotemporary confirms its news with some corrections. The gross amount is 100,000 tons, 10,000 tons are to be delivered yearly, they are to be delivered at Paris, delivery is to begin in 1883, and end in 1892, the price, delivered, is 200 fr. (instead of 210 fr. as first reported), say £8 (more strictly, £7 18s. 8d.). "Of course the rails will be made from cheap pig dephosphorised."

There is nothing else very new to report from the Rhone or Loire. The great steelworks are all well engaged, and there is no perceptible fall in quotations. The Balarne works are almost stopped; Beaucuire is in full swing, and is building additions; Decazeville has orders for hoop irons, Vignoles rails, plates and merchant irons, for at least a couple of months, having won back the footing on the market of Bordeaux which it had been driven from by English competition. The Decazeville Works now smelt 50 to 60 per cent. of the cheap ores of Mondalazac (Aveyron), which are now calcined as won, thus bringing their percentage up from 26 to 34. The Gard mills still have heavy orders to work out. The zinc works at Bousquet d'Orb are to be given up; leaving only two smaller establishments standing in the south of France, viz., at Violez (Aveyron) and Pix (Gard). A scheme for establishing large steelworks at some convenient place in the department of Arège, has been abandoned in consequence of the improbability of a sufficiently heavy import duty being maintained on steel goods.

M. Léon Say is reported to have confirmed while in England, the duty of 40 fr. (£1 11s. 9d.) on iron, proposed as one of the articles of the new treaty of commerce.

The strikes which were thought to be over at Lille, have broken out afresh, mostly in the engineering shops. Proceedings are this time varied by the masters, who made the strike by locking out. This week about 5000 men will be out at Lille and in its neighbourhood, the bone of contention being the reduction of the working day to 10 hours, without deduction of pay.

At the meeting on June 4th of the Paris Society of Civil Engineers, M. Ferdinand Gautier gave a historical *résumé* of the progress made by the dephosphorisation process in the last six or eight months. The speaker drew attention to the influence of manganese as a dephosphorising agent, and to the importance of phosphorus in its intermolecular combustion. M. Gautier stated that physically there was the same difference between Bessemerising with a fine white pig and a phosphoretic white pig as in the boiling of milk and of pure water—phosphorus rendering the bath very fluid. M. Jordan stated that a kilogramme of phosphorus yields 5867 calories, as measured by Thomsen, of Copenhagen University, and that a kilogramme of manganese converted into protoxide yields 1723 calories, and into binoxide (MnO₂) 2114 calories. Metallurgists now have four fuels at their disposal more than used so to be reckoned—iron, manganese, silicon and phosphorus, which yield non-gaseous products of combustion. Sulphur, which has acquired importance in the metallurgy of copper, is not to be compared to the foregoing, on account of the volatile nature of its products of combustion. M. Jordan was disposed to accept M. Pink's assertion that phosphorus may effectually replace silicon as a calorific element in the converter.

M. Tessié du Motay, well known for his scientific researches, has died in America. The economic production of oxygen was a favourite speculation of his.

The School of Mines made 617 analyses at its laboratory during 1879; twenty-one assays were of metallic alloys, ninety-four of iron ore and thirty of various metals and pig-irons. New Caledonia sent samples of chrome iron ores, containing 62 per cent. of oxide of chrome.

The consumption of coal in France from 1873 to 1878 is thus tabulated by the Ministry of Public Works:—

	French.	Imported.	Total consumption.
	tons.	tons.	tons.
1873	16,673,720	8,321,660	24,702,380
1874	15,984,060	7,433,470	23,417,530
1875	16,375,310	8,282,220	24,657,530
1876	16,251,460	8,220,730	24,472,190
1877	16,262,890	7,881,600	24,144,490
1878	16,353,990	8,201,300	24,555,290

BELGIUM.—There is a little more steadiness in Belgian rates, and quotations at Brussels are 60 fr. for pig, 140 fr. for No. 1 iron and 200 fr. for plates. Business should be good now, if at all this year, but the possibilities of consumption seem already to have been largely discounted. In the two districts of the Centre and of Charleroi there is now a large excess of make of pig over last year. One of the furnaces belonging to the Couillet Company was blown out on the 15th inst. At Charleroi strong forge pig is quoted 55 fr. to 57 fr. 50; foundry pig, 67 fr. 50 to 70 fr.; iron at 130 fr.; beams at 140 fr. and plates at 160 fr. The home mills are not buying much, but some good orders for France to be sent by way of Antwerp, have come in during the last week, and a few sparse inquiries for rails have made their appearance from America. Freight per ton just now from Antwerp to New York is 60s. The trade with India and China is characterised by the *Cote libre* as less bad than it was a fortnight ago, while South America and the West Indies are forwarding indents, though the prices offered by the latter countries are very low and the quantities taken

are too small to affect the market. It is curious to see these distant markets, which at one time, were almost entirely in English hands, now demurely reckoned on as natural outlets for the products of Belgian mills and engineering shops. There it is, however, and the fact may as well be noted by those gentlemen who in prize essays and leading articles scorn the possibility of Belgian competition. Beams are perhaps the firmest article in demand at Charleroi. Paris points and nails, machine made and forged, are very unsteady, makers are mostly without orders and are making for stock. At Liège prices vary from mill to mill, and there are no official quotations. The Charleroi Forgemasters' Association has sent another of its astounding begging letters to the unlucky Belgian Minister of Public Works, praying for the removal of the reduction of 1 fr. per ton, formerly made on the carriage of minettes from Luxembourg to Charleroi. In this shameless document we read that "the position of the iron trade has become worse than it ever has been. Our works are in a situation more critical than that from which they were relieved a few months ago. More than ever our blast-furnaces are again near extinction, and hundreds of workmen are near being condemned to vagabondage and starvation." Sackcloth and ashes are very pretty wear in their way, but the Association Maitres de Forges de Charleroi make so many appearances in that beggarly costume that for the credit of the trade at large we should hope they would one day get tired of it.

The Société métallurgique belge holds a general meeting of its shareholders on the 12th July, for the purpose of reducing the share capital, and borrowing money to work with.

The national Exhibition, opened at Brussels, as our readers are aware, on the 16th, is stated to be a scene of terrible disorder at present. More than 200 truck loads of goods are waiting to be placed, and the management has completely lost its head. No press orders have as yet been honoured, though they have been distributed, and everybody concerned is complaining loudly. One of the most remarkable exhibits is that made by the Cockerill Company. It comprises the fuel and ores raised and used by it, samples of its pig-iron and steel, specimens of castings and forgings; a compound pumping engine, of 1000 horse-power, ordered for Mansfeld, in Prussia, a 90 horse-power compound engine for a screw-steamer; and a 70 horse-power engine for a paddle steamer; six locomotives, of various types, two boilers, a locomotive and a machicol, a coal crusher, a siege gun, two field guns and a mountain gun. The Cockerill Works cover altogether 370 acres; the company employs a total of 9000 people; and pays £400,000 a year in wages; the steam-engines are 280 in number, and their total horse-power 11,660. One year with another, the value of the work booked is £1,500,000. Founded in 1817, the works have turned out since that time, 48,500 steam and other engines, and built 440 ships. In one year there have been built in them 100 locomotives, 70 steam-engines, 1500 various machines, 10,000 tons of bridges, turntables, framings, boilers, &c.; 14 metallic boats, great guns, hydraulic presses and cranes, &c.

The Société métallurgique has begun to put in position the girders which form part of the bridge at Boom. It has been practically decided to build a direct line of rail between Brussels and Antwerp, via Boom, and this line would be something shorter than the present one by way of Mechlin. The Boom bridge, according to the Brussels Interests, will comprise two fixed beams, 204 feet long—the longest in Belgium—and a swing bridge, 186 feet long—the longest in Europe.

GERMANY.—Prices have remained unchanged at Dortmund for at least a fortnight, except in plate, which Siegen is offering lower. Heretofore plates and Bessemer steel have been tolerably firm, or at least amongst the best branches of the trade. With a stoppage in the face of rates, and a slight revival of inquiry, trade would be far from bad, as a good many contracts are still in hand. Some hopes are entertained that America will be buying again this year freely, but Germany does not seem to profit very largely by the American harvests. In the first quarter of the present year the exports made by Germany to America were:—Fig, 4231 tons; scrap, 15,928 tons; bars, 2900 tons; angles, 10 tons; rails, 10,035 tons; fish plates, &c., 39 tons; plates and sheets, 36 tons; tinplate, 1 ton; iron wire, 2620 tons; forgings, 349 tons; anchors, chains, &c., 87 tons; cable, 5 tons; axles, wheels, &c., 336 tons; gun barrels, anvils, screw stocks, 5 tons; wrought-tubing, 10 tons; wire rod, 17 tons; coarse iron castings, 1203 tons; finer ditto, 119; in all, 36,842 tons. If this proportion were kept up all the year through, Germany would be exporting 150,000 tons yearly to the States, but there is little doubt that the exports were unusually large in the quarter just quoted. The American demand, however, is considered so important by the German Government that the *Government Gazette*, of May 3, contained a notification from the Minister of Public Works that in No. 3 of the *Handels-Archiv* would be found an article on the want of iron in America, and the way of meeting that want; and commending the information contained in it to the notice of the Chambers of Commerce and others.

Prices have fallen in Westphalia very considerably in a comparatively short time.

	End of April.	End of May.	Middle of June.
Spiegelisen	143s. 9d.	93s. 9d.	—
German foundry pig ..	100s.	87s. 6d.	70s.
.. Bessemer pig ..	85s.	75s.	75s.
Bar iron	207s. 3d.	200s.	150s.
Boiler plate	260s.	256s.	230s.

Hematite pig is now placed by English sellers at Dortmund at 74s. duty paid; German pig of like quality was a little while since not to be had under 80s. Merchant bars, although nominally quoted at 150s. are negotiated at 145s. for all but small quantities. However, these prices are better than those of last year, and the same may be said of the value of shares in ironworks. The proposal of the German Iron Trade Association to reduce output by common consent is not very earnestly supported. The make of 1879 (which is to be taken as the standard year) would probably be in excess of any present requirements, and play would therefore be allowed to speculation; while the example of the German coal trade convention, which, though it binds all its members to a smaller output, does not prevent the total output from growing, is at hand to make the proposal of the association look ridiculous.

On the eastern side of Germany work is said to be scarcer than on the western.

Mr. R. M. Daelen, the well-known Düsseldorf engineer, has patented a system of patent bricks, mixed with substances which give off oxygen, introduced into the Bessemer converter by means of a slanting cylinder of fireclay in the bottom of the converter, and stopped with a fireclay stopper, worked by a screw. When the fluid is let in upon the contents of the cylinder—coal or coke mixed with saltpetre or manganese-ore, air being excluded—an intense combustion of the latter takes place, and the burning gases pass through the bath of metal.

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 2413 to No. 2519, being the entries from June 15th, to June 21st.

NEW APPLICATIONS.

- Alarm Signals.—T. Jenkins, Gravely Hill, and W. Prior, Birmingham. [2414]
 Alarms for Steam Generators.—S. Richerton and H. V. Richerton, Ashton-under-Lyne, and D. Orme, Oldham. [2450]
 Artificial Leather.—A communication.—A. M. Clark, Chancery Lane, London. [2524]
 Betanaphthylamine and Betanaphthylaniline.—A communication.—C. D. Abel, London. [2516]
 Bicycle Lamp.—J. Lucas, Birmingham. [2493]
 Bicycles.—M. H. Gerring and R. B. Rumsey, Greenwich. [2515]
 Billiard Balls.—A communication.—H. G. Grant, Manchester, Lancashire. [2508]
 Bottle Stands.—G. Travis and T. Hill, Sheffield. [2510]
 Bottle Stands.—W. Bartram and J. W. Bartram, Sheffield. [2511]
 Bottle Stoppers.—J. Lament, Glasgow. [2488]
 Bookbinding Machinery.—A communication.—W. L. H. Lee, London. [2417]
 Braiding Machinery.—W. E. Jefferson and B. Lee, Leicester, Leicestershire. [2501]
 Breaching Arms.—A communication.—J. H. Johnson, London. [2493]
 Brickmaking.—G. H. Dean, Sittingbourne, Kent. [2498]
 Casters.—W. Burgess, New York, U.S.A. [2509]
 Chains.—A communication.—S. Pitt, Sutton, Surrey. [2426]
 Chemical Decomposition.—R. S. Newall and F. S. Newall, Newcastle-on-Tyne. [2417]
 Chronographs.—W. H. Douglas, Stourbridge, Warwickshire. [2500]
 Cleaning Steam Boiler Tubes and Flues.—A communication.—W. R. Lake, London. [2494]
 Compound Steam Pumping Engines.—E. B. Ellington, Chester, Cheshire. [2491]
 Continuous Brake.—J. Hirsiger, London. [2493]
 Converting Old Railway Rails into Billets.—A communication.—W. R. Lake, London. [2497]
 Cooking Ranges.—D. Robertson and T. Robertson, Glasgow. [2442]
 Coupling Railway Waggon.—T. G. Massick, the Oaks, Cumberland. [2436]
 Distillation.—A. Dudgeon, London. [2494]
 Drawing and Spinning.—E. Sykes, Huddersfield, and W. Cliffe, Golcar, near Huddersfield. [2487]
 Drying, &c., of Yarn or Thread.—T. P. Miller, Cambridge, Lancashire. [2489]
 Dyeing.—E. Possett and R. Peters, Bradford. [2493]
 Electric Brakes.—A communication.—J. C. Newburn, Fleet Street, London. [2453]
 Emery Wheels.—A communication.—W. R. Lake, London. [2424]
 Explosive Compound.—C. G. Björkman, London. [2483]
 Fastening for Belts.—J. A. B. Sabatier, London. [2470]
 Filtering Apparatus.—G. W. Dawson, Indianapolis, U.S.A. [2412]
 Furnaces.—C. Carr, jun., Smethwick, Staffordshire. [2486]
 Furniture-making Apparatus.—J. Reilly, Manchester. [2479]
 Gas Engines.—W. Foulis, Glasgow. [2422]
 Glazing Horticultural Buildings.—W. G. Smith, Bury St. Edmunds, Suffolk. [2474]
 Gun Locks.—T. Woodward and T. Woodward, jun., Birmingham. [2474]
 Heating and Ventilating Apparatus.—O. Sheppy, Bath. [2518]
 Hoist Protectors.—J. W. Midgley, Keighley, Yorkshire. [2478]
 Hot Air Engines.—A communication.—H. G. Grant, Manchester, Lancashire. [2500]
 Improved Stove.—J. Moore, Balham Hill, Surrey. [2415]
 Indiarubber Bands.—A communication.—C. Kessler, Berlin, Germany. [2447]
 Injectors.—S. Borland, Manchester. [2499]
 Lamps for Sewing Machines.—R. Bourne, Birmingham. [2450]
 Lighting Gas from Hydrocarbon Liquids.—A communication.—C. Kessler, Berlin. [2467]
 Lights and Ventilators for Roofs.—H. P. Holt, Leeds. [2437]
 Looms.—G. Kirk, Huddersfield. [2481]
 Machines for Folding Paper.—J. Richmond and W. Whiting, London. [2412]
 Match, &c., Boxes.—R. Bourne, Birmingham. [2451]
 Matches.—A communication.—W. R. Lake, London. [2476]
 Marine Chronometers.—J. S. Matheson, Leith. [2416]
 Melting and Refining Oils, &c.—G. Hugon, London. [2430]
 Metal Articles.—A communication.—W. A. Barlow, London. [2510]
 Metallic Fenders.—R. Roberts, Birmingham. [2452]
 Milk and other Cans.—W. B. Williamson, Worcester. [2471]
 Mining Machines.—A communication.—B. J. B. Mills, Southampton Buildings, London. [2513]
 Movable Stages for Loading Goods.—A communication.—C. D. Abel, London. [2495]
 Naval Construction.—H. Hirsch, London. [2498]
 Nickel Plating.—A communication.—J. Weller, London. [2493]
 Paper and Paper Bags.—J. Nichols, Ashford, Kent. [2420]
 Paper and Woven Fabric.—R. J. Edwards and A. Edwards, London. [2506]
 Paste-Moulding Apparatus.—W. S. Clark, D. Edwards and R. Davenport, Manchester. [2499]
 Perambulators.—J. Lloyd, Birmingham. [2436]
 Pottery Manufacture.—A. F. Wenger, Hanley, Staffordshire. [2439]
 Preparing Vegetable Fibres.—J. J. Sachs, Manchester. [2440]
 Preservation of Food.—T. F. Wilkins, London. [2438]
 Preventing Carriage Accidents.—A communication.—H. J. Allison, London. [2498]
 Prevention of Railway Accidents.—A communication.—A. D. Dupont, Southampton. [2459]
 Propulsion of Boats, &c.—A communication.—A. M. Clark, London. [2418]
 Purifying Water.—G. Best, March, Cambridgeshire. [2458]
 Railway Bars or Rails.—L. Richards, Douvres, Glamorgan-shire. [2490]
 Railway Couplings.—E. Wilson, London. [2485]
 Railway Points and Signals.—R. Hill and D. Macfar, Heywood, Lancashire. [2433]
 Raising Sunken Ships.—P. Kyle, Southend, Essex. [2413]
 Reaping Machines.—C. A. Davall and T. Hoshven, Ipswich, Suffolk. [2473]
 Regulating the Flow of Liquids.—D. Young, London. [2450]
 Rotary Heel Tip for Boots.—H. Bala, Birmingham. [2454]
 Rotary Pumps, &c.—J. W. Melling, Wigan, Lancashire. [2464]
 Seasoning Casks.—F. Baxter, Burton-on-Trent. [2454]
 Securing Scissors and other Blades.—W. Simpson and W. T. W. Simpson, Sheffield, and I. Wilkinson, Malin Bridge, Hillsborough, Yorkshire. [2414]
 Separating Dust from the Air.—A communication.—J. F. Stewart, London. [2440]
 Sewing, &c., Machine.—A communication.—W. R. Lane, London. [2430]
 Sewing Machines.—M. H. Pearson, Leeds. [2499]
 Sheaf-Binding Apparatus.—A communication.—C. D. Abel, London. [2517]

- Ships' Binnacles and Lamps.—J. M. Sim, London. [2412]
 Ships' Davits.—J. W. D. McDonald, Bembridge, Isle of Wight. [2463]
 Slotting and Planing Machines.—J. Barrow and J. Craven, Leeds. [2491]
 Smoke Consumption.—J. Turnpenny, Leeds. [2443]
 Stays and Corsets.—F. C. Nutter, London. [2429]
 Steam Boiler Floats.—F. Ludy, Brussels. [2445]
 Steam Engines.—A. Dobson, Belfast. [2462]
 Steam Engines.—A communication.—H. A. Bonneville, London. [2484]
 Steam Pumping Machinery.—G. H. Corlier, Providence, U.S.A. [2414]
 Steam Wheels.—J. T. Howson and W. Tute, Sheffield. [2490]
 Steel Binding Apparatus.—J. Harrison, Ipswich. [2475]
 Steel Wire.—J. Sykes, Lindley, near Huddersfield. [2482]
 Telephone Receivers.—R. M. Lockwood and S. H. Bartlett, New York, U.S.A. [2419]
 Telephonic Signalling.—E. H. Johnson, London. [2491]
 Tearing Cements, &c.—P. Adie, London. [2455]
 Tiles and Tile Roofing.—F. Baclesse, Walcourt, Belgium. [2420]
 Tram Car Brakes, &c.—E. W. Lemm, London. [2457]
 Transmitters for Telephones.—R. M. Lockwood and S. H. Bartlett, New York, U.S.A. [2418]
 Umbrellas.—A communication.—A. M. Clark, London. [2449]
 Varnish.—A communication.—W. R. Lake, London. [2407]
 Washing Woollen Fabrics.—A communication.—J. Weller, London. [2456]
 Woollen Manufacture.—A communication.—W. Brookes, Chancery Lane, London. [2431]

ABSTRACTS OF METALLURGICAL SPECIFICATIONS

PUBLISHED DURING THE WEEK ENDING JUNE 19, 1880.

(Prepared by PHILIP M. JUSTICE, 14, Southampton Buildings, W.C.)

Gold and Silver.—4668 (1879).—Barlow. Communicated by C. de Vaurcal.—To eliminate arsenic, copper and antimony, the ground ore, with 10 to 20 per cent. of galena and 8 to 10 per cent. of chloride of sodium, is placed in a gas retort and subjected to a dull red heat as also to the action of a current of hydrogen. The sulphuret of arsenic formed is distilled off, the lead, antimony and precious metals being reduced to a form of alloy. Air is admitted and the temperature raised until the sulphates react upon the chloride of sodium. The matters in fusion are received in iron forms. The matters which remain are cooled and preferably treated by the dry method for copper. The alloy containing the precious metals and antimony is scorified at a low temperature.

Armour Plates.—4669 (1879).—H. Studer.—Provisional only. The outer plate is made of cast steel or chilled cast iron, having plugs or tangs cast thereon, which fit in recesses formed in the back plate, which is formed of wrought iron or mild steel. Vulcanite, paper or other material is placed between the plates, the object being to localise any fracture produced on the outer plate.

Furnace Linings.—4806 (1879).—Glaser. Communicated by United King's and Laura Ironworks. To the pulverised dolomite (silicate of magnesia, or lime mixed with silicate of magnesia may be used) is added, from 5 to 10 per cent. of sulphate of magnesia or soda, and 8 to 10 per cent. of chromate of iron. Animal blood alone or with green vitriol is added and the bricks or tuyeres are pressed and dried.

Burning Limestone.—4268 (1879).—Glaser. Communicated by the United King's and Laura Ironworks.—In order to "dead burn" the purer kinds of limestone in a short time, oxygen is admitted into the furnace or hydrogen and hot air. The furnace is itself lined with limestone.

DIARY OF FORTHCOMING SALES.

NOTICES OF SALES OF ENGINES, PLANT, AND MACHINERY IMPLEMENTS, MINES AND COLLIERIES.

For Particulars of entries see Advertisements at end of Paper.

PLACES OF SALE.	PROPERTY FOR SALE.
London.	Woodford House Estate.
London.	Iron Merchant's Business.
On Great Northern.	Engineering Business.
Dumbarton.	Dennytown Forge Works.
Burton-on-Trent.	Mill and Plant.
Purton & Sharpness.	Plant, Engines, Timber, &c.
OPEN CONTRACTS.	
Strood Gaslight Co.	Supply and Erection of Condenser.
Admiralty.	Iron Bolts and Nuts, Bar Iron, Re-cutting Old Files.
India Office.	Ironworks.

PARTNERSHIPS DISSOLVED.

Dunthorn and Pond, Middlesex-wharf, Middlesex, and Pleasant-grove Works, York-road, smiths.—F. W. Fairbairn and Co., Canterbury and Whitstable, shipowners.—J. J. Shelton and Co., Birmingham, ironmongers.—Fletcher and Codd, Oswestry, Claxby, Usselby and elsewhere, Lincolnshire, thrashing machine owners.—Austin and Harper, Popham-green, Tipton, brick manufacturers.—Kellison, Hookham and Ludlow, Birmingham, screw manufacturers.—Kellison, Wood and Co., Birmingham, die sinkers; as far as regards W. T. Wilson.—J. Willis and Co., Birmingham, ring makers.—Cae Pen Tis Colliery Company, coalowners; as far as regards R. Rumley.—Ford, Brag and Co., Guildford-street, York-road, Lambeth engineers.—J. C. Harris and C. Edmunds, Wolverhampton, surveyors.—Pickford and Clarke, Denton near Manchester, plumbers.—C. W. Hitchen, J. Hamilton, and J. Mellor Baines, Bramley, near Leeds, in the concern of making and working a certain machine for making wire rope.

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

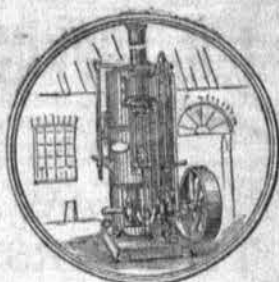
[FOR THE PRESENT AND PAST WEEK.]

Metal Market, City, Thursday Afternoon, 4 P.M. (June 24, 1880.)

METALS AND ORES.		JUNE 17.		JUNE 24.	
COPPER (per ton).—		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Chili, for 90 per cent.	57 17 1/2	63 0	63 10	63 10	63 10
Wallaroo	71 0	72 0	72 0	72 0	72 0
Burra Burra	61 0	61 0	61 0	61 0	61 0
English Trough	63 0	65 0	65 0	65 0	65 0
English Ingot best	67 0	70 0	70 0	70 0	70 0
Sheets sheathing and rod ..	67 0	70 0	70 0	70 0	70 0
Bottoms	71 0	76 0	76 0	76 0	76 0
Ore per unit	9 11 1/2	0 18	0 18	0 18	0 18
PROSPECTOR BRONZE					
Special Bearing Metal (p. tu)	112 0	112 0	112 0	112 0	112 0
Other alloys (per ton)	120 0	125 0	120 0	125 0	125 0
TIN (per ton).—					
Straits (Cash)	76 10	83 10	83 10	83 10	83 10
Do. for arr.	—	—	—	—	—
Billiton	—	—	—	—	—
Banco	80 0	88 0	88 0	88 0	88 0
English Ingot	81 0	85 0	85 0	85 0	85 0
Do. Bars	82 0	85 0	85 0	85 0	85 0
Do. Refined	82 0	85 0	85 0	85 0	85 0
Australian	76 10	83 10	83 10	83 10	83 10

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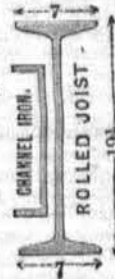


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Have always in their **TOWN STOCK** about **3,000 TONS** of the following sizes, from which orders can be immediately executed at low prices. Section Sheets and Book free on application.

MANCHESTER OFFICE: 6 BOND STREET.				TEES.		CHANNELS.	
ANGLES.							
8 x 4	3 1/2 x 3 1/2	3 x 3 = 10lbs.	5 x 3 = 13lbs.	7 x 2 = 14lbs.	8 1/2 x 3 1/2 = 24lbs.	12 x 3 = 42lbs.	5 x 3
6 x 6	3 x 3	5 x 1 1/2 = 5	6 x 4 1/2 = 23	7 x 3 1/2 = 20	9 1/2 x 4 1/2 = 29	12 x 6 = 66	4 x 4 1/2
6 x 3 1/2	2 1/2 x 2 1/2	4 x 1 1/2 = 7	6 x 2 = 11	8 x 4 = 22	10 x 4 1/2 = 32	14 x 6 = 60	5 x 3
5 x 3 1/2	2 x 2	4 x 3 = 12	6 x 3 = 16	8 x 5 = 29	10 x 5 = 36	16 x 6 = 62	3 x 3
4 x 3	1 1/2 x 1 1/2	5 x 2 = 8	6 x 5 = 29	8 x 6 = 34	10 x 6 = 54	18 x 6 1/2 = 82	2 x 2
4 x 4	1 x 1					19 1/2 x 7 = 100	1 1/2 x 1 1/2
							1 x 1

JOISTS—Lengths, from 6 to 30 ft. PLATES—Width, 6" to 18"; Length, 12 to 30 ft.; Thickness, 1/4" to 1".



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MERCHANTS, ENGINEERS, CONTRACTORS, &c.
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G. W. & Co. beg to intimate they are prepared to treat for purchase of Patents or the working of the same on Royalty.

PATENTS OBTAINED AND MANUFACTURERS' DESIGNS AND TRADE MARKS REGISTERED.
DRAWINGS, ANALYSES, &c., CAREFULLY PREPARED. PATTERNS AND MODELS MADE.

TIN PLATES, per box, I.C.	£ s.	£ s.	£ s.	£ s.
coke f.o.b. London	0 16/	0 30/	0 30/	0 30/
IX. do.	0 21/	0 24/	0 21/	0 24/
I.C. charcoal	0 21/	0 20/	0 21/	0 20/
I.X. "	0 27/	0 32/	0 27/	0 32/
LEAD (per ton)—				
Soft English pig	15 0/	—	15 10/	—
Do. W.B.	—	—	—	—
Spanish soft	14 15/	—	15 5/	—
Do. with silver	—	—	—	—
Sheet milled	16 0/	—	16 10/	—
Red lead	17 10/	—	17 10/	—
White	22 0/	—	22 0/	—
Patent shot—	19 0/	—	19 0/	—
Zinc (per ton)—				
Do. foreign	22 10/	—	22 0/	—
SPELTZER (per ton)—				
Silesian, com	18 0/	—	18 0/	—
Rhenish	—	—	—	—
English	—	—	—	—
QUICKSILVER, bot.	6 7/6	—	6 15/	—
ANTIMONY ore (per ton)—				
Australian	11 10/	14 10/	11 10/	14 10/
Spanish	—	—	—	—
French Star	69 0/	—	69 0/	70 0/
REGULUS				
Crude (per cwt.)	1 14/	—	1 14/	—
NICKEL (per lb.)	0 3/6	—	0 3/6	—
BRASS (per lb.)				
Sheets, 48 x 24	0 6/8	—	0 6/8	—
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 1/2	0 0/6	0 0/6 1/2
ASBESTOS (per lb.)	0 0/3	0 0/6 1/2	0 0/3	0 0/6 1/2
PLUMBAGO (per ton)—				
Ceylon lump	0 17/6	—	0 17/6	—
Do. chip	0 10/6	—	0 10/6	—
Do. dust	8 0/	—	8 0/	—
COALS (per ton)—				
East Hartlepool	1 2/	—	1 2/	—
Lambton	1 4/	—	1 4/	—
Tees	1 4/	—	1 4/	—
Hartley	1 2/	—	1 2/	—
Hetton	1 3/	—	1 3/	—
Hawthorn	1 3/	—	1 3/	—
Tunstall	1 2/	—	1 2/	—

OILS, CHEMICALS, &c.

OILS (per ton)—	JUNE 17.	JUNE 24.
Olive, Malaga	41 0/	40 0/
Do. Gioja	41 0/	39 10/
Do. Levant	41 0/	40 0/
Do. Mogador	—	—
Do. Tunis	41 0/	41 0/
Do. Sicily	45 0/	45 0/
Seal, pale	29 0/	30 0/
Seal, yellow	27 0/	27 0/
Seal, brown	25 0/	25 0/
Sperm head	70 0/	70 0/
Cod	26 0/	26 10/
Whale, pale	26 10/	26 10/
Do. yellow	25 10/	25 10/
Do. brown	26 0/	26 0/
E.L. Fish	20 10/	20 15/
Rapeseed, English, pale	27 10/	27 15/
Do. brown	—	—
Foreign Pale	—	—
Ground nut and Gingly	36 0/	36 0/
Madras	31 0/	31 0/
Palm oil, fine	31 0/	31 0/
Palm nut oil	32 10/	32 10/
Linseed oil	26 10/	26 15/
Cotton seed oil	25 10/	25 15/
Lard	30 0/	30 0/
Cocoon, Cochiti	35 0/	35 0/
Do. Ceylon	32 10/	32 10/
Mauritius	37 10/	37 10/

C. Price & Co.'s patent	£ s.	£ s.	£ s.	£ s.
engine oil (per gal.)	0 3/6	—	0 3/6	—
OIL CASKS (per ton)—				
Linseed, Ldn.	10 10/	10 15/	10 0/	10 10/
American bl.	9 15/	—	9 15/	—
Do. bags	9 2/6	9 5/	9 2/6	9 5/
Marseilles	9 0/	—	9 0/	—
Rape, English	5 0/	—	5 0/	—
Do. Foreign	—	—	—	—
Green Cotton	6 6/5	—	5 17/6	6 0/
TALLOW—P.Y.C.	41 0/	—	41 0/	—
S.American. Beel.	34 10/	35 0/	34 10/	—
Do. Sheep	32 10/	33 0/	32 0/	34 10/
Australian Beel.	30 10/	33 0/	32 10/	—
Do. Sheep	35 10/	36 10/	34 10/	—
Rough Town Fat	14 0/	—	14 0/	—
PETROLEUM—				
Fine (per gal.)	0 0/5 1/2	0 0/6	0 0/5 1/2	0 0/6
Do. spirit	0 0/6	0 0/7	0 0/5 1/2	0 0/6 1/2
TURPENTINE—Spirit—				
French	—	—	—	—
American (casks)	1 15/	—	1 15/	—
WHALEFINS (per ton)—				
Davis Straits	1000 0/	—	1000 0/	—
Arctic	1000 0/	1000 0/	950 0/	—
Southern	200 0/	—	500 0/	—
ROCKSTONE (per ton)—				
Rough, ad. ind.	7 0/	—	7 0/	—
Do. jds. do.	6 10/	—	6 0/	—
Roll	8 15/	0 10/	9 15/	—
SULPHUR, Flour (per cwt.)	0 10/9	0 12/6	0 10/9	0 12/6
Acid, (per lb.)				
Acetic, fine	0 0/2 1/2	0 0/3 1/2	0 0/2 1/2	0 0/3 1/2
Do. common (per gal.)	0 1/5	0 1/6	0 1/5	0 1/6
Citric	0 2/1	—	0 2/1	—
Muriatic fine (per cwt.)	2 4/	0 7/	0 4/	0 7/
Do. common	0 4/	0 5/	0 4/	0 5/
Nitric	0 0/4 1/2	—	0 0/4 1/2	—
Oxalic (per lb.)	0 0/4	—	0 0/4	—
Sulphuric, concentrated	0 1/1	—	0 1/1	—
Do. Brown	0 0/2 1/2	0 0/1	0 0/2 1/2	0 0/1
Tartaric Crystal	0 1/8 1/2	0 1/8	0 1/8 1/2	0 1/8 1/2
Do. Pulv.	—	0 1/8 1/2	0 1/8	0 1/8 1/2
ARSENIA—				
Carbonate, per lb.	0 0/6 1/2	0 0/6 1/2	0 0/6 1/2	0 0/6 1/2
Sulphate, White & grey (per ton)	18 10/	19 0/	18 10/	19 0/
ARSENIC—White Lump (per ton)	23 10/	—	23 10/	—
Powdered, do.	10 10/	—	10 10/	—
Bleaching powder	0 6/3	0 6/6	0 6/	0 6/3
BORAX, Rld., do.	2 15/	—	3 0/	—
COPPERAS (ton)	2 15/	3 0/	2 15/	3 0/
Bi-SULPHIDE CARBON (per ton)	24 10/	26 0/	24 10/	26 0/
PORTLAND CEMENT—				
1st quality, in cks 400 lb.	—	—	—	—
gross, inc. cks., f.o.b.	0 0/	—	0 0/	—
Thames, per csk.	0 0/	—	0 0/	—
Do. in sks, 200lb. net (per ton)	2 0/	—	2 0/	—
Sacks extra, 1/6 each.	—	—	—	—
Charlton White Paint (per cwt.)	1 15/	—	1 15/	—
Calley's Torbay Paint, Brown	0 30/	—	0 30/	—
Do. Red	0 34/	—	0 34/	—
HYPOPHOSPHITES (per lb.)				
Iron	0 0/3	0 10/	0 0/3	0 10/
Lime	0 5/3	0 7/	0 5/3	0 7/
Magnesia	0 9/	0 9/	0 9/	0 9/
Manganese	0 9/	0 9/	0 9/	0 9/
Soda	0 5/3	0 6/	0 5/3	0 6/
LEAD (per cwt.)				
Acetate, best	1 10/	2 0/	1 10/	2 0/
Nitrate	1 15/	—	1 15/	—
Red (per cwt.)	0 10/6	—	0 10/6	—
White	1 4/	—	1 4/	—
LITHIUM (per cwt.)	0 18/	—	0 18/	—
Link (per ton)	—	—	—	—
Acetate, Grey, 85%	21 0/	—	21 0/	—
Do. Brown 70%	14 0/	—	14 0/	—

POTASH—	£ s.	£ s.	£ s.	£ s.
Bichromate (lb.)	0 0/5 1/2	0 0/3 1/2	0 0/5 1/2	0 0/5 1/2
Chlorate (pr. lb.)	0 0/6 1/2	—	0 0/6 1/2	—
Muriate, 80% ton	6 15/	—	6 15/	—
Pruss. Red (lb.)	0 1/8	0 1/10 1/2	0 1/8	1/10 1/2
Do. Yel. lb.	0 0/10 1/2	0 0/11 1/2	0 0/11	0 0/11
Sulphate, 80% (per ton)	9 0/	10 0/	9 0/	10 0/
SALTPETRE (per cwt.)				
Engl. reind. kgs.	1 7/	—	1 7/	—
Do. barrels	1 7/	—	1 7/	—
Do. Bengal	0 19/6	1 1/6	0 19/6	1 1/6
SODA—				
Ash, deg.	0 0/1 15-16	0 0/2	0 0/1 15-16	0 0/2
Bicarb. (per cwt.)	0 10/9	—	0 10/9	—
Caustic, 60% to 72%	10 5/	10 10/	10 5/	10 10/
Nitrate (per ton)	14 0/	14 5/	14 0/	14 5/
Crystals (per ton)	—	3 5/	—	3 5/

* Per ton extra in London, Staffordshire, 15s.; Scotch, 10s.; Lancashire, 15s.; Welsh, 10s.

LONDON PRICE LIST OF IRON, (FOR THE PRESENT AND PAST WEEK.) (June 24, 1880.)

IRON.	JUNE 17.	JUNE 24.
IRON, per ton—	£ s.	£ s.
(at works)*		
Bars, Welsh, common	5 15/	5 15/
Do. Best	6 5/	6 5/
Scotch, Common	6 10/	6 10/
Do. Best	7 10/	7 10/
South Stafford, common	7 0/	7 10/
Do. Best	7 0/	7 0/
Sheets, singles, Cleveland	8 10/	8 10/
Staffordshire	9 10/	9 10/
Do. doubles, Staffordshire	11 0/	11 0/
Do. Lattens, Staffordshire	12 10/	12 10/
Plate, Ship, Stafford	9 0/	9 0/
Do. Scotch	7 10/	7 10/
Do. Boiler, Stafford	9 5/	9 5/
Hoops, Stafford	7 5/	7 5/
Nail Rods, Stafford	7 10/	7 13/
Swedish in Lond.	12 0/	12 0/
Anglo Iron, Welsh	—	—
Do. Stafford	8 0/	8 0/
Fud. Bars, Welsh	—	—
Do. Stafford	5 10/	5 10/
Do. Scotch	—	—
Rails, Welsh	5 5/	5 5/
Do. Stafford	7 0/	7 0/
North England	5 5/	5 5/
Light Rails, Welsh	0 0/	0 0/
Do. Stafford	7 0/	7 0/
Pig Iron at Glasgow	—	—
Scotch warrants	2 6/6	2 8/
Do. No. 1	2 10/	2 10/
Cleveland, Tyne or Tees	1 17/6	2 4/5
Indian Charcoal, London	—	—
Wrought Iron Girders (riveted up)	18 0/	18 0/
Boils and Nuts	16 0/	16 0/
Fish Bolts	16 0/	16 0/
Washers	17 10/	17 10/
Rivets	15 0/	15 0/
Spikes	16 0/	16 0/
SWEDISH IRON—		
f.o.b. Gottaburg, nett cash.		
Pig	10 10/	11 0/
Bar, rolled	11 10/	11 10/
Do. hammered	11 10/	11 10/
Billets	11 10/	11 10/
Horse Nail Rods	—	—

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Unter Mitwirkung bewährter Ingenieure und anderer Fachmänner aus dem In- und Ausland her gegeben von
Wilhelm Heinrich Unland,
Civil-Ingenieur und Patent-Anwalt in Leipzig.

Verlag von BAUMGARTNER'S BUCHHANDLUNG in Leipzig.

Inhalt des 11. Heftes: Regulator für hydraulische Motoren. Ueber das Wasserrohr-Kessel-System und dessen praktische Anwendung. Unkrautauslese und Getreidesortiermaschine von Ingenieur Krüger. Mühlen-Stellzeuge. Patent-Präzisions-Säge-maschine. Pulso-meter und Ejektor in Wasserstationen. Kaderfräsmaschinen mit Patent-Theilapparat. Der Stahl für Schiffbau und Maschinen-Constructionen der Zukunft. Kessel-Speisewasser-Filter. Wick's logotypische Setzmaschine.

Der „Practische Maschinen-Constructeur“ erscheint in halbmonatlichen Heften und kostet pro Quartal 6 Hefte mit Holzschnitten und 24 Photographen, Tafeln, sowie vielen Skizzenblättern 6 Mark 75 Pf. Einzelne Hefte werden nicht abgegeben! In London bei Herrn Williams und Norgate, 14, Henrietta Street, Covent Garden.

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Bars and Silt Rods, common		—	—	—	—	—	—
Best		—	—	—	—	—	—
Hammered		—	—	—	—	—	—
Puddled Steel		—	—	—	—	—	—
Bessemer		—	—	—	—	—	—
Hoops		—	—	—	—	—	—
Rails		—	—	—	—	—	—
Rolled Girders		—	—	—	—	—	—
STEEL—		Nominal.					
Best cast		40	0	65	4	40	0
Do. dbl. shear		45	0	50	0	45	0
Do. single do.		35	0	40	0	35	0
English spring med. quality		15	0	18	0	15	0
Blister		30	0	32	0	30	0
Swedish keg		16	0	17	0	16	0
Milan		20	0	21	0	20	0
Bessemer rails		7	0	8	0	7	0
SCRAP (per ton)—		£	s.	d.	£	s.	d.
Old rails for remanufacture		3	5	3	12	6	3
D.H.		3	2	6	3	0	6
Ditto flange or bridge		3	5	3	10	3	0
Engineers' scrap		2	0	2	5	2	0
Light scrap		1	10	2	10	1	10
Scrap metal		3	18	4	0	3	10
Old steel scrap		3	18	4	0	3	10
WIRE—		£	s.	d.	£	s.	d.
Best best drawn killed		16	10	—	16	10	—
gal. tel. Nos. 0 to 6		17	0	—	17	0	—
Do. 7 & 8		18	0	—	18	0	—
Do. 9		18	10	—	18	10	—
Do. 10		19	0	—	19	0	—
Do. 11		19	10	—	19	10	—
Do. 12		19	10	—	19	10	—
Rolled black fencing wire		11	10	—	11	10	—
(per ton) 1 to 4		12	0	—	12	0	—
Do. 5		12	10	—	12	10	—
Do. 6		13	0	—	13	0	—
Bright Iron Wire (Charnock)		0	12	6	0	12	6
wire, 48. 6d. per bundle		0	13	6	0	13	6
of 63 lb. 0 to 6		0	13	6	0	13	6
Do. 7 to 8		0	13	6	0	13	6
Galvanised, 8oz. per ton extra.		0	13	6	0	13	6
Best best annealed drawn		16	10	—	16	10	—
fencing wire, per ton		17	0	—	17	0	—
Do. 7		17	0	—	17	0	—
Do. 8		17	0	—	17	0	—
CASTINGS (per ton) at works—		£	s.	d.	£	s.	d.
Girders		6	10	7	10	6	10
Chairs		4	10	5	0	4	10
Floor plates		5	12	6	—	5	12
Pipes, 12 to 24 in.		6	12	7	0	6	12
Do. 3 to 4		6	2	0	5	6	2
Do. 5 to 8		6	1	0	4	6	1
Do. 10 to 12		6	0	0	2	6	0
Do. 14 to 18		5	17	6	0	5	17

THE INSTITUTION OF CIVIL ENGINEERS.—A new list of members of the Institution of Civil Engineers has just been issued, from which it appears that there are now on the books 1217 members, 1299 associate members, 579 associates, 18 honorary members, and 657 students—together 3770 of all classes. At the same period last year the numbers of the several classes were 1148, 1200, 622, 17, and 591, making a total of 3578, showing an increase at the rate of nearly 5½ per cent. During the past session, the elections have comprised 2 honorary members, 43 members, 129 associate members, and 15 associates, and 160 students have been admitted.

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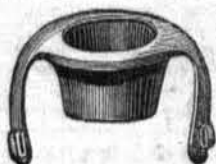
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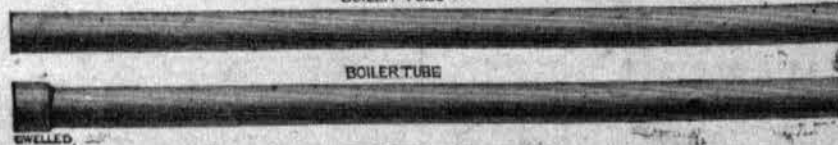
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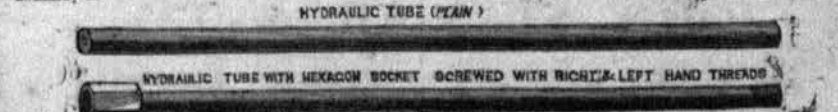
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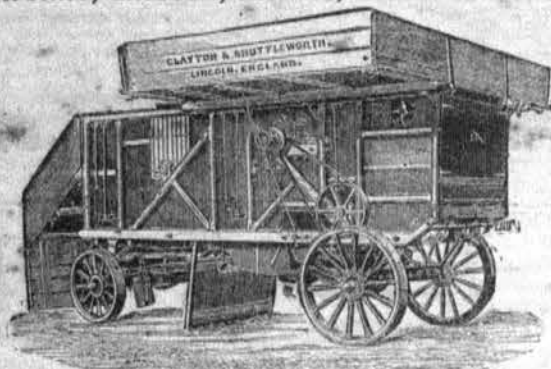
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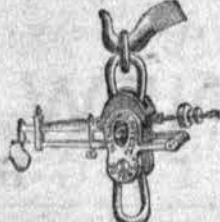
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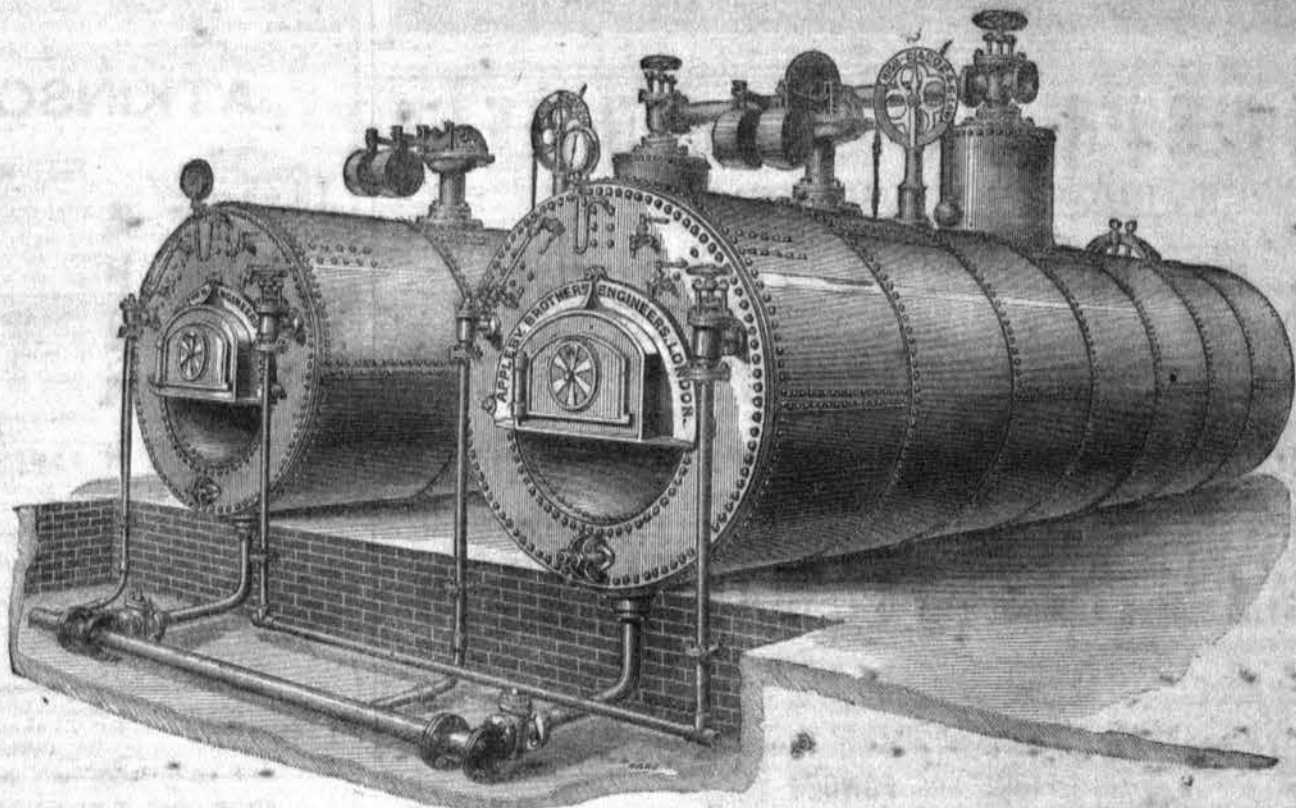


Fig. 46, see Appleby's Handbook of Machinery.—Section 1.

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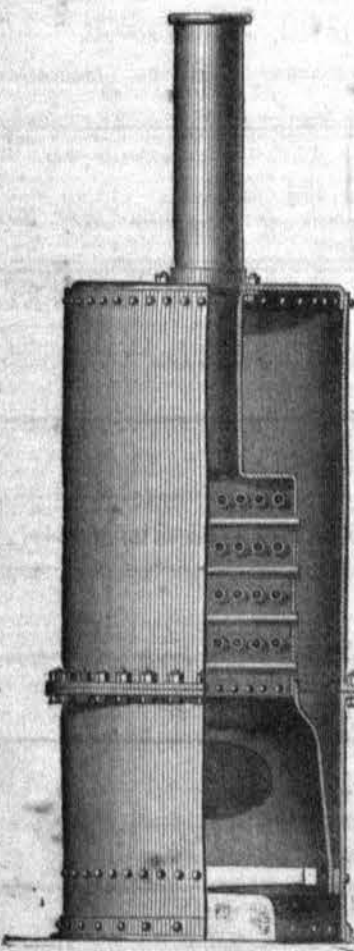


FIG. 53.

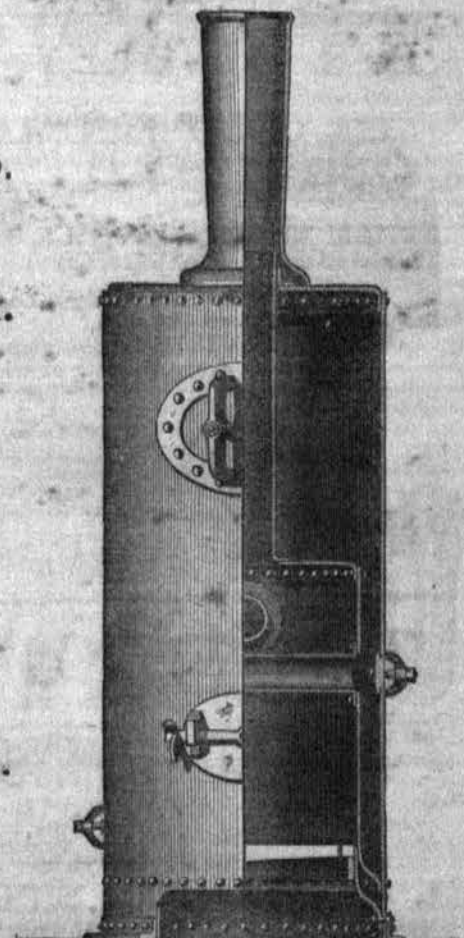
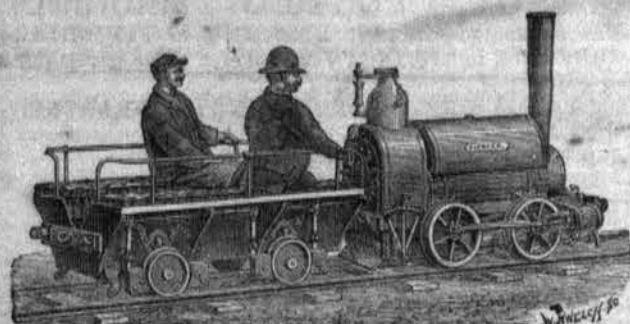


FIG. 52.

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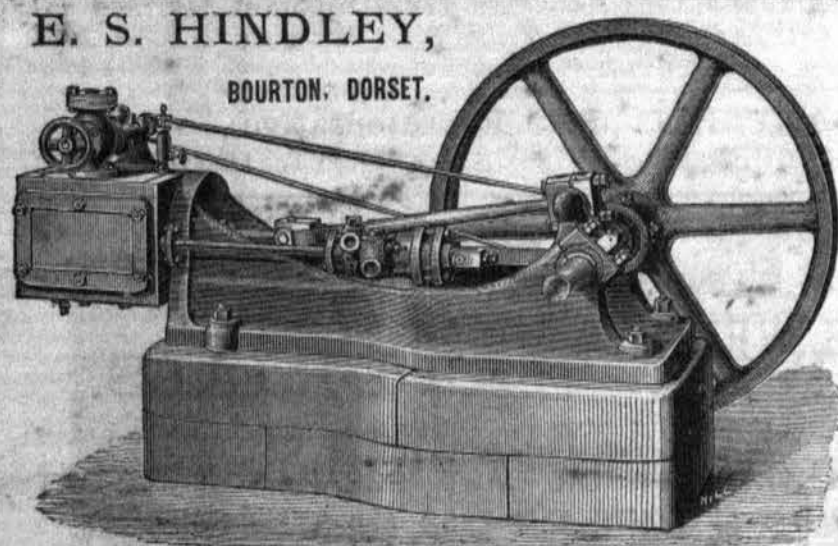
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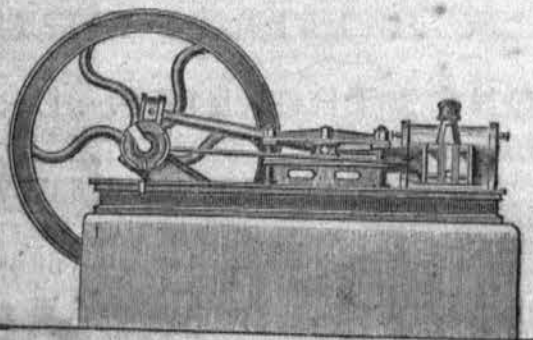


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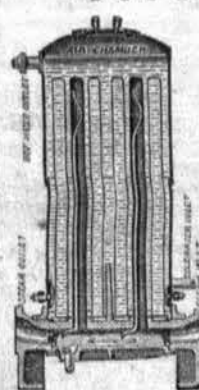
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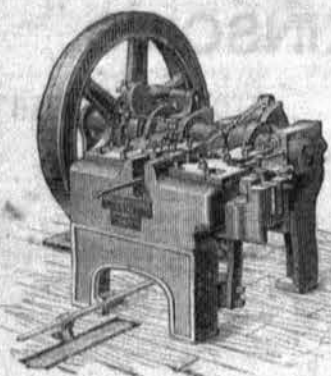


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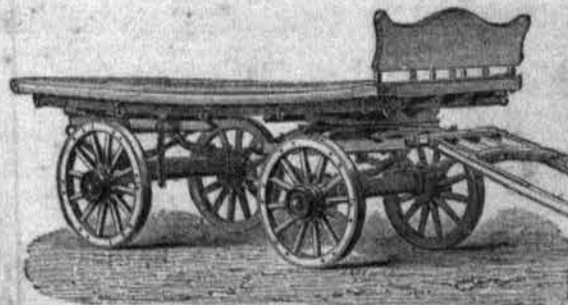
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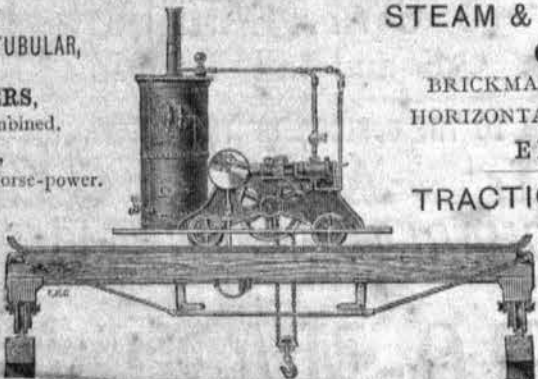
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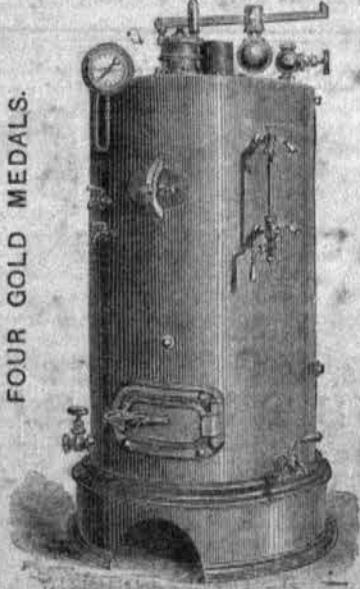
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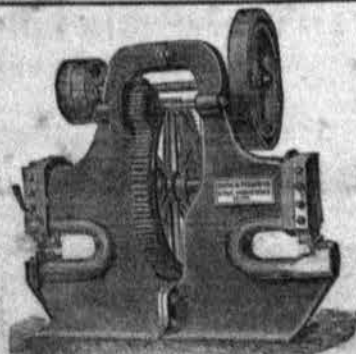
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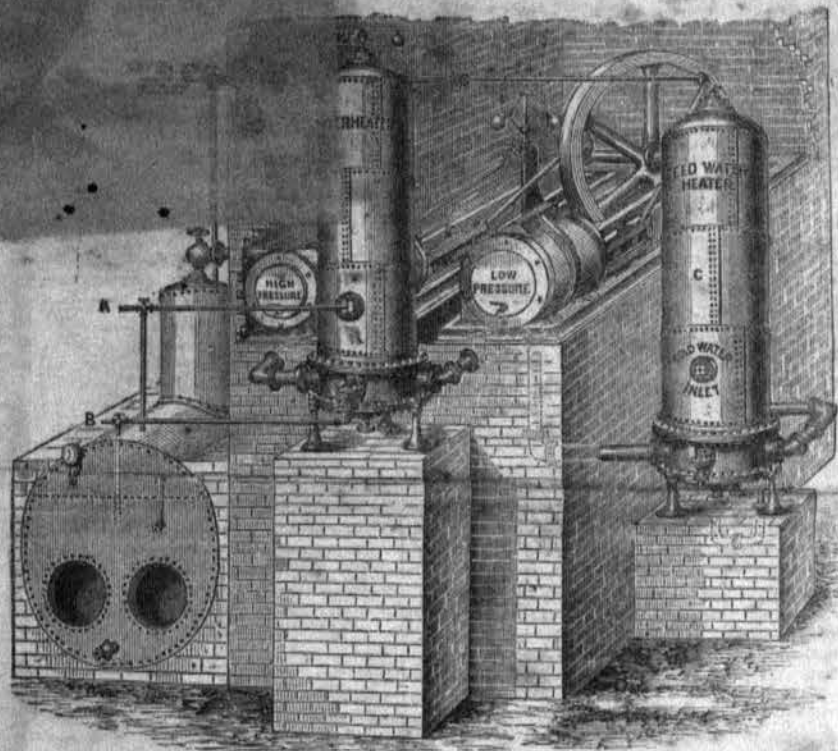
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London	1862
Paris (class 53)	1867
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Naples	1871
Trieste	1872
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Manchester and Liverpool ..	1867
Royal	1869
Royal	1870
Manchester and Liverpool ..	1871
Manchester (Gold)	1875
(Society for Promoting Scientific Industry)	
Ayrshire	1876
Highland Society	1879
Royal Cornwall	1877
Royal Manchester Liverpool and North Lancashire ..	1878

Sole Makers of
POOLEY'S PATENT
TRAMWAY
WEIGHBRIDGES
and
Improved Indicators
for
BILLY FAIRPLAY
MACHINES.

A NARROW GAUGE RAILWAY

WROUGHT IRON SLEEPERS TO FIT ANY RAIL, DISPENSING WITH SPIKES AND ALL LOOSE PIECES.

OR FEEDERS TO TRUNK LINES,
QUAYSIDES, ARSENALS,
FORESTS, MINES,
SUGAR AND COFFEE
PLANTATIONS.



THE OUTSIDE
CLIPPING SLEEPERS
ARE LAID FIRST, THEN
THE INSIDE SLEEPERS
ARE HAMMERED UP AS
FROM THE DOTTED LINES.



OVER 1000
MILES OF LINE
ARE NOW
LAID WITH THESE
SLEEPERS.



FOR CONTRACTORS,
FORTIFICATIONS,
BRICKYARDS,
EARTHWORKS,
QUARRIES.

SOLE AGENTS, **SHAW BROTHERS,** BIRMINGHAM.
DRAWINGS & PARTICULARS ON APPLICATION. TO SAVE TIME, PLEASE GIVE GAUGE, WEIGHT OF RAIL, AND KIND OF TRAFFIC.

TWO SILVER MEDALS, PARIS, 1875.
THE CRUIER MEDAL, SANTIAGO, 1875.
**THE GLENBOIG STAR
FIREBRICK WORKS,**
NEAR COATBRIDGE, N.B.

JAS. DUNNACHIE,
2, West Regent Street, Glasgow.

CONTRACTOR TO HER MAJESTY'S GOVERNMENT.

Manufacturers of Fire Bricks for Steel, Iron, Brass, Gas, Chemical and Glass Furnaces, Copper roofing, calcining and refining furnaces, the special bricks for the Siemens regenerative gas-furnace (this is the brand recommended by Dr. C. W. Siemens), Bessmer tuyeres, runners, plugs and stoppers, German fireclay. No other firebrick combines such a high degree of infusibility with the perfect absence of cracking and splitting on under sudden cooling.

Each brick bears the registered Trade Mark.

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Quotations, Illustrated Catalogues, &c., on application.

Shipping ports, Glasgow, Grangemouth, Leith, Granton, Dundee, &c.
London Agents: Messrs. Doulton and Co., Lambeth Pottery, and Crown Wharf, Victoria Park, E.

Wheatley Kirk, Price and Goult, ESTABLISHED 1850.
MECHANICAL VALUERS, AUCTIONEERS AND ARBITRATORS.

Head Offices—Albert Square, Manchester.

Partnerships. — Gentlemen
(Practical Engineers) desirous of entering established Engineering concerns, are invited to communicate with the undersigned, who have numerous bona-fide establishments open to admit such. References are given and required.—**WHEATLEY KIRK, PRICE AND GOULTY,** Albert Square, Manchester.

Engineering Firms of Good
REPUTE, open to admit partners, or desirous of selling outright, are requested to communicate with the undersigned, who have numerous clients open for such.—**WHEATLEY KIRK, PRICE AND GOULTY,** Albert Square, Manchester.

IN LIQUIDATION.
To be Sold by Private
TREATY, as a going concern, on the Great Northern Line of Railway, a well-established ENGINEERING FIRM, comprising the following branches, viz:—
The Manufacture of Stationary Engines and Boilers.
Portable and Compound do.
Agricultural Implements of all classes.
And especially the Manufacture of Wrought Iron Cranks, for which a complete Plant of Patent Machinery has been put down; also General Iron Founding with all the Appliances for carrying on and extending a first-class trade.

The Machinery and Tools are by well-known makers, and the new Buildings are erected upon land secured for 1,000 years' lease.
Full particulars can be obtained from Mr. Isaac Jenks, of Wolverhampton; Mr. Thomas Leman, Accountant, Nottingham; or Messrs. Corser, Fowler and Langley, Solicitors, Wolverhampton.

Dennystown Forge Works,
DUMFRIES.

For Sale, by Public Roup, within the Faculty Hall, St. George's Place, Glasgow, on WEDNESDAY, the 14th day of July, 1880, at Two o'clock, Afternoon (unless previously disposed of privately), in consequence of the death of one of the Partners, and the expiry of the Contract of Partnership.

The WELL-KNOWN DENNYSTOWN FORGE WORKS, which have been established upwards of 50 years, and have enjoyed a large share of public support.

They are situated in Dumfries, on the bank of the river Leven, bounded on the east by the North British Railway (from which there is a branch into the works), and on the west by the Leven, where there is a private quay.

The ground extends to 4 acres in poles or there by, at the moderate Rent-duty of £22 10s. 4d. The value of the ground has largely increased since the date of the lease.

The Plant is extensive and valuable. There are Seven Steam Engines, large and small; Sixteen Machines in Lathes, Slotters, Screwing Machines, &c.; Nine Steam Hammers, from 15 cwt. to 10 tons; 16 Vertical Boilers. The Cranes are numerous, and of the most improved and powerful description. The Furnaces and all other appliances complete and ample.

These Works are well situated for the receipt of the Raw Materials and the dispatch of the finished Forgings, having connection by rail to all parts of the County, as well as by water with the various Shipbuilding and Engineering Yards on the Leven and the Clyde.

In the locality there is a large demand for Forgings; while the situation of the Works at all times commands a superior class of Workmen, both skilled and labouring. The Works are now in full employment, and will be continued so for the entry of a purchaser.

UPSET PRICE, £20,000.

Mr. Muir, at the Works, will show parties over the Premises, and give all necessary information, and further particulars may also be had from JAMES RYAN, DUNDEE AND CO., Writers, 175, Hope Street, Glasgow, who are in possession of the Title Deeds, Inventories and Valuations, and the Articles of Roup.

Glasgow, 8th June, 1880.

IRON FIELD, NORTH OF IRELAND.

To be Let, a Valuable Mining
FIELD, situated in County Antrim, Ireland, near to the Northern Counties Railway, and within about an hour and a half distance from the FERRY of Belfast and Larne. The ground has already been opened and the ore tested, and found to be of excellent quality. A cargo may be taken for trial on terms. Applicants to address themselves to Messrs. HARRISON and Miles, Solicitors, Kentish Town, or Robert H. Goss, Esq., 24, Lombard Street, London.

200 TONS NUTS, BOLTS, &c.,
ALWAYS IN STOCK.
SAMUEL MARSDEN & SON,
LONDON ROAD, MANCHESTER.
Patentees and Makers of Special Machinery for Bolt, Spike and Nut Making.

Northamptonshire.—The Woodford House Estate, for many years the seat of the late General Arbuthnot, a highly important Freehold (and small-part leasehold) Residential and Sporting Property, of upwards of 750 acres, possessing great mineral value, adjoining Twywell, and within a mile of Cranford, both having stations on the Huntingdon branch of the Midland Railway, three miles from the nearest town of Thrapston, which has stations on the Midland and London and North-Western Railways, and seven miles from Wellingborough. The estate is of an undulating character, intersected by good roads. It includes a family residence, occupying a pleasing site, overlooking a timbered park, surrounded with well-grown plantations, interspersed by walks, tastefully arranged pleasure grounds, capital walled kitchen garden, green-house, stabling, small farmery, &c., two good farms, with suitable homesteads; also accommodation land in the thriving village of Woodford. The Pychley, Fitzwilliam, and Oakley Foxhounds are within easy reach, and there are several noblemen's and gentlemen's seats in the locality. Some of the richest beds of iron ore and limestone underlie the greater portion of the Estate, parts of which are now being worked, and it is believed there is no district where these minerals can be found under more favourable circumstances, or put into the market at a cheaper rate. There are private rails and tramways on the property connecting it with the Midland Railway by sidings at Twywell.

Messrs. Farebrother, Ellis, CLARK and Co. are instructed to offer the above valuable ESTATE for SALE by AUCTION, at the Mart, Tokenhouse Yard, London, on WEDNESDAY, 14th July, 1880, at 2 o'clock, in Lots. Particulars, with plans and conditions of sale, may shortly be obtained of Messrs. Walters, Deverell and Walters, Solicitors, 9, New Square, Lincoln's Inn, W.C.; Messrs. Hensley and Hensley, Solicitors, 5, Albany Court Yard, Piccadilly, W.; Messrs. Farrer, Outry and Co., Solicitors, 66, Lincoln's Inn Fields, W.C.; Messrs. Green and Chase, Solicitors, 9, Warwick Street, Charing Cross, S.W.; of Messrs. Longbourne, Longbourne and Stevens, Solicitors, 7, Lincoln's Inn Fields, W.C.; of Mr. S. Prickett at the Ironworks Office on the estate; at the Mart; and with orders to view, of T. H. Burroughs, Esq., 30, Lincoln's Inn Fields, W.C.; and of Messrs. Farebrother, Ellis, Clark and Co., 5 and 6, Lancaster Place, Strand, W.C., and 18, Old Broad Street, London, E.C.

Burton-on-Trent. — For Sale,
by PRIVATE TREATY, a well-established and profitable BUSINESS, situated at Burton-on-Trent, on the banks of the river Trent, with extensive newly-erected MACHINERY and PLANT therein, lately used as chemical, barytes, paint, and colour works, worked by water power derived from the river Trent, a never-failing source. Together with the dwelling-houses, two cottages, gardens, and several pieces of meadow land thereto belonging, the whole containing 84, 37, 34p., and being held for the term of 21 years, computed from the 10th of October, 1855, at the annual rent of £251 5s. Two additional wheels and a small outlay would bring up the power to 50-horse, and there is ample space and accommodation for the addition of extra works, such as the manufacture of flour, chemicals, crushed bones, or vitriol, &c., and capable of doing an extensive trade. The premises are well situated for freight or carriage, either by railway or canal. For further particulars, and permission to view, apply to Mr. A. J. FINE, Solicitor, 42, Pall Mall, Derby.

For Sale, in consequence of
the death of the surviving Partner, an old established IRON MERCHANT'S BUSINESS. To be SOLD by PRIVATE TENDER, with the exception of the stock and fixtures, to Richard Mullins, in the matter of the Estate of James Robertson, deceased, and in an action of Mandamus v. Whyte, the COODWILL of the BUSINESS (with possession of the premises) of the old established and well-known firm of MACNAUGHT, ROBERTSON and COMPANY, Iron, Steel, and Girder Merchants, with the right to use the name of Macnaught, Robertson and Co. The Business has, for many years, been carried on at or adjoining Bankside, Southwark. The Premises, No. 1, Bank End, are held on Lease for a term, which expires on the 24th June, 1881, at the very moderate rent of £200, together with the right of use in common, until the 31st of December, 1881, of a Wharf on the Thames at Bankside, having a frontage thereto of about 30 feet 3 inches, and of the Crane thereon.

The Warehouse Premises, situate No. 64, Malby Street, Bermondsey, Surrey, are held under a Lease, expiring on the 10th of June, 1887, at the moderate rent of £80 per annum.

The Leases and Documents of Title can be inspected three days before the 10th of June, 1880, by any intending purchaser, at the offices of Mr. H. Harris, 64, Moorgate Street, E.C.

The interest in the Business is at all pending Contracts and Works in hand, and also the Plant, fixed Machinery, Trade Fixtures and Fittings (of which a detailed inventory will be produced), and the Stock-in-Trade, loose Materials and Effects in or upon the premises are to be taken by the purchaser at a valuation to be made in the usual way.

Sealed Tenders are to be sent not later than the 10th June, 1880, to Mr. JAMES WADDILL, the Manager and Receiver, at his offices, No. 11, Queen Victoria Street, E.C. Further particulars can be obtained of him, and also of Mr. Henry Harris, Solicitor, 64, Moorgate Street, or Messrs. H. S. Harris and Goss, Solicitors, 64, Moorgate Street, E.C.

The Directors of the RO-
CHESTER, CHATHAM and STROOD GAS LIGHT COMPANY are prepared to receive TENDERS for the SUPPLY and ERECTION of a CONDENSER at their Works at Rochester, according to drawing, which may be had on application.

Tenders, marked "Tender for Condenser," to be delivered at the Company's Office, 20, High Street, Rochester, before noon of THURSDAY, 8th July.

W. SYMS, Secretary.

The Directors reserve the right to reject any Tender.

PURTON AND SHARPNESS,
GLOUCESTERSHIRE.
IMPORTANT THREE DAYS' SALE
OF THE
VALUABLE PLANT, LOCOMOTIVE
AND PORTABLE ENGINES, TIM-
BER, MATERIALS AND OTHER
ARTICLES

Used by the Hamilton Windsor Iron Com-
pany, Limited, in Constructing the
Severn Bridge.

**MESSRS. STEPHENSON, ALEX-
ANDER and CO.,** are instructed to
SELL by AUCTION, at the above
Places, commencing on TUESDAY, June
29th, at 11.30 a.m., and continuing daily until
the whole is Sold, the valuable

PLANT, MACHINERY, TIMBER,
MATERIALS,

&c., &c., used at these Works, the follow-
ing being some of the principal Lots:—

THREE SADDLE TANK LOCOMO-
TIVE STEAM ENGINES,

Recently overhauled and in excellent work-
ing order,

FIVE PORTABLE STEAM ENGINES,

By Barrow and Stewart and other excellent
Makers,

TWO VERTICAL BLOWING
ENGINES,

TWO Costly and Superior AIR BELLS,
5 feet diameter, suitable for Sinking Cylinders
in the Construction of the largest Iron
Bridges in the World,

FIVE STEAM AND OTHER DONKEY
PUMPS,

TWO TON STEAM CRANE,

TWO 20 TON GANTRY JENNIES, SIX
GOLIATH AND OTHER GANTRIES
and JENNIES,

PUNCHING and SHEARING
MACHINE, 20 Single, Double and Treble
Purchase Crab Winches of various descrip-
tions, 12 Screw and Hydraulic Lifting Jacks
of strengths varying in power from 1 to 20

LIME MILL, by Clayton and Shuttleworth,
With fittings and appliances complete, in
excellent condition, 600 fathoms of five-eighth
Chain, 20 Tons of various size Chain, TWO
SCOWS, 33 feet and 72 feet long, strongly
built, fitted with Sissons and White's Patent
Endless Chain Pile Drivers and Engines,

FIVE BARGES,

With Gear Fittings and Appliances complete,

TWO PATENT IRON LIFEBOATS,

24 and 28 feet by 6 and 8 feet beams,

FOUR COPPER FASTENED BOATS,

13, 21 and 35 feet by 4, 5 and 7 feet beam
with Sails, Kedge Anchors, Chains and Oars
complete,

FIVE VARIOUS SIZE BOATS,
Of useful dimensions,

Between 20 and 30 Tons of New Nuts and

SEVEN SURPLUS 10-foot IRON
CYLINDERS,

SIXTY TONS OF WROUGHT SCRAP
IRON,

FIFTY TONS OF SHORT RAILS,
Several Contractors' Earth Waggon, 4 feet
8½ inch Gauge,

CORRUGATED IRON AND WOODEN
BUILDINGS, OFFICES, &c.,

Three Sets of SIEBE AND GORMAN'S
DIVING APPARATUS AND DRESSES,
Divers' and Submarine Tools,

CENTRIFUGAL AND OTHER PUMPS,
2000 SPRUCE DEALS,

60,000 CUBIC FEET OF PITCH PINE
IN BULK,

Of superior growth, in excellent condition.
Easy of transit by rail or water,

100 VARIOUS SHEAVE IRON PULLEY
AND SNATCH BLOCKS,

Large and varied assortment of Smiths'
Tools,

30 LADDERS, from 9 to 40 feet in length.

Iron and Wooden Slips, Trolleys, &c.,

Fitters' Tools, Hearths, Circular Billows,
Drilling Stands, Ratchet Braces, Drills,

SHEAR LEGS, DERRICK POLES,
ROPES,

Brass, Piping, Sheet, Bar and other Iron,
&c., &c., and the whole of the Plant and
Effects used in the construction of the Severn
Bridge.

Catalogues are in course of preparation,
and may be obtained of the Auctioneers at
their Cardiff Offices, the principal Hotels at
Lydsey, Sharpness, Berkeley, Gloucester and
Bristol, on and after the 19th of June.

TENDER will be received by the
Director of Navy Contracts,
Contract Department, Admiralty, Whitehall,
S.W., 23rd June, 1880.

BY ORDER OF THE SECRETARY OF
STATE FOR INDIA IN COUNCIL.

The Director-General of
STORES FOR INDIA is prepared to
receive TENDERS from such persons as may be
willing to supply

Contract No. 1.—IRONWORK for Metro Gauge
Railway Bridges, spans of 100 feet.

Contract No. 2.—IRONWORK for Metro Gauge
Railway Bridges, spans 6, 10, 12, 20, 30, 40 and 60 feet.

Contract No. 3.—IRONWORK for Road
Bridges, spans of 20, 30, 40 and 60 feet.

The Conditions of the Contracts may be obtained
and the drawings inspected on application to the
Director-General of Stores, India Office, West-
minster, S.W., and Tenders are to be left at his
office at any time before two p.m. on TUESDAY,
13th July, 1880, after which no Tender will be
received.

A. ABERCROMBIE JOFFE,
Director-General of Stores.

India Office, 25th June, 1880.

To Iron Merchants, Paper
MANUFACTURERS, AND OTHERS.—
UPPER THAMES STREET.—To be LET, a
substantially built WAREHOUSE, possessing
capital loading facilities, and comprising five floors
and basement, each floor fitted with loop-holes and
cranes. Rent £500 per annum.—Apply to ST.
QUINTIN AND SONS, 37, Threadneedle Street, E.C.

Cape Colony.—Wanted, by
Advertiser, to represent in the Cape Colony
a few first-class ENGINEERING FIRMS.
Communications are requested.—Sub. G. L.,
Editor of this Journal.

Partnerships Wanted in En-
GINEERING BUSINESS, Agricultural
Implements preferred. One Client has £1000,
another £2000 to £3000.—Apply to EDWARD LAMB,
Ashby-de-la-Zouch.

JOHN BELLAMY,
MYNG STREET, MILLWALL, LONDON, E.

MANUFACTURER OF
WROUGHT IRON TANKS AND CISTERNS.

Cattle, Sheep, and Pig Troughs, Cast Bodies,
Corn, Flour, and Sack Bins, Funnels, Shoots,
Hoppers, Bolters, and every Description of
Wrought Iron work either painted or galvanized.

The only BELLAMY in the Trade.

No connection with any other house trading
under this name.

ESCHERICH'S GAS KILN,
only successful Gas Kiln for burning the
of a delicate colour, facing bricks, fire bricks,
pottery and china, &c., at a great saving in
fuel. For particulars, apply to.

HERMANN WEDEKIND
138, FENCHURCH ST., LONDON, E.C.

New Edition.
How to Make Money by
PATENTS.—Treatise by post, 11 stamps.—
RANLOW and YOUNG, Patent Agents and Consulting
Engineers, 23, Southampton Buildings, W.C.

A SILVER MEDAL, PARIS, 1878.
For Excellence of Quality.

WAS AWARDED TO
THE GLENBOIG FIRE CLAY
COMPANY,

ESTABLISHED 1856.
Office: 68, BATH STREET,
GLASGOW.

MANUFACTURERS OF FIRE BRICKS FOR
HIGH HEATS AND SUDDEN CHANGES OF
TEMPERATURE.

Repairs in smelting, puddling and other furnaces
occasion such expense and loss of time that it
becomes a matter of the greatest necessity to build
these furnaces of bricks possessing the highest
refractory power. Our experience shows that where
ever our bricks have been introduced, they have
superceded those of local make. They are specially
adapted for Siemens regenerative gas-furnaces; for
blast, puddling and glass furnaces; every descrip-
tion of furnace exposed to the most intense heat
and sudden changes of temperature, as they do
not crack and drop when quickly cooled or heated.
References can be given both in Great Britain and
the Continent to many of the largest firms in the
iron, steel and other trades where our fire bricks
are in constant use.

Quotations given delivered at Antwerp, Rotterdam,
Bremen, Hamburg, Havre, Dunkirk, &c.

Shipping ports, Glasgow, Leith, Grangemouth,
Granton, Dundee, &c. &c.