

THE PROPOSED WEST-END TRAMWAYS.—The scheme of the Bayswater, Marylebone, King's-cross and Islington Tramways Company formed the chief subject of discussion at a recent meeting of the St. Marylebone Vestry. The promoters of this scheme propose to construct a line of tramways from the Angel, Islington, to the Bayswater-road, passing along the Pentonville-road, Euston-road, Marylebone-road, Bishop's-road, and Queen's-road, Bayswater, and diverging, where the narrowness of the streets requires it, into two single and independent lines through different thoroughfares. This proposal came up for consideration in the form of an adjourned discussion on a report of the Parliamentary Committee of the Vestry, which recommended the Vestry to refuse their consent, as the road authority, to the scheme, and, if necessary, to oppose it in Parliament and at the Board of Trade. On the question of the adoption of this report, an amendment had been moved at a previous meeting to the effect that the Vestry should first inquire of the parishes of Islington and St. Pancras as to the effect of the tramways existing within their bounds. The discussion was now resumed by Mr. Hallam, who spoke with warmth in favour of the amendment. After some debate, Mr. Galsworthy, J.P., who opposed the amendment and supported the immediate adoption of the committee's report, said he understood the promoters of the scheme consisted of two persons only, and if these two people were fortunate enough to obtain the consent of the Vestry to the tramways he could only say he would like to be one of them. The question they had really to consider was whether the streets of that parish were or were not suitable for tramways. The committee had decided that they were not. He believed the proposed tramways would be injurious to the residents, and lead to a depreciation of ratable property. It was no doubt true as a general principle that the interests of the few ought to give way to those of the many, and it was certainly most important to have good means of communication. But they ought not to commit themselves in a hurry. They should first of all ascertain what had been the effect of tramways, not only in the parishes of Islington and St. Pancras, but in other districts also. He hoped, therefore, the Vestry would reject the amendment and adopt the report of the committee. After a prolonged discussion the proposal was rejected and the report of the committee adopted. Mr. Verrey gave notice that at the next meeting he would oppose the confirmation of this decision.

ELECTRICITY, TELEGRAPHY

WEST INDIAN CABLES.—The cable between Santa Cruz and Trinidad, made of Hooper's core, and laid in 1875, is interrupted; so, also, is that between St. Thomas and St. Kitts.—*Electrician*.

THE SOUTH AFRICAN TELEGRAPH.—It will be remembered that shortly before the opening of telegraphic communication with Zanzibar there was a fracture which caused several days' interruption. We learn that this was found to have arisen from the action of a submarine volcano about ten miles on this side of the Zanzibar landing place. A slight shock of earthquake was felt in the island, and the cable, which up to then had been working all right, suddenly ceased to act. On being recovered, it was found to have been ruptured in a way only to be accounted for in the manner named. In relaying, the position of the cable was altered by a couple of miles. We believe this is the first time such a thing has occurred in marine telegraphy.—*Natal Mercury*.

TELEGRAPHIC CABLE EXTENSION.—Extensive preparations are being made at Porthcurnow or Sandy Cove, between Penzance and the Land's End, for the laying of two new cables from Brest to Cornwall in connection with the new French Atlantic cable. This cable is the first French cable undertaking, as the former French cable was really owned and worked entirely by Englishmen. The opening of the Paris and Lyons Transatlantic telegraph system, therefore, occasioned much rejoicing in France a fortnight ago. The company are not at present seeking English traffic, being bent on first placing the larger French towns in direct communication with America; but the new cross-Channel cables, for which engineering surveys are now being made in the Penzance district, will enable the French company to compete with its Anglo-American rival, who has announced its intention, when this is completed, to reduce the tariff to 6d. per word. The French company has given the British Postal Department notice to prepare for the additional business their cables will throw upon the Penzance office, which has now become the most extensive centre for submarine cables in the world. Those to India, China, Australia, the Brazils, the Cape, and America, all pass through that office.

THE GERMAN SUBTERRANEAN TELEGRAPH SYSTEM.—The highly favourable experience made during the severe weather of the present winter with the underground telegraph lines in Germany has determined the Government of that country to proceed with the extension and completion of the system as soon as the warmer season of the year returns. According to the official report there were finished last year the lines connecting (1) Hamburg, Bremen and Emden, with branches to Bremerhaven and Wilhelmshaven; (2) Cologne and Coblenz; (3) Mayence and Coblenz; (4) Coblenz, Treves, and Metz; (5) Metz and Strasburg; and (6) Berlin and Dresden. During the year 1880 it is intended to lay down the lines (1) from Berlin to Frankfurt-on-the-Oder; (2) from Berlin to Munchenberg, which is afterwards to be extended to Thorn; and (3) from Berlin to Stettin. Preliminary works in connection with these three lines have already been carried out. After they are finished new lines are to be commenced connecting the following places:—(1) Stettin, Colberg, Dantsic, and Konigsberg; (2) Munchenberg, Kustrin, Posen, and Thorn; and (3) Cologne and Aix la Chapelle. It is subsequently to extend the lines from Konigsberg to Eydkubnen on the Russian frontier, and from Breslau to Oderberg on the Austrian borders. It is expected that by the beginning of 1883 the great scheme of a subterranean telegraphic connection between all the chief commercial and military centres of the empire will in its main features have been fully carried out.

NAVAL ARCHITECTURE.

NORTHERN SHIPBUILDING IN 1879.

THE course of northern shipbuilding during 1879, says *The Times*, has not been marked by the depression that has affected most northern industries—at least, not affected to the same extent, but it has been interfered with in several of its centres by a strike of some duration. Hence the number of vessels turned out is at several ports considerably less than in 1878—the ports of the Tees and the Hartlepool being instances. During the first half of the year the number of vessels launched from most of the shipbuilding ports in the north was fully up to the average—the tonnage launched from the ports between the Tees and the Tyne inclusive in the six months being over 180,000—all of which was of steamship, except 3300 tons. But in the third quarter of the year the ships built in these ports fell to about 74,000 tons, the declension being most marked in the Sunderland district; while in the last quarter of the year, owing to the strike referred to, there is at the centres affected a still more marked fall, which adversely affects the total. While the volume of production has been thus reduced, the value was during the first three-quarters of the year adversely affected also, the fall in the price of iron-materially reducing the cost of shipping; but with this the lower freights rendered employment less remunerative, and further contracted the demand for new tonnage. But the stimulus which has been recently given to trade, the increase in the cost of iron, the rise in the freight market, and other allied causes have very greatly changed the condition of the shipbuilding trade, and the languor and almost stagnation of the middle of the year have been succeeded by marked briskness, not at one only, but at almost every one of the northern shipbuilding ports.

From several causes, a very large part of the ship-constructional work of the kingdom seems gravitating to the north-eastern ports. Unquestionably, among these causes the largeness of the local employment for vessels, the comparative cheapness of iron, and the extent of the plate and angle mills of the district take front rank; while the ancient repute of the Wear, the Tyne, and the Tees for wooden vessels has contributed to the retention of the industry in its more modern form. Hence, the tonnage built at the northern ports rose from 133,000 for the year 1873—more than a third of the tonnage built in the United Kingdom in that year—to 177,000 for 1877, considerably more than a third of the larger tonnage for that year for the kingdom, and more than the tonnage built at the whole of the Scottish ports. The following year, 1878, was memorable in shipbuilding history as one of very large construction; and the great shipbuilding centres of the Clyde and of the north-east of England showed a remarkable growth, both in the number and tonnage of the vessels built. The Clyde district raised its tonnage to 215,000; but the ports on the north-east coast raised their tonnage in the total to 300,000. As we have seen, during the first half of the year 1879 the launches were considerably above that ratio, and even in the third quarter the ratio was not materially reduced, but in the last quarter the practical stoppage of launches on the Tees and at West Hartlepool has caused a sensible diminution. At the last-named port the largest contribution to the Mercantile Navy from any one British shipyard has for a year or two been made, and the large falling off from this and other yards sensibly affects the total. But it is evident from the number of vessels that have been ordered, and from the number in course of construction there will be in the early months of the year a recovery. The declension thus brought about represents, however, a falling off in the demand. Although there was a marked fall in the price of tonnage in the first and part of the second quarter, yet the lower prices did not bring about a recovery in the demand, and even so low a rate as £10 to 10s. per register ton failed to induce buyers to come forward. In the state of the freight market at that date there was no inducement to commence the construction of new vessels; but in the latter half of the year there was a recovery in demand and a rise in prices. The deficient harvest has called out a demand for tonnage for wheat and provision-carrying purposes, and the general recovery of trade is adding necessarily to the carrying needs. Hence, freights have risen, and the prospect of more remunerative employment for vessels and the probability of further increases in the cost of vessels have brought out orders until nearly every shipyard on the north-east coast has its order-book well supplied. Nor are the prospects worse for the immediate future, for generally it may be said that though the tonnage of iron vessels built is now very large, yet the loss is yearly large also, averaging from a fifth to a fourth of the total built yearly. This is of iron vessels only, and it is to be borne in mind that the iron shipbuilders have to replace the iron vessels lost, to replace a portion of the wooden vessels that are taken off the register yearly and not renewed, and to provide for the additional carrying capacity which the growth of international trade calls for. It may be added that there has not been on the north-east coast that rapid movement from iron to steel which was expected during 1879, and the orders that have been recently placed are generally, but not exclusively, for iron vessels. It is evident, however, that there is a continuance of that slow tendency, and that at several of the shipbuilding ports there will be the introduction of the steel shipbuilding industry, though not so rapidly as had been at first expected. Generally it may be said that the characteristics of the north-eastern shipbuilding trade during 1879 have been a decline in prices and extent of work in the earlier months of the year, and a more than complete recovery in the last quarter; but these facts are inversely represented in the finished work. But the prospects of the future brighten out, and 1880 promises to be the briskest of recent years.

LAUNCHES.

ENGLISH.

Lady Tylers.—On the 12th Jan. a paddle passenger steamer was launched from the shipbuilding yard of Messrs. T. and W. Smith and Co., North Shields, named *Lady Tyler*. This steamer has been built to the order of the Great Eastern Railway Company for their Continental traffic between Harwich and Rotterdam. She is 260 feet

long, 30 feet beam, and the depth is 13 feet 6 inches and 7 feet 3 inches. Her registered tonnage will be 1150 tons. Her complement of passengers will be 200, and her engines, 350 horse-power, are to be fitted by Messrs. R. and W. Hawthorn. It is expected that she will be ready for her trial trip in about two months' time.

SCOTCH.

Firth of Dornoch.—On Jan. 10 there was launched from the shipbuilding yard of Messrs. Russell and Co., Cartdyke, Greenock, an iron sailing barque of 900 tons. She is 200 feet in length between perpendiculars, 32 feet 6 inches broad, and 19 feet in depth. As she left the ways she was named the *Firth of Dornoch*. The vessel is intended for general trading, and has been built to the order of Messrs. James Spencer and Co., Glasgow. After the launch the new barque was towed up the harbour at Port Glasgow, where she will be fitted out.

Taramung.—On the 13th Jan., Messrs. Russell and Co. launched a screw-steamer of the following dimensions:—Length, 246 feet, breadth of beam 33 feet 6 inches, depth of hold, 16 feet 6 inches, and about 1300 tons. The engines, which are to be 130 horse-power, will be supplied by Messrs. Kincaid, Donald and Co., Greenock. This steamer, which has been named the *Taramung*, is to be engaged in the Australian trade. When fitted out, the *Taramung* will be taken to Glasgow, where she will load for Melbourne.

Vagliona A.—On the 10th Jan. Messrs. Thomas B. Seath and Co. launched from their shipbuilding-yard at Rutherglen an iron twin-screw steamer of the following dimensions:—175 feet in length and 27 feet beam. The machinery, which is supplied by Messrs. A. Campbell and Son, Anderston Quay, Glasgow, consisted of a pair of compound engines of 50-horse power. On leaving the stocks the vessel was named the *Vagliona A*. The *Vagliona A* is the first of two steamers being built by the Messrs. Seath for Messrs. Vagliona Brothers, of London. The vessels are intended for the grain trade on the Danube, Don and Black Sea. The *Vagliona A* is built with seven watertight compartments, and is fitted up with steam winches and all the recent improvements for the rapid loading and discharging of grain cargoes. The companion steamer, which is to be named the *Vagliona B*, is being rapidly pushed forward, and will be ready in the course of a week or two.

TRIAL TRIPS.

Cosmos.—On the 6th Jan. the official trial trip of the paddle-steamer *Cosmos* took place, with gratifying results, the speed attained being fifteen knots per hour. This steamer, built for the Messageries Fluviales à Vapor, of South America, presents some features of striking novelty. Her hull is of steel, manufactured by the Steel Company of Scotland, and by the use of this material the builders have been able to construct the vessel to sail in the light draught necessary for the navigation of the River Plate, without curtailing the elaborate arrangements for the accommodation of passengers, or diminishing in the least degree her structural strength. The dimensions of the *Cosmos* are:—Length, 250 feet; breadth, 29 feet; over spousons, 33 feet; depth, moulded to main deck, 11½ feet; gross tonnage, 1003 tons. The vessel is lighted by eight electric lamps on the Jablochkoff system, thereby ensuring the maximum of illumination with the least possible heating of the cabin. The effect of the lamps was much approved by the guests at the trial, and the extension of their use in steamers was confidently predicted by several gentlemen interested in shipping. The *Cosmos* is fitted by Messrs. Brown Brothers, of Edinburgh, with a complete set of hydraulic apparatus, comprising reversing gear for the main engines, warping capstan, steering gear, and cranes for loading and discharging cargo.

Superb.—The *Superb*, 16, armour-plated ship, 8760 tons, 7430 horse-power, got up steam at Chatham Dockyard on Monday morning, and proceeded to the measured mile off the Maplin Sands for the purpose of making a preliminary trial of her machinery. The *Superb* is a new vessel, and was originally constructed for the Turkish Navy. She was built on the Thames, and during the Eastern crisis was purchased by the Admiralty out of the six millions vote. She was shortly afterwards taken to Chatham Dockyard, and during the time she has been at Chatham she has undergone some very extensive alterations to increase her powers as a fighting ship. She will shortly be ready for sea, and when fully equipped will be one of the most powerful broad-side ships in the Navy.

DISASTERS AT SEA.—There were 23 British and foreign wrecks reported during the past week, making a total of 40 for the present year. The approximate value of property lost was £300,000, including British £210,000. Ten were lost off the British coasts.

NEW STEAM YACHT.—Mrs. Dawson, of Weston Hall, Yorkshire, has placed an order for a new steam yacht, of 150 tons, with Messrs. John Inglis and Co., naval architects, Glasgow, to replace her present steam yacht *Ranee*, 74 tons, *Royal Thames*. The new vessel is to be built of steel, and to class 100 A in Lloyd's Yachting Register. She will have powerful compound machinery, a Napier's patent combined capstan and windlass, worked by steam, for weighing anchors, &c., and is to be rigged as a three-masted schooner.

RATING OF SHIPPING PROPERTY.—A petition to Parliament is being sent to every Board of Guardians in the United Kingdom, with a request that it may be considered and adopted. It states that under the present laws ship-owners are not rated to the relief of the poor in respect of their shipping property, and that on the coast the casualties on board ship add to the burden ratepayers have to bear. It prays Parliament to so amend the law that all classes of property shall be rated to the relief of the poor and the burden on real property be lessened.

THE THAMES SHIPBUILDING TRADE.—At the Essex Quarter Sessions last week, some depressing facts in reference to shipbuilding on the Thames were stated in the case of "The Thames Ironworks and Shipbuilding Company v. West Ham Parish." The appeal was against the increase of the assessment of the Company's premises from £5250 net to £8108. For the appellants it was urged that it was impossible to conceive any ground for this increase, because the iron shipbuilding trade had practically left the Thames and gone to the Tyne and the Clyde, and if the premises of

the Company were to let now, it would be impossible to find a tenant for them. One witness stated that last year the shipbuilding on the Thames did not amount to 10,000 tons, adding that while wages were so much lower on the Tyne, very little would be done on the Thames.

THE GAS-LIGHT BUOY ON ROSENEATH SHOAL.—The light on this buoy was again extinguished between Sunday and Monday, the cause on this occasion being the exhaustion of the gas. The matter having been reported to the authorities, it is expected that a fresh supply will be provided when the lantern will be at once relighted. The original supply of gas has lasted twenty-two days, but it was originally estimated, we believe, that it would last about twenty-six days. The decrease may be accounted for by the extra supply of gas which was given to the lantern after the light had been once or twice extinguished by the late severe gales. All things considered, the experiment has up to this time given evidences of ultimate success, any hitch which have taken place being likely to be easily overcome.

SHIPBUILDING ON THE TYNE.—The class of vessels which have hitherto been built on the Tyne consists of screw cargo steamers, but it is hoped that a new era commenced on Monday last, when a paddle passenger steamer was launched from the yard of Messrs. T. and W. Smith, North Shields. This vessel has been built to the order of the Great Eastern Railway Company for the Continental passenger service between Harwich, Rotterdam and Antwerp. She is 260 feet in length, 30 feet beam, 1150 tons register, and will be fitted with engines of 350 horse-power by Messrs. R. and W. Hawthorn, of Newcastle, from the designs of Messrs. Hebborn and Ramsden, Liverpool. Her passenger accommodation is of a superior description, comprising dining saloons, smoking room, state cabins, and comfortable sleeping berths for both first and second class passengers. She is named the *Lady Tyler*, after the wife of Sir H. W. Tyler, one of the directors of the Great Eastern Railway Company.

STEAM PUMPS AND FIRE-ENGINES.—During the past week a series of experiments have taken place on board H.M.S. *Sultan*, in Portsmouth Dockyard, with steam pumping and steam fire-engines, constructed by Messrs. Shand, Mason and Company, for that vessel. The order was given out in consequence of the successful working of a similar pumping-engine put on board H.M.S. *Hercules* in March, 1878, for the purpose of pumping large quantities of water from the hold of the ship in case of emergency. In addition to the pumping-engine, the *Sultan* is fitted with one of Shand, Mason and Company's powerful steam fire-engines, both engines being worked from the same boiler, the whole placed on as high a level as possible in the ship, so that their working should not be interfered with by the influx of water. The result of these trials, the last of which took place on the 13th inst., has been that with the fire-engine 1120 gallons per minute have been delivered to a maximum height of 200 feet as measured by the mast of the vessel. On one occasion four jets were used simultaneously, of the following diameters:—1½ inches, 1½ inches, 1-16th inches, and 1 inch, when 1120 gallons were delivered under a hydraulic pressure of 100 lb. on the square inch. The tests with the pumping-engine showed that with one half-hour's continuous working a delivery was made at the rate of 720 tons per hour, from a depth of 21½ feet, and under a pressure of 22 lb. on the square inch, this amount being practically measured by the admission of water through stop-valves into a measured area of the hold. The tests, which gave entire satisfaction, were conducted in the presence of Admiral Foley, Superintendent of Portsmouth Dockyard; Mr. Newman, Chief Engineer of Portsmouth Dockyard; Mr. Marcom, his assistant; Mr. Icely, Inspector of Machinery; Captain Wells, Superintendent of Steam Reserve; Mr. Shearman, Chief Engineer of H.M.S. *Sultan*, and other gentlemen, Mr. Shand being present on the part of the contractors.

THE TEES BREAKWATER WORKS.—The accounts of the Tees Conservancy Commission, just issued, show the progress which has been made with the two great breakwaters designed to protect the two sides of the estuary of the Tees. The first of these, the South Gare Breakwater, commenced in 1861, is far advanced towards completion. Formed of slag, or the scorie from the blast-furnaces, there have been used of this material millions of tons, in quantities varying from 51,105 tons to 443,864 tons yearly, the quantity of slag deposited during the Commissioners' year just closed being 194,048 tons. Towards the gross cost of the breakwater, which averaged £10,000 annually during the first dozen years, the ironmasters from whom the slag is taken contribute largely, the cost being reduced one-fourth. Out of the 12,800 feet, the contemplated dimensions of the breakwater, there had been advanced 10,321 at the end of 1874, and though the work has not since that time progressed so rapidly, it may be considered as practically completed after the use of considerably more than three million tons of slag. The second breakwater is that on the north side of the Tees, the North Gare Breakwater, a work intended to be about half the length of that on the opposite side of the river. It is only five years since the survey on the part of the Public Works Loan Commissioners of this intended work, and though for some time since then there has been preparation for the work, the practical commencement cannot be said to be much more than a year ago. As yet the deposit of slag is on a much more limited scale on this breakwater work than it was on the southern one in its early years, the quantity deposited last year being 13,780 tons; but after these early steps greater rapidity is expected. The slag produced at ironworks near Middlesborough and at Port Clarence is conveyed to and tipped over the end of the breakwater, the ironmasters paying a stipulated rate per ton to get rid of the refuse. The deposits of slag have replaced "the shifting South Gare sand by an immovable bank," they have materially contributed to the deepening of the channel of the Tees, and they form a part of river operations which are officially described as "among the most successful engineering works of the time."

DEATH OF A SOUTH STAFFORDSHIRE IRONMASTER.—Mr. Thomas Holland, senior partner of the firm of Thomas Holland and Co., ironmasters of Bradley, died on Wednesday morning at his residence, in the Wolverhampton Road, Bilston, after an illness of only a week's duration. He was about 60 years of age.

ARMS, ARMOUR AND EXPLOSIVES.

BREECHLOADING GUNS.—The manufacture of the 43-ton breech-loading experimental gun has been commenced at the Royal Gun Factories, Royal Arsenal, Woolwich, and several of the coils have been prepared. In its early stages the gun will differ little from the muzzle-loaders on the Woolwich system, and it will be nearly built up and structurally complete before the operations are introduced which will impart its special character.

FARTHER TESTING OF THE MACHINE GUNS.—The Gatling, Nordenfeldt, and other machine guns are about to be tested under novel conditions at Portsmouth, in charge of the gunnery officers of the *Excellent*. While they will be submitted to a practical trial with a view of determining their efficiency as regards range and accuracy, the main purpose of the contest will be to ascertain their power to meet torpedo attacks. The guns have already been fired at the impulse tube with which the first-class torpedo-boats are fitted, and upon the shields by the men are protected, and in each case the battle has gone against the guns. At Woolwich, again, 2-ounce shots were discharged from a Gatling against the air-chamber of the Whitehead torpedo, which is about three-sixteenths of an inch thick, without injuring it in the slightest degree. Having thus failed against the projectile and the firing gear, means are now to be taken to determine the comparative effects of the guns upon the boats themselves which carry the torpedo. For this purpose a model of a boat will be placed upon a raft to prevent its sinking under fire, and, though stationary itself, it will be fired at by machine guns from the bows of torpedo-boats going at a high rate of speed. While the practice will exhibit the merits of the different weapons with respect to precision, it will be interesting to ascertain the effect of the various projectiles.

THE COMMITTEE ON MACHINE GUNS.—The Select Committee on Machine Guns met at the Royal Arsenal, Woolwich on Friday last week, and carried out some experiments with the Nordenfeldt and Gatling mitrailleuses at the proof butts, adjoining the Royal Arsenal. Both guns have been prepared specially for land service, and differ materially from their originals. The Nordenfeldt adopted by the Royal Navy has four parallel barrels firing 1-inch projectiles, for the purpose of repelling torpedo boats, and is mounted on a heavy, ill-shaped stand, whereas the land service Nordenfeldt now being tried runs on a light artillery carriage, and has ten barrels ranged in a row like those of the old-fashioned infernal machine, and bored to the calibre of a small-bore rifle. The Gatling gun, unlike its predecessors, has six barrels only, and these are also small-bore, while those already in the service throw bullets of half an inch diameter. As the ammunition used with both weapons is precisely of the same pattern as that of the Martini-Henry rifle, and the barrels are constructed after the same manner, their range and accuracy might have been taken for granted; but it has been considered desirable to prove their efficiency by actual demonstration, and it has been resolved to carry out an extended series of experiments at Shoeburyness, where the great stretch of sands offers an almost unlimited range. A lengthy programme has been prepared, which will probably occupy several days, and one of the primary conditions is that each weapon competing shall fire a minimum of 400 rounds a minute.

TESTING OF THE "INFLEXIBLE'S" TURRET ARMOUR.—The turret armour of the *Inflexible* was subjected to the final test on Tuesday morning on board the *Nettle*, turret ship, at Portsmouth, under the superintendence of Captain Herbert, of the *Excellent*. As has been previously stated, the inner armour consists of 7-inch iron plates and the outer of 9-inch compound armour, having a hard steel face 3½ inches thick welded upon iron plating 4½ inches thick, the whole being manufactured by Messrs. Cammell and Co., of Sheffield. The test piece, which was fired at on Tuesday was the fragment which had been cut out of one of the forward plates to form a gun-port, and might thus be said to bear the same proportion to the plate itself that a keyhole bears to a door. The ports themselves are elliptical, but the test piece had been cut to represent the largest rectangular area which could be described within the curves. It measured 4 feet by 2 feet 6 inches, and as it was fired at by the 9-inch gun "with a projectile weighing 250lb. and a charge of 50 lb.," it is clear that the target, even supposing the hit to have been fairly in the centre, could only allow of 10½ inches of clear space on each side of the shot. It is not easy to perceive what advantage was to be derived from an experiment conducted under such abnormal conditions as these; the more especially as, in consequence of the limited dimensions of the test piece, it was only found possible to enclose the target within an elastic timber framing. Only one shot was fired. The impact had a diameter of 14 inches, with a penetration of 2½ inches, the projectile being broken entirely up. Having completed the armour of the *Inflexible*, Messrs. Cammell will push forward the manufacture of the compound armour of the *Ajax* and *Agamemnon*, which will consist of a single thickness of 16 inches, and will be tested at Shoeburyness.

CORRESPONDENCE.

THE LONGITUDINAL AND DEEP FLOOR SYSTEM OF NAVAL CONSTRUCTION.

To the Editor of IRON.

SIR,—It will be readily conceded, I think, by all practical men, that the great desideratum in iron shipbuilding is to obtain the greatest amount of strength with the least weight of material, and at the same time to have sufficient local rigidity to prevent buckling or bulging. About fourteen years ago, when iron steamers were beginning to attract attention as general heavy-cargo carriers, the principal feature observable in their construction was the great amount of transverse as compared with longitudinal strength—the beams, floors, frames and reverse frames being much in excess of the present require-

ments; while the stringers, keelsons and some of the shell plating, were all considerably lighter than as now fitted. This error of construction was soon detected when vessels of great length with full cargoes were sent across the Atlantic by the butts of the sheer, bilge, and stringer plates showing signs of weakness, and the vessels usually had to be strengthened upon their return home.

It was, I believe, to Liverpool that we were indebted for making the first advances in an improved construction through the formation of the Liverpool Underwriters' Association, who, with the assistance of private shipowners and shipbuilders, formed their rules for the scantling of iron vessels to meet the new requirements. The principal changes which those gentlemen inaugurated consisted in considerably increasing the width of the stringer plates, the thickness of the sheer and bilge plates, and the dimensions of the keelsons and stringer angle irons, while at the same time reducing the dimensions of the frames, floors and beams. The wisdom of this course was soon perceived and was quickly taken up by others. Amongst other improvements which were then made was the introduction of iron decks which are at present so much in favour.

When the practice of fitting water-ballast tanks became general, various methods were adopted, which gradually resolved themselves into the present system of supporting the tank top by girders carried longitudinally on the top of the ordinary floors. This, though a great improvement in the construction of the tank, was also a cause of great weakness to the strength of the vessel where the engines and boilers were placed amidships—the same number of stringers and keelsons being fitted, whether the vessel had a tank or not, and the builder not being compelled to carry the girders through the engine and boiler-room, stopped them at the two bulkheads, the ordinary keelsons only being carried through. When it is remembered that the boiler seatings are generally so formed as to add no longitudinal strength to the vessel, and also, that the weight of the engines, boiler and bunker coal is seldom more than two-thirds, and often under one-half of the displacement, of that portion of the vessel in which they are contained, it is at once evident that a great hogging strain must be caused somewhere in the space between the engine and boiler bulkheads. As the engine seatings are usually constructed in the form of longitudinal boxes, and as the fore or main hold generally contains the most cargo, the weakness of those vessels invariably shows itself in the stokehole, or about six feet abaft the boiler bulkhead. In the case of half or long poop-decked vessels, this weakness is exaggerated through the break of the poop-deck, though the topsides are now usually extra strengthened to compensate.

My attention was first drawn to this cause of weakness through observing the appearances of the butts of the bilge and bottom plates of comparatively new vessels, which, when placed in dry dock, generally showed signs of working in way of the boiler bulkhead, also of a number of vessels which have been wrecked and have broken in two; they invariably gave way within a few feet of the same bulkhead. I was also much struck in observing the different effects upon steamers having their engines placed well aft, and amidships, the vessels with their engines placed well aft showing not the slightest sign of working, as in the case of those having their engines placed amidships. Having now pointed out some of the weak points in iron steamers, I will endeavour to explain my ideas as to their remedy in some degree.

In 1874 I first thought of the practicability of continuing the ordinary tank girders down to the shell plating and carrying them fore and aft as far as possible, and, of course, through the engine and boiler space, and of fitting deep floors between the girders on every second frame, the ordinary frames angles being fitted from keel to gunwale as usual, the ordinary floors being dispensed with. This arrangement was, I believe, first carried into effect by Messrs. Austin and Hunter, of Sunderland, in 1876, with the slight alteration of alternate deep floors being omitted and bracket plates fitted in their places. It is not, I believe, generally known amongst shipowners and engineers that in measuring a vessel, fitted with ballast tanks, for nett and gross tonnage the Board of Trade always take their measurements from the top of the floors, and consequently that the shipowner pays dues, &c., for a space which is never occupied by cargo; this is obviated in my system by the deep floors being carried to the tank top, and this reduces the tonnage from 80 to 100 tons in a vessel of 1000 tons net register; the vessel is also 2 feet less depth of hold than by the ordinary method of measuring from the top of floors. As regards the shipbuilder, he will gain about 15 tons of iron in a large steamer and also will save a considerable amount of time in getting the frames into position by having no floors or reverse frames to fit on the boards; the amount of labour will also be less, I think, when once the workmen get accustomed to the system.

Having described that portion of my plan which has already been carried out and which is rapidly gaining favour, I will endeavour to explain my ideas as regards the hold stanchion and deck beams. To exemplify what I consider the evils of the present method of fitting the stanchion and hatch coombings, &c., I will take two sample vessels, the one an ordinary Atlantic cargo-steamer or three-decked vessel, and the other an ordinary two-decked vessel with long poop and trimming hatches. In the first vessel we have generally a fore, main and after hatch, having coombings from 24 to 30 inches deep on the upper deck, the fore and main hatches generally being from 18 to 22 feet in length, and 11 to 12 feet in width. Between those two hatches is generally fitted an iron deck-house, containing the galley and entrance to stokehole and engine-room, leaving a space of deck clear at both ends. Now, if, either through weight of cargo, a sea striking the deck, or the vessel straining, one particular beam gives way, it has little or no support from its neighbour. Again, when the vessel receives a longitudinal strain each beam will be of little or no assistance to the bottom keelsons and girders. My idea is to take advantage of the great longitudinal strength of the hatch coombings and engine casings by connecting them together by a vertical plate, say 12 to 14 inches deep by 8 inches thick. Thus, with the stanchions well secured to those plates, and to the bottom longitudinals, the vessel would form a complete girder.

With respect to the second vessel mentioned, it is even

more important, and would cost less to connect the long main hatch coombings and the sides of the engine casings together, as it is very usual to see the hatch carried to within a few feet of the bridge bulkhead. Doubtless my ideas will not secure the approval of all, and may in some respects have to be modified; but though they are the result of several years' reflection, I am always open to conviction, and shall be glad to have any errors pointed out.—I am, &c.,

M. W. AISBITT, Naval Architect and Surveyor,
47, Mount Stuart Square, Cardiff,
9th January, 1880.

THE TAY BRIDGE DISASTER.

To the Editor of IRON.

SIR.—There is abundance of evidence that sparks were seen to issue from the bottoms of the wheels shortly before the train disappeared from sight. Now these sparks have been almost universally attributed to the friction of the flanges of the wheels against the rails. My object in writing is to point out the improbability of this theory, as railway wheels are specially constructed to obviate this friction. It is generally known that the periphery of a railway wheel is not horizontal but slopes slightly downwards towards the flange. This arrangement has a tendency to keep a carriage from going off the rails, for should the flange of a wheel approach the rail, the wheel becomes practically one of larger diameter, but at the same moment the other wheel on the axle becomes one of smaller diameter. The result of this action is that the tendency to keep the rails is overcome. It is, therefore, obvious that there is little or no friction between the flanges and rails. The sparks which were seen must therefore, in my opinion, be attributed to another cause, viz.: the application of the brakes. Is it not possible that the engine-driver, appalled at the bridge swaying under the influence of the gale, may have hesitated to proceed? If so he would apply the brakes. Now what would be the effect of applying brakes under the circumstances? Anybody who has travelled in a guard's van must have noticed the violent bumping which is caused when the brakes are suddenly applied. May not, then, this bumping of the carriages, caused by a sudden application of the brakes, coincident with the excessive strain upon the bridge due to the wind, have brought about the fatal catastrophe?—I am, sir, &c.,

CHARLES STEWART, M.A.

50, Colebrooke-row, N., January 10.

NOTICES OF NEW BOOKS.

Rough Ways Made Smooth. By R. A. PROCTOR.
London: Chatto and Windus, 1880.

We have here another series of Mr. Proctor's lively and popular essays on subjects multifarious and mix, ranging in the present instance from the Sun's Corona and his Spots and the Past History of the Moon, to Oxford and Cambridge Rowing and Mechanical Chess Players. Whatever may be thought of the author's theories and antipathies, there can only be one opinion as to the felicity of his method. Some of the matters treated of are among the most abstruse; but they are presented in such a way as to be easily understood by, as well as interesting to, the ordinary run of mortals. In the paper on electric lighting we have a popular account of the principles and apparatus of one of the most attractive inventions of the day, and one which has apparently more than most excited the popular imagination. That on mechanical chess-players is also well worth perusal, and one or two psychological questions are ably handled, while the articles on Cold Winters and Great and Recent Storms have the additional merit of being opportune.

A Textbook of Field Geology. By W. H. PENNING.
F.G.S. Second Edition. London: Balliere, Tindal and Cox. 1879.

THE author of this textbook, who is engaged on the Geological Survey of England and Wales, possesses special qualifications as an instructor of geological amateurs who wish to extend their investigations beyond mere fossil-hunting, and to test geological theories by practical observations in the field. To be able to do this is to have acquired an accomplishment that gives a peculiar charm to every country ramble, turning the landscape itself into a book in which its ancient history can be read. The instructions given are very full and complete, the *instrumenti belli* are described, and their uses explained. The mode of geological surveying is set forth in detail, including divers "wrinkles" as to the way of readily getting at desiderated information when it does not appear exactly on the surface, as well as map-making and the identification of rocks by their lithological structure. Where fossils, the "medals of creation," occur, the student will find ample guidance in the appended section on Palaeontology by Mr. A. J. Jukes Browne, who treats of the nature of fossil remains, instructs how to collect them, and shows the nature and importance of the information they supply. In the concluding section the importance of field geology is enforced, certain difficulties connected with it discussed, and its practical results shown. The illustrations of the volume include a coloured geological map and a number of sections and diagrams.

The Crayfish: an Introduction to the Study of Zoology. By J. H. HUXLEY, F.R.S. London: C. K. Paul and Co. 1880.

THERE could be no better illustration of the advanced stage which has been reached by biological science than is afforded by the book under notice. It is not a monograph on the species which constitutes its subject, but, in the author's words, a careful study of one of the commonest and most insignificant of animals, leading up from every-day knowledge to the widest generalisations, and the most difficult problems of biology. That such a process is possible is due to the labours of thousands of independent observers, and the synthetic work based upon these by men like Darwin, Owen, and the author himself; and owing to the unity which exists in nature, and the comparative accuracy which

classification has now reached, the thorough mastery of the structure of a plant or an animal is often the best as well as the readiest way of arriving at a comprehensive knowledge of the kingdoms to which it belongs.

After giving an account of the natural history, that is, of the external form, habits, and place in classification of the crayfish, the author proceeds to the description of the physiology or internal mechanism of the animal, which is painfully and intelligibly delineated; and in an equally thorough manner, its morphology, the structure and development of the individuals, both in themselves, and as compared with other living beings, is set forth. The latter section of the morphological portion will, to the general reader, prove the most interesting of all, for here the application of the novel evolutionary theories comes in, and the author shows that, while all the existing animals of its order are more or less closely related to the crayfish, the succession from the simpler to the more complex forms can be traced in the fossil species from a remote period of the earth's history, and that the ascertained facts of their etiology are "in harmony with the requirements of the hypothesis that they have been gradually evolved in the course of the mesozoic and subsequent epochs of the world's history from a primitive astacomorphous form." We must not forget to add that this volume contains eighty-two original illustrations of a much higher class than is usually to be found in English scientific works, as well as a comprehensive index.

A Catechism of the Marine Steam Engine. By EMERY EDWARDS, Mechanical Engineer. Philadelphia: Henry Carey Baird and Co. London: Spots. 1879. Pp. 374. WHEN a book is thrown into a catechetical or epistolary or conversational form, it is taken for granted that it is elementary in character, and Mr. Edwards's production, in classing itself as a practical book for practical men, does not pretend to be more than an exposition of elementary facts concerning steam and its utilisation for the propulsion of ships. It is a very praiseworthy effort of a marine engineer, working and writing on board ship, to lay before "engineers, firemen and mechanics" a terse and untechnical account of the facts a knowledge of which tells immediately on the efficient discharge of their respective duties. And the 'morcelement' of the information the author has to give is perhaps as conveniently effected by the contrivance he has adopted of question and answer as by any other plan of breaking statements of facts into expressions containing each one simple idea. All statements made go straight to their point in the plainest language, and all points of management, not excepting those apparently the most obvious, are made the subject-matter of definition and direction. It is a useful and practical book, and will, we hope, find a good many buyers on both sides of the Atlantic, in spite of an ugliness of exterior which is very rare in American books.

NEW BOOKS.

- Guide (A) to Nature-Printing Butterflies and Moths. By A. M. C. 16mo. Harrison.
Expanse (The) of Heaven. By R. A. Proctor. New edition, 8vo. Longmans and Co.
Our Place Among Infinites. By R. A. Proctor. New edition, 8vo. Longmans and Co.
Embroiderer's (The) Book of Design. By P. H. Delamotte. New edition, royal 8vo. Lockwood and Co.
Nile Gleanings: Concerning the Ethnology, History and Art of Ancient Egypt. By Villiers Stuart. Royal 8vo. Murray.
Times (The) Register of Events in 1879. 8vo. The Times Office.
Urania: A Magazine of Meteorology, &c. No. I. Simpkin and Co.
Thom's Irish Almanack, 1880. 8vo, 16s. Or, with Dublin Directory, £1 1s. Longmans and Co.
Rural Bird Life: Essays on Ornithology. By C. Dixon. 8vo. Longmans and Co.
Inquiry (An) into the Process of Human Experience. By Wm. Cycles. 8vo. Strahan and Co.
Handbook of Embroidery. By L. Higgin. 8vo. Low and Co.
Buckle (H. T.) Life and Writings of. Two Vols., 8vo. Low and Co.
Ten Lectures on Art. By E. J. Poynter. New edition, 8vo. Chapman and Hall.
Shareholder's (The) and Director's Companion. By F. B. Palmer. Second Edition, 12mo. Stevens.
Patent Law and Practice. By A. V. Newton. New edition, foolscap. Trübner and Co.
Easy Lessons in Heat. By C. A. Martineau. Foolscap. Macmillan and Co.
Statesman's (The) Year Book, 1880. By F. Martin. 8vo. Macmillan and Co.
Money in its Relations to Trade and Industry. F. A. Walker. Royal 8vo. Macmillan and Co.
Great Ice Age (The), and its Relation to the Antiquity of Man. By J. Geikie. Second edition. 8vo. Stanford.
Defence (The) of Great and Greater Britain. By Captain J. C. Colomb. 8vo. Stanford.
Artificial Manures: How to Make, Buy, Value and Use. By A. Sibsey. New edition, foolscap. Ridgway.

LEGAL INTELLIGENCE.

QUEEN'S BENCH DIVISION.—JAN. 13TH.

Sittings in Banco.—(Before the Lord Chief Justice Mr. Justice Lush and Mr. Justice Manisty.)

THE SOUTH-EASTERN RAILWAY COMPANY V. THE RAILWAY COMMISSIONERS AND THE MAYOR, &c., OF HASTINGS AND OTHERS.

THE Court gave judgment in this case this morning. It was a demurrer to a declaration in prohibition, by which the South-Eastern Railway Company sought to prohibit the Railway Commissioners from proceeding in an application by the Mayor, &c., of Hastings, under the Railway Traffic Acts of 1854 and 1873, for an order to require the railway company to enlarge the Hastings booking offices, provide

refreshment rooms, better waiting accommodation, and for enlarging, &c., the platforms, and otherwise affording better facilities for their passengers, cattle and goods traffic. The Railway Commissioners had delivered judgment in favour in part of what was asked for by the inhabitants of Hastings.

My. Justice Manisty, in delivering his judgment, after reviewing all the circumstances of the case, and applying the law to the same, said that he was of opinion that the Railway Commissioners had not the jurisdiction which they claimed to compel the structural works required to be done to be carried out.

Mr. Justice Lush was of a contrary opinion. He considered that the Railway Commissioners had powers to make orders for the carrying out of all the works required, except that of providing refreshment rooms.

The Lord Chief Justice reviewed at great length the railway legislation bearing on the question, and in conclusion said that the Act of 1854, in his opinion, did not confer on the Railway Commissioners the authority and jurisdiction which they claimed to exercise, and that consequently his judgment must be for the plaintiffs, the railway company.

Judgment accordingly.

FACTORY NOTES.

ADVANCE IN THE PRICE OF TIN.—Cornish smelters on Monday, advanced tin standards 2s. per cwt.; making present rates 89s. for superior common, and 90s. per cwt. for superior fine.

LINCOLNSHIRE IRON ORE.—We understand that Mr. M. C. Cohen is raising superior self-fluxing ironstone at Caythorpe, in Lincolnshire, which he is selling largely in Derbyshire, Yorkshire and Staffordshire for smelting purposes.

THE CHATWOOD PATENT SAFE AND LOCK COMPANY.—A searching public trial of the safes of this company was made at the Royal Factory, Amsterdam, in the end of last month, by the international jury of the Netherlands Exhibition. The safes were put to the severest tests, both with regard to their fire and burglar proof qualities, and the result was exceedingly satisfactory.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending 10th January:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum, 12,695; Mercantile Marine, Building Materials, and other Collections, 2,318. On Wednesday, Thursday, and Friday, (admission 6d.) from 10 a.m. till 4 p.m., Museum, 1,499; Mercantile Marine, Building Materials, and other Collections, 98. Total, 16,610. Average of corresponding week in former years, 16,798. Total from the opening of Museum, 18,645,297.

THE MANCHESTER COAL TRADE.—A proposal which has long been suggested is now being carried out, for holding the Manchester coal exchange in the large arcade of the Victoria Building, one of the most central positions in the city. Although all the arrangements have not yet been completed, it has been decided by a number of the principal buyers and sellers, not only of Lancashire, but from Yorkshire and Derbyshire, to meet in the arcade, which will form a most suitable exchange for the transaction of business next Tuesday.

THE TREASURY PROSECUTION OF A STAFFORDSHIRE IRON MERCHANT.—The prosecution by the Treasury of Mr. Joseph Jewkes, bankrupt iron merchant, of Wolverhampton, for fraudulent bankruptcy, is being continued. The evidence in the Wolverhampton Police Court showed that the prisoner had within four months of filing his petition bought iron on credit of the value of £4000, and that about three-fifths of his sales in that time were at a loss. At the first meeting of creditors a composition of half-a-crown in the pound was offered, but it was deemed a case for prosecution. The proceedings were adjourned, bail being allowed.

THE SOUTH STAFFORDSHIRE IRON TRADE.—Mr. Jones, Secretary of the South Staffordshire Mill and Forge Wages Board, in a circular explains that by the recent award of Mr. Chamberlain, M.P., the fine of puddling per ton of 2240 lb. is 8s., and with an addition of 6d. in lieu of northern extras, 8s. 6d. per ton. He adds: "You will bear in mind that all wages settlements are now made legally upon the imperial ton of 2240 lb., so that it is no longer correct to weigh the iron long weight, and then take off 1.15. The change from long to short weight was effected by the reduction of 1.15 under Mr. Chamberlain's award dated January 28, 1879, from which time the wages are paid upon the short or imperial ton, the rates being altered in proportion."

FAILURES IN THE UNITED KINGDOM.—From the valuable statistics annually compiled by Mr. Richard Seyd we learn that the number of failures announced in the United Kingdom last year was 16,637, of which 2546 were in the financial, wholesale and manufacturing branches of trade, and 14,991 in retail trades, builders, publicans and non-traders. In 1878, the number of failures under these two classifications were 2648 and 12,416 respectively, making a total of 15,064. The increase in the total number of failures shows how heavy has been the pressure of dull trade, but it is satisfactory to note that a great change for the better took place in the second half of the year. In London there were 215 failures in the last six months of the year, as compared with 315 for the half-year ending June, making a total of 530 a year, as compared with 566 for 1878, and 456 for 1877; Liverpool, shows 29 failures in the December half-year, as compared with 55 for the June half; Manchester 48 as against 107; Lancashire 82 as against 110; Yorkshire, not including Middlesbrough and Hull, 157, against 263, and the Birmingham and Midland iron district 83 against 120. The total failures in these places amounts for the December half-year to 614 as compared with 970; a decrease of 356 on the six months.

PROGRESS.—A second mill has been started at Parkend Tin Works, Forest of Dean. The works have been idle for four years.—Shotton Colliery, near Senham, owned by the Haswell, Shotton, and Easington Coal and Coke Company, which has been closed more than two years, will be in full work in a few days, employing 1500 men.—The Ellen Rolling Mills at Maryport have been sold, and it is reported,

to a new company which intends forthwith putting the works to long idle in operation.—The furnaces of the Lowther Hematite Company in Cumberland are being prepared for blast, and it is anticipated that in a few days they will be working. Mr. W. Wilson, for so many years secretary of the West Cumberland Iron and Steel Company, has been appointed managing director of the Lowther Works.—Two of the furnaces of the New Workington Iron Company have been put in blast, and two others are being prepared for lighting. There are also in these works two old well-mouthed furnaces, which are to be pulled down and rebuilt. The company propose to commence the manufacture of steel plates.—Large cargoes of Spanish ore will be imported this season to the West Coast of England from Spain. One order is said to be for 50,000 tons and another for 30,000 tons.—Large numbers of miners who emigrated from North Lancashire and Cumberland during the recent period of depression, are beginning to find their way back again in large numbers, and they speedily find work.

TRADE PROSPECTS IN THE WEST OF SCOTLAND.—At the annual meeting of the Glasgow Chamber of Commerce, held on Monday, the chairman, in reviewing the business of the year, took a hopeful view of trade prospects. Twelve months ago, in almost every department of industry, he said, business had ceased to be prosperous for either masters or men. Taking twenty of the leading articles of produce, not one of them was saleable at the price of the previous year, and, indeed, their depreciation below the average value of ordinary years amounted to not less than 12 per cent.; and added to all this was the great bank failure of 1871. The last three months, however, had introduced a gleam of sunshine, and if trouble did not arise from the inflation of prices in certain trades by unwise speculation, there seemed every reason to expect a gradual return to general prosperity throughout Great Britain. In the case of twenty leading articles to which he had referred, the increase of value averaged nearly twenty per cent. The selling price of Scotch pig-iron has advanced to an extent which, if maintained during the next twelvemonths, would represent an additional return for the manufacture of the same number of tons exceeding one million pounds sterling, and the most of that was clear gain falling to be divided between masters and workmen. The most encouraging feature, however, was the general improvement in the traffic receipts of the railways in the United Kingdom. The first forty-two weeks in 1879, as compared with 1878, showed a deficiency of a million and a half sterling, whereas the last ten weeks of 1879 showed an increasing surplus, the total excess over the corresponding ten weeks in 1878 being £350,000.

THE PATENT SHAFT AND AXLE-TREE COMPANY.—On Friday, last week, Mr. Corner, deputy stipendiary magistrate, concluded, at Wolverhampton police-court, the hearing of the charges of embezzlement against William Coath, late cashier to the Patent Shaft and Axle-tree Company, Wednesbury. In reply to one of the charges, of stealing £350, the accused read a statement in which he denied the accusation, and said, "Such portions of those moneys as do not appear in the books already produced were paid for bribes or commissions, as they have been called, and were entered in the company's private ledger, along with many other things it was not thought desirable for all the clerks to see. The bribes I allude to were sums of 10, 20, 30, and 50 pounds, and occasionally as much as £100 at a time, paid to inspectors, engineers, and others, when they came to the works to pass wheels and such like things that we had made for their employers, and to make inquiries in reference to further contracts, and in anticipation of further orders. The commissions paid to managers of companies and men of that class, with whose employers we did business regularly, were usually paid half-yearly by the private cheque of the managing director, Mr. Richard Williams, as described by Mr. Slocombe in his evidence. I demand the production of the private ledger containing the entries I have alluded to, and I challenge Mr. Williams to go into the box with the company's late auditor, Mr. Edmunds, and deny that such a book did exist in 1875, and since, whatever may have become of it now." He was afterwards committed for trial at the Stafford Assizes for stealing the £350, and also for stealing a sum of £2862. The charge of falsifying the books of the company was afterwards heard. Mr. Slocombe spoke to the defendant making false entries of pay drawn by workmen, to the amount of £2065 in May, 1875, and £2317 in May, 1876. Another false entry of £5850 was made in July, 1876, one of £3650 in January, 1877, one of £4850 in July following; and in July, 1877, there was another false entry of £2900. Mr. Slocombe said he knew of no subsequent entries either wholly or partially accounting for the false entries. Mr. C. Williams, the prisoner's solicitor, addressed the Court, urging that the vindictive prosecution by the directors was instituted with a view to screening themselves. The prisoner was afterwards removed to Stafford Gaol.

IRON AND COAL TRADES REPORTS.

BARNSELEY AND SOUTH YORKSHIRE.—The iron trade in this district is pretty good, the works at Milton and Elsecar being kept fairly going; a tolerable tonnage of merchant iron of various kinds is being produced, whilst at the Thorncliffe works, gas-fittings, stoves and grates are largely made. Generally speaking, there is no alteration to note with respect to the make of pig-iron, which is large. Circulars have, during the week, been issued by dealers in the Sheffield district, indicating that another advance will be made in prices. The works belonging to Messrs. Cammell and Co., at Penistone, have been partly idle since the holidays, owing to certain repairs being done. These include the enlargement of the Bessemer vessels for increasing the capacity of the works devoted to the manufacture of Bessemer steel goods. The engines connected with the rolling mills are also being strengthened, so that when work is resumed it is expected the output, which of late has been large, will be materially increased. It may also be noted that the demand for

gannister for coating the insides of Bessemer vessels is just now very active, and a large output is being raised on the edges of the Yorkshire Moors, above Penistone. No fewer than four firms are now engaged in working the stone, which a few years ago was considered worthless. The coal trade in this district is in a peculiar state. There has been a remarkable falling off in the demand for house coal during the past ten days or rather more, and some of the largest thick seam pits in the district have been laid idle for a day or two both last week and this. The tonnage to London to a great extent depends on contract coal, very few new orders are being received, and reports from the leading colliery agents on Tuesday report a very quiet market on Monday with ample supplies. There is also a quiet business doing with the eastern counties as well as with local markets. The steam coal trade holds pretty well, and a good tonnage is being dispatched to Hull, Grimsby, Goole and Barrow. A serious difficulty is, however, experienced inasmuch as both the hard and soft coal has to be got from the same seam, and when the one is in request the other has to be stacked unless a market can be found for it. There is rather more doing in engine fuel and slack for manufacturing purposes, but the great bulk of the small coal produced at some of the pits is now being converted into coke, which is in request for smelting purposes. The demand for North Lincolnshire is an excellent one, and a large quantity is sent weekly to that district. A good deal of interest is being taken in the split in the miners' union. Mr. Chappell, whose opposition to the restriction of the output cost him his seat, has formed a new union with about 8000 members. The sliding scale has not yet been adopted, and for the information of the public it may be stated that the matter has only been before a committee of the coalowners. It is true that a meeting of owners, associated and non-associated, was held, but was only very indifferently attended the majority of those present representing the Silkstone collieries.

BARNSELEY, WEDNESDAY NIGHT.—The attendance of representatives from the various collieries in the South of Yorkshire at Barnsley to-day was pretty large. Unsuccessful attempts were made to place orders for house-coal, but without success, although prices were quoted lower. The falling off in the demand for soft coal at this period of the year is somewhat remarkable, and is creating great surprise. The collieries raising the Silkstone seam, a favourite coal in the London market, are just now very slack, the orders on hand being insufficient to keep the pits going. It was stated that seaborne coal can now be purchased at less money in London than during the summer months. Hopes are entertained that the falling off is but a temporary one; but it is to be feared that the output of the district is now so large that the demand cannot possibly keep pace with it.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—The upward tendency in the iron trade of this district has experienced no check, but there are indications, on the contrary, that the position of affairs will be more satisfactory so far as prices are concerned. Values have advanced, it is said, to £6 per ton for best hematites, but there is no report that business has been done at this figure. Sales have, however, been noted at £5 10s. per ton, and makers are in some instances refusing to do business at this price. Indeed, there is no doubt that producers of iron, generally speaking, are not in a position to do much business, as they have sold forward so largely the output of their works. The permanency of the revival is beginning to be doubted, even in face of the fact that a very brisk season seems to be in store for us. The great advance in prices, and the extraordinary demand for hematite, have been brought about in such a manner, and in such a short space of time, as to induce the belief that this must have a very unhealthy effect on the district generally, and that sooner or later there will be a downfall as speedy and as marked as the revival has been. The sales already made for delivery during the spring and summer seasons represent a very large aggregate of tonnage, and it is observable that the arrangements for large shipments to America are already being made. Several steamers have already been chartered, and this week, although in the middle of winter, large consignments of metal are being exported from Barrow to Baltimore and elsewhere. The value of iron ore is maintained, and steel shows a disposition towards a further advance. Rails are worth about £9 per ton. Shipbuilders, engineers, and others employed in minor industries, are very briskly employed, largely increased quantities of coal being used both by manufacturers and others, but prices do not move upwards. Coke is a trifle dearer.

BIRMINGHAM.—The general result of the very animated local quarterly meetings of the iron trade, notwithstanding a large attendance of buyers from all the leading markets and a very active enquiry for all classes of iron, has not been anything like so satisfactory with reference to absolute business transactions, as might reasonably have been expected. It was clear that the high standard of prices had the effect of inducing buyers to do little beyond covering pressing requirements, and in the case of most of the heavy local consumers, purchases which would amply protect them for the present, had been made some weeks since and before the current high prices had been reached. Few specifications of any extent were placed at the quarterly meeting and none of importance have since been reported. The American demand for pig and finished iron and tinplates continues brisk, and large quantities are still going out, but with this exception there is little doing in the way of export. Still, makers, firmly maintain prices particularly for finished iron. The heavy advances made in the price of ore, which is still going up, and the increased cost of fuel, necessarily keeps up the quotations for pig; and the rise in spelter and sheet induced galvanised-iron manufacturers at an informal meeting held on quarter day, to make another advance in galvanised sheets. The recent award by Mr. Chamberlain, M.P., as arbitrator of the local wages board, upon the claim made by the ironworkers for an increase in their wages has created a considerable amount of dissatisfaction amongst the men. This found vent at a mass meeting held at Brierley Hill, last Monday. After Mr. Capper, the operatives' secretary on the wages board had explained the position in which matters stood, the men, though evidently very dissatisfied, consented to work on upon the terms of the award till the date fixed for the adoption of

the proposed sliding scale, the 1st of next April. In the best interests of the iron trade of the district it is to be hoped that some satisfactory basis may be agreed upon for it is evident that recourse to arbitration on every occasion when wages need adjustment, while it would be a clumsy and inconvenient process, might very possibly fail in giving satisfaction at some critical period, to the serious detriment of the trade generally. The local chainmakers have resolved in giving their employers notice from the 17th inst. for the new revised 4s. 6d. list which represents an increase of 7½ per cent. upon the list now in force. The men have also formerly expressed approval of the principle of Conciliation Boards for the settlement of trade disputes, and the hope that a board of this description may be formed at the chain trade. Following the course of the market as regards raw material, prices in the local hardware branches have gone up, but it is doubtful whether in many departments the increase is fairly proportioned to the rise in metals, and although there is generally speaking an improving tendency in trade, special activity is confined to a certain group beyond the limits of which business is as yet quiet. Within the circle of activity alluded to may be classed heavy iron goods generally, iron tubes, castings, chains, screws, rivets and nails, anvils and vices; some of the tube-makers have farther reduced discounts, and anvils and vices have been advanced £1 per ton. The home trade generally has, of course, been quiet since the turn of the year, and from the foreign and colonial markets the orders coming to hand for finished hardwares generally are limited in extent. In the rolled metal branch there is a fair request for copper sheets for India, and some other Eastern markets, and also for Russia. There is an improvement in the demand from the Cape for a few specialties, including articles turned out by the local bellows-making firms, and South African requirements generally are fairly good for the season. A steady trade is being kept up with France, and the United States demand continues active. Although some little improvement has been observed in Australian advices recently, trade is still dull with this important market. The monthly Australian mail, which has come to hand during the week, is generally reported as bringing only a moderate amount of orders, although a few lines have been received which rank above the average. Some little improvement has also recently manifested itself in the Canadian market. Generally speaking, the course of business has reduced stocks to a considerable extent lately, and manufacturers do not feel so much uneasiness about working for stock as was the case a few months since. The chandelier and gasfitting trades and brassfoundry work in general begin to exhibit some improvement, chiefly from increased activity in the home trade. At a meeting of the colliers' agents, held at Tipton on Wednesday, at which all localities in South Staffordshire were represented, the correspondence between the secretary of the men's association and the coalmasters' association was read and discussed. It was afterwards unanimously resolved that the necessity for revising the existing sliding-scale so that every advance of 1s. per ton in coal should be accompanied by a rise of 4d. per day in wages, instead of 3d. as at present, and the want of an improved organisation amongst the men should be laid before district meetings of the men. At Wolverhampton, on Wednesday, heavy American orders for bars, sheets, and hoop iron were on offer upon the market, in some cases reaching thousands of tons. Makers, however, were not prepared to book orders of such magnitude, nor were American buyers willing to give the prices asked by manufacturers, even for such quantities as they could consent to book. A few orders of limited extent were placed at good prices. Finished-iron manufacturers state that they are well supplied with orders, and specifications are coming in freely.

CLEVELAND.—There was a considerable attendance on Change at Middlesbrough on Tuesday, which gave it more the appearance of a quarter-day than an ordinary market day. It was also noticeable that there were more strangers than usual from a distance, attracted, no doubt, by the exceptional state of affairs. A rise of 5s. per ton from week to week is something uncommon and rather alarming when we reflect upon prices a few months back. On Tuesday, No. 3 G. M. B. was quoted by merchants at 61s. 6d. prompt delivery, and 65s. from March to June. Since then the fluctuations of the Glasgow market have weakened prices temporarily, but they are again firm. Makers' quotations are a shilling or two ahead of merchants'. Forge mottled and white iron are at a premium, being much in demand and very scarce. Many more furnaces are about to be blown in, some of them immediately. The North-Eastern Railway are preparing additional rolling stock for the increasing mineral traffic. The Messrs. Bell are reopening another of their mines which the dulness of trade had compelled them to close. The finished-iron trade is as busy as ever. The sudden rise in the price of pig has rather tended to embarrass them, especially those who have not bought as against their contracts. Most, however, have been prudent enough for this, and so it is that makers of pig are not so well off as prices might make one believe, having contracted for delivery now due at former low prices. To finished iron makers, also, present prices do not represent their present position, and so their men are apt to press for higher remuneration than what is just. The shipbuilders are in a difficulty of this sort, and are at present face to face with a threatened strike for 15 per cent. advance. One shipbuilder has had to declare to his men that his orders are about finished. An additional advance of wages would, of course, have a material effect on the procuring of fresh orders. There seems urgent need of a sliding scale adjustment in this trade, as it seems to be ever in a chronic state of strike. Shipping has kept up well considering the season of the year. The most goes to Scotland, but the Continent seems to be stirring also, and has taken a considerable quantity of late. The steel trade is very busy, the works at Eston being in full swing. The Middlesbrough Steel Works, owned by the same company, are being got ready as quickly as possible for the conversion of Cleveland iron into steel, about the success of which, even commercially, there is now not even the shadow of a doubt. Suitable plant is now all that is required, and that is being prepared. The coal and coke trade is improving with the iron trade, and prices are following suit. Households alone

are at a standstill, with, perhaps, a slight tendency to advance.

DERBYSHIRE.—The coal trade throughout this district is in a better position than it is in South Yorkshire. Some very large contracts for house-coal have been placed, and these alone provide an extensive tonnage of house-coal for the metropolis. The Midland are taking a large quantity from Clay Cross, from which district the average of late has been at the rate of over 23,000 tons per month, whilst from Eckington and Langley Mill about 14,000 tons per month is sent. The other district collieries are doing a fair trade, but prices are only low. There is a fair business doing with the Midland counties in house-coal and other kinds of fuel, Steam-coal, considering the period of the year, holds pretty well up. There is an excellent business doing in coke, which is now largely made in the district. It is gratifying to state that whilst similar associations are declining, the Chesterfield and Derbyshire Institute of Mining Engineers is in a highly prosperous state, and at its meeting on Saturday considerable interest was taken in the various papers read, which were numerous and interesting. It may also be stated that the Chesterfield centre of the St. John's Ambulance Association, of which Lord Edward Cavendish is president, is making good progress, several engineers and certificated managers of collieries were amongst those examined, and Mr. A. H. Stokes, the inspector for the district, regularly attends the classes, and passed a most excellent examination. Another local Institute of Mining Engineers has also aided the work. There is not much change to notice in the district iron and steel trades, both of which branches are pretty active. The make of pig-iron exhibits no decline, and prices are, on the whole, in the ascending. The nail trade of Belper, carried on with a fair amount of success at this place, has recently been in a very depressed state, but the horse-nail makers have just received an advance of 3d. per 1000, making the average prices about 3s. 3d. per 1000.

FOREST OF DEAN.—Since the commencement of the year, colliery proprietors have experienced a sudden and remarkable falling off in trade, and where a moiety of hands have not been discharged, there are ample evidences of incipient collapse. A combination of circumstances eventuated this reverse of trade, mainly, however, attributable, as alleged by merchants, to the recent advance of 1s. a ton. Regarding the fact that there was a November advance to the same extent, and that in South Wales scarcely any alteration had been made, there may be ample justification on the part of merchants in "shirking" the Forest, although locally there is a belief that a little conspiracy or "ring" had grown among them. Matters are somewhat changed to-day by the fact that a return of winter has appeared in a heavy visitation of snow, with prospects of continuance. Moreover, Staffordshire quotations are enlarged with a ten per cent. advance in that county to colliers. A movement of dissatisfaction is showing in the principalities, from which district a severe competition has come, strengthened by the maintenance there of old rates of wages. So long as colliery proprietors are determined to set district against district, and disregard the ordinary rules of trade, the general public—or, more probably, the merchants—will benefit. The Forest pig-iron trade is brisk, Messrs. Crawshaw continuing the only producers of crude iron. As previously announced, their old stocks diminished rapidly during October and November, and the December exports stand in the relation of 2240 tons, against 1166 in the corresponding month of 1878. At these furnaces, the men, on Saturday, received an intimation that their wages would be increased five per cent., making ten per cent. on the minimum rate. Iron wire commands an active market, and tin plates are in equally good request, affording full employment at the district mills. Iron ore of the better classes meets a ready sale, and prices are rapidly advancing. Wigpool mines are again in full operation, and the majority of the developed mines of this district are being reopened. This week arrangements are being made for restarting the Causeways iron mine near Coleford, the property of the Coleford Hematite Iron Company, Limited, closed some four years ago, owing to the depression in the iron trade. Apart from iron ore, the mines contain valuable deposits of colour, which in times of prosperity command high value. Writing later, our district correspondent adds that as a result of returned wintry weather, and the upward prices in competing districts, the Forest house trade is presenting features of improvement which it is hoped may strengthen.

GLASGOW.—The speculative element still continues to predominate in the warrant market, a large amount of business is daily being transacted, and the fluctuations are frequent. The American demand is still the chief factor in the market, and it would seem, as if the rise and fall of prices would shortly be governed by the quotations at New York. Considerable excitement is shown, and a strong feeling has been created that prices will go greatly higher in course of the next few months. There is said to be a rather better buying on Continental account, but the shipments as yet show no signs of it. On Thursday, 68s. 6d. to 70s. 6d. cash, and 69s. to 71s. a month was paid, rising on the following day to 71s. 9d. cash, and 72s. 3d. a month. On Monday extensive buying took place, from 72s. 3d. to 73s. 3d. cash, and 72s. 9d. to 73s. 9d. a month. Next day, on some large holders clearing out, from 73s. 1½d. to 70s. 6d. cash, and 73s. 9d. to 71s. 3d. a month was accepted; opening on Wednesday at 70s. 6d. cash, down to 69s. 9d. was accepted, then a rally took place to 72s. 9d. cash, and 73s. 3d. a month; sellers 1½d. per ton more. There is a strong demand for the special brands, and prices have been advanced about 10s. per ton, an advance from the bottom of about 100 per cent. Ordinary brands are chiefly wanted for storing. Another furnace has been blown in at Calder, making 701 in blast in Scotland. The shipments of pig-iron from Scotland last week were: Foreign, 2465 tons; Coastwise, 4224 tons; total, 6689 tons, against 6069 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were, 8130 tons, against 2330 tons in the similar period of last year. The stock of iron in Connal's store is still increasing, and now amounts to 427,526 tons. The makers of manufactured iron are full of orders. Bars are now £9; ship-plates, £9 10s.; nail-roads, £9; steel ship-plates, £16 per ton; and even at these prices there is a difficulty in getting orders for prompt delivery executed. The Americans are

now buying considerable quantities of manufactured iron. The exports last week were larger, including malleable iron for the United States, valued at £3159; for the Continent, at £2436; for Mauritius, at £1738; for South America, at £1781; and for the East, at £5959; cast iron, at £3969 for Buenos Ayres; at £2877 for the east; machinery for Mauritius, at £5335; for India, at £18,586; and for the Continent, at £7635. The Clyde shipbuilders launched, last year, 177 vessels, with an aggregate tonnage of 180,576 tons, and there are at present 146 vessels, with a tonnage of about 208,601 tons. The high price of material, however, is putting a stop to new orders being placed. Many of the engineers are fully employed, others are slack, as are also some of the founders employed in ornamental castings. The trade of the city generally, while showing signs of improvement, is still in a dull condition, and it is only branches affected by the American demand that are brisk. A great many men are still out of employment. The coal trade is unsettled, at some pits the men are working, at others they are on strike, but nearly all are agitating for higher wages.

LANCASHIRE.—The upward movement of prices in the iron trade of this district continues, and, although there is not yet any very largely increased quantity of iron going into local consumption, considerable orders both for pig and finished iron are coming into the market from America, and the advance which, week after week, is taking place in prices is causing rather a feverish desire on the part of many consumers to buy forward in anticipation of any requirements that may arise. At the Manchester weekly meeting on Tuesday, there was a larger attendance than has been known for some time, and there was a very strong market. Some holders of Scotch iron were underselling, but makers generally were very firm at a considerable advance upon last week's rates. Lancashire pig-iron has during the week again gone up about 2s. 6d. per ton, and for delivery into the Manchester district the quotations are now about 70s. per ton, less 2½ for both foundry and forge qualities; but makers are not willing to book any large quantities at these figures, and will not quote at all for delivery beyond the end of March. In Lincolnshire iron a special sale for delivery equal to Manchester commencing two months hence, is reported at as much as 77s. 6d. per ton, less 2½, and for prompt delivery 75s. 6d. is being asked, for both foundry and forge qualities. Business has been done in Middlesbrough iron at prices ranging from 68s. 4d. to 71s. 4d. per ton net cash, delivered equal to Manchester; but higher figures than these were asked by some of the makers, and others have withdrawn their quotations altogether. The same may be said with regard to some of the Derbyshire brands, the Stanton Iron Company having announced by circular that their quotations are withdrawn, and that any offers now made will be subject to arrangement. In the finished iron trade prices are very firm, with an upward tendency; some makers being now so full that they are not quoting at all. So far as prices can be given, the minimum quotations for Lancashire crown bars delivered into the Manchester district are £8 10s. to £9 per ton, £10 for hoops, and £11 10s. for sheets single, but these are scarcely more than nominal. During the week the merchants in the Manchester district have advanced their stock prices 10s. per ton on bars, and 20s. on hoops and sheets. Amongst founders, engineers and machinists the amount of new business coming to hand is still not very large, but some of the former are getting busy, and generally there is a more hopeful feeling throughout these branches of trade. In the coal trade there is not yet generally any large amount of activity, and prices are without material change. House-coal is moving off less freely than it was a month or so back, and there is now a good deal of coal standing in waggons on the colliery sidings. In manufacturing classes of fuel, however, there is a better feeling, owing to the improvement in trade generally. Round coals suitable for steam and forge purposes are firmer, and colliery proprietors are averse to entering into forward contracts even at an advance upon present rates. The limited quantity of burgy now being produced meets with a moderate enquiry. Slack is now in tolerably good demand, and although there are still heavy strikes in the district, these are being held for higher prices. The average quotations at the pit mouth are about as under. Best coal, 8s. 6d. to 9s.; seconds, 7s. to 7s. 6d.; common house-coal, 6s. to 6s. 6d.; steam and forge coal, 5s. 6d. to 6s.; burgy, 3s. 9d. to 4s. 3d.; good slack, 3s. to 3s. 3d.; and common, 2s. 6d. per ton. The shipping trade is tolerably brisk, and there is a good demand for coal for steamers' use, which is enabling sellers to obtain better prices.

LEEDS AND WEST YORKSHIRE.—The experience among the makers of the best Yorkshire iron is that the demand for boiler plates is extensive and urgent. As the manager of one of the largest forges has remarked, they are "almost eaten out for them." As regards other branches of this trade some disappointment is felt. Orders in connection with railway plant do not come to hand as it was thought there was good room to expect would be the case, so that this week but little work has been done in the way of making axles, tires and cranks. But there is a slackness also in such requirements as come under the designation of "uses." The consequence is that a large proportion of the finishing-hoppers in this district are at present unemployed. The common iron trade keeps tolerably brisk, notwithstanding the higher prices. Makers in this neighbourhood are able to compete successfully with other localities, because of the considerable stocks of pig-iron they had accumulated during the long period of depression. Their puddlers, however, are beginning to stand out for higher wages. An advance of 6d. per ton had already been made by one firm, but last pay day the men demanded another rise of 1s., so as to bring their rate of remuneration up to the Staffordshire level. Merchant iron of all brands is pretty brisk, and any further orders will only be booked at a fresh advance in price. There is an excellent market for cut-nails, but while makers can scarcely realise a profit, owing to the dearthness of sheets, consumers take advantage of the keen competition which exists between Leeds, Birmingham, and other producers. There is nothing new to report as regards railway locomotive building, but makers of traction engines are busy. For instance, Messrs. M'Laren, of the Midland Engine Works, Hunslet, are making full work. This is one of the most improving trades in the

district. Messrs. M'Laren have sent a road-engine out to Zanzibar for the Cambridge University Mission, who are there forming a station on an island and building a church. It is interesting to know that this engine will do away with a large extent of slave labour; and the same firm are making iron trucks which are to be substituted for those made of wood, which are mostly destroyed by the white ants, which are a great pest in the country. In the coal trade, matters remain as we have had to report them for a week or two past. An average of four days weekly is worked at the pits, but the extent of production does not seem to be on the increase.

LONDON.—Much excitement continues in the metal market, and prices rising for most descriptions. Manufacturers are well booked forward at good values. The Scotch pig-iron market has been steadily rising from 68s. 9d., our last, to 72s. 3d., closing slightly easier, 71s. 9d. Manufactured iron realised full prices. Copper, also, has shared in the general upward tendency. (Chili bars: £70 10s. to £71. Tin: After remaining at £91 for some days, on Monday a sudden rise took place, and has been fairly maintained, closing firm, £95 for foreign, English ingots, £100. Lead: Continued steady at list prices. English £19 10s. to £19 12s. 6d. Tinplates: Workers being well booked, are loath to enter even at present rates. Quicksilver: £7 to £7 5s.

NORTH STAFFORDSHIRE.—The unsettlement of prices, and the somewhat vague expectations formed as to what would be done at the quarterly meetings have had a rather disquieting effect on business; but it is now passing away and giving place to a renewal of steady activity in every branch of the trade. Manufacturers are still cautious in entering into new contracts, and as a rule decline to quote for any but *bona fide* orders. The home market is less animated, buyers probably waiting to see how prices go; but foreign customers are anxious to place some very heavy lots, and there are many inquiries on the same account in the market. As already stated, most of the local firms have sufficient orders on their books, to carry them on for some time longer, and there appears to be a prospect of the existing activity being maintained for a considerable period. The demand for pig-iron continues very brisk, and is hardly equalled by the supply, to increase which several furnaces are being relighted, including two of those put out a year ago or more by the Chatterley Company. There is also a considerable business doing in ironstone, and the sale of coal is more lively than it has been for many months, owing to which arrangements are in progress for adding to the output.

NOTTINGHAMSHIRE.—The position of the trade in this county holds well up, considering the large output which is being raised in most other colliery districts. In the Hucknall district, miners are pretty fully employed, and trade is active. The collieries along the Erewash Valley line of railway are doing very well, and being much nearer London than the Yorkshire and other coalfields, they are likely to become rather formidable competitors in house-coal. They are also doing a fair trade with various parts of the Midland Counties and Nottinghamshire. A fair quantity of coke is made in the district, which of late has met a ready sale. The ironworks exhibit a good deal of activity, and a large output of pig-iron is being made at the furnaces in blast. Prices are improving.

SHEFFIELD.—The great feature of the week is the rapid advance in the price of iron. Since my last report there has been a genuine demand for best classes of iron, hematites being especially required. Holders of stocks have for the most part sold out, and the market is now flooded with buyers, who are endeavouring to purchase forward at the rates of the day. Ironmasters, however, appear determined not to sell forward to any great extent, and the market is more than firm; it indicates that further advances in all classes of iron are apt to take place. Such a feeling of confidence as is at present evinced in regard to the future of the iron trade has not been developed for eight years past, and within a week it is certain there will be some further changes to note of an important character. Advances which are coming to hand from the North are in favour of purchasers of iron. Shipments of raw material next week from the northern ports are expected to be exceptionally heavy, and there is a disposition to invest largely in raw material. Advances from the Continent indicate an enlarged trade in that direction, even before the spring months, and requirements for America are also on the increase. Business on the above bases tends to a strengthening of the iron trade, and advances during the week have taken place varying from 5s. per ton for common hematites, to 7s. for best and select brands. The iron mills are for the most part employed full time in this district, and daily we hear of more hands being employed. In the steel trade there is both excitement and speculation, as buyers are seeking to invest even at the enhanced rates of the day. Stocks are running low in hematites, and before long there may be a dearth in supplies. At present inquiries for all classes of Bessemer steel goods are heavy and increased activity is anticipated. It may be noticed that the manufacturers and the ironworkers are altogether dissatisfied with Mr. Chamberlain's award, and there are indications of coming difficulties with the men. Rates for manufactured iron are not commensurate with increased cost of production, and any "jar" between employers and employed would now be regarded as of a disastrous character. In the coal trade there is also likely to be unpleasantness. The unionists are divided amongst themselves, but in addition to that a section has taken an aggressive attitude. A congress of some fifty delegates has met at Chesterfield this week, and determined, on behalf of those whom they represent, on having an advance in wages. The "sliding scale" in South Yorkshire has so far proved a failure, and it is feared that the old-fashioned "strike" will before long be again resorted to by the colliers.

SOUTH STAFFORDSHIRE.—Business in hardware is improving, though not to so great an extent as had been expected. The Australian monthly mail has just been delivered, but neither manufacturers nor merchants have generally received any very large orders by it. The galvanisers are fully employed both in the sheet and iron brazery departments. Some heavy orders for buckets are floating about the district, but in consequence of uncertainty

as to the price of sheets, makers are rather reluctant to accept the orders. The Willenhall boltmakers are sending out circulars announcing a reduction in discount on Nos. 8 and 9 tower bolts of 2½ per cent., and in some instances an alteration of as much as 5 per cent. is declared. The bedstead makers intimated that their prices are likely shortly to be advanced another 10 per cent. The cut-nail manufacturers notify another 6d. per cwt. advance. The wrought-iron tube and brassfoundry trades are steadily improving, but the japanners and hollow ware makers are not finding much to do. At the meetings of the iron trade this week negotiations begun at quarterly meetings were concluded in many instances, and a considerable amount of new business was also transacted. Prices were unaltered upon the basis of quarter-day rates.

WEST CUMBERLAND.—Each succeeding week furnishes new evidences of the growth of the improvement which is experienced in this hematite district. The furnaces are producing more iron, deliveries are larger, and orders continue to flow in all quarters, but it is not in many cases that makers are in a position to negotiate business. The extent of contracts already held is very considerable, and it is obvious from the feeling at present displayed, that makers intend to participate in any further improvement which may spring up further on in the season, as at present they are refraining as far as possible from accepting new work at existing prices, although the latter show a great advance, 120 per cent. in fact, on these ruling six months ago. From the Continent business is not so good, nor so large as last year, but it is highly probable that Russian orders will form an important factor in the business of the year. The steady request for all the products of the district, has resulted in a revival in every department; for instance, finished iron works are doing a large business, and are employing all the labour they can secure. The output of bars, plates, &c., has been very considerably augmented, and arrangements are in progress in different directions to manufacture steel bars, plates, &c., with modern machinery. Shipbuilding is in a better position for orders. Iron ore is selling well, but although raisers are doing all they can to facilitate the output of the raw material, they cannot supply the market fully; as a consequence, large cargoes are being imported from Spain and from Ireland, and for ores from these districts increased and increasing prices are being obtained. The coal trade is improving, but there is not such a marked improvement as in the iron and steel trades. Coke finds a ready market, native qualities being in especial request.

CONTINENTAL MINING AND METALLURGY.

GERMANY.

OPINIONS are divided as to whether the present briskness of trade in Germany is genuine or factitious, but as to the briskness itself there is no manner of doubt, and the majority of evidence tends in favour of its continuance for the immediate future. Reports from Dortmund state that the demand seems rather stimulated than checked by the rapid increase in rates which has taken, and is taking place. The warnings so plentifully given to avoid the follies of 1872-3 do not appear to have been too abundant, as a certain contingent of speculative buying appears to accompany the solid business done, and the public is found prompt in taking up shares in industrial undertakings, however many fingers may have been burnt in them, the moment their promises of dividends become plausible. The public faith, too, will naturally have been strengthened by the introduction of protective duties, which give an apparent steadiness to trade. The universality of the revival in the iron trade, which has affected equally the Old World and the New, with every variety, from country to country, of fiscal regulations, show that the movements of trade are not exclusively determined by economical legislation. The fluctuations of rates in Western Germany, so far as rates are represented by official quotations at the Düsseldorf Metal Exchange, have been already considerable, and they seem yet to have something like a history before them. The following table of maximum rates is instructive:—

	Dec. 1878.	Dec. 1879.	Jan. 1880.
German foundry pig ..	£ 3 4	£ 4 0	£ 4 15
Merchant bars ..	6 0	8 10	—
Angles ..	6 10	8 10	—
Pit rails, iron ..	6 0	7 0	—
“ steel ..	6 10	7 15	—
Boiler plate ..	7 10	9 10	10 10
Furnace coke ..	0 9	0 16	0 22

Most of the mills and furnaces of Western Germany have specifications on their books for the first and second quarters of the present year. For prompt delivery very high prices are paid; for forward contracts there is less disposition than in Belgium and England. Mills find it impossible to reckon on any continuous supply at steady rates of pig and fuel, and are therefore unable to fix rates for forward contracts, and merchants, in turn, are not able to settle the terms of their price-lists. The spring will no doubt bring with it a solution of this difficulty, as probable requirements may then perhaps be gauged with some approach to certainty. Meanwhile, all going works are more busily employed than in the famous period before six years since. When owners have had capital and enterprise, and have kept their plant up, they are doing even better than in that period, so many have been the improvements suggested by the necessity for economy, and so beneficially have the new patent laws been operating on German inventiveness. As yet, of course, there is not a great deal of profit accumulating. The revival was started by low-rate business, which was freely taken on account of the cheapness of raw material. The latter has risen, while mills have to work out their old contracts before they enter upon their better priced business.

In Siegen, ores have risen 50 per cent., and spiegeleisen has risen from 50s. to 90s. On December 29th tenders were opened at Bromberg for 1000 tons of steel rails. The lowest offer was found to be £8 at the works. At the same adjudication, De Wendel secured 800 tons of iron sleepers

at £6 10s. per ton on rails at Hayange. The Berlin Machinery Works (Schwarzkopff) has received an order for 40 locomotives from the Warsaw and Vienna Railway, which finds its rolling stock inadequate for the increased heavy traffic, and Schwarzkopff is expecting a further “line” for 240 coal trucks from a Warsaw firm which has heavy contracts on hand with several Polish railways. The condition of business at Krupp's is thus stated in a *Times* telegram of the 10th:—“The large establishment of Herr Krupp, at Essen, has within the last three months received considerable orders, as well for articles of peace as of war. In the latter category Russia and Chili particularly figure. For railway lines, orders have come in such masses that the largest number of workmen that the establishment can employ have been engaged up to the end of the year 1881, and many orders have had to be refused. England and America have also given considerable commissions, and the establishment is making steel plates for the construction of the Forth Bridge in Scotland, at a cost of about 3,000,000 marks. The prices are in general about 50 to 60 per cent. higher than they were three months ago, and most likely Herr Krupp will have to engage several hundred workmen more.” The number of workmen employed at Essen fluctuates between 14,000 and 20,000. America, which has bought heavy quantities of old rails in Germany, and Bessemer ingots, has now entered the market for rails. Orders have been placed in Rhenish Westphalia for over 20,000 tons of steel rails on American account, and the Deutsche Handelsgesellschaft at Frankfurt is shipping good quantities of new as well as old iron rails. The home demand for rails is not, for the moment, a very heavy one, the ownership of several lines being on the point of transference to the State. The manager of the Bochum Works does not share the general business enthusiasm, and recommends caution in operations. He declines to join in any movement of speculation, or to buy at any but fair rates, and, having convinced himself of the nature and causes of the late crisis, believes that those causes have not yet ceased to operate, and may again make themselves felt. He regards the dephosphorisation question as worthy of serious consideration, and fears that the work of Rhenish Westphalia may be called on to undergo a severe struggle with works on the Saar, in Luxembourg, and in Alsace. He announces for his firm results not behind those of the previous year, but repeats his caution that the present activity in trade is unhealthy.

In 1879, the German railways had ninety new locomotives built for them, all in Germany, at an average rate for all varieties, of £1675. The most costly was a locomotive with tender, at £2250; the least, an engine and tender at £1225.

At the end of a review of the German iron trade for 1879, in Glaser's *Annalen*, we find the following statements:—“The prosperity of the iron trade, neither can, nor will, if only it last, stand alone. Unless every sign is deceptive, there is dawning for us all a brighter business day.”

In attributing the revival of German trade principally to the “reform” of the import regulations, the writer in the *Annalen* gives indirect testimony against the theory, which we ourselves have persistently discredited, of American buying being the cause of the European revival. The closing of the American market was undoubtedly a great loss to English and Welsh pig and rail makers; but for the depression on the Continent the Americans have never been called into account. As deep depression has been reached in Germany as in England. But this was not a consequence of the loss of a market in America which Germany never had to lose. And so of the other States of Europe. Indirectly, indeed, America has been dragged into the discussion. England has been accused on the Continent of the most reckless and unprincipled selling, caused, so it was said, by the loss of her American market, which had left her with stocks on hand which she was compelled to part with at any sacrifice. Assertions like these, instead of stating fact, merely mean that the Continental mind was incapable of understanding the possibility of making cheap goods. In earlier days the whole difficulty would have been more simply explained by a reference to diabolical assistance. Whatever contributions America may be making to the prosperity of the iron trade of the Continent are in excess of the prosperity which would have come round without its help just as the depression occurred without its connivance.

British manufacturers, who see foreign manufacturers gliding easily into the British market under the grinning self-gratulation of their Continental or American rivals, while their own products are hurled back from foreign frontiers, will learn with surprise that the commercial treaties entered into by Germany were invariably one-sided compacts, which left German trade to “bleed to death.” The writer in Glaser's *Annalen*, to whom we have already referred, thinks that only the progress made in methods of working, and the millions of francs which came into the country in 1871, helped to stave off for Germany the ruin introduced by the free trade policy inaugurated in 1865. He expresses great thankfulness that Germany has gone back to the old Prussian traditions of 1818—more than sixty years since. For our own part, we are tolerably sure that the German trade has but weakened its hold on its own and foreign market, and must inevitably shrink.

The project of holding an international exhibition in Berlin has been definitely rejected by the German Government. The turners and wood-carvers of Germany and Austria are invited to take part in an exhibition of products of skill in trades of turnery and carving, machinery, materials, &c., which is to be opened at Leipzig on March 10, and continue open till May 18. Dr. Georgi, burgomaster of Leipzig, is to be the president of the Exhibition Committee.

The “Verein deutscher Eisenbahn-Verwaltungen,” or German Railway Association, is about, so it is said, to offer a prize of £500 for a method of fastening lines to wheels so make rupture impossible. The solution of this question of railway technics was brought into prominence during the late severe frosts, most of the accidents which occurred during its continuance being ascribed to the breaking of lines. Query: Would not the discoverer of so valuable a secret find it worth more than £500?

AUSTRIA.—A tendency to improvement has come in with the new year, foreign demands rising, especially for pig-iron, which is bought in large quantities by England, Russia, and America. Official quotations have undergone no change, but from five to ten per cent. more is got for

forward bargains. Rolled sorts and tinned sheets are only bought by speculators, who are mostly cautious. A better trade is hoped for in the spring. The supply of rails for the Francis-Joseph Railway, 2000 tons, has been contracted for by the Prague Ironwork Company, at about £12 per ton delivered, the rails being guaranteed for a term of three years only.

SWEDEN.—The market is improving steadily rather than rapidly, prices not being so inflated as in other ironmaking countries. Many stores are all but empty, the depletion which began to take place in the autumn not having been overtaken by the make, for most of which for the next few months there are orders which stand on hand. The works which stand on the banks of the Hed are most of them fully occupied, and prices, though not high, give a satisfactory profit.

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 42 to No. 137, being the entries from Jan. 6th, to January 9th, 1880.

NEW APPLICATIONS.

Alarm Locks.—F. Marley, London.	[74]
Axle Boxes.—J. Young, Bunker Hill, Durham.	[121]
Balancing Millstones.—J. Comerford, Rathdrum, Ireland.	[152]
Bar Cutting Apparatus.—J. W. Newall, Salford.	[101]
Bleaching Apparatus.—G. E. Bennett, Glasgow.	[100]
Boat Disengaging Gear.—J. Mackenzie, Glasgow.	[85]
Brackets or Stays.—G. Lee, Watford.	[102]
Brickmaking Machinery.—T. C. Fawcett, Leeds.	[82]
Button-turning Tools.—A. Wright and W. Jones, Birmingham.	[77]
Bunghole Valves.—A communication.—A. M. Clark, London.	[132]
Cab Indicator.—T. and H. Green, Birmingham.	[120]
Caoutchouc and other Gums.—H. Gerner, New York, U.S.A.	[47]
Carburetted Materials.—J. Kidd, London.	[109]
Carriage Springs.—S. Bowland, Londonderry.	[50]
Carriages.—H. Mulliner, Leamington, Warwickshire.	[111]
Cast-Metal Hollow Ware.—O. Banks, Widdesbury.	[81]
Caustic Soda.—W. J. Menzies, St. Helen's, Lancashire.	[73]
Churns.—A communication.—H. J. Hadden, London.	[95]
Combining Machines.—A communication.—E. de Pass, London.	[64]
Copying Machine.—W. Barker, London.	[89]
Copper Tubes.—J. Wilkes, Birmingham.	[89]
Crystalline and other Forms of Carbon.—J. Maclear, Glasgow.	[45]
Diving Apparatus.—W. A. Gorman, London.	[93]
Dyeing Textile Fabrics.—A communication.—E. Pottell and R. Peters, Bradford.	[57]
Electric Light.—A communication.—A. M. Clark, London.	[75]
Electric Lighting.—R. Werdermann, London.	[79]
Fare Registering Apparatus.—A. J. Aspinall, Liverpool.	[105]
Felt.—A communication.—H. J. Hadden, London.	[96]
Fenders and Fire-Irons.—F. Housh, Birmingham.	[106]
Fire-arms.—A communication.—H. J. Hadden, London.	[107]
Fire Screens.—A communication.—G. E. Vaughan, London.	[124]
Fog Signals.—H. Morris, Balsall Heath, Worcestershire.	[122]
Gas Apparatus.—J. H. Vale, Hambury.	[83]
Gas Motor Engines.—H. Robinson, Manchester.	[117]
Gas Purifiers.—T. Woodward, Manchester.	[50]
Hayricks, &c.—R. P. Plenty, Newbury, Berkshire.	[51]
Horse-shoe Nails.—A communication.—J. H. Johnson, London.	[155]
Hydrocarbon Oils.—A communication.—H. J. Hadden, London.	[86]
Lamp and Gas Stoves.—A. M. Silber, London.	[62]
Looms.—R. Meadows, Blackburn.	[67]
Looms.—H. Holmes, Linsley, near Huddersfield.	[130]
Lubricating Machinery.—A communication.—H. J. Hadden, London.	[126]
Lubricators.—A communication.—H. J. Hadden, London.	[159]
Magazine Fire-arms.—A communication.—W. R. Lake, London.	[128]
Microphones and Telephones.—A communication.—W. R. Lake, London.	[91]
Millstones.—H. Smith, Titchfield, near Fareham.	[92]
Mining Cages.—W. Davies, Merthyr Tydfil.	[80]
Ore Stamping Machinery.—C. J. Appleby, London.	[133]
Organ Reeds.—H. Smith, Caversham.	[108]
Paper Manufacture.—A communication.—F. J. Cheesbrough, Liverpool.	[145]
Permanent Ways.—W. Morris, London.	[88]
Permanent Ways.—T. Seddon, Liverpool.	[106]
Permanent Ways for Tramways.—N. P. Burgh, London.	[72]
Phosphoric Acid.—A communication.—W. R. Lake, London.	[53]
Photographic Album.—J. Bittling, London.	[43]
Pianofortes.—A. G. Gigney, London.	[82]
Picker for Looms.—G. Ambler, Queensbury.	[84]
Piercing Apparatus.—A communication.—A. C. Henderson, London.	[78]
Piston Rod Packings.—A communication.—J. W. Preston, Boston, Massachusetts, U.S.A.	[110]
Piston Rod Packings.—A communication.—J. W. Preston, Boston, Massachusetts, U.S.A.	[111]
Preventing Mildew on Cotton Goods.—D. S. Bles, Manchester.	[131]
Railway Buffers.—H. Statkam, Manchester.	[137]
Railway Signalling Apparatus.—A communication.—S. J. P. Day, Glasgow.	[71]
Removing Water from Furnaces, &c.—J. Clark, London.	[73]
Rotary Motion.—J. Shepherd, Coventry.	[107]
Screw-Cutting Machines.—A communication.—W. Morgan, Brown, London.	[44]
Screw Propeller Shafts.—R. Thompson, Wigan.	[139]
Sewer Inverts.—W. Brierley, Blackburn.	[104]
Shears.—D. Ward and T. Birkhead, Sheffield.	[127]
Shop Window Fittings.—Partly a communication.—W. P. Thompson, Liverpool.	[128]
Signals for Railways.—A communication.—J. H. Johnson, London.	[69]
Salts.—G. Evans, London.	[119]
Spinning Machinery.—J. Darlow and W. Woodhead, Halifax, Yorkshire.	[123]
Spring Attachments.—A communication.—G. W. von Nawrocki, Berlin.	[118]
Springs for Mattresses.—A communication.—H. Carey, London.	[113]
Stamp and Receipt Books.—R. L. Hiches, London.	[154]
Stands for Bottles, &c.—T. B. Grinell, London.	[117]
Steam Engines.—J. D. Larsen, London.	[65]
Steam Engines.—J. C. Stevenson and J. B. Price, Preston, London.	[97]
Steam Plough Gear.—R. A. Edwards and E. B. Edwards, London.	[103]
Stoppers for Bottles.—A communication.—E. W. Grimwade, London.	[149]
Timbales.—W. Purvall, Harborne, Staffordshire.	[115]
Transmission of Mechanical Power.—A communication.—G. W. von Nawrocki, Berlin.	[161]
Treads for Steps, &c.—H. Hedges, London.	[42]
Treating Impure Liquids.—W. Rodger, Selkirk, and A. L. Cockayne, Galashiels.	[135]
Twisting Machinery.—J. Farrar, Halifax.	[129]
Umbrellas.—E. Restaux and W. W. Stead, Shrewsbury.	[99]
Umbrellas.—A communication.—G. W. von Nawrocki, Berlin.	[125]
Utilisation of Refuse.—W. R. W. Smith, Glasgow.	[70]
Utilisation of Town Refuse.—W. R. W. Smith, Glasgow.	[146]
Velocipedes.—J. W. Pierce, London.	[134]
Velvet.—R. S. Collinge, E. Collinge, and R. Collinge, Oldham.	[114]
Water Gauges.—J. Blake, Accrington.	[106]
Waterproof Compound.—R. Condy, London.	[64]
Wool-Combining Machinery.—A communication.—H. Simon, Manchester.	[98]
Zinc Baths.—J. Kirkwood, Leith, Midlothian.	[140]

THE LABOUR MARKET.

A GOOD deal of dissatisfaction is expressed by the South Staffordshire ironworkers at Mr. Chamberlain's award limiting the advance of wages to 1s. per ton or 10 per cent., instead of 2s. 6d. or 25 per cent., as asked. At a mass meeting of ironworkers at Brierley Hill, many of the men were loud in their complaints of Mr. Chamberlain and of the masters, on whose representation he had made his award. Mr. Capper, one of the delegates at the Wages Board, said he might tell them frankly that when he asked for the 2s. 6d. advance he did not expect to get the whole. The figure was fixed by the twelve representatives, and not by him, and he persisted in it in order to force the masters to have the accountants at their books. A workman moved, "That we try Mr. Chamberlain until April," but this was scouted as insulting; another workman moved, "That we accept the explanation given, and proceed to work until April." This was carried unanimously. Following Mr. Chamberlain's award for an advance of wages in the Staffordshire district, an advance of wages is being conceded to the finished-iron workers in the Lancashire district.

An intimation was made to the employees of Messrs. Crawshaw at Cinderford furnaces, Forest of Dean, on Saturday, that the wages rate would be advanced 5 per cent., dating from the 5th of January. This is the second 5 per cent. increase since the minimum rate, prevailing at midsummer last. In accordance with the sliding-scale arrangement agreed to between the Cleveland enginemen and mechanics and their employers, the men received an advance of wages on Saturday. Though the sliding scale is generally considered satisfactory, a portion of the men are aggrieved at the question of hours, about which there seems to have been some understanding, and we hear that the subject will be brought before the masters shortly with a view to an amicable arrangement being come to. The action of the operative shipbuilders at Middlesbrough in demanding an advance of 15 per cent. on time and piece wages has induced the masters in the Tees district to re-form their association and take some measures to protect themselves against the threatened strike of the men. They complain that as soon as one of their number has got a little work in hand and several berths filled with vessels in course of construction, the men demand an advance in prices. Believing that this is but the forerunner of what the men in the other yards will do, the employers have arranged to hold a full meeting of themselves and deputations of the men from Stockton, Middlesbrough, the Hartlepoons, and South Stockton, to endeavour to fix upon some line of procedure, so that they may not be subject, first in one part, and then in another part of the district, to demands for advances. It is further stated that unless the notices are withdrawn the masters will discharge the whole of the union men employed in their yards, and fill their places as speedily as possible with others. It is rumoured that the men employed in the other yards disapprove entirely of the action of the Middlesbrough men. The wages of the horse-nail makers of Belper have been advanced 3d. per 1000 nails. Two years ago the price paid per 1000 was 4s. 3d., but one drop succeeded another until it was reduced to 3s. This is the first rise that has taken place, and 3s. 3d. is now paid. The questions in dispute between the puddlers and their employers at Parkgate were satisfactorily settled on Wednesday; the night shift started work. The summonses issued and served upon those who struck work on Monday night are to be withdrawn, the men to pay the expenses incurred. An adjourned conference of miners' delegates was held on Monday, at the Miners' Hall, Wigan, to consider the wages question and the replies of the masters to the notice of the men for an advance in wages equal to the last reduction. Mr. W. Pickard, of Wigan, presided, and delegates were present from the various mining districts in Lancashire, representing about 20,000 men. The notices for the advance stated expire at most of the collieries on Wednesday. Deputations from the men waited upon the masters at the end of last week, and the replies received were reported to Monday's conference. Most of the replies were to the effect that prices had not sufficiently increased to justify any advance in wages at present, but some of the masters stated that they would give the advance if other masters granted it. The conference was engaged for six hours discussing what steps should be taken by men, and ultimately it was resolved that "seeing that the employers refuse to give an advance of wages on account of their not having increased the price of coal, but hold out a hope that they will be able to give it towards the end of the present month, we adjourn this meeting for three weeks, and in the event of the employers not having given the desired advance, or consented to a basis for a sliding scale by that time, we adopt means to decrease the output of coal until they do so." The conference also resolved to organise committees in the whole of the principal mining districts, and to hold mass meetings of colliers there, in order to carry out the above resolution, and to take steps for the successful working of the sliding scale, should one be adopted by masters and men. As already reported, Mr. Macdonald's scheme for colliers restricting the output has caused a split amongst the miners of South Yorkshire and North Derbyshire. Mr. Chappell, secretary to the old association, has been dismissed for opposition to Mr. Macdonald's views. On Wednesday morning, delegates representing upwards of 8000 men, whose number is expected to be largely increased, approved of Mr. Chappell's action, and met at Rotherham to form a new association and draw up working rules. It is most probable that Rotherham will be selected as head-quarters, with Mr. Chappell as secretary. A meeting of the South Wales Sliding Scale Committee was held at Cardiff on Wednesday. The deliberations between the colliers' representatives were very lengthy. It was ultimately agreed to adopt the scale. The workmen employed by the Derwent Hematite Ironworks in Cumberland have asked for an advance of 10 per cent. A strike at the Yardside Iron Mines, near Barrow, has terminated, the men resuming work on rather better terms, but their demands could not be listened to in their entirety. The furnaces of Askam, the property of the Furness Iron and Steel Company, were to have been damped down on Monday owing to the demands of the men, but a compromise was come to, and the works are again in full operation.

COMMERCIAL.

NEW COMPANIES.

COMPRESSED AIR ENGINES.—This company proposes to work the following inventions:—An invention for an improved compressed air motor, and an invention for an improved means of, and apparatus for utilising, compressed air for obtaining motive power. Both these inventions have been patented, the number and date of the first being 3338, 2nd of May, 1873; and of the second 3498, 28th of March, 1876. The company was registered 2nd inst., with a capital of £3000 in £10 shares.

ESSINGTON BUILDINGS.—Registered 6th inst., with a capital of £10,000 in £10 shares, to erect dwellings for the workmen of the Darlaston Coal and Iron Company (Limited).

GRIFFITHS WILLIAMS AND COMPANY.—This company proposes to take over the business of slate merchant, carried on by Mr. Griffiths Williams at Carnarvon, and also his interest in a similar business carried on at Liverpool, under the style of "J. E. Williams and Co." It was registered 2nd inst., with a capital of £10,000 in £10 shares.

GLOBE OIL.—With a capital of £5000 in £5 shares, this company proposes to carry on business as dealers in mineral and vegetable oils, grease, tallow, fat, and other oleaginous substances. It was registered 3rd inst.

HALSTEAD GAS.—With a capital of £10,000, in £10 shares, this company proposes to acquire the existing works for supplying gas to the town and parish of Halstead, Essex. It was registered 2nd inst.

MONYDD GORDDU LEAD MINE.—This is a reconstruction company of the Mynydd Gorddu Lead Mine Company. (Limited), a company incorporated on the 16th of June, 1873, with a capital of £65,000 in £5 shares, for the purpose of acquiring and working certain mineral lands in the parish of Llanfihangel, Genwighen, in the county of Carnarvon. The present company was registered 5th inst., with a capital of £40,000 in £4 shares, of which 200 are to be issued as fully paid, and the remainder as paid up to the extent of £3 per share. The whole of the shares are to be divided *pro rata* amongst the members of the old company.

SPENNYMOOR IRON AND STEEL WORKS.—This company proposes to acquire a piece of land in the township of Merrington, adjoining the Byers Green Branch of the North-Eastern Railway, with the stock, plant, &c., thereon, for the purpose of carrying on there the business of manufacturing wrought and cast iron and steel. It was registered 5th inst., with a capital of £20,000 in £10 shares.

STAVELEY GAS LIGHT.—This company was provisionally incorporated under the 7 and 8 Vic., c. 110, on the 1st of April, 1856, and completely registered by filing of the deed of settlement on the 22nd of July of that year. It was constituted a limited liability company under the Acts of 1862 and 1876 on the 1st inst., in accordance with a resolution passed by the shareholders at a general meeting held on the 30th ult. The capital is £3000 in 300 shares of £10 each; 150 of the shares are fully paid and £6 per share has been paid on the remainder.

THOMAS ROBINSON AND SON.—This is a conversion to a company of sawmill engineers, millwrights, and wood cutting machinists, and manufacturers of prepared joinery, carried on by the above firm at the Works, Rochdale, and at 145, Cannon Street. It was registered 5th inst., with a capital of £200,000 in £50 shares. The purchase is regulated by an agreement of 24th ult., and includes leasehold premises, machinery, plant, and stock-in-trade and other effects of the said business. The consideration is £139,574 8s. 8d., being the amount of the valuation thereof; £80,000 of this amount is payable in shares.

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

[FOR THE PRESENT AND PAST WEEK.]

(Metal Market, City, Thursday Afternoon, 4 P.M., January 15, 1880.)

METALS AND ORES.

	JANUARY 8.	JANUARY 15.
COPPER (per ton)—		
Chili, for 96 per cent.	60 10/	70 10/
Wallaroo	75 10/	76 0/
Burra Burra	74 10/	75 10/
English Tough	71 0/	72 0/
English Ingot, best	72 10/	73 10/
Sheets sheathing and rod ..	70 0/	77 0/
Bottoms	80 0/	81 0/
Ore per unit	13 0/	13 0/4
PHOSPHOR BRONZE		
Special Bearing Metal (p. tn) ..	110 0/	110 0/
Other alloys (per ton)	115 0/	130 0/
TIN (per ton)—		
Straits (Cash)	92 0/	95 0/
Do. for sale	—	—
Biliton	—	—
Banco	—	—
English Ingots	95 0/	96 0/
Do. Bars	77 0/	201 0/
Do. Refined	98 0/	103 0/
Australian	98 0/	95 0/
TIN PLATES, per box, I.C.		
Do. L.O.B. London	0 30/	0 30/
IX. do.	0 35/	0 35/
I.C. charcoal	0 34/	0 34/
I.X. do.	0 40/	0 40/
LEAD (per ton)—		
Soft English pig	29 10/	29 10/
Do. W.B.	—	—
Spanish soft	19 7/6	19 5/
Do. with silver	20 0/	20 0/
Sheet melted	20 10/	20 10/
Red lead	24 0/	24 0/
White	22 0/	23 0/
Patent shot	22 0/	23 0/
ZINC (per ton)—from No. 6 Gauge.		
Sheets, rolled	24 0/	24 0/
Do. foreign	24 5/	24 5/
SPELTER (per ton)—		
Silesian, com.	20 10/	20 10/
Rhenish	—	—
English	—	—
QUICKSILVER, bot.	7 5/	7 5/

	JANUARY 8.	JANUARY 15.
ANTIMONY ore (per ton)—		
Australian	11 10/	14 10/
Spanish	—	—
French Star	66 0/	68 0/
Regulus		
Crude (per cwt.)	1 14/	1 14/
Nickel (per lb.)	0 4/3	0 4/6
BRASS (per lb.)—		
Sheets, 48x24	0 0/6	0 0/6
Tubes	0 0/8	0 0/9
Wire	0 0/7	0 0/7
Yellow metal	—	—
ASBESTOS (per lb.)—		
Do. chip	13 6/	13 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 4/	1 4/
Hawthorn	1 3/	1 3/
Tonstall	1 2/	1 2/

IRON.

	JANUARY 8.	JANUARY 15.
Iron, per ton (at works)*—		
Bars, Welsh, common	6 5/	6 7/
Do. Best	7 0/	7 0/
Scotch, Common	8 10/	8 10/
Do. Best	9 0/	9 0/
Do. Best	8 10/	8 10/
Sheets, singles, Cleveland ..	9 0/	9 0/
Staffordshire	9 5/	9 10/
Do. doubles, Staffordshire ..	10 15/	11 5/
Scotch	10 5/	10 5/
Do. Lattens, Staffordshire ..	12 5/	12 5/
Plates, Ship, Stafford	10 0/	10 5/
Do. Scotch	8 5/	8 5/
Do. do. Stafford	12 0/	12 0/
Do. Boiler, Stafford	9 0/	9 0/
Hoops, Stafford	8 10/	8 10/
Nail Rods, Stafford	7 10/	7 10/
Swedish in Lond.	11 0/	11 0/
Angle Iron, Welsh	7 10/	7 10/
Do. Stafford	8 10/	8 10/
Pud. Bars, Welsh		
Do. Stafford	6 0/	6 10/
Do. Scotch	—	—
Rails, Welsh		
Do. Stafford	5 0/	5 10/
Do. North England	5 5/	5 5/
Light Rails, Welsh	5 7/6	5 7/6
Do. Stafford	7 10/	8 0/
Pig Iron at Glasgow		
Scotch warrants	3 8/0	3 11/0
Do. No. 1	3 11/	4 1/
Cleveland, Tyne or Tees ..	3 11/	4 1/
Indian Charcoal, London ..	—	—
Wrought Iron Girders	13 0/	13 0/
Bolts and Nuts	13 0/	13 0/
Fish Bolts	13 0/	13 0/
Washers	13 10/	13 10/
Rivets	10 0/	10 0/
Spikes	12 10/	12 10/
SWEDISH IRON—		
Do. b. Gottenburg, nett cash.		
Pig	—	—
Bar, rolled	11 0/	11 10/
Do. hammered	11 0/	11 10/
Billets	11 10/	11 10/
Horse Nail Rods	14 0/	14 10/
BELGIAN IRON—		
Do. b. Antwerp, less 2 1/2 per cent.		
Bars and Slit Rods, common		
Best	—	—
Best Hammered	—	—
Puddled Steel	—	—
Resemer	—	—
Hoops	—	—
Rails	—	—
Roller Girders	—	—
STEEL—		
Best cast	40 0/	42 0/
Do. dbl. sheet	45 0/	45 0/
Do. single do.	35 0/	40 0/
English spring med. quality ..	12 0/	12 0/
Blister	31 0/	31 0/
Swedish keg	10 0/	10 0/
Milan	25 0/	28 0/
Resemer rails	6 5/	6 5/
Do. tires	11 0/	11 0/
Do. billets	7 10/	7 10/
Do. ingots	7 0/	7 0/
SPIEGELISEN—		
Manganese, best	6 0/	6 10/
Common, and white, per ton	5 0/	5 10/
SCRAP (per ton)—		
Old rails for remanufacture,		
D.H.	4 0/	4 0/
Ditto flange or bridge	4 0/	4 0/
Enginers' scrap	3 0/	4 0/
Light scrap	3 0/	3 0/
Scrap metal	3 0/	3 0/
Old steel scrap	3 15/	4 10/
WIRE—		
Best best drawn killed		
gal. tel. Nos. 0 to 6	14 10/	17 0/
Do. 7 & 8	15 10/	18 0/
Do. 9	16 5/	18 15/
Do. 10	17 0/	19 10/
Do. 11	17 10/	20 0/
Do. 12	18 10/	21 0/
Roller black fencing wire		
(per ton) 1 to 4	8 0/	10 10/
Do. 5	8 15/	11 0/
Do. 6	9 0/	11 10/
Do. 7	9 10/	12 0/
Bright Iron Wire (Charcoal		
wire, 48. 6d. per bundle		
extra per bundle		
of 63 lb. 0 to 6	0 10/6	0 13/
Do. 7 to 8	0 11/	0 13/6
Galvanised, 80s. per ton extra.		
Best best annealed drawn		
fencing wire, per ton		
Do. 0 to 6	6 15/	12 5/
Do. 7	10 5/	12 15/
Do. 8	10 10/	13 0/
CARTINGS (per ton) at works—		
Girders	6 10/	6 10/
Chairs	4 10/	4 10/
Floor plates	5 12/6	5 12/6
Pipes, 1 1/2 to 2 1/2	6 12/6	6 12/6
Do. 3 to 4	6 2/6	6 2/6
Do. 5 to 8	6 1/6	6 1/6
Do. 10 to 12	6 0/	6 0/
Do. 13 to 24	5 17/6	5 17/6
Boils and Nuts	17 10/	17 10/
Fish Bolts	18 10/	18 10/
Spikes	17 10/	17 10/
Rivets	14 10/	14 10/
Washers	19 10/	19 10/

* The entire ton consists of ten times 100 kilogrammes, or about 2240 lb. short of an English ton.

OILS, CHEMICALS, &c.

	JANUARY 8.		JANUARY 15.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
OILS (per ton)—				
Olive, Malaga	—	—	—	—
Do. Gioia	—	—	—	—
Do. Levant	48 0	—	45 10	—
Do. Mogador	—	—	—	—
Do. Tunis	—	—	—	—
Do. Sicily	48 0	—	47 10	—
Do. Sardinia	45 0	40 0	45 0	40 0
Seal, pale	31 0	—	30 0	—
Seal, yellow	28 0	—	27 0	—
Seal, brown	26 0	—	25 0	—
Sperm head	70 0	—	69 0	—
Cod	27 10	—	27 10	—
Whale, pale	27 0	—	27 0	—
Do. yellow	26 0	—	26 0	—
Do. brown	25 0	—	25 0	—
E.I. Fish	—	—	—	—
Rapeseed, English, pale	31 15	—	31 15	—
Do. brown	30 0	30 5	30 0	30 5
Foreign Fat	—	—	—	—
Ground nut and Gingelly	—	—	—	—
Madras	—	—	—	—
Palm oil, fine	36 0	36 10	35 15	—
Palm nut oil	32 0	37 0	32 0	37 0
Linseed oil	28 0	—	28 0	—
Cotton seed oil	29 0	30 5	29 0	30 5
Lard	44 0	—	44 0	—
Cocoonut, Ceylon	30 0	—	30 0	—
Do. Ceylon	30 10	—	30 10	—
Mauritius	37 10	—	37 10	—
C. Price & Co.'s patent engine oil (per gal.)	0 3 6	—	0 3 6	—
OIL Cakes (per ton)—				
Linseed, Indn.	11 4	—	11 5	—
American lin.	10 17 6	—	10 17 6	—
Do. bags	10 12 6	—	10 12 6	—
Marcellis	0 2 6	—	0 2 6	—
Rape, English	5 2 6	—	5 2 6	—
Do. Foreign	—	—	—	—
Green Cotton	6 0	—	6 2 6	—
Tallow	45 0	—	45 0	—
S. American, Beef	—	—	—	—
Do. Sheep	—	—	—	—
Australian Beef	15 10	—	15 10	—
Do. Sheep	37 10	—	37 10	—
Rough Town Fat	14 0	—	14 0	—
PETROLEUM—				
Fire (per gal.)	0 0 6 7-16	—	0 0 7	—
Do. spirit	0 0 7 1/2	—	0 0 7 1/2	—
TURPENTINE—Spirit—				
French	—	—	—	—
American (cask)	1 11 9	1 2	1 11 9	1 2
WHALEBONE (per ton)—				
Davis Straits	1100 0	—	1100 0	—
Arctic	1000 0	1000 0	1000 0	1000 0
Southern	500 0	—	500 0	—
BIRNSTONE (per ton)—				
Rough, and ind.	7 0	—	7 0	—
Do. grs. do.	5 7 6	—	5 10 0	—
Roll	8 15	—	8 15	—
SULPHUR, Flour	11 0	—	11 0	—
ACID (per lb.)				
Acetic, fine	0 0 4	—	0 0 4	—
Do. common	0 0 2 1/2	—	0 0 2 1/2	—
Citric	0 2 0	0 2 1	0 2 0	0 2 1
Muriatic fine (per cwt.)	2 4 0	0 4 0	0 4 0	0 4 0
Do. common	0 4 0	—	0 4 0	—
Nitric	0 0 4 1/2	—	0 0 4 1/2	—
Oxalic (per lb.)	0 0 5	—	0 0 5	—
Sulphuric, concentrated	0 0 6 1/2	0 0 7	0 0 6 1/2	0 0 7
Do. Brown	0 0 6 1/2	—	0 0 6 1/2	—
Tartaric Crystal	0 1 6 0	0 1 7	0 1 6 0	0 1 7
Do. Pulv.	0 1 6 0	0 1 7	0 1 6 0	0 1 7
AMMONIA—				
Carbonate, per lb.	0 0 6 1/2	0 0 6	0 0 6 1/2	—
Sulphate, White & grey (per ton)	20 0	—	20 0	—
ARSENIC—White Lump (per ton)				
Powdered, do.	11 5	—	11 5	—
Bleaching powder	8 0	—	8 0	—
Borax, Kid, do.	2 0	2 1	2 0	2 1
Coverlas (ton)	2 5	2 10	2 5	2 10
BI-SULPHUR CARBON (per ton)				
Do. Red	24 10	26 0	24 10	26 0
PORTLAND CEMENT—				
1st quality, in cks 400 lb. gross, inc. cks, i.o.b.	—	—	—	—
Do. in sks, 200 lb. net (per ton)	0 9	—	0 9	—
Sacks extra, 1/6 each	2 0	—	2 0	—
Charlton White Paint (per cwt.)	1 12	—	1 12	—
Calley's Torbay Paint, Brown	0 30	—	0 30	—
Do. Red	0 34	—	0 34	—
HYDROGENSULPHIDE (per lb.)				
Iron	0 9 3	0 10	0 9 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 18	—	2 0	—
Nitrate	1 15	—	1 15	—
Red	1 1	—	1 1	—
White	1 3	1 4	1 3	1 4
LITHARGE (per cwt.)				
Acetate, Grey, 85 %	0 10	—	0 10	—
Do. Brown 80 %	11 0	11 0	11 0	—
POTASH—				
Bichromate (lb.)	0 0 7	—	0 0 7	—
Chlorate (pr. lb.)	0 0 7 1/2	—	0 0 7 1/2	—
Muriate, 80 % ton	0 15	—	0 15	—
Pruss. Red (lb.)	0 1 11	—	0 1 8	—
Do. Ver. lb.	0 0 11 1/2	0 1	0 0 11 1/2	0 1
Sulphate, 80 % (per ton)	11 0	16 0	14 0	16 0
SALT PETRUM (per cwt.)				
Engl. reind. kg.	1 7 6	—	1 7 6	—
Do. barrels	1 0	—	1 0	—
Do. Bengal	0 19 6	1 1 6	0 19 6	1 1 6
SODA—				
Ash, deg.	0 0 15 16	0 2	0 0 15 16	0 2
Bicarb. (per cwt.)	0 10 3	—	0 11	—
Caustic, 60 %	11 9	—	0 12	—
Do. 72 %	0 14 6	—	0 14 6	—
Nitrate	0 19 6	—	0 19	—
Crystals (per ton)	3 12 6	—	4 0	—

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

IRON AND STEEL RAIL EXPORTS.

THE following is an account of the exports of iron and steel rails during the month ending December 31st, 1879, as compared with the corresponding month of 1878; also as to the exports during the twelve months of 1878 and

1879. The Board of Trade make the usual reservation as to accuracy:—

	QUANTITIES			
	Month ended Dec. 31.		Twelve months ending Dec. 31.	
	1878	1879	1878.	1879.
IRON RAILS:—	Tons.	Tons.	Tons.	Tons.
To Russia	—	—	1,316	414
Sweden and Norway	—	—	12,508	460
Germany	—	—	1,730	1,222
Spain	—	—	2,015	4,805
Italy	262	281	304	30,820
United States	153	3,594	—	—
Brazil	65	65	6,041	2,428
Chili	25	—	252	112
British North America	—	—	4,538	2,807
British India	168	1,099	20,568	5,223
Australia	1,085	8	26,107	5,953
Other Countries	855	1,533	20,094	10,187
Total	2,550	7,132	107,268	55,604
STEEL RAILS:—				
To Russia	2,706	520	53,990	35,291
Sweden and Norway	—	50	9,182	12,015
Germany	—	—	34,237	1,745
Spain	2,194	1,050	14,997	11,700
Italy	—	1,101	12,374	31,362
United States	—	3,170	—	23,750
Brazil	287	518	7,134	25,098
Chili	32	—	543	616
British North America	—	—	27,749	58,280
British India	350	7,547	13,652	44,380
Australia	5,022	1,384	40,692	28,811
Other Countries	1,204	5,048	16,813	41,240
Total	11,855	20,650	251,451	328,425
TOTAL OF IRON AND STEEL RAILS	14,405	27,782	358,750	384,029

	VALUE			
	£	£	£	£
	1878.	1879.	1878.	1879.
IRON RAILS:—				
To Russia	—	—	10,588	2,110
Sweden and Norway	—	—	76,990	2,201
Germany	—	—	10,541	7,800
Spain	—	—	47,046	6,770
Italy	1,362	3,799	31,316	23,471
United States	1,050	17,452	1,768	101,797
Brazil	367	599	37,652	12,228
Chili	147	—	5,075	620
British North America	—	—	27,362	12,511
British India	662	7,610	125,211	35,010
Australia	5,534	87	100,459	37,150
Other Countries	4,692	8,340	120,540	58,030
Total	13,844	38,260	655,334	296,264
STEEL RAILS:—				
To Russia	19,241	4,500	400,785	222,945
Sweden and Norway	—	285	69,592	77,502
Germany	—	—	208,351	10,101
Spain	16,162	5,774	106,010	68,801
Italy	—	6,147	181,297	166,038
United States	—	20,500	—	138,108
Brazil	1,850	2,662	50,821	155,281
Chili	216	—	4,014	4,286
British North America	—	48	209,218	343,500
British India	2,216	37,417	227,034	253,045
Australia	11,000	7,841	280,700	231,308
Other Countries	7,225	20,045	122,272	255,717
Total	79,413	115,259	1,868,103	1,987,605
TOTAL OF IRON AND STEEL RAILS	93,257	153,519	2,523,437	2,963,869

IRON EXPORTS.

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

Port.	1879. Jan.	1879. Feb.	1879. March.	1879. April.	1879. May.	1879. June.	1879. July.	1879. Aug.	1879. Sept.	1879. Oct.	1879. Nov.	1879. Dec.
(PIG IRON.)	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ardrassan	1,070	1,440	615	590	1,885	190	965	2,280	1,850	5,510	2,000	555
Borrowstoness	—	—	—	180	335	100	102	—	—	—	—	—
Cardiff	—	—	250	278	750	10	7	208	60	1,103	300	700
Charlestown	—	—	—	—	30	—	15	—	—	—	—	—
Glasgow	4,253	5,072	7,804	10,153	8,237	5,504	6,912	8,432	16,786	21,120	26,186	12,374
Goole	—	11	10	100	100	—	—	—	150	94	—	—
Grangemouth	300	1,075	7,267	11,053	10,955	1,524	2,460	2,110	2,870	3,447	2,295	320
Granton	10	10	50	30	30	20	30	180	9	—	10	20
Greenock	855	70	707	106	10	—	175	180	2,000	6,000	—	60
Grimby	—	3	10	160	72	25	80	35	50	—	—	—
Hartlepool	—	3	690	2,280	2,414	1,540	1,109	2,223	2,111	5	2,795	1,605
Hull	470	—	2,504	2,280	2,414	1,540	1,109	1,600	1,618	2,191	3,395	—
Irvine	150	208	875	1,207	1,711	2,601	1,600	1,618	2,191	2,191	3,395	—
Liverpool	—	2,026	920	2,280	2,402	3,751	1,861	2,534	2,851	10,892	21,731	17,637
Middlesborough	—	17,250	23,685	41,771	38,911	41,107	25,449	29,652	31,288	49,621	49,528	31,723
Newcastle-on-Tyne	—	2,300	1,991	793	1,095	5,991	2,184	4,160	4,160	5,114	7,392	7,583
Newport	—	—	—	—	41	—	—	110	—	—	50	1,000
North Shields	—	200	—	—	—	—	—	400	322	—	250	60
Port Glasgow	—	—	—	—	—	—	—	—	—	200	—	—
South Shields	—	—	—	—	—	—	—	—	—	70	140	510
Sunderland	—	120	28	—	310	540	180	—	—	—	—	—
Swansea	—	10	25	—	4	—	—	20	—	—	—	20
Troon	—	175	430	150	780	550	310	2,250	400	20	1,850	200
Whitehaven	—	2,610	7,200	5,325	45,521	5,145	850	4,320	1,200	1,800	700	2,400
(MERCHANT IRON.)												
Ardrassan	—	—	—	—	—	6	—	—	—	—	—	—
Cardiff	—	—	—	—	—	—	823	3,560	930	1,290	2,016	2,708
Glasgow	658	340	1,139	2,016	2,445	—	723	954	619	883	770	710
Goole	340	—	311	1,584	997	522	—	—	—	—	—	—
Grangemouth	—	—	—	15	—	—	—	—	—	—	—	—
Greenock	—	307	7	—	—	—	—	—	14	—	—	—
Grimby	—	5	11	26	10	33	15	5	8	4	5	50
Hartlepool	291	212	680	464	734	705	905	47	564	632	89	517
Hull	173	339	734	981	984	804	913	1,247	1,595	2,070	3,595	1,239
Llanelli	—	—	—	—	—	—	—	—	450	—	—	—
Liverpool	6,325	4,872	7,093	7,425	6,282	6,795	6,377	5,850	7,011	10,170	12,040	11,114
Middlesborough	1,908	2,547	2,945	3,073	5,154	4,022	3,486	775	2,095	943	1,913	517
Newcastle-on-Tyne	1,131	413	609	1,220	4,102	1,220	1,336	1,250	1,665	1,510	1,377	3,075
Newport	—	—	—	—	—	—	32	—	—	—	321	20
North Shields	—	—	—	—	439	134	13	—	—	10	—	—
South Shields	—	—	—	—	—	—	—	—	—	—	—	—
Stockton	—	—	17	21	90	1	47	29	58	187	1,189	5
Sunderland	—	—	—	—	199	—	—	—	—	—	—	—
Swansea	413	—	—	95	—	11	—	6	—	545	—	—
Troon	70	—	169	—	—	—	385	936	922	39	1,016	52
(RAILS.)												
Ardrassan	—	—	—	—	—	—	—	—	—	—	1,000	910
Cardiff	—	—	—	—	—	—	—	—	—	—	6,007	7,043
Glasgow	3,694	4,290	4,555	7,120	3,427	4,532	5,151	10,174	11,380	10,192	3,504	794
Greenock	—	—	—	—	—	—	503	900	1,516	—	—	—
Grimby	—	—	—	—	—	—	—	700	—	—	—	—
Hartlepool	—	—	—	—	—	—	—	—	410	687	1,095	410
Hull	—	—	501	484	37	1,285	7	9	157	827	1,315	450
Liverpool	2,110	3,021	4,205	2,018	5,621	8,120	8,042	7,440	9,116	12,580	8,050	—
Middlesborough	—	1,575	2,011	2,114	4,950	4,358	2,105	1,605	1,654	2,231	1,733	450
Newcastle-on-Tyne	—	—	—	—	3	4	1,171	—	—	3	—	255
Newport	6,295	7,688	2,546	3,433	5,501	4,691	10,586	5,013	8,758	3,222	4,200	5,803
North Shields	—	—	—	—	—	—	—	—	—	—	593	—
South Shields	—	—	—	—	10	—	—	—	—	—	100	—
Sunderland	—	—	—	—	—	—	—	—	—	—	—	1,670
Swansea	—	240	—	—	10	—	—	1,144	—	733	346	688
Troon	—	—	—	—	—	—	—	—	480	6,000	—	—

PARTNERSHIPS DISSOLVED.

W. Heitsch and F. H. Weare, Wardour Street, Soho, manufacturing goldsmiths.—Logan and Elder, Berwick-upon-Tweed, agricultural implement makers.—W. Kempe and Co., Leeds, machinists.—Lowenthal Brothers and C. Wolff, Hatton Garden, City, wholesale jewellers; as far as regards C. Wolff.—T. Broadbent and D. Brown, Huddersfield, patent liquor machine makers.—Blogg and Wigg, Bartlett's Buildings, Holborn, manufacturing jewellers.—J. M. and W. Spargo, Wolverhampton, japanners.—Herbert and Son, Newman Street, Oxford Street, manufacturing goldsmiths; as far as regards R. H. Burton.

PRICES CURRENT OF MANUFACTURED GOODS

BIRMINGHAM AND DISTRICT.

* * This List being compiled exclusively for the papers 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.

January 14th, 1880.

Last week we had to notify an advance in cut-nails, gas-tubes, bolts and nuts, cut-tacks and brads. This week further lists are coming to hand, and the heavy trade generally shows large advances. No doubt the settlement of the price of marked iron has now made it possible to give quotations, but the markets are very strong, and other advances seem to be confidently looked for soon. This week the wire manufacturers have advanced prices of wire of all sorts 40s. per ton; wrought iron hinges are advanced 1s. per cwt., the second advance made; Bessemer steel wire is advanced 50s. per ton; chains, cables and anchors 40s. per ton, and another rise soon expected—makers will only quote on specification; axle-pulleys are advanced in the commoner kinds. Mr. W. A. Lyndon and other makers have reduced their discounts in spades and shovels 2½ per cent. all round; copper and brass wire, tubes, rolled metals, and others are advanced ¼d. per lb.; plate-locks were reduced in discount 5 per cent., making the second advance in these, altogether on the nett of 20 per cent.; lead wire is advanced ¼d. per lb. Some tin-ware manufacturers are reducing their discounts 2½ per cent. Contrary to all other manufacturers at this time of general rise in almost every trade, the coffin furniture makers have advanced their discounts 5 per cent., equal to a nett reduction of over 15 per cent. This always has been a strange trade, and we may well wonder at a step in the way of so large a reduction being made at a time when tin and brass have gone up so very high. Now, we should say, is the time to buy coffin furniture, common at, say, 77½ per cent., and registered at 57½ per cent. BB annealed drawn fencing wire is now quoted 0 to 6 at £12 5s.; prepared bright 0 to 6, £13 10s.; and steel 0 to 6, £15 15s. Prices same as last week with the following alterations:—Plate locks, £3 less discount; wrought-iron hinges 1s. per cwt. on; spades and shovels, discount, 1s. per cwt. on; 2½ discount less on spades and shovels; copper and brass goods, ¼d. per lb. on; all sorts of wire 2s. per cwt. additional.

[BY TELEGRAPH.]

THURSDAY EVENING.

On 'Change to-day there was a good attendance, and the tone of market was very firm in all departments; buyers were anxious to place heavy orders, especially for hoops and sheets, but makers being fairly full, declined to book forward heavy lines without revision of prices, and buyers were not prepared to come up to terms which would induce makers to yield, still a fair amount of business was done. For limited orders of sheets £11 was asked, some firms going up to £11 10s., but for large quantities lower rates were accepted. Bars, marked and unmarked, were firm, at quarter-day quotations. Tin plates in good request. I. C. Cokes quoted 30s. to 32s. 6d. per box. Anticipation of higher prices in trade generally was prevalent on 'Change. Coal in good demand, coke 2s. dearer.

ABRIDGED LIST.

Axles, 15 to 25½; coach ironwork, 10 to 15½; coach and waggon springs, 15 to 20½; Augers, 10 to 20½. Axes.—Ship carpenters', 5½ to 6 per lb.; Kent and house carpenters', 5 to 6; ditto, steel polished, 5½ to 7; felling axes, 4½ to 5½; polished, 4½ to 6; bright and blued solid steel, 7 to 8; American felling or wedge axes, steel polished, 1 to 1¼ per lb.; common Anvils, 84 lb. and upwards, 18½ to 20 per cwt.; best warranted, 22 to 24; ditto, and ends warranted not to break off, 27 to 35½. Basins, shallow galvanised, 10 inch, 7 to 7½ per doz.; deep Basins, galvanised, 12 inch, 10 to 12½ per doz.; Bastard Bellows, 4½ to 5½; Best extra nailed Bastard, 37½ to 45½; Best improved long Bristol, 35 to 40½; casters or moulders', best extra nailed, 12 inch, 30 per doz. net; common Smith's Bellows, 45 to 50½; Best warranted, extra leather double nailed, 36 to 40½; with movable pipe for shipment 2½ less discount. Bed screws, 6 and 7-16 and 1 inch, 10½ to 11½ per gross for London black heads; London heads with bright turned collar, 6 and 7-16 and 1 inch nuts, 12½ to 13½; Black welded heads, 6 to 10½; common slit heads, 6 and 7-16 and 1 inch, 12½ to 13½; Black turned notched heads, 6 and 7-16 and 1 inch, 12½ to 13½; Bright notched heads, 10½ to 11½ per gross; Brass head nails, 40 to 45½; star head, 35 to 40½; Brass plated countersunk head, 25 to 30½; Blacksmiths' tongs, 20 to 28 per cwt.; real fine wrought Box irons, 20 to 25½; fine cast, 42½ to 60½; middle cast, 42½ to 60½; charcoal box irons—Victoria, 45 to 50½; ordinary charcoal box irons, 55 to 70½; Bolts—Straight tower, solid end tower, 6½ to 7½; end Best solid tower, 6½ to 7½; solid end barrel brass knob, 6½ to 6½; Japanned Scotch tower bolts, 17½ to 25½; painters' brushes, 15 to 65½; Best, 10 to 40½; light galvanised Buckets, 12 inch, 38 lb. to the doz., 10½ per doz. net; Blind cord, list price net; Bed hooks and eyes, 50 to 55½ malleable, 62½ to 67½; Brass chain Bending, 30 to 35½; Brass and plate coach heading, 30 to 35½; ashpan moulding, 20 to 30½; Bottle Jacks—Linwood's, 15 to 20½; Salter's, 30 to 35½; Nicholas's, 15 to 20½; common painted Beams, 35½ to 65½; Bright round end beams, 40½ to 55½; Bright box end beams, 40 to 55½; deep Copper scales, 45 to

65½; Steelyards, 40 to 60½; pocket steelyards, best counter weighing machines, Avery or other best make, 25 to 30½; common, with round copper scale, 1 lb., 3 to 5½; 14 lb., 3 to 5½; 28 lb., 5 to 8½ each, net; Bedsteads, cheap stump, 6 feet by 3 feet 6 in., 7½ to 9½ each; cheap Bedstead, 6 feet by 3 feet 6 in., 8½ to 12½ each, rising ½ for every 6 inches. Brass—Rolled brass, 2 to 12 inches wide, to 30 W.G., 9½ to 10½ per lb.; Brass sheets, 24 by 48 in., 8 lb. and upwards, 10 to 11½ per lb.; turned edge, 11½ to 1¼; thick, and lacquered on edge, 1½ to 2½ per lb.; cattle and sheep bells, with brass loops, 1½ to 1½ per lb.; clock bells, 1½ to 1½; ship and turret bells best, 1¼ to 1½; Battery Kettles, 150 per cwt.; composition sheathing and Slatting nails, 10½ to 11½ per lb.; Brass Escutcheon pins, 1 by 16 inch, W.G., 10½ to 1½; Brass Jelly pans, with balls, 1 to 1½; without balls, 1½ to 1½ per lb. Mangle kettles, cast, 4 to 16 inch, W.G., 10½ to 1½ per lb. Pinpoints, 1½ to 1¼. Brass Rivets for boots, 12 to 17, W.G., 9½ to 10½ per lb. Brass Shoe Bills, 1½ to 1½ per lb. Brass Scale pans, 2 to 2½; Brass Toddy Kettles, 15 to 20½. Brass Tubes, plain rough, 1 inch and above, 10½ to 11 per lb. Locomotive and marine boiler tubes, seam less from 1½ to 4 inch outside diameter, to 14, W.G., 24 to 30.

Copper—Copper boat nails, wrought 1½ by 12 inch, W.G., and upwards, 10½ to 11½ per lb. Copper 1 boat Roves, 1 inch and upwards, 12½ to 13½ per lb. Copper Brads and bills, same price as tacks. Light round Copper Kettles, bare rivets, 1½ to 2½ per lb. Light round covered rivets, 1½ to 1½½; loaded, 1½ to 1½; oval Copper kettles, bare rivets, 2½ to 2½ per lb.; oval bare rivets raised round, 2½ to 2½ per lb. Copper Rivets and washers, 1 to 1½ per lb.; Copper Slatting nails, cut, 1 to 1½ inch and upwards, 11½ to 1½ per lb.; Copper Scale pans, 1½ to 2½ per lb.; cut Copper Nails and tacks, 1 inch and upwards, 1 to 1½ per lb.; wrought Copper nails and tacks, 1½ to 1½ per lb.; Copper Wire, 20 to 20 W.G., 10½ to 11½. Brass cupboard turns, 45 to 52½; Chair webbing, No. 9, 4½ to 10, 4½; No. 10, 4½; No. 11, 4½; No. 12, 4½; No. 13, 4½; No. 14, 4½; No. 15, 4½; No. 16, 4½; No. 17, 4½; No. 18, 4½; No. 19, 4½; No. 20, 4½; No. 21, 4½; No. 22, 4½; No. 23, 4½; No. 24, 4½; No. 25, 4½; No. 26, 4½; No. 27, 4½; No. 28, 4½; No. 29, 4½; No. 30, 4½; No. 31, 4½; No. 32, 4½; No. 33, 4½; No. 34, 4½; No. 35, 4½; No. 36, 4½; No. 37, 4½; No. 38, 4½; No. 39, 4½; No. 40, 4½; No. 41, 4½; No. 42, 4½; No. 43, 4½; No. 44, 4½; No. 45, 4½; No. 46, 4½; No. 47, 4½; No. 48, 4½; No. 49, 4½; No. 50, 4½; No. 51, 4½; No. 52, 4½; No. 53, 4½; No. 54, 4½; No. 55, 4½; No. 56, 4½; No. 57, 4½; No. 58, 4½; No. 59, 4½; No. 60, 4½; No. 61, 4½; No. 62, 4½; No. 63, 4½; No. 64, 4½; No. 65, 4½; No. 66, 4½; No. 67, 4½; No. 68, 4½; No. 69, 4½; No. 70, 4½; No. 71, 4½; No. 72, 4½; No. 73, 4½; No. 74, 4½; No. 75, 4½; No. 76, 4½; No. 77, 4½; No. 78, 4½; No. 79, 4½; No. 80, 4½; No. 81, 4½; No. 82, 4½; No. 83, 4½; No. 84, 4½; No. 85, 4½; No. 86, 4½; No. 87, 4½; No. 88, 4½; No. 89, 4½; No. 90, 4½; No. 91, 4½; No. 92, 4½; No. 93, 4½; No. 94, 4½; No. 95, 4½; No. 96, 4½; No. 97, 4½; No. 98, 4½; No. 99, 4½; No. 100, 4½.

Door springs, X, 75 to 80½; XX, 70 to 75½; XXX, 65 to 70½; XXXX, 55 to 60½; brass circular and iron circular, 55 to 60½; brass reliance, 10 to 15½; climax, 10 to 15½; universal, 50 to 60½; paragon, 10 to 15½; smith's, 10 to 15½; O'Connor's patent lever hinge springs, 10 to 15½; O'Connor's vertical spring hinge door spring, 15 to 25½; Gerish's spring hinges, iron, 20 to 25½; brass, 10 to 15½; Japanned Door chains, 30 to 60½.

Fires, 25 to 30½; Fryng pans, best, 60 to 62½ common, 67½ to 70½; kitchen Fireirons, in sets, 5½ to 6½ per lb.; tongs only, 7½ to 10½; poker only, 7½ to 10½ per lb. Fish hooks, 30 to 35½; best; common, 50 to 55½; light kitchen Fenders, 5 to 28 assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 27 to 28 per doz.; bright fronts, 30½ to 31½; Manchester pattern kitchen Fenders, 5 feet 1 inch top, black front, 1 foot 9 inches to 3 feet 3 inches, 30½ to 40½ per doz.; 3 feet 3 inches to 3 feet 9 inches, 41½ to 45½. Cut wire Fencing staples, 0 to 6, 18 to 20 per cwt.

Gridirons, London pattern, fluted, 62½ to 65½; light ditto, 61½ to 63½; hanging round bar, 62½ to 65½; double, 61½ to 63½; round bar, 14 per bar, 57½ to 60½; best fluted bar, 53 to 62½; flat bar, 57½ to 62½; common flat bar, 57½ to 62½; common Gridirons, 12, 13 and 14 per bar, 64 to 70½; Gofering tongs, two prongs, 5½ to 6½ per doz.; Gimblets, 10 to 15½.

Holdfasts, Japanned, 20 to 21 per cwt. Hammers, plate-layers' keying, 3½ to 35½; miners', 27½ to 28½; sledge, 27½ to 28½; stone sledge, 27½ to 28½; stone hand, 28½ to 30½; stone-masons' hand, 28½ to 30½; pin maul, 2 to 6 lb., 35½ to 37½ per cwt.; sledge hammers, 6 lb. and upwards, 28½ to 30½ per cwt.; riveting hand-hammers, 28½ to 30½; miners, not steeled, 22 to 24 per cwt.; common Kent hand hammers, 20 to 50½; patent haps and staples, 20 to 25½. Cast hinges, polished joint light patent tariff butts, 20½ to 25½; double, 24 to 42½; 50½ to 52½; polished joint, best, 20½ to 25½; ditto light, 20½ to 25½; ditto light tariff, broad butts, 45 to 50½; best heavy, broad butts, 45 to 50½; Patent Hinges, edge butts, light, 60 to 65½; strong, 42½ to 55½; patent Scotch butts, 55 to 57½; same off broad end narrow. Patent table, bed and back-flap hinges, 50 to 55½; extra strong bed hinges, 45 to 57½; patent chest, 50 to 60½; patent strap, 50 to 57½. H Hinges, 42½ to 57½; HL hinges, 42½ to 57½; Japanned and garnett hinges, double washed, light and strong, 40 to 45½; best patent London or Lancashire tons, 55 to 62½; patent light Japanned Scotch Tons, 57½ to 65½; light patent hook and hinges on plate and to drive, 22½ to 32½; weighty patent hooks and hinges, weighty Gothic, 10½ to 24½; acollaped edges, not Japanned, 20½ to 23½; Scotch Japanned, Tees double washed, 19 to 22½; Gothic Scotch Japanned, Tees 21½ to 26½; Gothic Scotch, Tees self colour, 20½ to 23½; Wrought hinges, common and best, 17½ to 42½; best, 22½ to 37½; heavy wrought hinges, common black, 14 to 16½ per cwt.; common bright, 16 to 18½; filed edges, 17 to 19½; Japanned Gothic fancy, 16 to 20½ per cwt. common bright, broad eye, 10 to 24½; Japanned broad eye fancy, 21 to 22½; best bright, 22½ to 24½; best broad eye, 23 to 25½; best self-colour frog hooks 25 to 30½ per cwt.; Lancashire hinges wrought, 32½ to 37½; Pressed hinges, common, 62½ to 65½; best, 52½ to 57½; common brass butt hinges, 13 inch standard, 15 to 18 per gross; pairs net; very light, 13 inch, 9½ to 12 per gross, pairs net; horseshoes, fullered fore, 17½ to 19½; fullered hind, 18½ to 19½; stamped, fore, 17½ to 19½; hind, 17½ to 19½. Hollowware, 45 to 50½; common to best, enamelled, 20 to 25½, delivered in Liverpool, London.

Ironfoundry, general.—Ash grates, 10 to 12½; ash bricks, 2½ to 3½; half, single, 3½ to 4½; double, 5 to 7½; bars and bearers, 8½ to 9½ per cwt.; harrow wheels, 9 to 10½; bake pans, 9½ to 10½; cart bushes, 10½ to 12½; camp ovens, 9 to 11½; cooking stoves, 16½ to 12½; cogs for blocks, 16 to 17½; cellar grating, 9½ to 10½; clock weights, 8 to 10½; Dutch stoves, 10 to 17½; dumbbells, common, 8 to 10½; best Japanned, 18 to 20½; frying pans, cast handles, 12½ to 13½; frying pans with wrought handles, 16 to 18½; furnaces, up to fifty gallons, 13½ to 14½; galvanised furnaces up to fifty gallons, 11 to 12½ per gallon; furnace doors, 11 to 13½; furnace grates, 8½ to 10½; forge backs, 11½ to 12½; heaters for box irons, 7½ to 9½; heaters for urns, 9 to 10½; jack wheels, 17 to 19½; oven doors and frames, 11 to 13½; pots; three legged, Danish, plumbers' and Negro, 9 to 11½; pump spouts, 13 to 15½; saash weights, 7½ to 8½; ditto, with pulleys, 10 to 12½; shoe anvils, 10½ to 11½; slippers 11½ to 12½; Italian irons, 35 to 60½.

Knitting pins, iron, 1½ to 5 per lb.; steel knitting pins, 15 to 24 W.G., 1 to 2½ per lb.; brass knitting pins, 1 to 1½ per lb.; keys and banks, 40 to 55½; extra strong plate, 30 to 32½; extra strong Banbury, pin'd keys, 30 to 35½; brass shutter knobs, 52½ to 57½; brass cupboard turns, 52½ to 57½; brass drawer knobs, 52½ to 57½; brass ash pan knobs, 52½ to 57½; brass range knobs, 35 to 40½; kettle ears, 77½ to 80.

Lock furniture, brass, 60½ to 62½; buffalo, 25 to 30½; china lock furniture, 37½ to 42½; ebony lock furniture, 21-inch, Wilkes' spindle, 15 to 18½ per dozen sets; sham ditto, 8 to 9 per dozen sets; Norfolk lockboxes, common, 75 to 77½; best, 55 to 65½; common Suffolk lockboxes, 70 to 72½; best Suffolk lockboxes, 45 to 55½; tinned struck ladle bowls, 4-inch, 15½ to 16½; 4½-inch, 18½ to 20½; 5-inch, 23 to 25½ per gross net.

Netting, wire, galvanised, 57½ to 60½, delivered Cast nails, 10½ to 11½ per cwt. cast wall nails 8½ to 11½ per cwt. cast headed bills, 1 by 8 ounce, 14 to 15½; fine round cast bills, 1-inch, 14 to 15½; strong round cast bills, 1-inch, 12 to 15½; cast slate pegs, 12 to 16½; cast garden loops, 14 to 16½ per cwt., all at works. Patent wrought nails, 12½ to 17½ per thousand and 27½ those sold as weighty by the cwt.; patent machine-made horse nails, 25 to 30½; cut-nails, clasp, clout or rose nails, 1 inch and upwards, 10 to 11½ per cwt.; cut lath nails, 1 inch and upwards, 13 to 14½; cut flooring brads, 2½ inch and upwards, 10½ to 11½; fine cut tacks, 1 inch, 34 to 38½ per cwt.; 1 inch 30½ to 31½; 1 inch, 20½ to 28½ per cwt.; fine cut joiners' brads, or strong, 12 inch, 15 to 17½; 2 inch, 14 to 16½; 2½ inch, 14 to 15½; 3 inch, 13 to 14½ per cwt.; cut shoe bills, strong, or 15 W.G., 12½ to 14½ per cwt.; middle, or 14 W.G., 15 to 16½; fine, or 15 W.G., 14½ to 16½; fine cut tacks, per packet, 75 to 80½; fine cut brads, per packet, 62½ to 65½; wrought nails, long count, 15 to 20½; wrought nails, May, 1866, list, 15 to 17½; wrought Broomgrove nails, March, 1878, list, 15 to 17½; best countersunk clout nails, 1 inch, 31½ to 35½; 2 inch, 24 to 25½; 2½ inch, 20 to 21½; best countersunk and half-countersunk horse nails, fine best; Swedish charcoal iron, 15½ to 16½ list price; wrought rose or duck-head spikes, 4 inch, 13½ to 14½; 5 inch, 13½ to 14½; 6 inch, 11 to 14½; fine, 6 to 1 per cwt. extra; galvanised, 7 to 8½ per cwt. extra; wrought rose nails for India, 1 inch, 10½ to 16½; 2 inch, 10½ to 13½; 3 inch, 18 to 19½; 3 inch, 23 lb., 17 to 17½; malleable nails, coffin nails, black, 35 to 40½; white lacquered and gilt, 25 to 30½; sacking; moulders' nails and chaplets, 13 inch to 3 inch, 27 to 28½; bright nuggets, 27½ to 28½; tile pegs, 14 to 15½ per cwt.; bright nails, 4 to 5 extra; tinned nails, 12 to 13½ extra; galvanised nails, 10 to 12½ extra; nuts, square forged, untapped, 1 inch, 10 to 11½ per gross; 1 inch, 25 to 26½ per cwt.; 1 inch, 23 to 24½ per cwt.; square forged nuts, tapped, 1 inch, 12 to 14½ per gross; 1 inch, 30 to 32½; 1 inch, 27 to 29½; forged hexagon, untapped, 1 inch, 10 to 11½; 1 inch, 32 to 34½; 1 inch, 27 to 29½; forged hexagon, tapped, 1 inch, 29 to 34½; 1 inch, 30 to 32½; 1 inch, 17 to 13½; machine-made nuts, square untapped, 1 inch, 20 to 22½; 1 inch, 18 to 20½; 1 inch, 18 to 20½; square tapped, 1 inch, 25 to 26½; 1 inch, 21 to 25½; 1 inch, 21 to 26½; machine-made hexagon nuts, untapped, 1 inch, 21 to 30½; 1 inch, 22 to 24½; 1 inch, 22 to 24½; hexagon tapped, 1 inch, 35 to 36½; 1 inch, 30 to 32½; 1 inch, 28 to 30½.

Oddwork, tinned and black, 15 to 20½ list; Paris pointers, best English, 12½ to 13½; foreign, 10 to 11½; planes, 25 to 30½; iron axle pulleys, 12 inch, 12½ to 18½; brass face axle pulleys, 28 to 40½ per gross; B. F. and wheel, 48 to 60½ per gross; brass escutcheon pins, 1 inch to 16 W.G., 1 to 1½ per lb.; bright gimps, 1 to 19 W.G., 10 to 18 per lb.; black, 7 to 19; brass, 1½ to 1½ per lb.; Japanned cut gimps, 1 inch, 7 to 8 per lb.; tinned, 8 to 9 per lb.; cut clog or coffin pins, Japanned, 1 inch, 5 to 6½; tinned, 7 to 8½; brass pin pointers, 1½ to 1½; plate locks, fine 45 to 52½; strong, 35 to 40½; Lancashire plate locks, 32 to 35½; pewter measures, 20 to 25½.

Riddles, 35 to 40½; Rivets, iron boot rivets, 13 to 14 per lb.; patent machine-made Rivets, 30 to 35½; wrought timmer's Rivets, 50 to 55½; round or panhead boiler Rivets, 1 inch, 21 to 22½; 1 inch, 15½ to 17½; 1 inch, 14½ to 15½; 1 inch, 13 to 14½. Delivered in London or Liverpool; machine-made wire Rivets, 1 inch, 13½ to 14½ per cwt. Rakes, light garden Rakes, 50 to 60½; light solid end Rakes, 47½ to 50½; bolstered teeth garden Rakes, 50½; solid end bolstered teeth garden Rakes, 40 to 45½.

Spades and Shovels, common, 15 to 57½; second, 15 to 40½; best 10 to 35½; best strong country Shovels, 25 to 30½; best hammered Spades and Shovels, 5 to 10½; Ship Borapors, black steel blades, 45 to 50½; bright, 42½ to 47½; cast-steel black, 42½ to 47½; bright, 37½ to 42½; best cast-steel black, 35 to 40½; bright, 30 to 35½; iron Wood Screws, 75½; brass wood screws, 65 to 67½; copper, 45 to 50½; Stove Screws, 62½ to 67½; dowel Screws, 52½ to 57½; brass headlock Screws, 40 to 47½; gilt, silvered and plated head Screws, 40 to 45½; Jute Bash cord, 52½ to 57½; flax Bash-cord, 25 to 30½; best flax, 5 to 10½; super flax, 7½ to 12½; extra super flax Bash-cord, 5 to 10½; patent steel ribbon Bash-line, 25 to 35½; copper Bash-chain, 52½ to 57½; zinc Bash-chain, 47½ to 52½; iron prepared, 40 to 45½; copper Bash-cord, 15 to 20½. Bad irons, common, 8 to 10 per cwt.; best Japanned, 12½ to 14½; best best Japanned, 16 to 18½ per cwt.; Shoe heels, York No. 1, 1½ to 1½; No. 2, 4 to 4½; No. 3, 8 to 8½ per gross net; Danes hoe turned, 5½ to 6½; bright-edge imperial or solid Scotch, 6½ to 10½; bright York 6½ B, 8 to 8½; bright solid, 6½ to 9½; toe plates, 9½ to 10½ per gross. Stair rods, turned ends, 75 to 80½; solid fancy ends, 60 to 65½; cast tube, 30 to 35½; patent solid ornamental, 35 to 40½. Sofa Springs, coppered, 8 by 6 inches, 25 to 27½ per gross; 9 by 7 in., 21½ to 23½; 7 by 7 inches, 17½ to 19½ per gross; galvanised Waterloo Scoops and hods, 17½ per doz.; Japanned Waterloo scoops and hods, 16 inch, 15 to 16½; Japanned scoops and hods, light, 16 inch, 15 to 16½ per doz.; Shutter bars, common spring, broad and double, 75 to 77½; Scotch iron drop, 77½ to 80½; brass drop, 70 to 72½; brass drop and catch, 67½ to 70½; registered brass spring box shutter bars, 52½ to 67½; double-handed brass spring box, 57½ to 65½; Saddlers' tools, 5 to 10½; Stocks and Dies for nails' use, 35 to 40½; ditto for engineers, 10 to 20½; Steel Toys, 10 to 30½.

Traps, bow spring, sham Dorset and real Dorset rabbit traps, 45 to 65½ list prices; common traps, 4 inch, 5½ to 8½ per doz.; iron traps, 2½ inch, 4 to 8½ per doz.; bird traps, 3 to 4 per doz.; wolf and other double flat spring, common bridge, 17; axle bridge, 14 per lb., 40 to 45½; hawk or pole traps, 54 to 50½; wrought mouse traps, Japanned, 2½ to 3½; galvanised, 3 to 4½. Tin plates, 1 C, 25 to 26½. Tinmen's machines and tools, 5½; Brass Bell Tube, 1 inch and upwards, 1 to 1½ per lb.; copper bell Tube, 1½ to 1½ per lb.; zinc bell Tube, 45 to 50½ list; Patent cased Tube, 45 to 50½; cut lengths, 40 to 45½; burnished and lacquered brass tube, 30 to 35½; polished and lacquered twisted brass tube, 30 to 35½; patent taper iron tube, 30 to 35½; patent cased taper iron tube, 30 to 35½; parallel iron braced tube, 30 to 35½; twisted iron parallel tube, 30 to 35½; patent cased twisted iron parallel tube, 30 to 35½; iron Gas Tubes, 60 to 62½; fittings, 60 to 65½; iron Water Tubes, 50 to 52½; fittings, 52½ to 55½; iron Steam Tubes, 45 to 47½; fittings, 47½ to 52½; galvanised iron Gas Tubes, 45 to 47½; fittings, 47½ to 50½; lap-welded Boiler Tubes, 47½ to 50½, delivered in London, Liverpool or Glasgow; table catches, 30 to 40½; ditto, improved brass follow, 20 to 25½; wrought Japanned Tea kettles, 50 to 60½; galvanised Turnip skips, 21 inches, light, 25 to 26½ per doz.

Vices, common black, 30 to 32½ per cwt.; common bright, 38 to 40½ per cwt.; black staples vices, solid box black, 33 to 40½; bright, 39 to 45½; solid box, black staple, with spherical washer, 40 to 45½; bright 45 to 50½.

Washers, light iron, 72½ to 75½; heavy washers, 13 to 16 lb., W.G., 9 to 10 per cwt.; 1 inch thick, 8½ per cwt. extra; 5-16 inch, 3 to 4½; 1 inch 4½; shank bright washers, 3 to 5 per cwt. extra; Wall knobs, 23 to 25 per cwt.; Washing tubs, galvanised oval, 22 inch, 10 to 30½; 24 inch, 14 to 15½; round, 22 inch, 38 to 40½; Water bowls, hammered, list price, 52½ to 57½; light seamed 9 inch, 48 per dozen; light wired 9 inch, stamped, 11 to 12½; Wove wire list price, iron, copper and brass, 45 to 50½; iron Wire, bright, 0 to 6, 10½ to 11½ per cwt.; galvanised, 14½ to 15½; fine galvanised iron wire, No. 23, 4½ to 5½ per stone 14 lb.; annealed tinned wire No. 18, 38 to 4½ per stone 14 lb.; cut tinned bottling wire, No. 22, 4½ to 5½ per stone 14 lb.; weaving and binding wire, No. 23, 3½ to 3½ per stone 14 lb.; bright or annealed fine wire, 23, 5½ to 3½ per stone 14 lb. net; cast steel wire, 0 to 6, 9½ per lb.; 20 to 22½; metallic or horticultural wire, 6 to 14, 5½ to 6½ per lb.; No. 15, 5½ to 6½; extra; prepared bright fencing Wire, 0 to 6, 10½ to 11½ per cwt.; annealed drawn galvanised, 0 to 6, 14 to 14½. Bright or annealed steel, 0 to 6, round or oval 12 to 13½ per cwt.; blackrolled, 1 to 4, 8 to 8½ per cwt.; galvanised rolled, 1 to 4, 11½ to 12½ per cwt.

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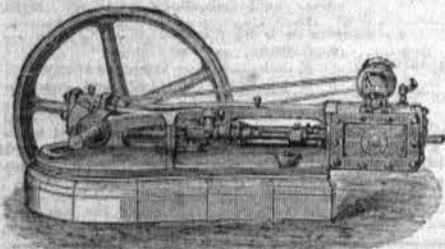
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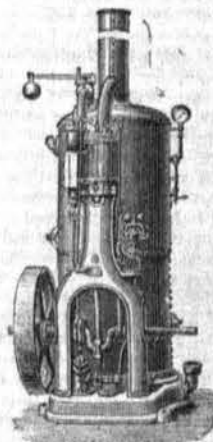
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6 x 2 = 8 "	6 x 5 = 29 "	8 x 6 = 34 "	10 x 6 = 54 "	18 x 6½ = 82 "	2½ x 2½	6 x 2½	6 x 2½
				10½ x 7 = 100 "	2 x 2	4½ x 2½	4½ x 2½
					1½ x 1½	2½ x 1	2½ x 1
					1 x 1		

JOISTS.—Lengths, from 6 to 30 ft. PLATES.—Width, 6" to 18"; Length, 12 to 30 ft.; Thickness, ½" to 1"

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5 x 3	9 1/2 x 3 1/2	5 x 3	9 1/2 x 3 1/2
3 x 3	8 x 3 1/2	3 x 3	8 x 3 1/2
2 1/2 x 2 1/2	6 x 2 1/2	2 1/2 x 2 1/2	6 x 2 1/2
2 x 2	4 1/2 x 2 1/2	2 x 2	4 1/2 x 2 1/2
1 1/2 x 1 1/2	2 1/2 x 1	1 1/2 x 1 1/2	2 1/2 x 1
1 x 1		1 x 1	



GOLD MEDAL, PARIS, 1878.

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THE NORTHERN IRON TRADE IN 1879. (From Mr. C. E. MULLER'S Annual Iron Trade Report.)

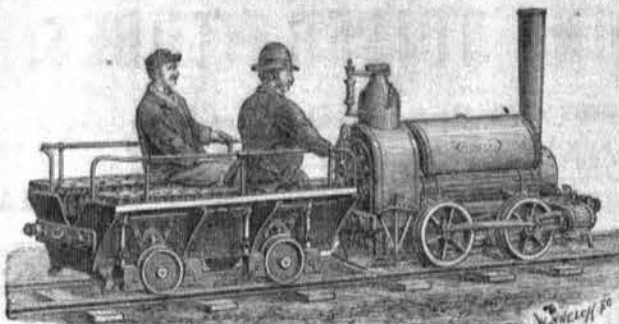
THE story of the decline and revival of the Iron trade is soon told; the reaction which set in, in the winter of 1873, was the natural consequence of feverish overtrading. A few short-lived rallies left behind them a deeper gloom of hopelessness, then came the bitter struggle for the survival of the strongest, fierce competition for orders made the buyer feel that he was master of the situation, consumers' stocks were allowed to run low in spite of temptingly low prices, an exceptionally bad harvest last year, and the unsettled political situation deepened the gloomy prospect, as the year advanced into the second half, when somewhat unexpectedly help came, and from a quarter whence least expected. The United States of America had barricaded themselves so well with a high tariff, and their Iron industry had been so largely expanded, that this once so important customer was considered not only as entirely lost to us, but even threatened us with competition in the very heart of our own iron industry. A succession of deficient crops in Europe, and great abundance in America, turned the balance of trade largely in favour of the latter country; the increasing traffic necessitated extension of railways, the American iron and steel works received a steady stream of orders; they booked all, raised prices, booked ahead and heavily, in their anxiety to keep the trade in the country, but still the demand continued, and when order-books were full and prices well run up, the overflow set in; large orders for steel and all classes of iron came pouring into all the British iron centres. This changed promptly the state of our trade; the steadily rising prices made consumers and merchants anxious to supply themselves and replenish stocks, and finally speculators began to look favourably again on iron. They bought largely of Scotch and Cleveland pig-iron, of which they are now holding large quantities. We have, however, got rid of some heavy and inconvenient stocks, and entered on a course of remunerative trading. A repetition of the inflated trade and high prices of 1871-73 is neither probable nor desirable; the situation is not analogous. America was then, as it is at this moment, a large buyer; but, on the other hand, the purchasing power of the United Kingdom is much less at the present time. Germany has no milliards to spend. Russia is unsettled and exhausted through an expensive and fruitless war. France has had a very deficient wheat harvest, a complete failure of the beetroot (sugar) crop, and a bad vintage. Europe is poor at present.

The brisk demand and rapid rise of prices has the effect of bringing into play the large reserve power of production—and it is interesting to note to what extent this has already taken place.—The increase in the number of working blast-furnaces since the 1st July, amounts to 12 in Scotland, 12 in Cleveland, 19 in Cumberland, 5 in Lincolnshire, 4 in Northamptonshire, 7 in Derbyshire, 16 in South Staffordshire, 17 in South Wales and Monmouthshire and 7 in South Lancashire. The number of additional furnaces preparing to blow in this spring amounts to about 53 in the above-named districts. This would still leave a large reserve of furnaces which could be prepared for work in the course of the year. In Luxemburg and German and French Lorraine the increase has been four furnaces; in Westphalia and the lower Rhineland the addition will shortly amount to 24 furnaces. A great dearth of coke exists at present in Westphalia, and a great number of coke ovens are being built. Coals are plentiful. No statistics for the year are to hand as yet from the United States. At the end of November one-third more furnaces were at work than at the beginning of the year, increasing the yearly output to 3,300,000 tons and if sufficient material can be got, the make, it is estimated, will be increased to 4,000,000 tons by next summer. The chief stocks of pig-iron are held in Scotland and Cleveland; the former with 745,000 tons shows an increase of 66,000 tons, the latter with 282,886 tons shows a decrease of 54,451 tons, at the end of the year. As compared with 1878, Scotland has made 30,000 tons more in 1879, and Cleveland 241,734 tons less.

The malleable iron trade has been in a wretched state during nine months of last year. Scarcity of orders, unprecedentedly low prices, and consequent losses, are the dark lines which trace the situation. Many works were closed, and not a few passed under the protection of the Bankruptcy Court. In September only the tide began to turn. The sudden demand from America, coupled with responsive awaking of the home trade, which had low stocks to replenish, and large orders for ships, in anticipation of a heavy grain-carrying trade, caused great activity and quickly advancing prices. The general demand for Staffordshire and Welsh iron has been chiefly American; but the buying agents for Colonial, South American, East and West Indian markets, have also been placing large orders; and home iron merchants, who had been letting down their stocks, have been giving out orders to bring them up to their normal condition, many buying large extra quantities on account of expected advances. Foundries and engineers throughout the country are very quiet and short of work, but they are hopeful of extra work with so much more machinery working.

Steel continues more and more to take the place of iron; its universal use has been limited, so far, by the comparatively narrow area of its production. A greater number of steel ships were built last year than in any previous year, and more would have been built of this material but for the limited supply of steel plates. Arrangements are now being made to increase this supply considerably. The great rise in price of hematite pig-iron—say 100 per cent. during four months, based on the pressing demand in every country for steel rails, would considerably hamper the further development of the steel industry, if the new process by which the phosphorus can effectually be eliminated from other classes of crude iron, did not throw open a large supply of raw material at a lower cost. The Thomas-Gilchrist process has now passed beyond the experimental stage. At several large works in Westphalia and in Belgium steel is being made by this process, regularly and in considerable quantities, and a number of steel works on the Continent are engaged in making alterations in this direction. In Sheffield, one of the large steelworks is producing steel from Lincolnshire pig-iron in two converters, by this process. Messrs. Bolckow, Vaughan and Co., who at their Eson Steelworks

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practically tested the process, and without whose intelligent and spirited action, it might still have remained within the blue covers of the patent specifications—are engaged in erecting a large and complete plant, specially designed to produce steel by the new process, and before the new year will be three months older, we shall have two 10-ton Bessemer converters at work, making steel of the finest quality from Cleveland pig-iron. The production of steel-rails and bars in 1879, in Cleveland, amounted to 90,000 tons. The prices ranged from £4 7s. 6d. to £8 10s. 0d. for steel rails; from £7 10s. 0d. to £8 15s. 0d. for angle bars; from £8 15s. 0d. to £12 10s. 0d. for steel plates. The exportation of rails from Great Britain, for the last three years:—

	1877. Tons.	1878. Tons.	1879. Tons.
Iron rails.....	177,852	107,268	55,604
Steel rails	235,453	251,491	328,425

Middlesborough, Jan. 10th, 1880.

MELBOURNE INTERNATIONAL EXHIBITION.—The Commissioners for this Exhibition, which will open at Melbourne upon the 1st of October, have delegated all matters connected with the allotment of space to countries of Europe and America to their London committee, of which the Right Hon. Hugh C. E. Childers, M.P., is, and, during his absence, Sir Henry Barkly, G.C.M.G., K.C.B., was chairman. The Commissioners have sent Mr. G. Collins Levey, C.M.G., Secretary to the Commission, to Europe to assist the London committee in their duties of allotting space, and of securing the co-operation of foreign governments. The Commissioners have within the last few days decided that the Exhibition building shall contain 650,000 square feet of space, of which 400,000 have been reserved for Europe and America. The French Government, which will be officially represented, have appointed a commission in Paris, have voted £10,000 towards its expenses, and will forward the exhibits in a ship of war. Germany has adopted a similar course, except that its vote is £12,000, and that it is not at present proposed to send any vessel of war. The Italian Government will send a ship of war and will make certain concessions to Italian exhibitors, principally in the direction of reducing the cost of transport by railway. The United States have appointed a commission, and the President has recommended Congress to make an appropriation to defray the necessary expenses, and the Secretary for the Navy will dispatch a ship of war. The representation of Holland has been entrusted to a commission, which has had £1200 of public money placed at its disposal. Belgium has appointed a commission, and will probably vote £4000 towards its expenses. Austria and Switzerland have placed the representation of their commercial interests in the hands of gentlemen to whom they have given official recognition. The applications for space are as follows:—France, 75,000 square feet; Germany, 65,000; Italy, 42,000; United States, 30,000; Belgium, 25,000; Austria, 22,000; Holland, 10,000; Switzerland, 3000; other countries, 10,000. The demands for space from British exhibitors amount to 180,000 square feet. The British Government has appointed a Royal Commission, of which His Royal Highness the Prince of Wales is executive president, and by its support has greatly aided the operation of the Melbourne Commission. All information on the subject of the Exhibition may be obtained on application to the secretary, at the offices of the Agent-General for Victoria, 8, Victoria Chambers, Victoria Street, S.W. The Melbourne Social Science Congress, proposed to be held contemporaneously with the Exhibition, has been successfully formed. Mr. R. L. J. Ellery, the Government Astronomer, has been elected President; the Hon. J. J. Casey, C.M.G., and Professor Hearn, vice-presidents. Sir William Stawell, Chief Justice, Sir Redmond Barry, K.C.M.G., Sir Archibald Michie, K.C.M.G., Sir Samuel Wilson, and other leading colonists form the Council of the Congress.

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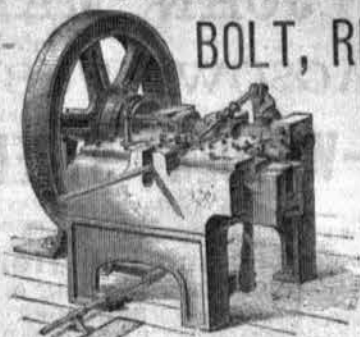
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Advertisements for this Paper must be sent in not later than 6 p.m. on Thursday.

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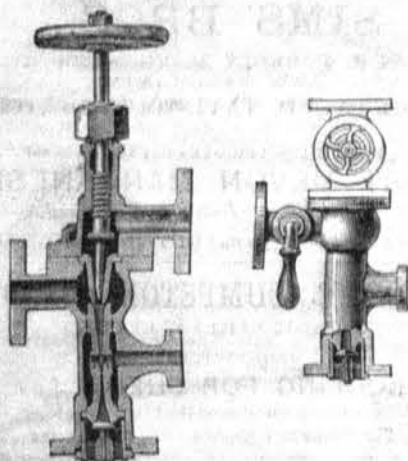
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that works it, or
will raise pure
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well whilst it is
worked by a
stream of impure
water.

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"In answer to your enquiry, I am glad to say the
Hydraulic Ram you sent me in November, 1875, is working
exceedingly well, and gives no trouble. It will work when
quite immersed, as it has been several times during the
floods this winter, forcing up water through a delivery pipe
900 yards long at the rate of 80,000 gallons per day,
although you only promised 50,000."

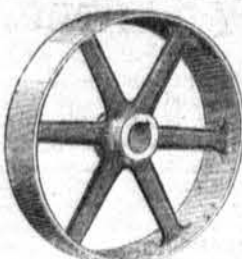
FROM W. SCARTH, ESQ., AGENT TO HIS GRACE THE
DUKE OF CLEVELAND.
"Raby Castle, Darlington, July 16th, 1878.
"The Hydraulic Ram you supplied to His Grace the
Duke of Cleveland in 1875 is a complete success. It worked
for more than two years without once stopping, and throws
more water than promised."

FROM JOHN TAYLOR, ESQ., THE ROCKS, BATH,
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"The Self-Acting Hydraulic Ram you fixed here in March
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NEW YORK: 58, HUDSON STREET.
SAN FRANCISCO: 22 & 24, FREEMONT STREET.

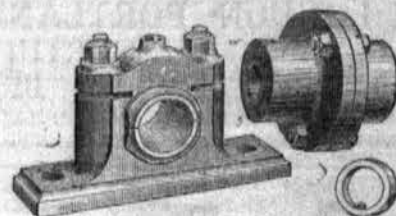


CAST IRON PULLEYS.
As shown below or in halves,
made any diameter or width.

TAYLOR & CHALLEN,
DERWENT FOUNDRY,
BIRMINGHAM.

For each extra 1 inch in width
add 10 per cent. to following prices:

LEADING SIZES AND PRICES, TURNED AND BORED.															
Diameter in	6	8	10	12	15	18	21	24	28	36	42	48	54	60	
Width, ditto	2	2	3	3	3	3	3	4	4	5	5	5	6	6	
Price, Split,	8	9	10	11	14	17	20	25	30	38	46	55	66	80	110
Do. Plain do.	5	6	7	8	10	13	16	20	25	30	38	45	55	80	100



Plummer Blocks, with brasses and bolts, planed, bored, &c. Couplings, bored, faced, keywayed, and with turned bolts. Loose Collars of wrought iron bored, turned, and steel screws.

STOCK, SIZES, and PRICES, delivered here.
Bore, in inches to standard
PLUMMER BLOCK, each 11 13 15 18 21 24 28 36 42 48 54 60
COUPLINGS, pair 6 7 8 10 12 15 18 22 28 36 42 48 54 60
LOOSE COLLARS, each 7 8 10 12 15 18 22 28 36 42 48 54 60
SHAFTING, sup. qual. foot 1 1/2 1 3/4 2 2 1/4 2 3/4 3 3/4 4 4 1/2 5 5 1/2 6 6 1/2 7 7 1/2 8 8 1/2 9 9 1/2 10 10 1/2 11 11 1/2 12 12 1/2 13 13 1/2 14 14 1/2 15 15 1/2 16 16 1/2 17 17 1/2 18 18 1/2 19 19 1/2 20 20 1/2 21 21 1/2 22 22 1/2 23 23 1/2 24 24 1/2 25 25 1/2 26 26 1/2 27 27 1/2 28 28 1/2 29 29 1/2 30 30 1/2 31 31 1/2 32 32 1/2 33 33 1/2 34 34 1/2 35 35 1/2 36 36 1/2 37 37 1/2 38 38 1/2 39 39 1/2 40 40 1/2 41 41 1/2 42 42 1/2 43 43 1/2 44 44 1/2 45 45 1/2 46 46 1/2 47 47 1/2 48 48 1/2 49 49 1/2 50 50 1/2 51 51 1/2 52 52 1/2 53 53 1/2 54 54 1/2 55 55 1/2 56 56 1/2 57 57 1/2 58 58 1/2 59 59 1/2 60 60 1/2 61 61 1/2 62 62 1/2 63 63 1/2 64 64 1/2 65 65 1/2 66 66 1/2 67 67 1/2 68 68 1/2 69 69 1/2 70 70 1/2 71 71 1/2 72 72 1/2 73 73 1/2 74 74 1/2 75 75 1/2 76 76 1/2 77 77 1/2 78 78 1/2 79 79 1/2 80 80 1/2 81 81 1/2 82 82 1/2 83 83 1/2 84 84 1/2 85 85 1/2 86 86 1/2 87 87 1/2 88 88 1/2 89 89 1/2 90 90 1/2 91 91 1/2 92 92 1/2 93 93 1/2 94 94 1/2 95 95 1/2 96 96 1/2 97 97 1/2 98 98 1/2 99 99 1/2 100 100 1/2 101 101 1/2 102 102 1/2 103 103 1/2 104 104 1/2 105 105 1/2 106 106 1/2 107 107 1/2 108 108 1/2 109 109 1/2 110 110 1/2 111 111 1/2 112 112 1/2 113 113 1/2 114 114 1/2 115 115 1/2 116 116 1/2 117 117 1/2 118 118 1/2 119 119 1/2 120 120 1/2 121 121 1/2 122 122 1/2 123 123 1/2 124 124 1/2 125 125 1/2 126 126 1/2 127 127 1/2 128 128 1/2 129 129 1/2 130 130 1/2 131 131 1/2 132 132 1/2 133 133 1/2 134 134 1/2 135 135 1/2 136 136 1/2 137 137 1/2 138 138 1/2 139 139 1/2 140 140 1/2 141 141 1/2 142 142 1/2 143 143 1/2 144 144 1/2 145 145 1/2 146 146 1/2 147 147 1/2 148 148 1/2 149 149 1/2 150 150 1/2 151 151 1/2 152 152 1/2 153 153 1/2 154 154 1/2 155 155 1/2 156 156 1/2 157 157 1/2 158 158 1/2 159 159 1/2 160 160 1/2 161 161 1/2 162 162 1/2 163 163 1/2 164 164 1/2 165 165 1/2 166 166 1/2 167 167 1/2 168 168 1/2 169 169 1/2 170 170 1/2 171 171 1/2 172 172 1/2 173 173 1/2 174 174 1/2 175 175 1/2 176 176 1/2 177 177 1/2 178 178 1/2 179 179 1/2 180 180 1/2 181 181 1/2 182 182 1/2 183 183 1/2 184 184 1/2 185 185 1/2 186 186 1/2 187 187 1/2 188 188 1/2 189 189 1/2 190 190 1/2 191 191 1/2 192 192 1/2 193 193 1/2 194 194 1/2 195 195 1/2 196 196 1/2 197 197 1/2 198 198 1/2 199 199 1/2 200 200 1/2 201 201 1/2 202 202 1/2 203 203 1/2 204 204 1/2 205 205 1/2 206 206 1/2 207 207 1/2 208 208 1/2 209 209 1/2 210 210 1/2 211 211 1/2 212 212 1/2 213 213 1/2 214 214 1/2 215 215 1/2 216 216 1/2 217 217 1/2 218 218 1/2 219 219 1/2 220 220 1/2 221 221 1/2 222 222 1/2 223 223 1/2 224 224 1/2 225 225 1/2 226 226 1/2 227 227 1/2 228 228 1/2 229 229 1/2 230 230 1/2 231 231 1/2 232 232 1/2 233 233 1/2 234 234 1/2 235 235 1/2 236 236 1/2 237 237 1/2 238 238 1/2 239 239 1/2 240 240 1/2 241 241 1/2 242 242 1/2 243 243 1/2 244 244 1/2 245 245 1/2 246 246 1/2 247 247 1/2 248 248 1/2 249 249 1/2 250 250 1/2 251 251 1/2 252 252 1/2 253 253 1/2 254 254 1/2 255 255 1/2 256 256 1/2 257 257 1/2 258 258 1/2 259 259 1/2 260 260 1/2 261 261 1/2 262 262 1/2 263 263 1/2 264 264 1/2 265 265 1/2 266 266 1/2 267 267 1/2 268 268 1/2 269 269 1/2 270 270 1/2 271 271 1/2 272 272 1/2 273 273 1/2 274 274 1/2 275 275 1/2 276 276 1/2 277 277 1/2 278 278 1/2 279 279 1/2 280 280 1/2 281 281 1/2 282 282 1/2 283 283 1/2 284 284 1/2 285 285 1/2 286 286 1/2 287 287 1/2 288 288 1/2 289 289 1/2 290 290 1/2 291 291 1/2 292 292 1/2 293 293 1/2 294 294 1/2 295 295 1/2 296 296 1/2 297 297 1/2 298 298 1/2 299 299 1/2 300 300 1/2 301 301 1/2 302 302 1/2 303 303 1/2 304 304 1/2 305 305 1/2 306 306 1/2 307 307 1/2 308 308 1/2 309 309 1/2 310 310 1/2 311 311 1/2 312 312 1/2 313 313 1/2 314 314 1/2 315 315 1/2 316 316 1/2 317 317 1/2 318 318 1/2 319 319 1/2 320 320 1/2 321 321 1/2 322 322 1/2 323 323 1/2 324 324 1/2 325 325 1/2 326 326 1/2 327 327 1/2 328 328 1/2 329 329 1/2 330 330 1/2 331 331 1/2 332 332 1/2 333 333 1/2 334 334 1/2 335 335 1/2 336 336 1/2 337 337 1/2 338 338 1/2 339 339 1/2 340 340 1/2 341 341 1/2 342 342 1/2 343 343 1/2 344 344 1/2 345 345 1/2 346 346 1/2 347 347 1/2 348 348 1/2 349 349 1/2 350 350 1/2 351 351 1/2 352 352 1/2 353 353 1/2 354 354 1/2 355 355 1/2 356 356 1/2 357 357 1/2 358 358 1/2 359 359 1/2 360 360 1/2 361 361 1/2 362 362 1/2 363 363 1/2 364 364 1/2 365 365 1/2 366 366 1/2 367 367 1/2 368 368 1/2 369 369 1/2 370 370 1/2 371 371 1/2 372 372 1/2 373 373 1/2 374 374 1/2 375 375 1/2 376 376 1/2 377 377 1/2 378 378 1/2 379 379 1/2 380 380 1/2 381 381 1/2 382 382 1/2 383 383 1/2 384 384 1/2 385 385 1/2 386 386 1/2 387 387 1/2 388 388 1/2 389 389 1/2 390 390 1/2 391 391 1/2 392 392 1/2 393 393 1/2 394 394 1/2 395 395 1/2 396 396 1/2 397 397 1/2 398 398 1/2 399 399 1/2 400 400 1/2 401 401 1/2 402 402 1/2 403 403 1/2 404 404 1/2 405 405 1/2 406 406 1/2 407 407 1/2 408 408 1/2 409 409 1/2 410 410 1/2 411 411 1/2 412 412 1/2 413 413 1/2 414 414 1/2 415 415 1/2 416 416 1/2 417 417 1/2 418 418 1/2 419 419 1/2 420 420 1/2 421 421 1/2 422 422 1/2 423 423 1/2 424 424 1/2 425 425 1/2 426 426 1/2 427 427 1/2 428 428 1/2 429 429 1/2 430 430 1/2 431 431 1/2 432 432 1/2 433 433 1/2 434 434 1/2 435 435 1/2 436 436 1/2 437 437 1/2 438 438 1/2 439 439 1/2 440 440 1/2 441 441 1/2 442 442 1/2 443 443 1/2 444 444 1/2 445 445 1/2 446 446 1/2 447 447 1/2 448 448 1/2 449 449 1/2 450 450 1/2 451 451 1/2 452 452 1/2 453 453 1/2 454 454 1/2 455 455 1/2 456 456 1/2 457 457 1/2 458 458 1/2 459 459 1/2 460 460 1/2 461 461 1/2 462 462 1/2 463 463 1/2 464 464 1/2 465 465 1/2 466 466 1/2 467 467 1/2 468 468 1/2 469 469 1/2 470 470 1/2 471 471 1/2 472 472 1/2 473 473 1/2 474 474 1/2 475 475 1/2 476 476 1/2 477 477 1/2 478 478 1/2 479 479 1/2 480 480 1/2 481 481 1/2 482 482 1/2 483 483 1/2 484 484 1/2 485 485 1/2 486 486 1/2 487 487 1/2 488 488 1/2 489 489 1/2 490 490 1/2 491 491 1/2 492 492 1/2 493 493 1/2 494 494 1/2 495 495 1/2 496 496 1/2 497 497 1/2 498 498 1/2 499 499 1/2 500 500 1/2 501 501 1/2 502 502 1/2 503 503 1/2 504 504 1/2 505 505 1/2 506 506 1/2 507 507 1/2 508 508 1/2 509 509 1/2 510 510 1/2 511 511 1/2 512 512 1/2 513 513 1/2 514 514 1/2 515 515 1/2 516 516 1/2 517 517 1/2 518 518 1/2 519 519 1/2 520 520 1/2 521 521 1/2 522 522 1/2 523 523 1/2 524 524 1/2 525 525 1/2 526 526 1/2 527 527 1/2 528 528 1/2 529 529 1/2 530 530 1/2 531 531 1/2 532 532 1/2 533 533 1/2 534 534 1/2 535 535 1/2 536 536 1/2 537 537 1/2 538 538 1/2 539 539 1/2 540 540 1/2 541 541 1/2 542 542 1/2 543 543 1/2 544 544 1/2 545 545 1/2 546 546 1/2 547 547 1/2 548 548 1/2 549 549 1/2 550 550 1/2 551 551 1/2 552 552 1/2 553 553 1/2 554 554 1/2 555 555 1/2 556 556 1/2 557 557 1/2 558 558 1/2 559 559 1/2 560 560 1/2 561 561 1/2 562 562 1/2 563 563 1/2 564 564 1/2 565 565 1/2 566 566 1/2 567 567 1/2 568 568 1/2 569 569 1/2 570 570 1/2 571 571 1/2 572 572 1/2 573 573 1/2 574 574 1/2 575 575 1/2 576 576 1/2 577 577 1/2 578 578 1/2 579 579 1/2 580 580 1/2 581 581 1/2 582 582 1/2 583 583 1/2 584 584 1/2 585 585 1/2 586 586 1/2 587 587 1/2 588 588 1/2 589 589 1/2 590 590 1/2 591 591 1/2 592 592 1/2 593 593 1/2 594 594 1/2 595 595 1/2 596 596 1/2 597 597 1/2 598 598 1/2 599 599 1/2 600 600 1/2 601 601 1/2 602 602 1/2 603 603 1/2 604 604 1/2 605 605 1/2 606 606 1/2 607 607 1/2 608 608 1/2 609 609 1/2 610 610 1/2 611 611 1/2 612 612 1/2 613 613 1/2 614 614 1/2 615 615 1/2 616 616 1/2 617 617 1/2 618 618 1/2 619 619 1/2 620 620 1/2 621 621 1/2 622 622 1/2 623 623 1/2 624 624 1/2 625 625 1/2 626 626 1/2 627 627 1/2 628 628 1/2 629 629 1/2 630 630 1/2 631 631 1/2 632 632 1/2 633 633 1/2 634 634 1/2 635 635 1/2 636 636 1/2 637 637 1/2 638 638 1/2 639 639 1/2 640 640 1/2 641 641 1/2 642 642 1/2 643 643 1/2 644 644 1/2 645 645 1/2 646 646 1/2 647 647 1/2 648 648 1/2 649 649 1/2 650 650 1/2 651 651 1/2 652 652 1/2 653 653 1/2 654 654 1/2 655 655 1/2 656 656 1/2 657 657 1/2 658 658 1/2 659 659 1/2 660 660 1/2 661 661 1/2 662 662 1/2 663 663 1/2 664 664 1/2 665 665 1/2 666 666 1/2 667 667 1/2 668 668 1/2 669 669 1/2 670 670 1/2 671 671 1/2 672 672 1/2 673 673 1/2 674 674 1/2 675 675 1/2 676 676 1/2 677 677 1/2 678 678 1/2 679 679 1/2 680 680 1/2 681 681 1/2 682 682 1/2 683 683 1/2 684 684 1/2 685 685 1/2 686 686 1/2 687 687 1/2 688 688 1/2 689 689 1/2 690 690 1/2 691 691 1/2 692 692 1/2 693 693 1/2 694 694 1/2 695 695 1/2 696 696 1/2 697 697 1/2 698 698 1/2 699 699 1/2 700 700 1/2 701 701 1/2 702 702 1/2 703 703 1/2 704 704 1/2 705 705 1/2 706 706 1/2 707 707 1/2 708 708 1/2 709 709 1/2 710 710 1/2 711 711 1/2 712 712 1/2 713 713 1/2 714 714 1/2 715 715 1/2 716 716 1/2 717 717 1/2 718 718 1/2 719 719 1/2 720 720 1/2 721 721 1/2 722 722 1/2 723 723 1/2 724 724 1/2 725 725 1/2 726 726 1/2 727 727 1/2 728 728 1/2 729 729 1/2 730 730 1/2 731 731 1/2 732 732 1/2 733 733 1/2 734 734 1/2 735 735 1/2 736 736 1/2 737 737 1/2 738 738 1/2 739 739 1/2 740 740 1/2 741 741 1/2 742 742 1/2 743 743 1/2 744 744 1/2 745 745 1/2 746 746 1/2 747 747 1/2 748 748 1/2 749 749 1/2 750 750 1/2 751 751 1/2 752 752 1/2 753 753 1/2 754 754 1/2 755 755 1/2 756 756 1/2 757 757 1/2 758 758 1/2 759 759 1/2 760 760 1/2 761 761 1/2 762 762 1/2 763 763 1/2 764 764 1/2 765 765 1/2 766 766 1/2 767 767 1/2 768 768 1/2 769 769 1/2 770 770 1/2 771 771 1/2 772 772 1/2 773 773 1/2 774 774 1/2 775 775 1/2 776 776 1/2 777 777 1/2 778 778 1/2 779 779 1/2 780 780 1/2 781 781 1/2 782 782 1/2 783 783 1/2 784 784 1/2 785 785 1/2 786 786 1/2 787 787 1/2 788 788 1/2 789 789 1/2 790 790 1/2 791 791 1/2 792 792 1/2 793 793 1/2 794 794 1/2 795 795 1/2 796 796 1/2 797 797 1/2 798 798 1/2 799 799 1/2 800 800 1/2 801 801 1/2 802 802 1/2 803 803 1/2 804 804 1/2 805

THE LANDORE-SIEMENS STEEL CO., LIMITED.

DIPLOMA OF HONOUR,
VIENNA, 1873.



GOLD MEDAL,
PARIS, 1878.

Contractors to the Admiralty, British and Foreign Governments.

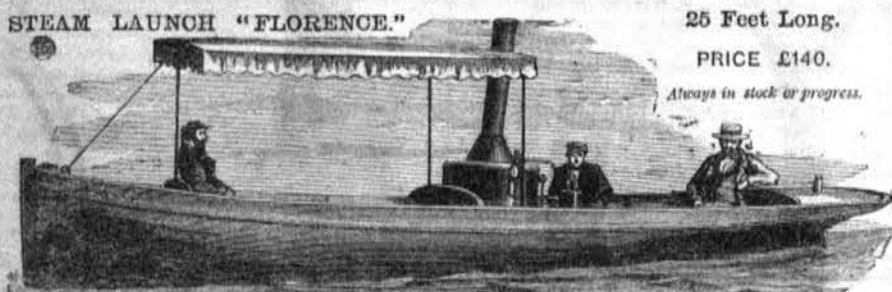
MANUFACTURERS OF

STEEL PLATES FOR SHIPS, BOILERS, AND GENERAL WORK.

SHEETS, ANGLES, TEES, BULB BEAMS of all Sections. "S. S." Brand. Special Quality for
BOILER-FURNACES, TUBE-PLATES, &c. AXLES, TYRES, FORGINGS, CASTINGS.
Weldless Angle and Flat Rings for Boilers, Weldless Dredger Bucket Mouths, Ingots, Blooms, Billets,
Bars, Wire Rods, &c.

D. CAMPBELL, (Sole Representative),
3, WESTMINSTER CHAMBERS, VICTORIA STREET, LONDON, S.W.

STEAM LAUNCH "FLORENCE."



25 Feet Long.

PRICE £140.

Always in stock or progress.

MILLER & TUPP,

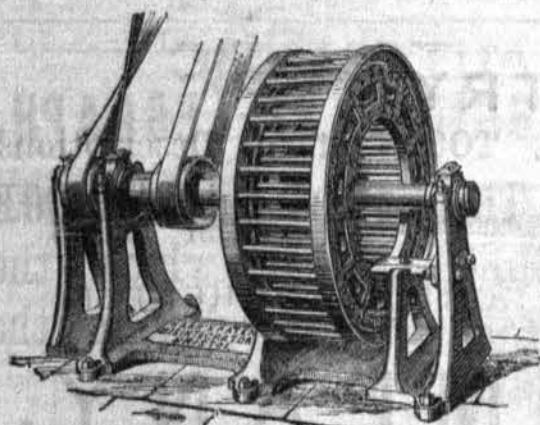
Steam Launch Builders, Creek Engine Works,
Middle Mall, Hammersmith, London.

SINGLE-HANDED STEAM LAUNCHES 20 FT. LONG FROM £80.—LAUNCH ENGINES AND BOILERS.
Illustrated descriptive Price List of Steam Launches from 20 ft. to 60 ft. long, free on application.

Awarded Bronze Medal, Paris Universal Exhibition, 1878.

REVISION OF PRICES. ABOLITION OF ANNUAL LICENSE CHARGE.

CARR'S PATENT DISINTEGRATOR.



This Machine effectually pulverises by the combined influences of percussion and of centrifugal force, Iron, Zinc, and other Ores, Asphalte, Artificial Manures, Phosphates, Fire Clay and many other substances. It is also largely in use for the pulverisation of coal for the manufacture of Coke, Patent Fuel, &c.; and is very effective for mixing Sugar.

These Machines are capable of reducing to a fine granular powder from 50 to 200 tons per day (according to size) of any unfibrous material. Machines made to order from 18 inches diameter, to suit special requirements of purchasers; these small machines being specially adapted to the requirements of Chemical Manufacturers for Mixing and other purposes.

A Descriptive Pamphlet will be sent free on application to the Managing Trustee of the Estate of the late Patentee.

PHILIP TRIGGS, 39, Broad Street, Bristol.

BEVERLEY'S Patent Self-Contained RADIAL DRILLING MACHINE.

The Cheapest Machine in the Market by 25 per cent. owing to the extreme simplicity of its construction obtained by this Patent.

PRICES AND PARTICULARS ON APPLICATION.

For further Particulars and Estimates, apply to

BEVERLEY & ATKINS,
"SPECIAL TOOL WORKS,"
STANLEY STREET, WICKER, SHEFFIELD.

MAKERS OF

Beverley's Patent Lathes, Improved Jaw Chucks, Slot Drilling Machines, Wall Drills, & every description of Machine tools.

AN INSPECTION INVITED.

No. 1 SIZE, 8 feet 6 inch RADIUS.

HUNT & TAWELL,

ATLAS WORKS,

EARLS COLNE, ESSEX,

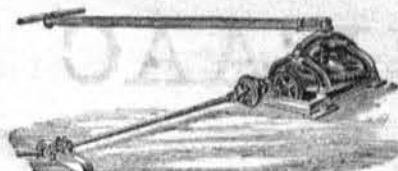
Manufacturers of

AGRICULTURAL IMPLEMENTS

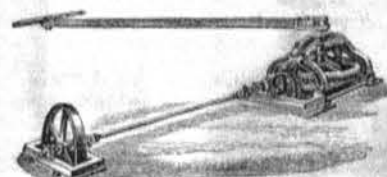
Including



Pony Gears for Churns and Elevators.



Horse Gears for Chain and Barrel Pumps.



Horse Gears for Saw Benches and Cotton Gins.



Horse Gears for Thrashing Machines Chaff Cutters, &c.,
And fitted for 1, 2, 3, or 4 horses.

Sole Manufacturers of BIDEELL'S PATENT FOOD PREPARING MACHINERY, recently manufactured by Messrs. Ransomes, of Ipswich.

Prices and terms to Shippers, with cost of packing, quoted on application.



BARNARD AND LAKE,
AGRICULTURAL IMPLEMENT MAKERS,
RAYNE FOUNDRY,
BRAINTREE, ESSEX.

PATENT THATCH MAKING MACHINE.



MACHINE AT WORK.

Capable of producing 1500 feet of Thatch per hour.



METHOD OF APPLYING THATCH.

ALSO

PATENT HORSE HOES, ROOT GRATERS,
TURNIP CUTTERS, PULPERS, &c.

PARIS EXHIBITION, 1878. GRAND PRIX, GOLD AND SILVER MEDALS AND HONOURABLE MENTION.

JOHN BROWN AND CO., LIMITED,

ATLAS WORKS, SHEFFIELD.



Armour-Plates, Bolts, &c., Iron and Steel Plates, Beams, Angles, &c.,

As supplied to the Admiralty, and to stand Lloyd's and Board of Trade Tests.

TYRES, AXLES, RAILS, STEEL FORGINGS AND CASTINGS.

PATENT DEAD WEIGHT SAFETY VALVES. PAPER-CENTRE RAILWAY WHEELS.

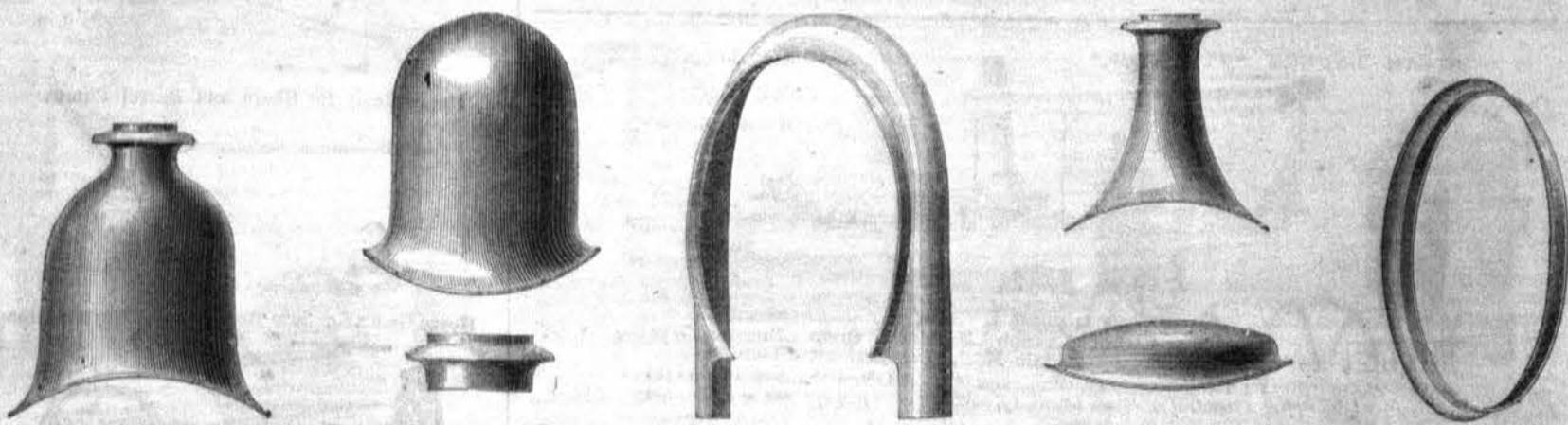
Railway Springs, Buffers, Points, Crossings, Switches, Wheels and Axles, Files, Tools and Spiegeleisen.

Bessemer, Siemens', Crucible, Special Chrome and all kinds of Special Steel. Gannister and Gannister Bricks.

CHIEF OFFICES—SHEFFIELD.

LONDON OFFICES—12, FENCHURCH STREET, E.C.

ISAAC STOREY AND SONS.



LOCOMOTIVE ENGINE MOUNTINGS

IN BRASS, COPPER, OR CHARCOAL IRON.

PIPE-WORK FOR MARINE AND LOCOMOTIVE ENGINES.

Specialities of any kind in Coppersmiths' Work made to Orderings.

Estimates Furnished on Application.

KNOTT MILL BRASS AND COPPER WORKS, LITTLE PETER STREET, AND AT CATHEDRAL YARD, MANCHESTER

London and Continental Agent:—T. W. BAINES, Billiter House, Billiter Street, London, E.C.

SMITH & COVENTRY,

Makers of PATENT SPECIAL and GENERAL MACHINE TOOLS of all Descriptions.

MANUFACTURERS
OF



STRAIGHT LIP
TWIST DRILLS.

OF THE HIGHEST QUALITY, WITH GRINDING LINE. A LARGE STOCK ALWAYS READY FOR DELIVERY.

GRESLEY IRON WORKS, ORDSAL LANE, SALFORD, MANCHESTER.

LONDON OFFICE: 46, FISH STREET HILL, E.C., W. PARSEY, Agent, where the TWIST DRILLS may also be obtained from Stock.

CLIVE AND COMPANY,

MANUFACTURERS OF

STEAM & HYDRAULIC ENGINE PACKINGS,

WORKS—SUFFOLK GROVE, SOUTHWARK, LONDON, S.E.

SPECIALITIES.

Improved Patent Self-Lubricating TALC and GLYCERINE PACKING, adapted for High Pressures. Improved Patent, Self-Lubricating Dry TALC Packing.

Any description of Cotton or Hemp Packing (either round or square) made to order for SHIPPERS AND LARGE BUYERS.

SAMPLES AND PRICES ON APPLICATION.

ASBESTOS.

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



WITHOUT THIS

Inventor and Sole Manufacturer of Asbestos Putty, for Steam and other Joints.

Asbestos Jointing Mill-Boards, in Sheets and Washers, any thickness.

All kinds of Crude and Manufactured Asbestos kept in Stock.

CLAYTON AND SHUTTLEWORTH,

STAMP END WORKS, LINCOLN, AND 78, LOMBARD STREET, LONDON.

TWO GOLD MEDALS & OTHER PRIZES

Have been awarded to Clayton and Shuttleworth for their

STEAM ENGINES.

THRASHING MACHINES,

GRINDING MILLS,

TRACTION ENGINES, &c.

AT THE PARIS EXHIBITION, 1878

CATALOGUE FREE ON APPLICATION.

The Royal Agricultural Society of England have awarded First Prizes to Clayton and Shuttleworth at every meeting at which they have competed since 1849.

JAN. 16, 1880

IRON.

XIII.

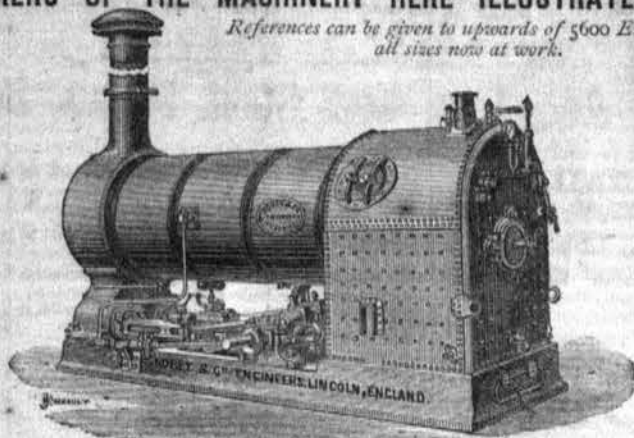
ROBEY AND CO., ENGINEERS, LINCOLN,

SOLE MANUFACTURERS OF THE MACHINERY HERE ILLUSTRATED.

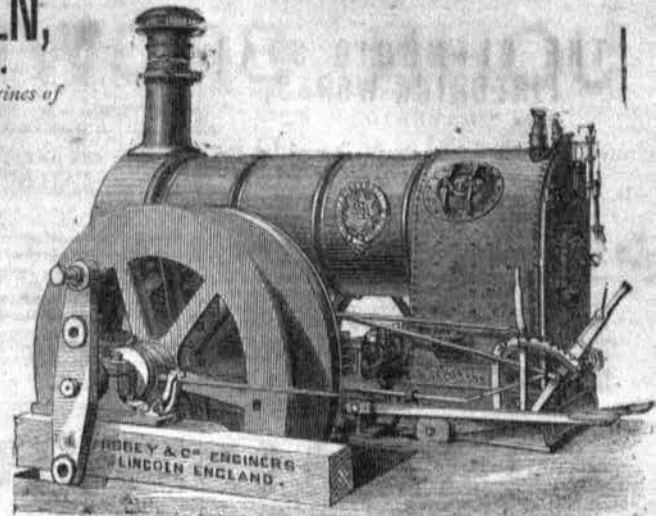
References can be given to upwards of 5600 Engines of all sizes now at work.



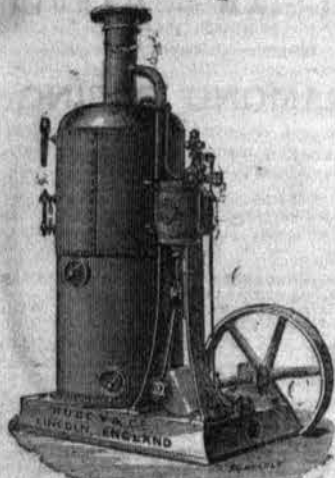
Superior Portable Engines, 4 to 50 h.p.



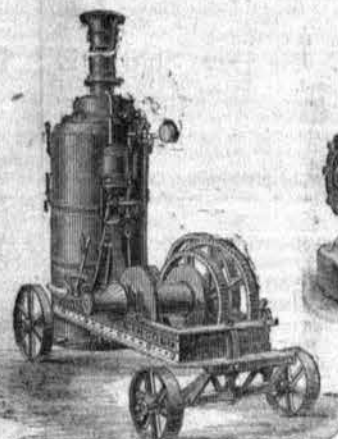
The Patent "Robey," Fixed Engine, 4 to 50 h.p.



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

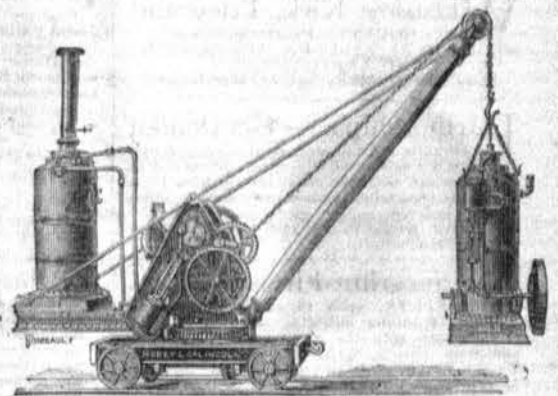


Vertical Engines, 1 to 12 h.p. Improved Steam Travelling Crane Catalogues, Prices and Photographs on Application.



Horizontal Fixed Engines, 4 to 60 h.p.

ROBEY & CO.,
ENGINEERS,
LINCOLN, ENGLAND.



Improved Barrow Hoist.

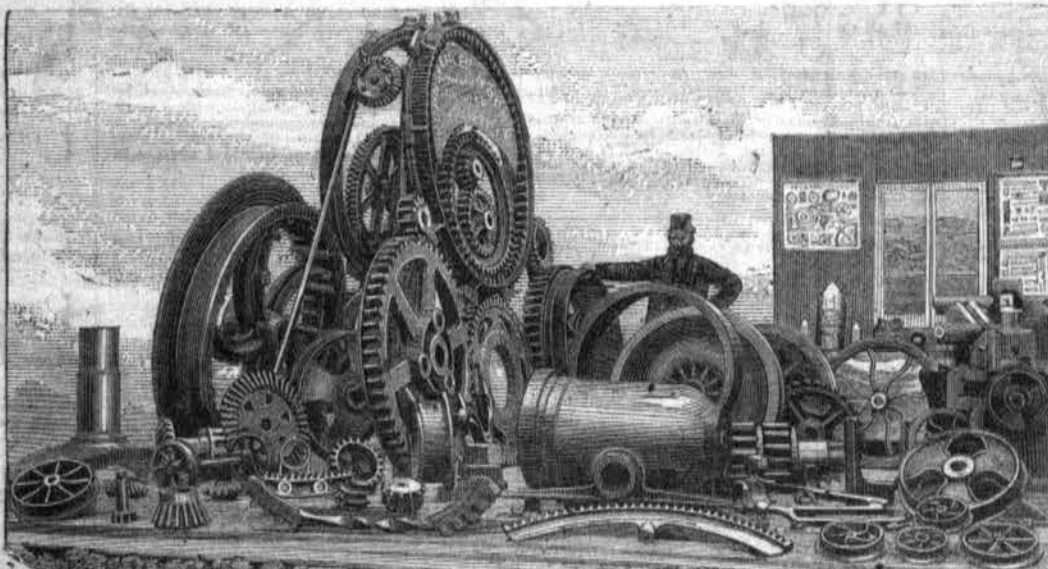
JOHN SPENCER AND SONS,

Newburn Steel Works, Newcastle-on-Tyne.

STEEL
CASTINGS



ORIGINAL MANUFACTURERS OF
VOLUTE SPRINGS.
Best Cast Steel Files.



STEEL
FORGINGS



RAILWAY
SPRINGS & BUFFERS.
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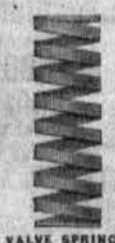
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COLLIERY SIGNAL BELLS, RASTRICK'S TUBE SCRAPER,

Conical, Spiral, & all kinds of Coiled Springs

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SCHAEFFER GAUGE



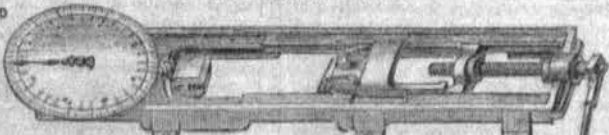
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WIRE TESTER ANY PRESSURE UP TO 3 TONS



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THE CHILIAN MEDAL, SANTIAGO, 1875.

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

CONTRACTOR TO HER MAJESTY'S GOVERNMENT
Manufacturer 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). Bessemer tuyeres, runners, plugs and stoppers. Gorman 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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GOULTY. 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.

The Cheshire Lines Com-
MITTEE are prepared to receive TENDERS for the supply of the undermentioned PERMANENT WAY MATERIALS, viz:—
Steel Rails ... 1200 tons or 1800 tons
Chairs ... 1175 " " 2000 "
Fish Plates ... 150 " " 200 "
Fish Bolts ... 40 " " 80 "
Spikes ... 60 " " 150 "
Sleepers (crossed) ... Number 35,000 or 65,000
Crossing Timbers (crossed) ... 3000 " 6000
Telegraph Poles (crossed) ... 100 " 600
Keys ... 122,000 " 220,000
Fetters ... 50,000 " 100,000
Patterns can be seen, and Specifications with Form of Tender obtained, upon application to the Committee's Engineer, Mr. W. G. Scott, C.E., Cent. at Station, Liverpool.
Sealed Tenders undered "Tenders for ... " to be in the hands of the undersigned not later than 9 a.m. on the 21st inst.
EDWARD ROSS, Secretary.
London-road Station,
Manchester, and January, 1880.

THE GREAT NORTHERN RAILWAY
COMPANY.—STOKES CONTRACT.
The Directors of the Great
Northern Railway Company desire to receive Tenders for the Supply of New, and the Purchase of Old Stores for periods of six and twelve months respectively, from the 1st February next. Samples and patterns may be seen at the Office of Mr. Nicholls, the Storekeeper, at Peterborough, from whom also Forms of Tender and Specifications, and every information as to the Contracts may be obtained, on and after the 16th inst. Tenders addressed to the Secretary, sealed and marked on the outside "Tenders for Stores" (specifying the class of Stores tendered for), must be sent to the Office at King's-cross on or before 10 a.m. on SATURDAY, the 23rd January inst. The Directors do not bind themselves to accept the lowest or any Tender.
ALEXANDER FORBES, Secretary.
Secretary's Office,
King's-cross Station, London,
8th January, 1880.

LOFTUS IRONWORKS AND MINES,
CARLIN HOW, NEAR LOFTUS, YORK-
SHIRE.

To be Sold by Public

Auction, in one lot, as a going concern, by Mr. CHARLES WILLMAN, C.E.M.E., in the Board Room of the Royal Exchange, Middleborough, on TUESDAY, January 27th, 1880, at eleven o'clock for noon precisely, subject to such Conditions of Sale as will be then produced.
All that Valuable concern known as the "Loftus Ironworks and Mines," situate at Carlin How, near Loftus, in the County of York, consisting of two blast-furnaces, complete in every respect for the output of a maximum make of Cleveland pig-iron, together with the fixed plant.
All the land appertaining to the blast-furnaces is leased for 99 years (and consists of 40 acres or thereabouts), from June 30th, 1873, at the aggregate rental of £145 per annum.
The surface land appertaining to the Mines for the due working of the same, comprises two acres or thereabouts, and is leased for 33 years from 1st December, 1857.
There are 63 workmen's cottages built in close proximity to the works, leased for 99 years from May 19th, 1873, subject to Ground Rent of £50 per annum. Printed Particulars, Conditions, and Plans may be had on application to the Auctioneer, Exchange-place, Middleborough; Mr. Robert McCracken, Royal Exchange, Middleborough; Mr. T. C. Macmillan, Newport Milling Mills, Middleborough; Mr. Henry C. Duncan, Solicitor, 7, India-buildings, Fenchurch-street, Liverpool; or to Mr. George Robinson, Solicitor, Bank-buildings, Skipton.

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. DO.,
AGRICULTURAL IMPLEMENTS OF ALL CLASSES,
And specially the manufacture of wrought-iron cranks, for which a complete plant of Patent Machinery has been put down; also general Iron Foundry, 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 lands secured on a 999 years' lease.
Full particulars can be obtained from Mr. ISAAC JENKES, of Wolverhampton, or Mr. THOMAS IREMAN, Accountant, Nottingham; or Messrs. Corset, Fowler and Langley, Solicitors, Wolverhampton.

TO ENGINEERS AND OTHERS.

This Corporation being de-
sirous of receiving TENDERS for the CONSTRUCTION and delivery at the Trinity Works, Orston, near Plymouth, of GUN METAL and other FITTINGS for the new Eddystone Lighthouse, Notice is hereby given, that the drawings may be inspected and specifications and forms of tender obtained on application at the Store Department at this House on any day between the hours of ten a.m. and four p.m.
Tenders, sealed and marked outside "G n Metal Fittings for Eddystone Lighthouse," must be addressed to the Secretary and delivered at this House on MONDAY, the 19th inst., and no tender can be entertained that is not made on the form provided.
The Corporation does not pledge itself to accept or any tender.
ROBIN ALLEN, Secretary.
Trinity House, London, Jan. 6, 1880.

TO IRONMASTERS, MANUFACTURERS
MERCHANTS, ORE PROPRIETORS,
CONTRACTORS, AND OTHERS.
NORTHAMPTONSHIRE.—The Woodford House Estate, a freehold residential property of about 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 Thrapstone, which has stations on the Midland and London and North-Western Railways, and seven miles from Willingham. It includes a FAMILY RESIDENCE, stabling, small farmery, &c. Two good farmhouses, with homesteads; also accommodation land and cottages. Some of the richest BEDS OF IRON ORE and LIME-STONE 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 Railways by sidings at Twywell.

Messrs. Farebrother, Ellis,
OLARK, and Co., are instructed to OFFER the above valuable ESTATE for SALE by AUCTION, at the Mart, London, on WEDNESDAY, the 23rd of January, at two, in lots. Particulars, with plans, may be obtained of Messrs. Walters, Devereux and Walters, Solicitors, 9, New Square, Lincoln's Inn, W.C.; Mr. S. Prickett, at the Ironworks office on the Estate; at the Mart; and, with orders to view, of Mr. T. H. Durrant, No. 30, Lincoln's Inn Fields, W.C.; and of Messrs. Farebrother, Ellis, Clark and Co., 5 and 6, Lancaster Place, Strand, W.C., and 15, Old Broad Street, London, E.C.

SWANSEA HARBOUR TRUST.

TO IRON SHIPHULLERS, ENGINEERS,
AND OTHERS.

To be Let, valuable and
extensive PREMISES, Shops, &c., adjoining the entrance to the South Dock, Swansea, and in about the centre of the Dock Estate.
Three years' lease at a moderate rental.
Apply to the General Superintendent.
Harbour Office, Swansea,
23rd January, 1880.
N.B.—The late tenants having dissolved partnership, a business as above was put an end to.

LONDON AND NORTH-WESTERN RAILWAY COMPANY.

OLD WHEELS FOR SALE.

The Directors are pre-
PARED to receive Tenders for the purchase of the following OLD WHEELS, lying at Wolverton:—
60 pairs with steel tyres and steel axles.
81 " " steel " and iron
17 " " iron " and steel
141 " " iron " and iron
Further information may be obtained, and the wheels inspected, on application to Mr. R. Lorr, Superintendent of the Carriage Department, Wolverton.
Tenders to be sent in for the whole or any part, to the undersigned not later than the 31st inst.
By Order,
Euston Station, 13th January, 1880. S. KEAY, Secretary.

Iron.—A Gentleman desirous

of extending mines on his property, working a magnetic and brown iron ore of the highest class, proved by eminent analysts and used with satisfaction in Staffordshire and the Scotch furnaces, is prepared to negotiate with a limited number of gentlemen to join in forming a small private company. The quantity of ore to work by day level without any expense for machinery, is of considerable extent. Sea-port and railway access within cutting distance, by excellent roads. Particulars on application to "X" (No. 12, Bedford Row, London, W.C., or to C. Harrison, 101, West Nile Street, Glasgow, with whom plans and analyses may be seen.

H. AUGUSTUS GUY AND COMPANY,

Government Contractors and Metallists,
STEEL CONVERTERS AND REFINERS.
Sole proprietors and manufacturers of
GUY'S INVINCIBLE "RELIABLE" & "MINING"
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Steel Forgings and Castings of every weight and Section.
The unequalled excellence and undeviating uniformity of these famous Brands secure an immense export in the workshop and the mine.
Inventors and Sole Makers of the
"IMPERIAL" METAL.
An economical and efficient substitute for ordinary brass and gun metal, being much more durable and cheaper than these materials.

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Pekham, London, S.E., and Sheffield.
Full descriptive price Lists on application.

Re S. B. WALMSLEY, OF BRADFORD, IN
CHANCERY.—BY ORDER OF THE
COURT AND OF THE RECEIVER, J. H.
BLACKBURN, ESQ., TO MACHINE
MAKERS AND OTHERS.

Mr. J. Buckley Sharp is
instructed, as above, to Sell by Auction on MONDAY, Jan. 19th, 1880, and following days, the whole of the MATERIALS, costly Models and Loose Tools, particulars of which in catalogues ready January 15th, to be had from Mr. Sharp, 29, Well Street, Bradford.
The late Mr. Walmsley had both European and American fame as a maker of 'combings' &c., machinery.

NORTHUMBERLAND.

SALE OF COLLIERY PLANT.

Messrs. Joel and Son are
instructed to Sell by Auction, at Wylam Hill Colliery, near Newcastle-on-Tyne, on WEDNESDAY, January 21st, the whole of the COLLIERY PLANT AND MATERIALS. Including a winding steam engine and tubular boiler, about 50 tons of heavy flat-bottomed rails, a 20-ton weighing machine, coal tubs, timber, scrap iron and metal, and the usual materials to be found at a colliery.
Sale at half-past 12 o'clock. Catalogues now ready.

WEAR IRONWORKS.

For Sale (by Private
Treaty) the valuable and modern Puddling Forges, Plate Mills, Angle Mills, and Bar Mills, known as the WEAR IRONWORKS, situate at Castletown, near Sunderland, on the north bank of the river Wear, and in close proximity to the shipbuilding yards and manufacturing works on the river.

The works stand on 25 acres of freehold land, have a good private wharf, and are most advantageously connected by railway with the sources of fuel supply and the inland markets for finished iron.

The Plant and Tools are very efficient, and the works could be put into operation with a small outlay of time and money, and are capable of turning out 800 to 1000 tons of shipbuilding iron, boiler plates and merchant bars per week, with space for large increase.

Adjoining there are 105 acres of additional freehold land, on part of which 174 workmen's houses have been built, leaving nearly half of the land vacant and available for building purposes.
Further particulars and permission to inspect the property may be obtained on application to Messrs. A. B. and C. Wright, Solicitors, Sunderland.

TO MINING CAPITALISTS AND ENGINEERS.

The undersigned has for
SALE several valuable LEAD MINES and promising Lead Sets, which he can offer on very favourable terms. For particulars apply to Mr. John B. Adams, General and Financial Agent, 57, King William Street, City, London.

Private Secretary or Confi-

DENTIAL Clerk.—Situation wanted as above to a Nobleman or Gentleman by a well-educated young man, age 27. First-class references can be given.—Address, "H. F.," 71, Catherine Street, Strand, London, W.C.

Wanted, Second-Hand Iron
GATES, suited for a corridor, about 7 feet by 4 feet, plain or ornamented. Give sketch and price. Address—J. F. Foun, Long Eaton, Notts.

AVIS IMPORTANT.

Le Journal Iron (le Fers)
occupe de tous les traités matières dunt commerce et de la fabrication du fer. Il donne les prix-courants des articles spéciaux fabriqués à Birmingham et à Sheffield, ainsi que dans les districts avoisants. Il contient des rapports commerciaux et scientifiques sur les métaux et la quincaillerie de tous les pays du monde. Il donne des descriptions des fonderies, usines, &c., ainsi que des articles de fond sur la fabrication du fer et des autres métaux, comme aussi des comptes-rendus sur tous les nouveaux ouvrages qui se rapportent à la fabrication du fer, aux hauts-fourneaux, aux usines, à la métallurgie, &c. Ce journal est de la plus haute importance pour ceux qui veulent faire des annonces industrielles ou métallurgiques, attendu qu'il circule beaucoup parmi les commerçants, les exportateurs, et acheteurs dans les deux hémisphères. Ce journal se publie tous les Vendredis. L'abonnement par an, le port compris, est de 30 shillings, un seul numéro, 6d.
Toutes les communications doivent être adressées à la Direction, au Bureau Central, No. 151, Fleet Street, Londres, E.C.

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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.

BOROUGH OF TIVERTON.

TO IRON MERCHANTS, FOUNDERS, &c.

The Town Council of the
Borough of Tiverton, acting as the Urban Sanitary Authority, are prepared to receive Tenders for Cast Iron Socketted WATERMAINS of different sizes, weights and thicknesses of Metal, coated with Dr. Angus Smith's solution.
For copies of the specified quantities and quantities apply to Mr. George Soudon Bridgeman, C.E., and Surveyor, Torquay.
The Town Council do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Iron Pipe," should be sent to me before ten o'clock on SATURDAY, the 31st day of January instant.
C. M. HOLLE.
Town Clerk, Tiverton.
Dated 10th January, 1880.

IRONSTONE.

For Sale, Good Self-Fluxing
IRONSTONE (an contract).—Apply to Mr. C. COHEN, Caythorpe Ironstone Mines, Caythorpe, Lincolnshire.

Locomotive Tank Engines

of all sizes and for all gauges. Several in stock and in progress.—FLETCHER, JENNINGS and Co., Lowca Engine Works, Whitehaven.

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Patent Agent and Consulting Engineer. Patents obtained at Home and Abroad. Designs and Trade Marks Registered. Specifications and Disclaimers prepared. Opinions given on cases submitted. A Handbook, giving full information as to the costs of Patents, &c., post free. Office for Patents, 159, Fleet Street, London.

Inventors should read "How

to MAKE MONEY by PATENTS."—The "Engineer" wrote:—"We recommend it as a valuable mecum for inventors." Free 14 stamps.—HARLOW and Co., 25, Southampton Buildings, W.C.

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For Excellence of Quality.

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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 wherever 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.
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Shipping ports, Glasgow, Leith, Grangemouth, Granton, Hones, &c. &c.

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No. 367. Vol. XV.

LONDON, FRIDAY, JANUARY 23, 1880.

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Superior to ordinary Silica, and equal to three
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nous sommes prêts en toute occasion à fournir
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Is made in Rings exactly to fit each Box.—Will
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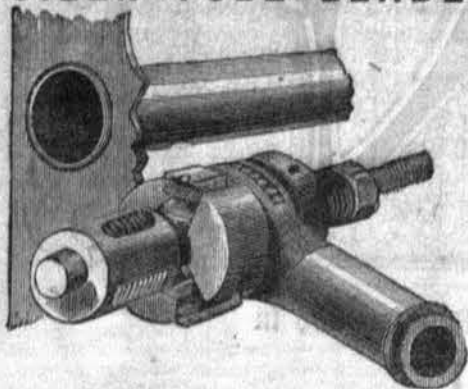
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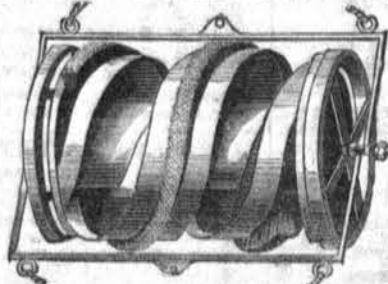


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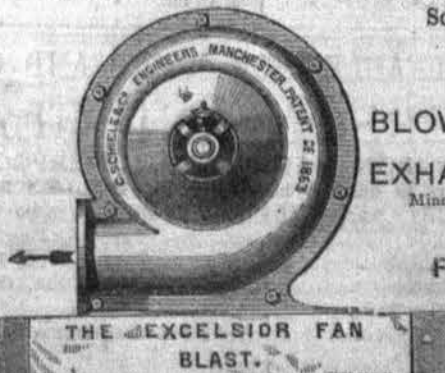
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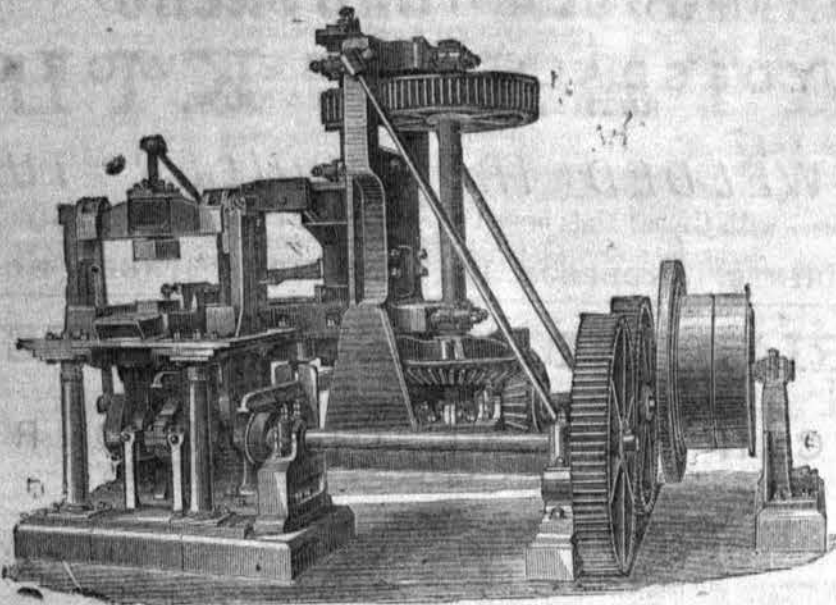
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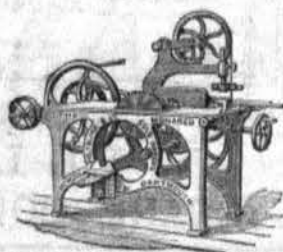
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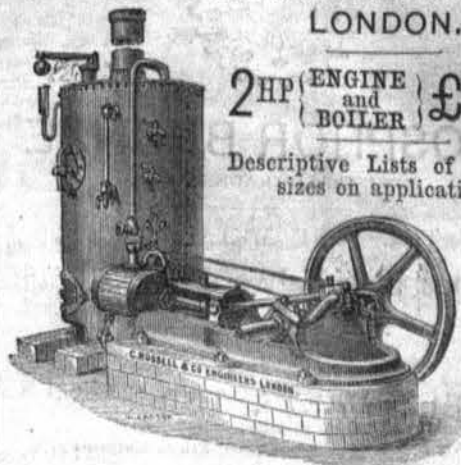
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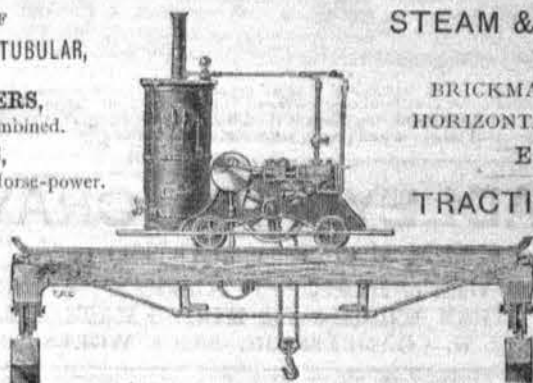
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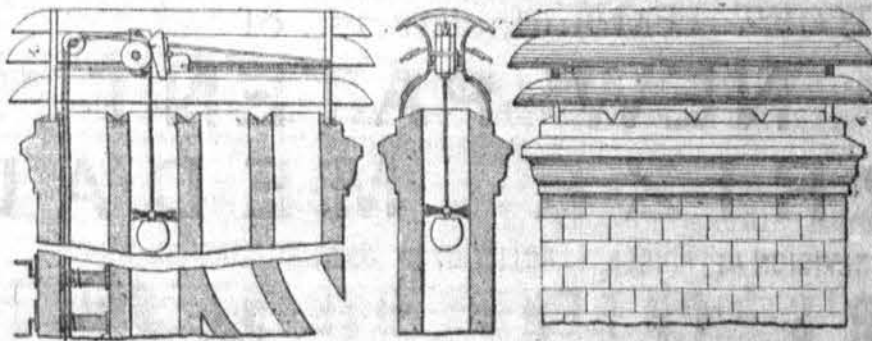
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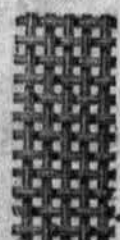
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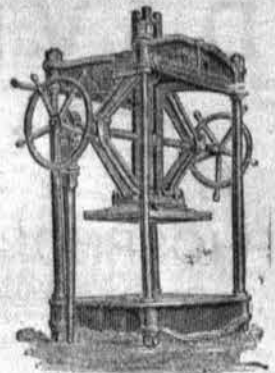
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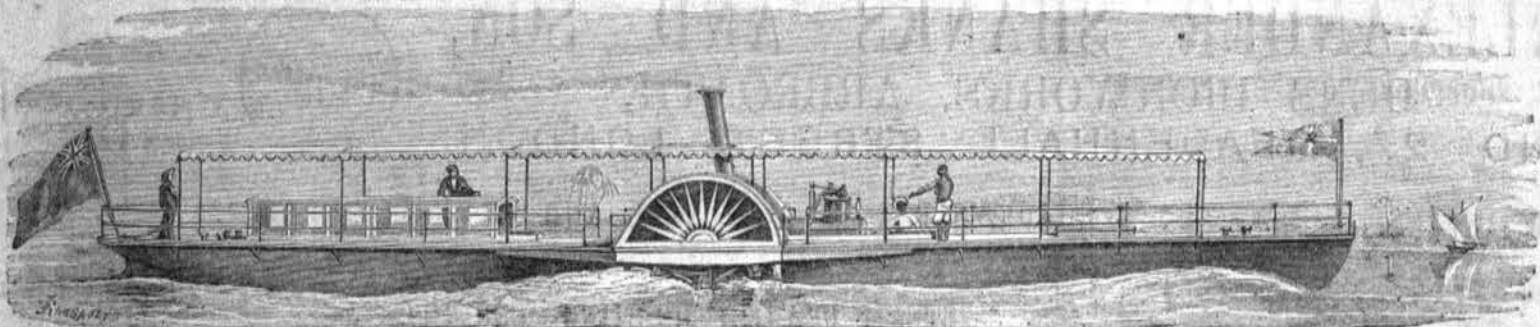
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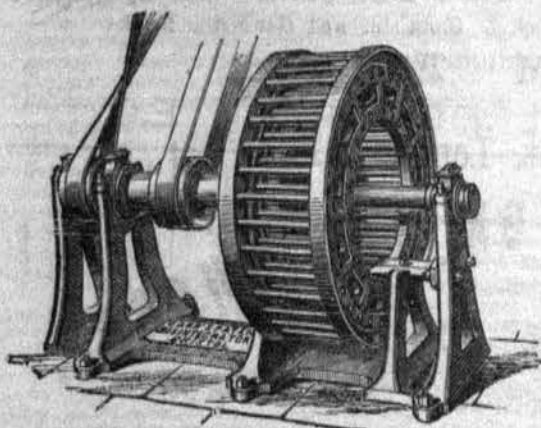
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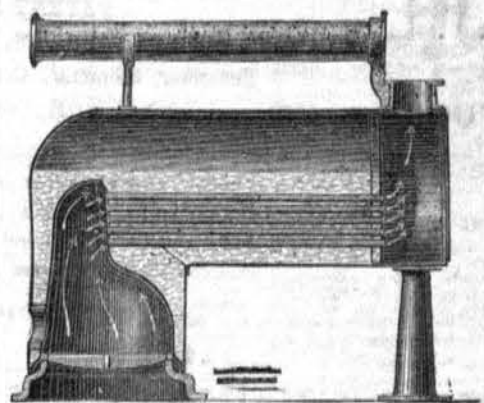
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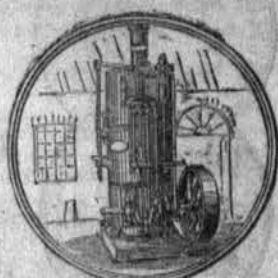
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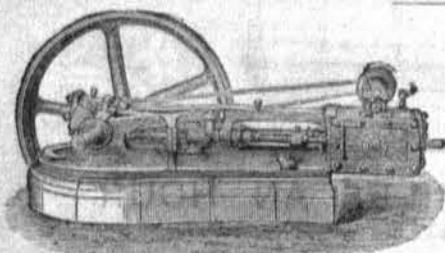
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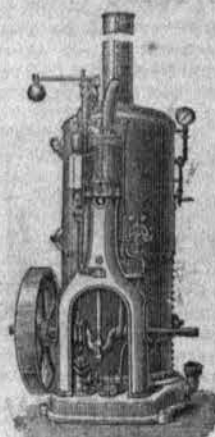
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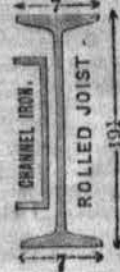
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4 x 3 = 12 "	6 x 3 = 16 "	8 x 5 = 25 "	10 x 5 = 36 "	16 x 6 = 82 "	3 x 3
5 x 2 = 8 "	6 x 5 = 29 "	8 x 6 = 34 "	10 x 6 = 54 "	18 x 6 1/2 = 82 "	2 1/2 x 2 1/2
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IRON.

LONDON, FRIDAY, JANUARY 23, 1880.

THE COAL TRADE.

THE present sudden but not unexpected change in the position of the coal trade of this country, demands of us a few words of notice. To those connected with that trade who are wont to scan with eager eyes the last recorded movements in the price of iron, believing that any advance thereon should naturally lead to a corresponding improvement in the price of coal, it must have been disappointing to see that while iron gradually doubled its price, coal practically remained where it was, the only improvements in the latter commodity being expressed in the phrases, "better feeling," "more demand," "greater animation," and the like, but not affecting prices unless for very advanced delivery. It was pleasant to see again such unaccustomed terms applied to what had been so long a drug in the market, but an advance in price would have been more appreciated.

The causes of this want of response in the coal trade to the upward movement in iron are easily to be found by those who read between the lines, and are acquainted with the changed condition of things in the manufacturing districts. In the first place the recent revolution in the process of making iron and steel is a weighty element in the consideration, only a fifth or sixth of the quantity of coal formerly used in the work being now required. Secondly, in the iron trade there is a long lee-way to fetch up, for while the coal proprietors have, with few exceptions, continued their operations during the dull times, living upon their profits of the past and their hopes for the future, the manufacturers of iron in large numbers had their furnaces blown out, and in several well-known cases had to go into liquidation. Thirdly, the American demand, which, for example caused the export of rails to the United States to rise from 304 tons in 1878 to 44,570 tons in 1879, and which certainly initiated the improvement in iron, cannot, of course, be expected to extend directly to coal, which is now produced plentifully in America at a much lower price than that at which it can be imported. Fourthly, the number of new mines brought into existence, and old mines resuscitated during the years of high prices, 1872 to 1875, have been sufficient to choke off any extra demand arising, and might continue to do so if labour were to continue as plentiful and cheap as it has lately been.

There are other general reasons, notably the fact that as coal is used for so many purposes, industrial and domestic, besides being largely exported abroad, its total consumption is never very greatly affected, one way or another, by good trade or bad, and it does not feel the benefit of the former, or become so sensitive to the baneful effects of the latter, as articles of lesser production. Notwithstanding these drawbacks and hindrances to the advance of price in coal, however, the absorption of large quantities for iron making and manufacturing purposes should by this time have had an effect, and a substantial advance is without doubt now overdue. This, we believe, would have taken place ere now, but for the competition which took place among coal proprietors two or three months ago for the annual contracts of the large railway and steampacket companies and coal shipping firms, for the present year, the intensity of which caused the coal companies to accept lower prices than had ruled for ten years. Added to this was a sharp demand from the States for tonnage for the grain crops—inducing large numbers of vessels to run out there in ballast or otherwise, in September and October; and strong easterly winds setting in during November and December, caused a scarcity of tonnage at the coal shipping ports the last four months of the year, and did much to prevent the advance in prices which should then have taken place. Moreover, no settlement had during that time been arrived at with the men, and with such an important matter in abeyance proprietors themselves were not anxious to force prices up.

Now, however, the atmosphere has been cleared. As regards the inland demand for coal, the improvement in the iron trade has continued, and during the last two or three weeks prices have still further advanced. Iron rails, which six months ago were selling at £4 per ton, now fetch £8 to £9. Steel rails, which were down to £4 10s., now sell readily at £10 to £11. Other hardware manufactures have risen also, the effect upon coal being that large quantities are now required for manufacturing purposes, for which the consumers can at length afford to pay higher prices. For foreign shipments tonnage has become more plentiful, the latest advices from the principal shipping ports informing us that stems were full, business brisk, and heavy demurrages being paid. Then as to the workmen. We are glad to know that in South Wales, during the last week or two, a sliding scale arrangement has been come to by the principal companies with their miners, which, though not by any

means perfect, meets with general approval, and is likely to be adhered to by both sides for at least the next two or three years.

The result so far is that prices have generally advanced—in Scotland and Lancashire 1s. 6d. to 2s. per ton above the lowest prices, those of six months ago; in South Wales 1s. to 1s. 6d. per ton, though even at the improved figures proprietors are loth to make engagements for any lengthened period; and in Northumberland (where prices were not allowed by the large companies to drop to a very low level) an advance of 6d. per ton has been declared, and fresh engagements are only being made for small quantities for early delivery.

It may be asked—Is the improvement in price now to stop? We emphatically answer, No. We congratulate those companies and firms who have completed their coaling arrangements for the present year, and we pity those whose hesitancy has left them out in the cold; and we warn those who have purchases to make to lose no time in making them. "If 'twere well 'twere done, 'twere well 'twere done quickly." It is better to be wise in time than after the event, and more agreeable to pay 1s. or 1s. 6d. per ton more than one's neighbours, than 3s., 4s., or 5s. per ton more. There are arrears to be made good in the export coal trade. Before these are cleared off the Baltic ports will be open. Then it is to be hoped that the long-awaited-for improvement in the Revenue returns may at last show itself, that confidence in monetary circles may revive more than it has yet done, and that a few years of genuine good trade will follow the partial and spasmodic improvements we are now witnessing. For too long a time have coal proprietors been working for little or nothing, or even at a loss. We shall rejoice to see them sharing in the coming general prosperity.

OUR TRADE SUMMARY.

CONTINUED activity is perceptible in almost every branch of the metal trades, and prices are rising without materially restricting the demand, the only difficulty, indeed, is that orders cannot be executed rapidly enough; and the most experienced, as well as the most cautious observers, agree that the country has experienced a genuine trade revival, and is entering upon another prosperous term. Speculation has been rife in the Glasgow warrant market during the past week; but at the same time there is considerable reason for expecting a further substantial rise. On Wednesday prices closed at 72s. 4½d. to 73s. 1½d., buyers 3d. a ton less. The manufactured trade continues to flourish, somewhat extensive purchases of bars for America making up for the slackening of orders from the shipbuilding yards. The engineers and foundries are still slack but are hopefully looking forward to better times. At Middlesbrough on Tuesday last, there was a large attendance; and though prices for pig were then 2s. lower than they had been the previous market-day, they have since returned to the former figure. The finished trade remains as before, prices ruling according to the variations in the crude material. A good index of the extent to which trade has improved is afforded by the rise of iron companies' shares. Those of the Darlington Company, for instance, which some months ago were sold as low as 30s., now realise £11 10s. on the £15 share, £12 being paid up. There is little to report from Cumberland or North Lancashire, where the iron industries continue to prosper, as they have done since the dawn of the revival. Indeed, many of the makers are sold forward for six months, and even more, while they are producing to the full extent of their capabilities. Large deliveries, both in Bessemer and forge, continue to be made, and now that there is every prospect of a further rise when the spring and shipping season opens, buyers are anxious to arrange for new deliveries. Prices have risen during the week fully 10s. per ton all round. On Monday best Bessemer was quoted 125s. to 130s. per ton on trucks at makers' works, forge iron, 120s. to 127s.; but since then 130s. has been refused for best qualities of Bessemer. A few new furnaces have been lighted, but even these and any more that are likely to be added will not bring the supply abreast of the probable demand. Engineers, shipbuilders, boilermakers, and railway rolling stock works are actively employed. There has been a slight falling off in demand in the Manchester market recently, and the requirements of the local industries are still very slight, although American orders continue to come in in some quantity. In finished iron there is a continued upward tendency in prices, and some makers are so full of orders that they decline to quote at all. The common iron trade of the West Yorkshire district appears to be in a satisfactory condition, and in all departments a continuance or increase of the existing prosperity is anticipated. The make of pig throughout South Staffordshire is now an average one, and all the available furnaces are in blast, the supply of ore now coming largely from North Lincolnshire, owing to exhaustion of the native beds. From Sheffield farther advances are reported in pig and manufactured iron, with stiffening prices. The cutlery market is becoming active on foreign account, while

large orders for heavy goods are coming in from the Australian colonies. There is a corresponding increase in the edge tool and file trades, and the manufacturers of electro-plate and Britannia metal goods are much busier. The local trades of Birmingham are assuming a more satisfactory position. There is also more doing in the hardware trades of the Wolverhampton district, the galvanising department keeping the lead, although in other branches there is also considerable activity. The coal trade seems at last to have partaken of the general improvement. The demand for coal, and especially for coke, has been for some time increasing; and now prices are also tending to advance, with the prospect of still farther improvement.

THE THUNDERER'S 38-TON GUN.

THE series of experiments which are in course of being carried out at Woolwich, with the 38-ton gun taken from the turret of H.M.S. *Thunderer* were resumed on Friday last. It will be remembered that the previous experiments with this gun had reference mainly to the question of air-spacing, and were carried out with the view of ascertaining whether or not the bursting of the sister gun, may have been due to the projectile not having been rammed home. The various rounds were fired alternately with 85 lb. of P-3 powder, and a 600 lb. common shell, and 110 lb. of the same powder and a 700 lb. Palliser shell. The first two rounds were fired with the projectiles driven hard home upon the powder, the subsequent rounds, twelve in number, having been fired with air-spaces, 1 foot, 2 feet, 4 feet, 6 feet, 8 feet and 10 feet respectively in each pair of rounds. The results of these experiments, which were reported by us at the time,* having disposed of the air-space theory, the proof or disproof of the wedging theory had next to be undertaken in conformity with the recommendations of the committee which was appointed to investigate the matter. The wedging theory supposes the *papier-maché* wad—which is usually rammed home after the projectile to keep it in its place—to have become canted over, and to have caused the projectile to jam in the bore, and thus to have led to the bursting of the gun. This theory has been most persistently advocated by Sir William Palliser, who holds that the wad became displaced either by slipping or by the withdrawal of the hydraulic rammer, and was left in such a position as to act as a wedge and so to check the passage of the projectile. The members of the committee, however, would none of them admit the possibility of such a contingency, their opinion being that the wad would be blown out of the muzzle by the blast before the shot reached it. The fact of wooden wedge wads being constantly employed with spherical projectiles, though under somewhat different conditions, was instanced to disprove the notion of risk. Notwithstanding this, however, a protest was entered before commencing proceedings by Mr. Bramwell, who declared that it had been proved most conclusively by evidence that the wad was fairly against the nose of the shell when the gun was fired, some singular testimony to the fact being afforded by the socket of the wad, which was rent off in the loading. With regard to the wad itself we may mention that it is a disc ½ of an inch thick, and made of coarse *papier-maché*, tightly fitting the bore of the gun. The centre of the wad is perforated and is occupied by the socket previously referred to, into which the point of the shot fits when the loading has been completed. In the experiments on Friday last the powder-charge for the first round of the day—which was the 15th of the series—consisted of 85 lb. of P-3 powder, and a common shell weighing 502 lb. rammed home. After the gun had been charged, a *papier-maché* wad was carefully placed 5 feet in front of the shot, and, with a wedge-headed hammer made for the purpose, was canted over to an angle of 45°, in such a position that if it remained there it would be likely to jam in the bore between the shot and the gun. Every precaution had been taken in order to prevent any accident arising from the fragments of the gun, should it burst, by strengthening the cell in which the gun is placed for firing, and by extending and enclosing the approaches. The gun was fired as usual by electricity, and upon subsequent examination it was found to be uninjured. Whilst some advocates of the wedging theory are of opinion that the wad was canted, others hold that it was displaced but not canted, and that, being suddenly struck by the pointed projectile, it doubled up and jammed in both sides. To prove or disprove this was the duty of round No. 16, in which the wad was left in a vertical position in the bore of the gun at a distance of 5 feet from the nose of the projectile. The charge consisted as before of 85 lb. of powder and a common shell rammed home. This round was fired without any apparent injury being caused to the gun, and fragments of the wad were afterwards recovered between the gun and the sand-butts into which the shots were fired. So far, the wedging theory has been disposed of, and it now only remains for the crucial test to be carried out. This will consist in

* Vide IRON, vol. xiv., pp. 744 and 770.

doubly loading the gun and firing it, which, it is anticipated by the committee, will result in the destruction of the weapon, and at the same time will prove the correctness of their opinion that the *Thunderer's* gun burst under similar conditions. It will be remembered that Sir William Palliser lately carried out some experiments at Erith with a 64-pounder Palliser rifled gun doubly loaded. The results, however, were unfavourable to the conclusions of the *Thunderer* committee, inasmuch as the gun remained unhurt. It is argued by some that trials with a weapon so dissimilar from the 38-ton gun as is the Palliser gun can have no bearing upon the question at issue. There are, however, attendant circumstances which point to a greater analogy between the two sets of conditions than appears on the surface, and for these we would refer our readers to our report of those trials.* All that can be said at present is that the theory supported by Sir William Palliser and others as to wedging has not been borne out in practice with the 38-ton gun, and it remains to be seen whether the theory of doubly loading to which they are opposed will be substantiated by the remaining experiments with the weapon.

VULCANISED FIBRE.

UNDER the name of vulcanised fibre a new material, which is found to subserve many useful purposes, has recently been brought under our notice. Although it was only brought prominently before the public towards the close of last year, it has been known and in good use in England for more than a year. It comes to us from the United States, where four years of practical use have established its reputation for purposes to which it is applicable, and to which we shall presently refer. This material, which may be said to take the place of vulcanite on the one hand and indiarubber and leather on the other, consists of vegetable fibre reduced to a pulp and then subjected to powerful chemical treatment, whereby the original properties of the fibre are entirely changed and a new material is produced, which, as we have said, is already largely utilised, and will, no doubt, eventually enter extensively into most branches of mechanical industry. The manufactured articles are made either hard or flexible, as desired, varying in their properties to some extent, according to the uses for which they are intended. The hard fibre is somewhat like horn in its consistency; it is very tough and strong, and has remarkable durability under friction, remaining permanently elastic under all ordinary conditions of weather or temperature. The flexible fibre closely resembles the best English leather in appearance, and is largely used as a substitute for it in mechanical appliances. It is, however, much closer grained and far more durable, and being of uniform quality and thickness throughout, cuts without waste.

In noting the various applications of vulcanised fibre, we may first refer to its use for condenser ferrules for packing surface-condensers. It has always been a great trouble to marine engineers to keep the packings tight around the tubes of surface condensers, so as to prevent leakage, and yet to permit the tubes to contract and expand freely through the tube sheets or heads of the condensers. Various substances, such as leather, paper, rubber, lead, hemp and wood, have been tried for this purpose, but none with perfect success (wood being the best), prior to the discovery of vulcanised fibre. The vulcanised fibre ferrules have been thoroughly tested, and we understand that they have proved to be perfect in their operation. For axle washers, the flexible material is found to be superior to leather in durability, and is not affected by oil or grease. Compression cock washers for plumbers' use is another useful application, the material being insoluble in hot or cold water, oil, naphtha, petroleum, or alcohol, and is but slightly affected by most of the acids. There are many other purposes to which this material is advantageously applied, but which we need not stay to enumerate. We may, however, refer its application at the Clay Cross Collieries, where a vulcanised fibre pump clack was tried against one of leather on a similar pump. The fibre clack lasted 171 days, but the leather clack was worn out in 40 days. The manufacture of the vulcanised fibre is at present carried on in the United States, the manufactured articles being imported by Messrs. Mosses and Mitchell, of 62, Queen Victoria Street, London.

TRAMWAY RIOTS IN BRAZIL.—In consequence of articles in the opposition Press inciting the people to resist the new tramcar passenger duty of 20 reis, and the inflammatory speeches of demagogue orators, a riot of a serious nature broke out in Rio Janeiro on New Year's Day. The mob destroyed the tramcars, tore up the rails, attacked the conductors, and threw stones and fired revolvers at the troops who were sent to quell the disturbance. Ultimately the military charged and dispersed the mob. Three persons were killed and thirty wounded, including soldiers and policemen. A partial renewal of the rioting occurred the next day, when an attempt was made to burn the doors of a gunshop with kerosene. The ringleaders were arrested. In reply to a deputation of the chief opponents of the tax, the Government refused to suspend the impost. Order was ultimately restored and the tramcar traffic resumed.

* Vide IRON, vol. xiv., p. 705.

BATEMAN'S SHAFT-COUPLING.

EXCEPT in the case of turned shafts with their ends carefully fitted into flange couplings, it is difficult to get line shafting to run true; and the projecting keys and set-screws of ordinary box couplings, besides being a constant source of danger, prevent their being used for the purpose of driving. Besides this, the cotter is so apt to throw the shaft out of truth, that two key-ways, one opposite the other, are not unfrequently resorted to to counteract this tendency. With the experience of these drawbacks, Messrs. A. H. Bateman and Co., of East Greenwich, have brought out a new box coupling, which is self-centering, connects shafts without any fitting, and will make a true joint even if the two shafts are not of the same diameter. Besides this, the joint can be made quickly by any unskilled hand without previous experience. In our engravings fig. 1, shows an outside view of this new coupling, which has no projection, so that it may be used as a pulley for driving. Fig. 2, shows a section of the simplest form of this arrangement. The two cast-iron coned rings are split longitudinally; and the more they are squeezed the more the opening closes. They fit the shaft easily and are tightened up against the internal conical surfaces of the box by the circular plates, which are simply screwed into

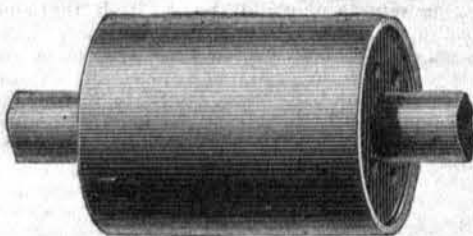


FIG. 1.

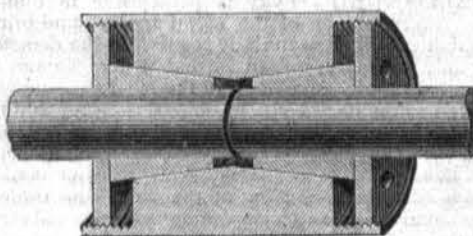


FIG. 2.

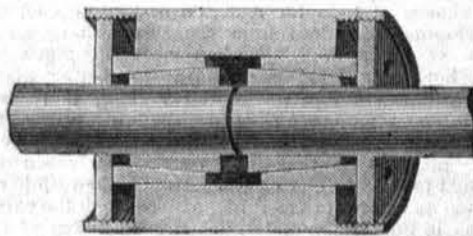


FIG. 3.

the ends of the box. Owing to the split, they grip the shaft firmly, and the tight fitting of the cone surfaces prevents any slip in the box. Fig. 3 shows modification with double cone, which is adapted for heavy shafting. In this case the cones are sometimes divided longitudinally into three portions, and are inserted in the box with strips of wood between them. All the parts are interchangeable, being made accurately to gauge; and the coupling is supplied in thirteen sizes from 1 to 6 inches.

It has been found that a very moderate tightening-up of the end plates gives sufficient grip to carry heavy work. A small model of the single-cone form was lately subjected to a severe test. A piece of gas-pipe was coupled up instead of a shaft, and this was twisted completely off with a pair of gas-tongs without the joint slipping. This coupling is admirably suited to the Kirkstall Forge rolled shafting, in connection with which it has been practically working for some time. Its simplicity, ease, and speed of application by unskilled labour, and the certainty of a true joint being secured without accurate fitting, recommend it to the attention of all who possess shafting.

THE CLOTHWORKERS' COMPANY AND TECHNICAL EDUCATION.—The Clothworkers' Company offer through the Yorkshire Union of Mechanics' Institutes a series of prizes, amounting in the total to £500, for designs in eleven classes in textile fabrics. The prizes are intended as a special encouragement of originality in thought and design, and will be awarded in accordance with that object. The Court of this company made the following vote at their last monthly meeting: £500 to make up the total amount of the cost of the new Clothworkers' Hall, in connection with the North London Collegiate and Camden Schools for Girls, as now finally complete (£3000), i.e., over and above £2500 previously voted and paid; £105 to Princess Helena Cottage; £21 to National Health Society; and £21 to Church of England Temperance Society.—*City Press*.

MANILA ROPE TESTS.

ONE of the most important, and perhaps most critical, operations which have to be performed in connection with torpedo service is lowering the torpedo boats from the deck of a ship ready for being sent on their deadly mission. In the case of H.M.'s torpedo ship *Hecla*, the small craft, after having been charged with Whitehead or other torpedos, are raised from the deck and lowered from the davits to the water by ropes, and on their return they are raised by the same means. When it is considered that some of these mischievous little craft weigh from 8 to 10 tons, it will be seen that the ropes used in thus manipulating them are required to be of the highest quality and most trustworthy make. To this end the authorities at Portsmouth Dockyard have recently cast about for a really reliable rope for the *Hecla*, which has now been supplied by Messrs. Frost Brothers, of Shadwell. The rope selected is best 3-strand white manila, of two sizes, namely, 5½ inches and 6 inches circumference, respectively. The 5½-inch rope was guaranteed by the makers to lift 12 tons, and the 6-inch 14 tons. Samples of these ropes were recently tested at Portsmouth, under the superintendence of Staff-Captain Kiddle, the Master Attendant, with excellent results. The lengths tested were each 12 feet, between the gripping points, and the 5½-inch rope did not break until a tensile strain of 12½ tons was reached; whilst the 6-inch rope held out up to 16½ tons, thus giving an ample margin over the guaranteed strength. As a means of comparison, it may be interesting to mention that a 6-inch Italian fibre rope would not stand a strain of more than 13½ tons, whilst Russian hemp rope of the same size cannot be reckoned on for more than 11½ tons.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE first sitting of the thirty-third annual general meeting of the Institution of Mechanical Engineers took place yesterday afternoon. The meeting is being held in the lecture-hall of the Institution of Civil Engineers, by the kind permission of the Council of that body, which is ever ready to afford accommodation to cognate institutions which do not possess sufficiently large rooms of their own. The chair was taken at 3 p.m. by the retiring President, Mr. John Robinson. The proceedings were commenced by the reading of the Annual Report of the Council by the secretary, Mr. W. R. Browne. From this document it appears that the total number of members at the close of 1879 was 1178. As compared with the numbers at the end of 1878, this shows a total increase of 38 members during the year. This is, of course, after allowing for members elected, deceased, and resigned during the year. The Report then goes on to point out that at the last Annual General Meeting a sum of £300 was voted for the purposes of experimental research on mechanical questions. The Council decided that the subjects to be first investigated should be:—The Hardening, Tempering, and Annealing of Steel; the Best Form of Riveted Joints to resist strain, in iron or steel, or in combination; and Friction between solid bodies at High Velocities. Committees were appointed to deal with each of these three subjects, and each Committee made it their first duty to collect and collate all the information already available upon the particular subject. This was at length so far completed that each Committee was able to present to the Council a First Report, stating the results of their investigation into the subject, and the nature of the experiments which in their opinion it was still desirable to make upon it. These Reports will be placed before our readers in due course. After some other routine business had been transacted, the President, Mr. Robinson, gave expression to a few appropriate valedictory remarks, and quitted the chair, which he has occupied for the past two years. He then introduced to the meeting the new President, Mr. E. A. Cowper, who took the chair and proceeded to deliver the following

INAUGURAL ADDRESS.

Having had the honour thirty-two years ago of assisting in the formation of the Institution of Mechanical Engineers, I now have the pleasure of thanking you very cordially for your confidence in entrusting me with still greater responsibility in the conduct of the affairs of the Institution. I must tell you honestly that the position in which you have so kindly placed me to-day is not one that I have ever coveted or sought for, as I consider so much responsibility attaches to it; but if by hard work and close attention to the various interests of the Institution I am able so to assist in its conduct as to give you satisfaction, I shall feel amply repaid, and shall not spare myself or any pains that may be necessary to accomplish the object. But one thing I must ask of you (and without it I should only expect to fail), and that is your kind and decided support of the chair at all our meetings, together with such indulgence to the occupant for the time being as you have always exercised to our late President, than whom we have

never had a more genial and truly admirable leader to conduct us forward in the paths of science and practice. One matter I may allude to, as sufficient time has now elapsed to show the wisdom of the important step that was taken at the time. I need hardly say I refer to the transplanting of the Institution to London, which has proved a perfect success, as the metropolis is now the true centre of England, and head-quarters of the mechanical engineering of the kingdom. The number of our members has greatly increased, the quality and interest of our papers has improved, and the attendances at our meetings are more numerous. I long foresaw that this removal was only a question of time, as soon as the present lines of railways had express trains direct to the metropolis, not only without stopping at Birmingham, but without going within fifteen miles of it. The Institution now so completely stands at the head of mechanical engineering in this country (and is admitted by all other institutions to occupy such a proud position), that it is but natural that it should rest in the metropolis as its fit and proper home, and long may it pursue its peaceful and thoroughly useful course. The Institution, having from the first been conducted with a due regard to economy, has never been in debt, and the result is that it is now comfortably and conveniently settled in excellent offices well suited for its requirements for many years to come; this is the more satisfactory, as it is most difficult to find a good site for such an institution in Westminster. I do not propose to-day to trouble you with anything like a history or resumé of mechanical engineering, as that has been done much better than I could hope to give it; but if not trying your patience too much, I should wish to say a few words (direct to the point) with regard to the position of this country among the nations, in respect to the advancement of manufactures generally. Now it cannot be doubted for a moment, but that the manufactures and commerce of this country depend very greatly upon mechanical engineering, skill and invention; and if this country, is to continue to be called "the manufactory of the world," we must on no account shut our eyes to what is now going on around us in many countries. I much fear that some manufacturers have so little enterprise about them that they consider they are doing enough if they make things (perhaps chiefly or entirely by hand), as their fathers did, in small numbers, instead of attempting to manufacture articles in a better manner in large numbers by machinery. They seem to forget that in the past times the good sale here depended very much upon the fact that they had no rivals or competitors for the trade, owing to foreigners not having devoted themselves to manufactures, and, indeed, having been very much hindered from so doing by very frequent wars taking place actually in their countries, whereas we have had no wars in this country for 200 years or more. Now there is one important fact, that has perhaps hardly been considered sufficiently by mechanical engineers and manufacturers generally, and it is this:—When railways first began to spread over the Continent, engineering tools and machines were just springing into existence in England, and partly for the purpose of manufacturing the locomotives for which there was a large demand. Then when foreigners had to repair their engines, they bought engineering tools and machines, and were able to work them without any very highly skilled labour, such as our old millwrights were obliged to possess in our fathers' and grandfathers' time; so that in a very short time, despite the want of skilled labour, the Continental firms became not only the manufacturers of their own locomotives, but of all other kinds of machinery. What must now be done if our commerce is to flourish, and our manufacturers keep to the front, is that instead of trying to avoid adopting any new improvements, and refusing to experiment or incur any outlay for the purpose of trying to improve their wares and the means of producing them, they should do so heartily; and mechanical engineers should do so too, in adopting and improving machinery to produce in a better manner, by power, in quantity, and therefore economically, what had previously been done in a small way, expensively, by hand. Often, too often, a good thing is allowed to lie dormant for years, because each manufacturer thinks he will let some one else in the trade spend his money to try the proposal; but the energy shown in the United States in proving a new thing as soon as brought out (and on the Continent, also, very often), and adopting it if good, has a wonderful effect in promoting progress and increasing the prosperity of the country. Sometimes it has struck me that mechanical engineers hardly seem to think it their province to strive to improve manufactures generally, and confine their attention too much to tools and engines, more particularly for engineering purposes, whereas a little more, or I would say a great deal more, co-operation between manufacturers who know what is wanted and engineers who would quickly find out how to accomplish it, would be of the greatest possible advantage to the commerce and manufactures of the country. A difficulty well stated is half overcome already. But our manufacturers and mechanical engineers must come together, must interchange their ideas, and correspond freely if any great good is to be accomplished in maintaining this country in the proud position of being the manufactory of the world. And as some of us gave an earnest

helping hand to establish the Institution, so I would venture to ask all our members to join hands with our friends the manufacturers, to make as much use as possible of the advantages of this Institution, which, as stated in our rules, was established to enable mechanical engineers to meet and to correspond, and to facilitate the interchange of ideas respecting improvements in the various branches of mechanical science, and the publication and communication of information on such subjects.

The delivery of this address was followed by the reading of a paper, by Mr. C. B. Browne, on Brown's Tramway Locomotive, which will be found described and illustrated at page 644 of our last volume. This was succeeded by the reading of a reply, by M. Leon Francq, upon the discussion which took place upon his paper on Fireless Locomotives, which was read at the Manchester meeting. The reading of these communications was followed by a long discussion upon tramway locomotive practice, after which the meeting was adjourned until three o'clock this day (Friday). It was announced that the summer meeting of the institution would be held at Barrow-in-Furness.

OCCASIONAL NOTES.

THE LEGAL POSITION OF TRADES UNIONS IN THE UNITED STATES.

ON several occasions it has fallen to us to notice the unfavourable position which trades unions occupy in America in comparison with this country; and a case in point is furnished by a transatlantic contemporary just to hand. A glass manufacturing company in Ohio had brought over a number of Belgian workmen on a three years' engagement, and the union president, in the interest of the strikers whom these men had supplanted, had been endeavouring to induce the strangers to break their engagement and return home. The manufacturer sued the official in the local court and obtained an injunction, the judge ordering that the discharged men must not make any attempt to procure the annulment of the contract of the Belgians, or enter the premises, or even converse with the foreigners, with the purpose of inducing them to leave their present employers until the expiration of the contract; adding, after reviewing the organisation and workings of the trades unions, that he had no doubt the one implicated in the transactions before the court was in conflict with the laws both of the States and the United States. In England, picketing is rarely interfered with unless accompanied by violence or obstruction.

BAITING THE SWIM.

The police authorities of Geneva appear to have lately done a thing hardly to be equalled in the history of British Vestrydom. As in some of our own police establishments, there has accumulated in that of Geneva a most extensive, remarkable, and miscellaneous collection of instruments of robbery and murder. The roll of the latter recalls the gruesome catalogue of similar properties in "Tam o' Shanter," or the contents of the Chamber of Horrors in Upper Baker Street, comprising the ropes with which suicides had hanged themselves, knives, daggers, and pistols used by murderers, and their blood-stained vestments. The dispersion among the public of these, however, although its moral effect might be baneful in certain cases, need not lead to crime, and the revenues of the little State are said to be lamentably in arrear; but what of the sale by the police of burglars' tools—jimmies, skeleton-keys, crowbars, noiseless hand-drills, dark lanterns, and the like? The correspondent of *The Times*, who notices the incident, suggests that, in announcing the sale, they were but baiting a trap for burglars, and that at all events the articles would, in due course, come back into their possession; but that latter result would depend very much on the ability of the force—in this country, judging from recent experience, it would be some time before the balance of trade in such commodities readjusted itself.

THRIFT.

A society for the promotion of habits of thrift among the people has been established in London, and it proposes to hold a conference, to use personal influence in order to obtain the concurrence of large employers of labour, to distribute gratuitously thrift literature, and to give prizes for essays upon the subject. Whatever may be the result of these operations, there is undoubtedly an excellent field open for them; for the English, without distinction of class, are the most unthrifty people under the sun. The excessive pecuniary penalty exacted from the French by the Germans at the close of the late war was paid at once out of the savings of the masses, and enough was left to enable France to enter upon a career of material prosperity which is in striking contrast with the present condition of her spoilers; even the Irish might set us an example in frugality. It is to be hoped that the members of the Thrift Society, who probably belong to the comfortable classes, will not content themselves with preaching alone, but while showing the road to frugality, will also endeavour

themselves and induce others of their class to lead the way. It is, indeed, more than probable that a great deal of the extravagance of the working people, in dress especially, may be traced to the example of their so-called superiors. At the same time, it is questionable whether there is not as much, if not more, of the spirit of economy among the masses than there is among those who are so ready to blame them for prodigality. The recent report of the Chief Registrar for Friendly Societies shows considerable progress in the face of great commercial depression. In 1878, after several bad years, the accumulations in the Post Office savings banks had reached £74,500,000, and the assets of the seventeen hundred building societies in the country are estimated as not far short of thirty millions, a great part of which belongs to the wage-earning classes. After all, however, the whole of this is far below what it ought to be; the savings bank deposits in England do not amount to much more than 40s. a head; and the income of the working classes is at least four hundred millions sterling per annum; while the expenditure, calculated per head, upon liquor is £20 a year, or a total of £140,000,000. The extension of saving habits among the people would be a national as well as a personal benefit; for, as Lord Derby showed the other day at Liverpool, the more money there is in the country the cheaper the use of it will be, and the better will we, therefore, be able to compete with our manufacturing rivals.

THE DANGERS OF PROSPERITY.

Mingled with the jubilations which rise on all sides on account of the growing prosperity of the iron trades, there is a note of warning against over-speculation, and especially against a too rapid rise in prices. There is little apparent sign of reaction on the surface. In all the great centres sustained activity continues to be the rule, and prices have lately been moving upwards until they have advanced from 70 to 120 per cent. There is at the same time no abatement in the prosperity of the iron, steel, rail, and hardware trade of the United States, our chief customer for crude and manufactured iron, and at home the local demand increases regularly if somewhat slowly. But the writer of the letters in *The Times* under the signature of "Iron" persistently maintains that the present activity is largely based on speculative demand; that there has been no corresponding increase of consumption; that the supply in sight for 1880 is about a million and a half tons over 1879, to which a further quarter of a million will fall to be added; and that, looking to the increase of production in America, and the unfavourable indications in other parts of the world, there is very considerable danger of reaction. He also points to the undoubted fact that much of the iron recently bought by America has been bought speculatively and put into store on its arrival to be held in anticipation of an advance; and finally, he anticipates the advent of the "promoter" of iron companies to complete the scene. Another correspondent of the same journal declares that something of the sort has already taken place—that syndicates and operators for the rise are actively at work, prepared, when the time comes, to bring about a fall by the employment of the reverse tactics. On the other hand, Mr. John Dixon, of Lawrence Pountney Hill, adduces facts which show that even for railway repairs and renewals there is a great and increasing demand for iron, without including the vast extensions now in progress or projected in America, France, and other countries; while a depletion of stocks has been going on during the whole period of restricted production; and, what is an important element in any trade forecast, that compared with former cycles the period of depression must have reached its natural termination—that the time has come at which the pendulum must swing in the opposite direction.

THE METROPOLITAN BOARD OF WORKS AND THE CATTLE DISEASE.

The Metropolitan Board of Works, which has been described as the essence of metropolitan vestrydom, appears, by the report of its last meeting, to be saving the pockets of the ratepayers at the expense of their constitutions. According to one of its committees, which adopts the title of sanitary, the Board is in the habit of taking over cattle afflicted with pleuro-pneumonia, killing them, and disposing of their skins to the tanner, and their carcasses to the poor for food, thereby saving half the compensation money. Properly cooked, Dr. Brewer said in his remarks deprecating the practice, the flesh of animals suffering from lung disease may not be directly dangerous, but it contains little or no nutriment, and brings on dyspepsia and other painful disorders on those who eat it. Dr. Ingleby and Mr. G. Freeman supported Dr. Brewer, the former observing that in poor neighbourhoods, the meat was often eaten half raw, and that no one could estimate the amount of mortality that might be thereby produced. Several other members stoutly defended the practice, which is surely not lawful, however indisinct may be the enactments bearing upon it.

DANGERS OF THE ELECTRIC LIGHT.

Every new enlistment of the forces of nature into the service of man is accompanied by new and peculiar dangers. We are far from having

reached the last fatality from steam or even from gas; the first from the electric light has just occurred at Birmingham. A theatre in a suburb of that town is lighted by the new process, and, when the lamps are not burning, two brass connections, used for the purpose of crossing the current, are hung up over the orchestra. One of the members of the band—it is supposed out of curiosity—caught hold of them. The man in charge shouted a warning, but it was too late, the unfortunate musician had received the full shock of the current of the powerful battery which supplies the whole of the lamps in the building and grounds, and although restoratives were applied he died in about forty minutes afterwards.

THE POST-OFFICE AND THE TELEPHONE COMPANIES.

Unless the Government can find a better excuse than any we have yet heard for the attempt it has just made to lay violent, if not dishonest hands on the telephone, it is to be hoped that the temporary injunction obtained on Tuesday will not be made permanent. The Telephone company, which does not employ electricity at all in transmitting its messages, ought at least to occupy safe ground. The public are interested in this question more than perhaps is generally supposed. Inventors know how difficult it is to get Government officials even to consider their discoveries, not to speak of adopting them and remunerating the discoverer, which is another matter; the telephone is as yet far from perfect; and if the companies are worsted, and the benefits of competition lost, progress in telephony may be expected to lag as progress in telegraphy has in England since the telegraph was handed over to red-tapery.

THE AMERICAN IRON TRADE IN 1879.

THE year which has just closed was a most remarkable year in the history of the iron trade of this country. When complete statistics are received it will be found that we made more pig-iron, more bar-iron, more rails, and more steel than in any previous year. The advance in prices during the year was also without precedent. To speak more specifically, the percentage of increase in prices in all lines, except perhaps in crucible steel, was greater in 1879 than in any preceding year, if allowance be made for the premium on gold during the war, the advance in 1879 being on a gold basis of values. The importations of pig-iron, old rails, and new iron and steel rails during the year were unexpectedly large, recalling our experience before the panic of 1873, while our importations of iron ore were not only exceptional in their magnitude, but phenomenal, amounting to about five times as many tons as were ever before imported in one year. But the most remarkable fact in connection with the history of the American iron trade for 1879 remains to be stated. Notwithstanding all the activity that has been mentioned, the demand for pig-iron, iron and steel rails, and iron ore was not met, and many orders have been carried over to the new year which consumers sought in vain to have filled in 1879. The business embraced in the orders which were necessarily deferred to the new year amounts to a very large percentage of the actual consumption of the old year. Such a sudden and powerful stimulus to the demand for iron and steel, and ore, following a period of great depression was not expected by any of our manufacturers, and to the excitement caused by the suddenness of this demand the rapid advance in prices is mainly due.

Turning from generals to particulars, we present below a careful estimate of the production in 1879 of pig-iron, iron rails, and steel rails, compared with the actual production of these articles in 1878; to which we have added the probable importations in 1879 of pig-iron, old rails, and other old iron for remanufacture, and new iron and steel rails, compared with actual importations in 1878. The tons used are gross tons of 2,240 pounds. We also add the production of the Lake Superior iron ore mines in 1878 and 1879, with the probable importations of iron ore in both years. No means exist for ascertaining the production of all the ore mines of the country, but it may be stated that the production of the important mines of Lake Champlain, New Jersey, and Missouri was greater in 1879 than in 1878.

ARTICLES.	1878.	1879.
	Gross tons.	Gross tons.
Pig-iron and old iron—		
Production of pig-iron ..	2,301,215	2,800,000
Importation of pig-iron ..	66,503	275,000
Importation of old rails and other old iron ..	5,558	175,000
Total ..	2,373,276	3,250,000
Rails—		
Production of iron rails ..	288,294	450,000
Production of steel rails ..	499,817	650,000
Importation of iron and steel rails ..	9	680,000
Total ..	788,120	1,160,000
Iron ores—		
Lake Superior production ..	1,125,231	1,350,000
Importation ..	31,400	300,000
Total ..	1,156,631	1,650,000

We have not ventured on an estimate of the production of rolled iron in 1879, but, excluding iron rails, which are noticed above, it was probably 20 per cent. greater than in

1878, when the total production, not including iron rails, was 1,109,612 gross tons.

In the table given above the probable consumption of pig-iron in 1879 is not fully indicated by the figures of production and importation; to these must be added a reduction during the year of the stocks of domestic pig-iron in the hands of the makers and unsold at the beginning of the year. These stocks amounted at that time to 513,004 gross tons. The quantity of unsold domestic pig-iron at the beginning of the new year can not be so great as it was a year ago.

In the following table we give the prices at Philadelphia and in Pennsylvania of various iron and steel products on the 1st of January, 1879, and the 1st of January, 1880, with the percentage of increase in the intervening year. The prices are fair average quotations.

ARTICLES.	Jan. 1, 1879.	Jan. 1, 1880.	Percentage of increase.
	Dols.	Dols.	
No. 1 anthracite foundry pig-iron in Philadelphia ..	17'00	35'00	106
Best refined bar iron in Philadelphia ..	42'56	71'68	68
Bessemer steel rails at works in Pennsylvania ..	42'00	70'00	67
Best iron rails in Philadelphia ..	34'00	57'00	68
Cut nails by the keg in Philadelphia ..	2'10	4'25	102
Old iron rails in Philadelphia ..	19'00	36'00	89
No. 1 wrought scrap in Philadelphia ..	20'00	34'00	70

Such a rapid rise in prices as is here shown we have already remarked has never before taken place in one year in this country, except during the war, but if allowance be made for the depreciation in the currency in that period the present rise is absolutely without parallel.

The year 1879 was also remarkable for the new impulse which it gave to the building of railroads. About 4000 miles were built during the year, against 2747 miles in 1878, 2177 miles in 1877, 2657 miles in 1876, and 1758 miles in 1875. The mileage of 1879 was equal to that of 1873, which was 4069 miles. The greatest mileage in any one year was in 1871, when 7608 miles were built. The increased demand for rails for new roads in 1879 was one of the leading causes of the revival in the American iron trade, but a more potent cause was the sudden demand last spring by existing roads for rails, cars, and locomotives, to meet the requirements of increased transportation of agricultural products and to compensate for the wear and tear of the hard times. The increased railway mileage of the year was expected, but the wild scramble by the old roads for new rails was not, and the rail mills of the country were placed at a disadvantage through no fault of their own. They had vainly urged the officers of many of the leading railroads to purchase rails in 1877 and in the first part of 1878, when prices were very low, and as a consequence of the refusal of these roads to give out orders the mills were compelled in those years to run but a part of their time. The railway officials not only missed their opportunity to buy rails at low prices, but they precipitated by the suddenness and magnitude of their demands last summer the excited condition of the market which still continues, and which all thoughtful business men deprecate.

The business of building iron ships did not improve in 1879, owing partly to the lack of encouragement by the General Government and partly to the high prices for iron and other materials. The New York elevated railways, which gave to the iron trade of the country a much-needed lift in 1878, were still further extended in 1879. The manufacture of steel-wire fencing was greatly extended during the year, about 20,000 tons of steel being consumed in this new industry. There was a large demand during the year for iron pipes and tanks for the Bradford and other oil regions.

The production of both anthracite and bituminous coal during 1879 was greater than in any previous year in our history. Very great activity prevailed in the Connellsville coke region during the last three quarters of the year; many new mines were opened and many new ovens were erected. The production of 1879 was almost double that of 1878. Prices of course advanced. In the anthracite region there was less excitement, and prices did not greatly advance, but the production was largely increased above the highest figures ever before attained. The total production, in which is included the consumption in the region as well as shipments, was over 26,000,000 tons. The best record ever before reached was in 1873, when 21,227,952 tons were produced. The production of 1878 was only 17,605,262 tons, all told. These figures we obtain from Mr. John H. Jones, and they may be accepted as reliable.

The large importations during 1879 of pig-iron, old iron, iron and steel rails, and iron ores will attract attention and are worthy of the most serious consideration. One incident of these importations should not be overlooked—they occurred mainly in the last six months of the year, and are therefore all the more suggestive. They should teach our manufacturers that the English policy of piling up iron in bad times to be prepared for good times is a safe policy to follow; that they should supply the home demand for iron products, and thus keep out foreign importations; and that it is the worst possible policy in a financial sense, and the worst possible statesmanship, to buy ores or any other raw material abroad when the undeveloped resources of such States as Michigan and Virginia could supply all wants. These importations teach still another lesson, and we hope that it may receive instant attention. When the tide in the present demand for iron and steel begins to ebb, as it must ebb some day, will it be safe in that day to have duties on foreign iron and steel lower than they now are? When orders again slacken and prices again fall in this country, prices abroad will also fall, and, if our tariff be lower than it is now,

the iron industry of this country, with high wages and high freights, will once more be crippled and helpless.

Experience has taught us that it is not safe to prophesy what any new year has in store for the American iron trade. We will, therefore, simply state what probably every person in the trade already knows, that more furnaces and mills will be running in 1880 than in 1879, and that, as a consequence, our iron and steel production in the new year will be greater than in the old year. After the 1st of April it will be fully equal to the demand in all lines. Whether prices will remain as high as they are, or go still higher, no man can find out, nor whether we will build more railroads in 1880 than in 1879. It seems certain that our importation of iron ore in 1880 will be larger than in 1879, large contracts having already been made. Probably 500,000 tons will be imported in 1880. We regret that this should ever have become necessary. Whether importations of iron and steel shall increase in the new year depends partly on the course of prices at home and partly on the action of the present Congress. The steel blooms bought during 1879, aggregating considerably less than 50,000 tons, have not yet arrived.—*Bulletin of the American Iron and Steel Association.*

NAVAL CONSTRUCTION IN 1877-78.

ON taking office, the present Secretary of the Admiralty insisted strongly on the necessity, not merely of building new ships to repair the annual waste of the Navy, but on a regular system of repairs, by which the existing fleet might be kept in a state of efficiency, ready for any emergency. Accordingly, in the report of Mr. Hamilton, the Accountant-General of the Navy, which is prefixed to the shipbuilding accounts of 1877-78, care is taken to distinguish between the sums spent upon construction and those devoted to repairs, and in a tabular form he compares the expenditure on each of these items over a period of nine years, distinguishing, in the case of building, between construction at the royal dockyards and at private yards, and in both cases showing separately the sums spent on ironclads and unarmoured ships respectively. The sums spent on construction are shown on the following table, but it is unnecessary for our purpose to distinguish between the dockyard and contract-built ships:—

	Ironclads.	Unarmoured.	Total.
1869-70 ..	£1,076,348	£310,699	£1,387,047
1870-71 ..	1,014,215	316,599	1,330,814
1871-72 ..	695,038	489,134	1,184,172
1872-73 ..	299,825	509,262	809,087
1873-74 ..	385,959	904,069	1,290,028
1874-75 ..	742,164	785,997	1,528,161
1875-76 ..	1,058,463	554,755	1,613,218
1876-77 ..	940,318	1,181,642	2,121,960
1877-78 ..	1,948,472	973,970	2,922,442

From this we see a steady decrease in the expenditure throughout the administration of the last Government, until, in a moment of alarm, and stimulated by the clamour raised against this policy in the public press and in Parliament, Mr. Goschen, in his last year of office, made an effort to stem the tide of neglect, raising the expenditure suddenly in one year from £800,087, to which it had fallen, to £1,290,028. Since that time it has steadily and even more rapidly increased, until in 1877-78 it rose to the exceptional height of £2,922,442. But, as we have seen, 1877-78 was a very exceptional year, and the large sum of £1,948,472 spent on ironclad construction includes the large sum paid for the purchase of ironclads building in private yards for foreign Governments. The total amount paid for the purchase of ships of different classes, as we learn from another part of Mr. Hamilton's report, amounted to £1,523,197, as shown in the following table:—

Belleisle, ironclad ..	£240,138	including armament.
Neptune ..	614,051	including armament and other stores.
Orion ..	126,825	including armament.
Superb ..	453,033	including stores but not armament.
Hucla, unarmoured ..	79,000	
Torpedo lighters and other boats ..	9,850	
Miscellaneous expenditure ..	300	
Total ..	£1,523,197	

The year 1877-78, however, was no exception to the almost invariable rule that the dockyards, from some cause or other, fail to accomplish the work allotted to them in the programme laid down in the Navy estimates. Comparing the anticipation with the result, Mr. Hamilton tells us that the performance fell short by 2188 tons of the promise, and that £60,318 less was actually paid as wages to men employed in shipbuilding than was voted for that purpose. As, however, the vote for dockyard wages did not show at the end of the year a surplus, but, on the contrary, a considerable deficiency, we may assume that the saving of wages arising from a deficiency of construction was absorbed and exceeded by the additional repairs that were undertaken. These repairs amounted, in the aggregate, to no less a sum than £1,069,425. In a similar tabular form, Mr. Hamilton shows the expenditure during the nine years ending with 1877-78, thus:—

	Ironclads.	Unarmoured.	Total.
1869-70 ..	£130,743	£446,549	£577,292
1870-71 ..	182,065	478,551	660,616
1871-72 ..	87,595	397,342	484,937
1872-73 ..	158,923	389,983	545,916
1873-74 ..	291,381	524,601	815,982
1874-75 ..	320,229	672,570	992,799
1875-76 ..	321,871	631,806	953,677
1876-77 ..	207,446	600,210	807,656
1877-78 ..	489,182	580,243	1,069,425

In 1871-72 the expenditure on this service reached its lowest ebb at £484,937, and the trifling addition of £60,000, in the following year is scarcely worth mention, but from

that time the increase has been maintained with tolerable regularity, never since then having fallen below £807,656.

In another table Mr. Hamilton gives for the same nine years the total direct expenditure upon ships as compared with the total sums voted to defray the expense of the dockyards, and for the purchase and manufacture of stores, and with the total amount of the Navy Votes. From this comparison we are able to see not only the proportion which the direct expenditure on ships bears to the totals of Vote 6 (the Dockyard Vote) and Vote 10 (that for stores and for payment to contractors for building ships and engines), but the correspondence between the increase or decrease upon these Votes, with the increase or decrease upon the aggregate Estimates for the year. This is an important fact, as proving that it is not merely the number of men, as we have been told in times past, that governs the amount of the Navy Estimates; but rather the variation in the expenditure on ships which produces the variation in the Estimates. It should be borne in mind that the figures we have hitherto quoted refer exclusively to what are known as the direct charges upon the ships; but under the present system of Admiralty accounts the cost of maintaining the dockyards, and the expense of dockyard salaries, &c., are added, in the shape of indirect or incidental charges, in order to arrive at the gross cost of a ship. From a table showing the total amounts paid during the seven years from 1871-72 to 1877-78, both for direct and indirect expenditure, we arrive at the very satisfactory conclusion that the large increase in direct expenditure has been accompanied by a relative decrease in the indirect charges—or, in other words, that the construction and repairs of ships have been carried on without any corresponding increase in the cost of dockyard plant and machinery or establishment charges. Thus, in 1871-72 the indirect expenditure was 26·12 per cent. of the direct charge; in 1872-73 it rose to 30·76 per cent.; in 1873-74 it was 22·50 per cent.; in 1874-75 it was 19·45 per cent.; in 1875-76, 20·65 per cent.; in 1876-77 only 17·47 per cent.; and in 1877-78 it reached the unprecedentedly low figure of 13·02 per cent. This is interesting, as showing the capacity of the dockyard establishments to turn out a very large quantity of work without any proportionate increase in the permanent staff of officials, and the comparative wastefulness of maintaining a large establishment of plant and machinery working far below its capabilities.

A few examples, taken from this report of the Accountant General of the Navy, of the cost of individual ships, are sufficient to dispel all ideas that may be entertained of the possibility of constructing really powerful and effective ships, whether armoured or unarmoured, or of maintaining the existing fleet in a state of efficiency, except at an enormous cost. The requirements of modern warfare are of the most expensive character, and the cost of the materials used in shipbuilding is now so much larger than it was formerly, that if the nation desires to possess a powerful fleet, it must face the fact that it has to pay heavily for it. One or two of these examples may be cited here. In a table showing the ships and vessels whose construction was proceeded with during the year, in which also the total amount already expended since they were first taken in hand is given, we are told that the *Dreadnought* and the *Inflexible*, which were at the close of the year completing for sea, had cost respectively £577,467, and £566,034, and *Temeraire*, which was still incomplete, had already absorbed £489,586. Turning to the unarmoured ships, we find the *Bacchante* debited with £229,240, and the *Buryatus*, still incomplete, with £215,949; while the *Iris* and *Mercury*, two despatch vessels, constructed especially with a view to attaining a high rate of speed, while yet incomplete, had had £188,471 and £158,278 respectively spent upon them. Of the ironclad ships repaired the *Monarch* took £79,972, the *Invincible* £74,433; the *Hercules* £67,409, and the *Iron Duke* £45,727; and the unarmoured *Tenedos* absorbed £27,855; the *Inconstant*, £24,133; the *Druid*, £20,637; and the *Enchantress*, £19,827.

MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

AT the meeting of the Manchester Scientific and Mechanical Society, held on Friday week, Mr. Bowes in the chair, a paper on "American and English Hardware" was read by Mr. F. Smith. A circular paper was read last winter by Mr. Smith, when he spoke strongly of the apathy and the want of inventive and progressive spirit which seemed to characterise the English manufacturer. Since then a number of samples of builders' hardware had been sent to him by both American and English makers, and some of these he laid before the meeting. After describing the various examples, in which he pointed out the superiority of the American over the English article, Mr. Smith said that as he had not a personal knowledge of the rules of the various trades unions in the lock districts, he was not prepared to assess the value of the statement made by some people to the effect that much of the inferiority of the English goods was to be attributed to the absurd and anti-progressive action of the unions. But he failed to see how they could be justly held responsible for inferior castings, bad japanning, and clumsy design. For a long time our manufacturers, having had command of both their own and foreign markets, had been masters of the situation, and the result had been, first, a laxity in the supervision of the processes of manufacture. So long as the article produced by the "garret master" brought profit to his principal, the clumsy, wasteful "rule-of-thumb" process by which it was produced was not considered, and if the late depression had given our manufacturers time to think, they might say, "Sweet are the uses of adversity." Secondly, this abundance of work, if he was rightly informed, had led in many cases to the buying up and suppressing of improvements; and, thirdly, this great demand had led manufacturers to lose sight of the quality of their goods, and to enter into competition with each other to produce a low-priced article. After condemning the pestilent fallacy which was often raised, "our customers demand these worthless goods," Mr. Smith said that if they wanted to get an idea of how our national prosperity was

influenced by the quality of the goods we manufactured they had only to consider the position held by certain firms. Why should a Chubb's lock or a Whitworth lathe command higher prices than even the good work of less-known firms? Simply because the name guaranteed the quality, and when the same could be said of English goods generally we should be in a fair way to "enjoy our own again." Another and most important factor in the sum of dead-weights under which we had to struggle was our absurd patent laws, and if our Legislature had set out with the intention of suppressing the inventive genius of the country they could not have succeeded more completely than they had done. In order that we might improve our goods it seemed to him that we must discard many of our old and obsolete patterns. We must adopt a method of founding which would secure a clean casting, we must copy the Americans in the employment of mechanics and artists, one to arrange the mechanical portions of the work and the other to design suitable and artistic forms. We must look far more to our reputation for good and honest work, and we must agitate for such an alteration of our patent laws as would place it in the power of the skilful artisan to protect the fruits of his brains at a reasonable cost. In conclusion, he believed that there was enterprise and skill sufficient among our workmen and manufacturers to enable us to recover much of our lost ground, and the samples of English goods which he had displayed that night showed a marked advance upon those of three or four years back, whilst the prices were low enough to secure a sale, although in some cases a better article could be produced at the same cost. A discussion followed the reading of the paper. The Chairman observed that there had been great room for improvement in this branch of trade for the last twenty years, and Mr. Smith had attributed this want of improvement to the right cause. This class of goods had not been made by mechanical men. One manufacturer got into a certain groove, and they would have kept much longer in that groove had it not been for the competition of America. He had not the slightest doubt we could produce these articles quite as cheap and as good in England as in America. In the way of castings, America could not surpass us, and it was only necessary that our manufacturers should get out of the old groove, and introduce scientific and mechanical motions into their productions to enable us to outstrip America. Mr. Corbett also thought one great fault had been that we had got too much into one groove.—Mr. McLeod was of opinion that the existence of store factories in every town was one reason why the Americans were able to turn out such good small castings.—Mr. Heys strongly condemned the want of intelligence displayed by English founders; there were one or two firms in England who could make good castings, but they were the exception. If we could only persuade our founders that they could improve on their existing processes we should have made a great step.—After some further discussion Mr. Smith replied, and the proceedings closed.

ILLUSTRATED SCIENTIFIC LITERATURE.—No. V.*

ELECTRICAL subjects being at the present moment of considerable interest, we proceed to lay some selections from the electrical section of Deschanel's *Natural Philosophy* before our readers.†

ELECTRICAL MACHINES.

"*Ramsden's Machine*.—The kind of machine most commonly employed at present is the plate-machine, invented by Ramsden about 1768, and only slightly changed and improved since.

"The most usual form of this machine is shown in fig. 350. It has a circular plate of glass, which turns on an axis supported by two wooden uprights. On each side of the plate, at the upper and lower parts of the uprights, are two cushions, which act as rubbers when the plate is turned. In front of the plate are two metallic conductors supported on glass legs, and terminating in branches, which are bent round the plate at the middle of its height, and are studded with points projecting towards it. The plate becomes charged with positive electricity by friction against the cushions, and gives off its electricity through the points to the two conductors, or, what amounts to the same thing, the conductors give off negative electricity through the points to the positively-electrified plate. In order to avoid loss of electricity from that portion of the plate which is passing from the cushions to the points, sector-shaped pieces of oiled silk are placed so as to cover it on both sides. The cushions become negatively electrified by the friction; and the machine will not continue working unless this negative electricity is allowed to escape. The cushions are accordingly connected with the earth by means of metal plates let into their supports."

"*Holtz's Machine*.—The inventor has recently introduced a modified form of his machine. The plates are placed horizontally (fig. 357), they have neither windows nor armatures, and they both revolve, but in opposite directions. Two conductors furnished with rows of points are placed

* This series was begun in No. 341 of *IRON*, and was thus introduced:—

Under the present heading we hope to bring before our readers from time to time samples of the contemporary scientific literature of Europe taken from the works themselves. These extracts we should give in place of the ordinary notice, which, if given in the common way, in our column of Reviews, would necessarily be critical in character. Our endeavour is thus to convey to our readers some idea of new books, by a more or less perfect sampling of them. The original drawings will be given, and will, of course, be evident that in one essential particular our "sampling" will sometimes fall short of the original. In the printing of engravings in book form the manipulations necessary for bringing out their full effects are much more possible than when they are placed in the columns of a newspaper; and reader and publisher will alike understand that we cannot pretend to effects in the rendering of illustrations which claim to be more than approximate. Still, we hope to be so largely useful to the book-buying public as to be justified in reckoning on its most favourable construction of our efforts.

† Deschanel's *Natural Philosophy*, translated and edited, with extensive additions by J. D. Everett, M.A., D.C.L., F.R.S. Part III. Electricity and Magnetism. Illustrated by 411 engravings on wood, and one coloured plate. London: Blackie and Son, Old Bailey, E.C. 1879.

above the upper plate at the extremities of one diameter, and two others below the lower plate at the extremities of another diameter perpendicular to the former. Each of the upper conductors is connected with one of the lower, so that there are virtually only two conductors. In starting the machine, a sector of electrified vulcanite is held over the upper plate, opposite one of the lower combs. When the machine has been turned for a few seconds, the sector may be removed, and a continual discharge of sparks takes place between the two knobs which are connected with the two conducting systems. Frequently, as in the figure, a comb is placed above, opposite to the lower comb, and this arrangement appears to increase the efficiency of the machine. The action of this form of the machine also depends upon induction, the conductors performing the duty of armatures as well."

VARIOUS EXPERIMENTS WITH THE ELECTRICAL MACHINE.

"*Brush*.—When a powerful machine is working in a very dry atmosphere, the rubbers being in good order, and the machine being turned rapidly, a characteristic sound is heard, which is an indication of continuous discharge into the air. In the dark, luminous appearances called *brushes* are seen on the projecting parts of the conductors. They may be rendered very conspicuous by presenting a large conducting surface at a distance a little too great for a spark to pass. It will then be observed that the brush consists (fig. 363) of a short foot-stalk, with a multitude of rays diverging from it like a fan, and with other smaller ramifications proceeding from these. Positive electricity gives larger and finer brushes than negative. We may add, that, when the machine is working well, brilliant sparks continually leap across the plate, consisting of discharges between the cushions and the nearest part of the conductor. The conductor itself is also surrounded with luminosity. In the dark, the brilliant spectacle presented by these combined appearances, with the continual crackling which accompanies them, is very impressive, and furnished an inexhaustible subject of curiosity to the electricians of last century."

"*Chemical Properties of the Spark*.—The electric spark is able to produce very important chemical effects. When it occurs in an explosive mixture of two parts of hydrogen with one of oxygen, it causes these gases instantly to combine. This experiment is usually shown by means of Volta's pistol (fig. 375), which is a metallic vessel, containing the mixture, and closed by a cork. Through one side passes an insulated rod with a knob at each end, that at the inner end being at a short distance from the opposite side of the vessel, so that, if a spark is given to the exterior knob, a spark also passes in the interior, and inflames the mixture. This effect is accompanied by a violent detonation, and the cork is projected to a distance."

"*Wind from Points*.—If a metallic rod terminating in a point be attached to the conductor of the electrical machine, electricity escapes in large quantity from the point, which, accordingly, when viewed in the dark, is seen to be crowned with a tuft of light. A layer of air in front of the point is electrified by contact, and then repelled, to make way for other portions of air, which are in their turn repelled. A continuous current of air is thus kept up, which is quite perceptible to the hand, and produces a very visible effect on the flame of a taper (fig. 376)."

"*Hughes' Printing Telegraph*.—The employment of Morse's alphabet requires on the average about three currents to be sent per letter. The extension of telegraphic service has stimulated the industry of inventors to devise means for obtaining more rapid transmission. Hughes, about 1859, invented a system which requires only one current to be sent for each letter, and which, accordingly, sends messages in about one third of the time required by Morse's method. Hughes' machine also prints its messages in Roman characters on a strip of paper. These advantages, are, however, obtained at the expense of extreme complexity in the apparatus employed. It is only fit for the use of skilled hands; but it is extensively employed on important lines of telegraph. We will proceed to indicate the fundamental arrangements of this marvellous piece of ingenuity.

"Fig. 527 is a general view of the machine. It is propelled by powerful clockwork, with a driving weight of 120 lb., and with a regulator consisting of a vibrating spring, *l*, acting upon a scape wheel. A travelling weight on the spring can be moved towards either end to regulate the quickness of the vibrations. The clockwork drives three shafts or axes: (1) the type-shaft, so called because it carries at its extremity the type-wheel, *T*, which has the letters of the alphabet engraved in relief on its circumference at equal distances, except that a blank space occurs at one place instead of a letter; (2) the printing-shaft, which turns much faster than the type-shaft, making sometimes 700 revolutions per minute, and carrying the fly-wheel, *V*. These two axes are horizontal, and are separately represented in fig. 528; (3) a vertical shaft, *a*, having the same velocity as the type wheel, which drives it by means of bevel-wheels.

"This vertical shaft consists of two metallic portions, insulated from each other by an ivory connecting-piece. In the position represented in fig. 528, these two metallic parts are electrically connected by means of the screw, *V*, but they will be disconnected by raising the movable piece, *v*.

"The revolving arm composed of the pieces *v* and *v'* is called the *chariot*. It revolves with the vertical shaft, and travels over a disc, *D*, pierced with as many holes as there are letters on the type-wheel, these holes being ranged in a circle round the base of the shaft, and at such a distance from the shaft that the extremity of the chariot passes exactly over them. In these holes are the upper ends of a set of pins, *g*, which are raised by putting down a set of keys, *BN*, resembling those of a piano. When the chariot passes over a pin which is thus raised, the piece *v* is lifted away from *v'*, and the current from the battery, which previously passed from the pin through *v* and *v'* to the earth, is now cut off from *v'*, and passes through *v* to the electro-magnet, and thence to the line-wire. This is the process for sending signals. We will now explain how a current thus sent causes a letter to be printed by the type-wheels at both the sending and receiving stations, the sending and receiving instruments being precisely alike.

"The current traverses the coils of an electro-magnet *E* (fig. 527), beneath which is a permanent steel horse-shoe magnet, having its poles in contact with the soft-iron cores

ILLUSTRATED SCIENTIFIC LITERATURE.

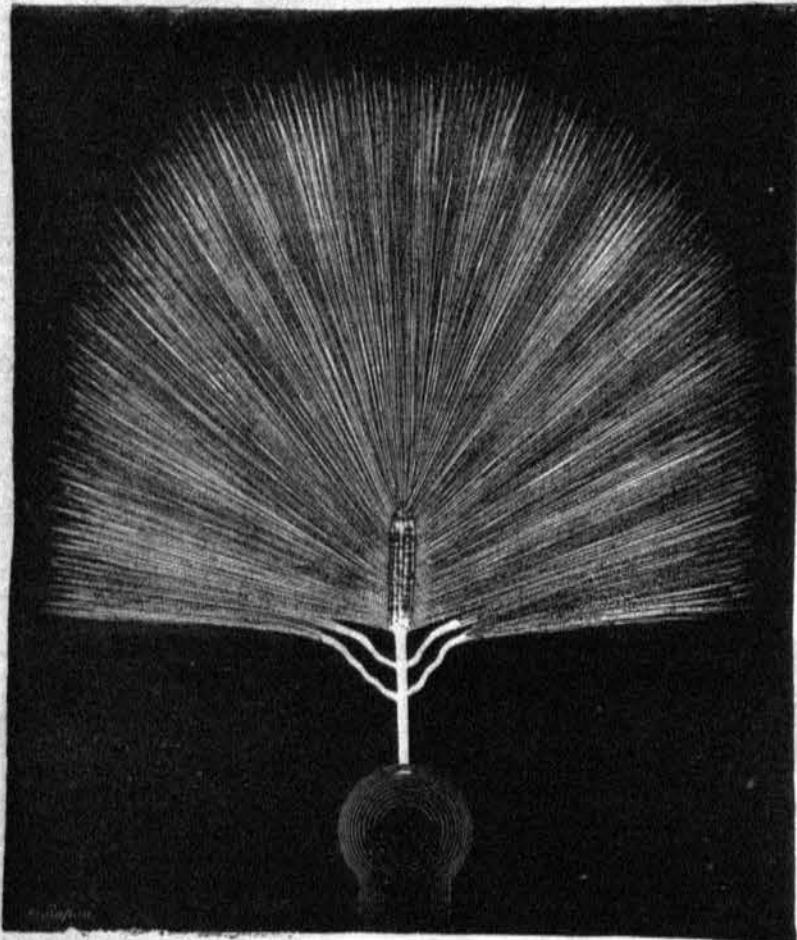


FIG. 363.—Electric Brush.

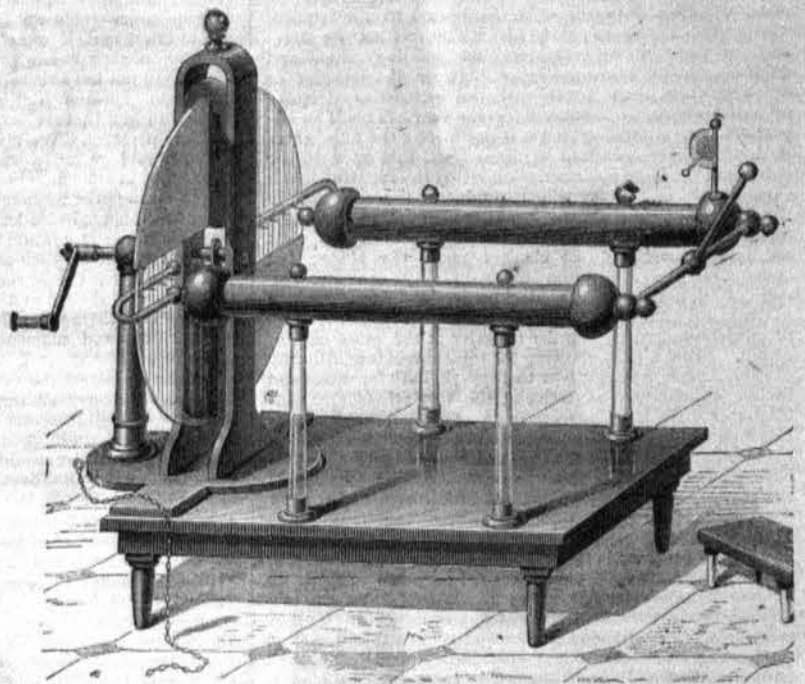


FIG. 350.—Ramsden's Electrical Machine.

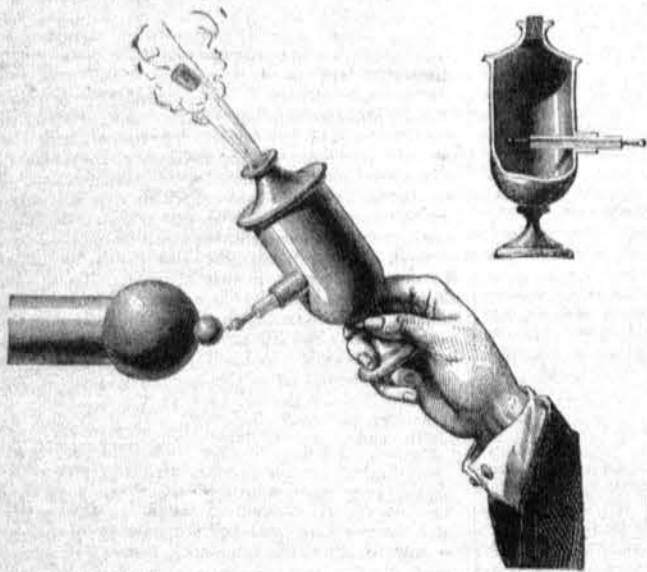


FIG. 375.—Volta's Pistol.

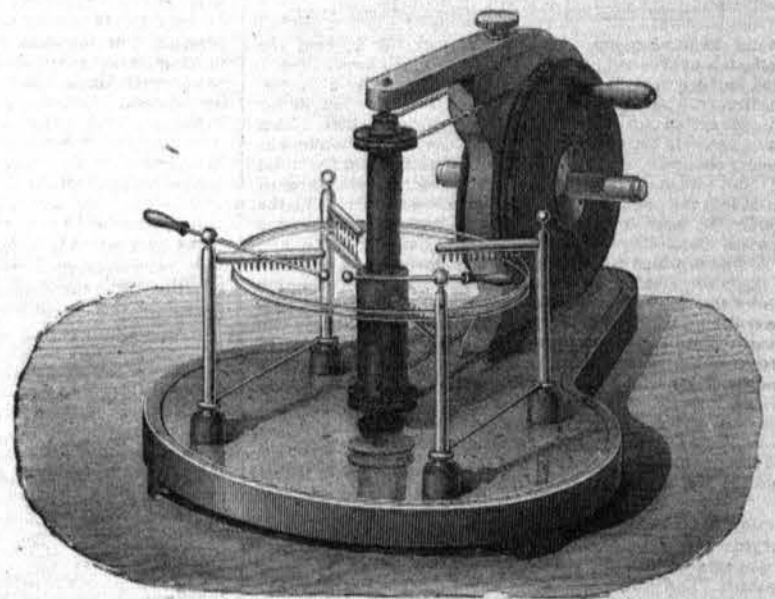


FIG. 357.—Holtz's Machine with Horizontal Plates.

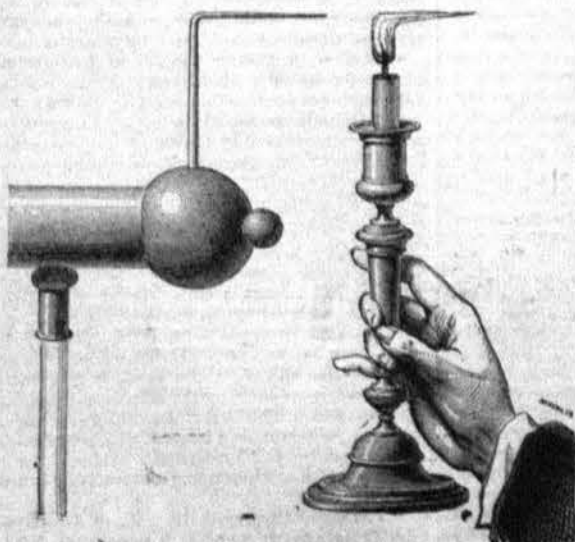


FIG. 376.—Wind from Points.

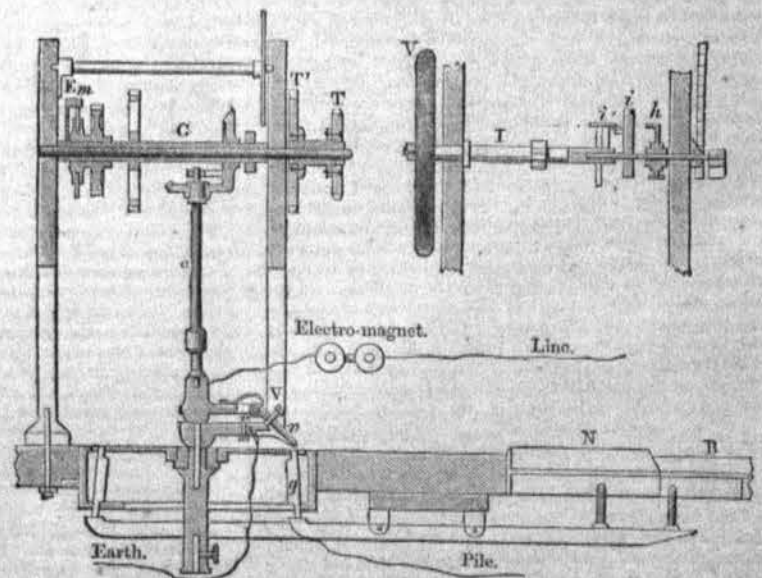


FIG. 528.—Type Shaft and Printing Shaft.

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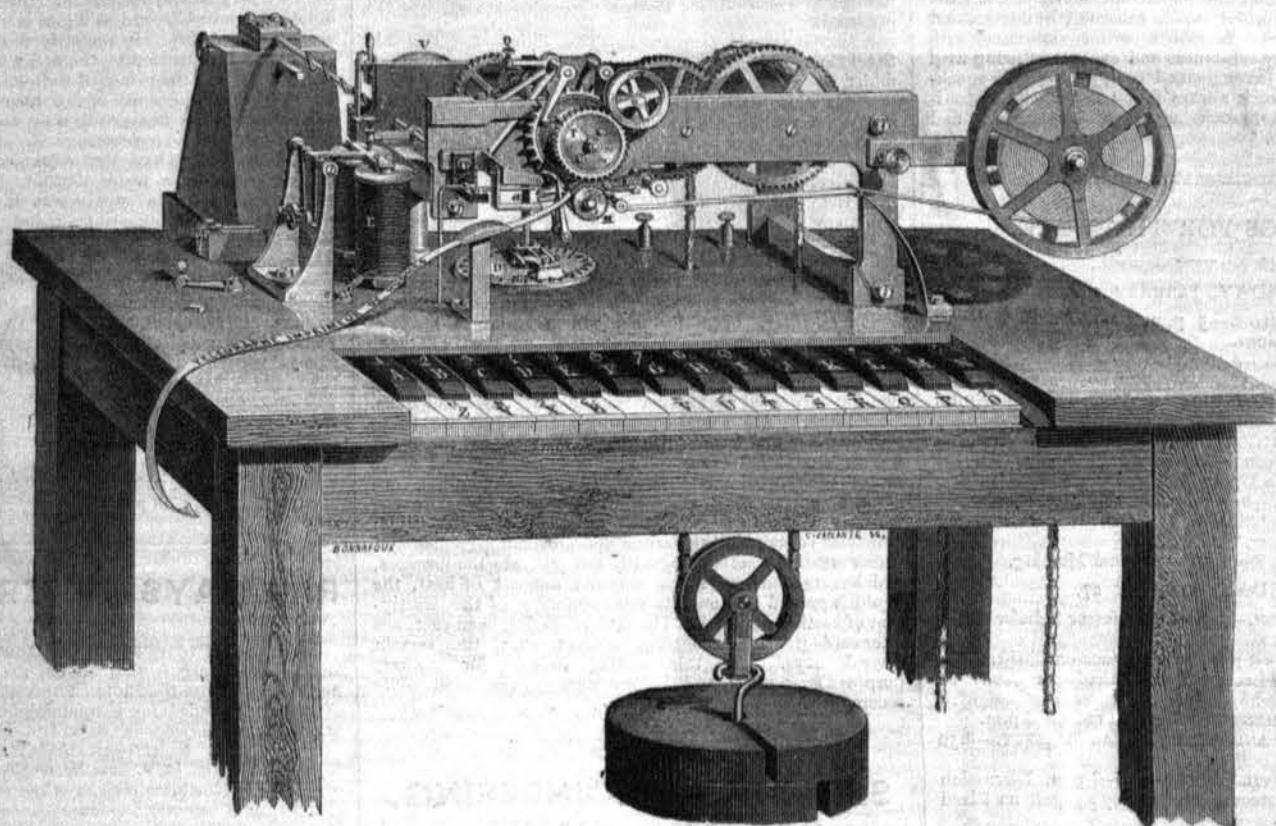


FIG. 527.—Hughes' Printing Telegraph.

of the electro-magnet. When no current is passing, the influence of the steel renders these cores temporary magnets, and enables them to hold the moveable armature, *a*, against the force of an opposing spring. The current is in such a direction that tends to reverse the magnetism induced by the steel. It is not necessary, however, that it should be strong enough to produce an actual reversal, but merely that it should weaken the induced magnetism of cores sufficiently to enable the opposing spring to overpower them. This is one of the most original parts of Hughes' apparatus, and is a main cause of its extreme sensibility.

"The printing-shaft consists of two portions, one of which I (fig. 528), carries the fly-wheel, *V*, and turns uniformly under the action of the clock movement; the other which is next the front of the machine, remains at rest when no current is passing; but when the armature of the magnet rises, the two parts of the shaft become locked together by means of ratchet-wheel and click *i* *i*."

SCIENCE AND ART.

THE ROYAL AGRICULTURAL SOCIETY.—The official list of prizes for agricultural implements, machinery, &c., to be competed for at the forthcoming Carlisle Show, has now been issued. The judges are empowered to award gold and silver medals to any implements and machines for the cultivation of the land by steam or other mechanical force which, in the opinion of the stewards and judges, are new inventions, and have not been previously submitted to trial by the society. The gold medals will be awarded only in cases of special merit, and for implements and machinery likely to be practically useful. The Society also offer ten silver medals, the award of which the judges may recommend in cases of sufficient merit in new implements. The judges are further empowered to make special awards of medals for efficient modes of guarding or shielding machinery, especially when working by steam, from contact with persons immediately engaged in attending to such machinery while at work. With a view of bringing the machinery yard within moderate compass, it has been decided that the maximum size of stands be 150 feet, and that the charge for space in the miscellaneous department be double that hitherto in force.

THE STATISTICAL SOCIETY.—At a meeting of this Society, held on Tuesday evening, at King's College, Sir Rawson W. Rawson in the chair, a paper, entitled "The Strikes of the Past Ten Years," was read by Mr. G. Phillips Bevan. The paper, after adverting to the difficulty of getting at reliable information about the cause or results of strikes, stated that the total number of strikes from 1870 to 1879 was 2352. Demands for increase of wages or resistance to a reduction were the causes of nine-tenths of the trade quarrels, the remainder being attributable to various sources. The persistence with which the battles were fought was remarkable, many a strike having lasted the best part of a year, with the result that the men had gone back on less than the original terms. After analysing the list of strikes above mentioned, Mr. Bevan remarked that it was difficult to propose a remedy, so many had been tried and failed. Arbitration had been but a doubtful remedy, and had been played so fast and loose with that it had lost all dignity, and neither masters nor men had faith in it. On the other hand, he recommended making the experiment of the *Conseils de Prud'hommes* as they exist in France and Belgium. In France, 26,000 cases on an average were

annually heard by these councils, and a reconciliation effected in about 1800, or 71 per cent. In Belgium, in 1877, out of 3854 cases heard, 2866 were conciliated. Why, asked Mr. Bevan, should not similar legalised institutions be founded in this country, in the shape of twelve local industrial boards for the twelve great industrial counties? Each board should consist of an equal number; ten each of employers and employed should sit as often as required, and the expenses be met by a scale of fees, based upon the amount in dispute. A superior board of appeal might be constituted for the whole kingdom, consisting of twenty-four members—one employer and one employed out of each district board. The decisions of the board should carry legal weight, and should be enforced like the orders of a judge or a magistrate. If the case were decided in a way unpalatable to the men, they could leave the work, and let the masters fill up their places as best they could; but the least attempt at coercion, either moral or physical, should be stringently punished. In the discussion which ensued, Mr. Bunney, of Newcastle, considered that strikes could never be prevented, but he advocated the bringing of masters and men together as much as possible to discuss their different propositions among themselves without the interference of outsiders.—Mr. Alsager H. Hill, Mr. G. Howell, and others took part in the discussion, and a vote of thanks to Mr. Bevan for his paper closed the proceedings.

PROPOSED NEW YORK EXHIBITION.—The Hon. John Sherman, Secretary of the United States' Treasury, had a conference just before Christmas with the executive committee of the "World's Fair" proposed to be held in New York in 1883. After hearing Mr. Henry Stebbins, chairman of the committee, and the secretary, Mr. W. H. C. Price, Secretary Sherman made a speech in which he said:—"New York is the natural place in this country for one of these exhibitions, and this country of ours is peculiarly adapted to such a fair, because our productions are more varied than those of any other nation. Our population is greater than that of any civilised Christian country, with the exception of Russia. We have already surpassed the population of the old Empire of France and the great German Empire of modern times. When you compare our productions with those of other countries it will be seen that there is a still greater diversity. We surpass them in every respect. We produce more gold and silver than all the European countries. Our plains are already beginning to send forth their products, and our capacity for raising cattle is not equalled by any country except Brazil, and we can do it cheaper than they. By our cheap prices, by the savings and economy made necessary by five years of hard times, we are rivalling all the countries of Europe. We make cotton and woollen goods, and even compete with them in the manufacture of silks. Our coalfields are unrivalled. England used to boast that with her coal she could control all the manufactures of the world, and so she did; but now we are competing with her in supplying the world with fuel. Our means of transportation are increased. It is now shown that wheat may be carried with reasonable profit at the rate of 3c. per ton per mile. We have now over 80,000 miles of railway, bringing the productions of every port and of every country to New York. Here these roads must have their outlet. We may almost hope to see the day when New York will be the empire city of the world, when the finances of all nations shall seek through her their exchange. Even now it is rapidly becoming so. San Francisco and the West are becoming the clearing-house for the trade of China and Japan, and California and San Francisco must necessarily

make their exchanges with New York. I believe that in the future the money power of the world will be here in this city of New York. There is nothing which we may not hope for in this country of ours. As a matter of course, I can have little influence in your movements or success, and can only say that I wish you to go ahead with all the energy that you carry into any other enterprise, and let us have the biggest show in the world."

COAL.—On Saturday afternoon Professor T. Rupert Jones, F.R.S., delivered the first of a short course of three illustrated lectures at the Royal Institution, Albemarle-street, Piccadilly, on "Coal." He could not promise, he said, to bring to the knowledge of his audience anything very new; all he contemplated was to present in one view the facts bearing on the subject so far as they had been ascertained by the latest scientific researches. He began by describing a lump of common household coal. It presented a seamy structure, composed of parallel plates. There was a bright, shiny face, contact with which did not soil the hands, as happened when we touched it in the transverse direction, where, moreover, the surface was of a decidedly dull appearance. In trying to break the coal ignorant people were wont to strike it on the bright side and found the task troublesome, while the intelligent easily separate the plates by directing their blows to the dull surface. Of course the plates came asunder more readily in proportion as they become heated. Some kinds of coal were very brassy, being streaked with flakes of a metallic lustre, often mixed with others of a white colour. The latter were sulphate of lime, and the brassy-looking flakes were sulphuret of iron, commonly called iron pyrites. Other impurities in coal were noticed, such as those commonly but improperly called "slates," which were rather of a clayey nature, although the admixture of clay was not enough to allow of their being baked into porcelain. No kind of coal was to be judged by its appearance only; the fiery trial was the sole true test. The lecturer exhibited two sorts of coal from Tasmania, which looked very unlike those we are all familiar with, but answered their purpose very well. He showed also specimens of bitumen from Trinidad, which, as was explained, had been greatly changed by contact with a lower stratum of volcanic coal. Having mentioned granulated coal, he described anthracite, a highly bituminised kind of coal, which was smokeless. Albertite, so named after Albert county, in New Brunswick, where it was found, rivalled anthracite in brightness and general appearance, but was of quite a different nature. For the purpose of determining of what coal consists, it was macerated for several weeks in a solution of caustic potash, after which it was found to be of a leathery consistency, the mass being in layers which might be lifted up one by one, and were like layers of compressed bark or wood. Another process was boiling in nitric acid. The microscope revealed that the layers were really woody tissue, half-a-dozen forms of which, as found in coal thus treated, were shown by the lecturer on a diagram. Whole plants with stems many feet long had been handed over to botanists by the chemists, and had been recognised, by Williamson and others, as conifers, &c., of extinct species. Diagrams exhibited branches of these fossil trees, and drawings of *lycopodium* and *equisetum* were handed round among the audience, as well as other depicting *lepidostrobus* with its microspores and *Bowmanites* with its microspores. These spores, lesser and larger, played a great part in the history of coal, said the lecturer, as he held up a piece of coal picked out of a cellar that morning and presenting "lovely little bits of *lepidodendron*" marked distinctly upon

it. How the pollen-showers from the conifers and the germs scattered by mosses and other cryptogams helped in the formation of coal was graphically illustrated by the analogy of the evergreen jungles in the Eastern Archipelago, with their luxuriant vegetation. All they knew bore out the definitions of coal given by Dr. Redfern and Professor Jukes. The former said that under that name "those substances must be comprised which consisted of compressed and chemically altered vegetable matter associated with more or less of earthy substances and capable of being used as fuel." Professor Jukes defined coal, geologically speaking, as "a stratified rock always found in beds inter-stratified with other rocks, such as clays, sandstones, and occasionally limestone."

MEETINGS FOR THE WEEK.

MONDAY, JANUARY 26.

LONDON INSTITUTION.—5 p.m. Mr. E. B. Tylor on the History of Inventions.
MEDICAL SOCIETY.—8.30 p.m.
INSTITUTE OF ACTUARIES.—7 p.m.
ROYAL INSTITUTE OF BRITISH ARCHITECTS.—8 p.m. Mr. Porter on Architectural Competitions.
ROYAL GEOGRAPHICAL SOCIETY.—8.30 p.m. Dr. Emil Holub, A Journey Through Central South Africa, from the Diamond Fields to the Upper Zambesi.
ROYAL ACADEMY.—8 p.m. Mr. Britton Riviere on Truth in Art in its Relation to the Old Masters and the Student's own Character.
ENGLISH DIALECT SOCIETY.—Annual Meeting.

TUESDAY, JANUARY 27.

ROYAL INSTITUTION.—3 p.m. Professor Schafer on the Physiology of Muscle.
MANSION HOUSE.—3 p.m. Conference on Thrift.
GRESHAM HALL.—Lecture 6 p.m. Professor Abdy on Law.
WEST LONDON SCIENTIFIC ASSOCIATION.—8 p.m.
ROYAL MEDICAL AND CHIRURGICAL SOCIETY.—8.30 p.m.
INSTITUTION OF CIVIL ENGINEERS.—8 p.m. Discussion on Messrs. Vernon Harcourt and Buckley's papers on Fixed and Movable Weirs.
ANTHROPOLOGICAL SOCIETY.—8 p.m. Anniversary.

WEDNESDAY, JANUARY 28.

MANSION HOUSE, 3 p.m.—Meeting respecting a New Arctic Expedition.
HUNTERIAN SOCIETY, 8 p.m.
GRESHAM HALL.—Lecture, 6 p.m., Professor Abdy, On Law.
SOCIETY OF TELEGRAPH ENGINEERS.—8 p.m.
SOCIETY OF ARTS, 8 p.m.—Mr. William Paul, On the Future of Epping Forest.

THURSDAY, JANUARY 29.

ROYAL INSTITUTION.—3 p.m. Professor Dewar on Recent Chemical Progress.
LONDON INSTITUTION.—7 p.m. Mr. H. B. Wheatley on Two Centuries of Shakespearean Acting.
PHILOSOPHICAL CLUB.—6 p.m.
GRESHAM HALL.—Lecture, 6 p.m. Professor Abdy on Law.
SOCIETY OF ANTIQUARIES.—8.30 p.m.
ROYAL SOCIETY.—8.30 p.m.
ROYAL ACADEMY.—8 p.m. Mr. E. M. Barry on Architectural Ornament.
SOCIETY FOR ENCOURAGEMENT OF THE FINE ARTS.—8 p.m. Mr. J. W. Bradley on Book Decoration.

FRIDAY, JANUARY 30.

INSTITUTE OF BANKERS.—6 p.m.
CITY OF LONDON COLLEGE.—Dr. N. Heinemann, on Political Economy. Wages.
GRESHAM HALL.—6 p.m. Lecture. Professor on Abdy on Law.
ARCHITECTURAL ASSOCIATION.—7.30 p.m. Mr. W. H. Brewer on the Domestic and Civil Architecture of Germany, 1500-1700.
ROYAL INSTITUTION.—8 p.m., Weekly Meeting; 9 p.m., Professor John Marshall on the Proportions of the Human Figure.
SOCIETY OF ARTS.—8 p.m. Indian Section. Colonel G. B. Melleson on Herat.

SATURDAY, JANUARY 31.

ROYAL INSTITUTION.—3 p.m. Professor Rupert Jones, on Coal.

MINERALOGY AND MINING.

MALLEABLE BRONZE.—M. Dronier has patented in Germany a process for rendering bronze as malleable as copper. About 1 per cent. of mercury is added to the tin in a warm state, and this is then mixed with the melted copper.

A NEW TEST FOR FIRE-DAMP.—On Wednesday night Professor Forbes, of Anderson's College, Glasgow, announced to the Glasgow Philosophical Society the invention of an apparatus for accurately measuring the presence of fire-damp in mines. The variation from accuracy was only one-half per cent. He had made the experiments with Mr. Young, the discoverer of paraffin. The apparatus, by the aid of a phosphorescent dial, can be introduced where safety lamps cannot be used.

DESTRUCTIVE COLLIERY ACCIDENT.—A fearful colliery explosion occurred on Wednesday morning in the Fair Lady Pit of the Crewe Coal and Iron Company, between Newcastle-under-Lyme and Crewe. Nearly seventy men went down into the Banbury seam, and about half-past eight a very loud report was heard. As soon as practicable a descent was made, when the worst fears were found to be realised. A few men were found alive, but even these were so fearfully burnt and injured that small hopes of their

ultimate recovery are entertained. As the bodies were brought to the bank they were received with heartrending cries from the women and others surrounding the-pit. The total number of deaths up to Wednesday night was over sixty. The pit is the same as that in which eight men were killed a few months ago, the seam itself being identical with the one in which all the great Staffordshire explosions have occurred.

NEW GLASGOW INDUSTRY.—The Caledonian Crucible Steel Company have just inaugurated a new industry in our midst, their first casting having been very successfully made one day this week. The event was one of considerable interest, for while mild steel for shipbuilding purposes is extensively made in the West of Scotland, this, we believe, is the first attempt that has been made in Glasgow to produce steel of the crucible description. Sheffield has long been the great centre for producing this kind of material, and many difficulties stood in the way of attempting to make it in Glasgow, one obstacle being the conservative spirit manifested by the workmen in checking attempts to spread the *modus operandi* of the trade beyond the precincts of the great cutlery town. The newly-formed company have, however, been fortunate in securing a staff of Sheffield workmen and in booking orders that will keep them fully employed for some time. The works of the company are situated in Washington Street, and were at one time occupied by Messrs. Walter Macfarlane and Sons. Nine furnaces are now in operation, but others are being rapidly constructed, and when these are completed there will be, in all, fifty furnaces. The first casting was made under the superintendence of Mr. T. Lawrence, one of the partners of the company, and the process, which is the old cast-steel one, may be briefly indicated. Crucibles containing the various mixtures and ingredients of which crucible steel is composed, are put into the furnaces, and having undergone the required amount of heat, the liquid is poured into moulds representative of the description of casting required. The articles having been cast, are afterwards put into annealing furnaces, where they remain several days. At this casting, wheels for colliery purposes were made, and the operation was very successfully accomplished.—*Glasgow Herald*.

SANITARY ENGINEERING, GAS AND WATER.

THE WATER COMPANIES AND THE GOVERNMENT.—In view of the early acquisition by the Government of the rights and interests of the London Water Companies, the announcement of the forthcoming issue of £50,000 of new capital by the Grand Junction Waterworks Company becomes of special interest. It will take the form of a £50 ordinary share, bearing interest at the rate of 7 per cent. per annum, and is the first portion of new capital authorised under the Company's Act of 1878. The mode of issue is one which highly recommends itself. The shares were put up by public auction at Cannon Street Hotel, London, on the 22nd inst., the sale being conducted by Messrs. Edwin Fox and Bonfield.

LIVERPOOL WATER SCHEME.—In fulfilment of the provisions of the Borough Funds Act, the Liverpool Town Council had a special meeting, on Wednesday, to confirm their resolution (adopted by a clear majority of the whole Council) in favour of the Vyrnwy water scheme, which has been endorsed by a poll of the ratepayers. A motion of confirmation was adopted by 39 votes to 8. It was originally designed to seek powers for only the first instalment of the project, but the Corporation have since been advised that the better policy is to seek the full powers at once, and have only one contest with the "interests" instead of several. A clause in the Bill gives £3,250,000 as the estimated cost of the whole scheme for producing 40,000,000 gallons of water per day.

DUST WORKERS.—The prevalence of phthisis among artisans who are engaged in dusty occupations is well shown in a series of observations made in the hospitals at Breslau and Würzburg, the percentage of cases being classified as follows:—Of those who work in metallic dust, the percentage was—needle polishers, 69.6; file cutters, 62.2; lithographers, 48.5; sieve makers, 42.1; grinders, 40.4; compositors, 36.9; watchmakers, 35.5; type-founders, 34.9; engravers, 26.3; dyers, 25; varnishers, 25; painters, 24.5; printers, 21.6; belt-makers, 19.7; tinkers, 14.1. Of those who work in mineral dust—flint-workers, 80; grindstone makers, 40; stone cutters, 36.4; plasterers, 19; porcelain makers, 16; potters, 14.7; carpenters, 14.4; masons, 12.9; diamond cutters, 9; cement makers, 8.10. Of those who work in vegetable dust—cigar makers, 36.9; weavers, 15; rope makers, 18.9; millers, 10.9; bakers, 7; chimney-sweepers, 6.5; coalminers, 0.8. Of those who work in animal dust—brush makers, 49.1; hair-workers, 32.1; upholsterers, 25.9; fellmongers, 23.2; turners, 16.2; hatters, 15.5; button makers, 10. Of those who work in mixed dust—glass cutters, 35; glass makers, 17.8; labourers, 15.1.

THE CONTROL OF NOXIOUS VAPOURS.—The annual meeting of the subscribers to the Manchester Association for Controlling the Escape of Noxious Vapours and Fluids was held on Friday last week, at the offices, 100, King Street, Manchester, Mr. Robert Phillips presiding. The report presented by Mr. Francis Greg, the hon. sec., stated that the committee were satisfied with the Bill introduced in the House of Commons by Mr. Selater-Booth, to provide for the more effectual condensation of noxious and offensive gases in alkali and other works. A petition was presented in favour of the Bill. Amendments were also agreed upon, which Mr. Hardecastle, M.P., kindly undertook to take charge of when the Bill came to be discussed in the committee of the House. A letter was addressed to the mayors of a number of towns, stating that Mr. Selater-Booth's Act was withdrawn, and pointing out that it was clearly of importance to corporations to possess the power of protecting their suburbs and public parks from the evil of noxious vapours. There was every reason to hope that the Bill would be again introduced next session. The total income, including the balance at the beginning of the year, was £129,

and the balance in hand at present is £31. On the motion of the chairman, seconded by the Rev. Canon Woodhouse, the report was adopted; and the officers for the ensuing year were appointed, on the proposition of Mr. J. G. Cooper, seconded by Dr. Samuelson.

CARLUKE WATER WORKS.—Last week the new water supply was turned on at Carlisle. Hitherto the water has been obtained from wells, and as it rose in a limestone formation it was hard in quality. In quantity it was inadequate, and to add to the inconvenience, the wells were private property. Some years ago the principal well was drained by the sinking of a pit to the south of the town. During one or two of the dry seasons households were restricted to one service of water daily. Four years ago the Parochial Board made a vigorous effort to have the matter remedied. The village was formed into a water district; several places in the vicinity from which a supply was likely to be got were examined, and certain springs, rising in old red sandstone some four miles from Carlisle, were ultimately fixed upon. The work has been completed in a satisfactory manner. The scheme embraces seven miles of pipes, 800 yards of a tunnel, with a built clear-water cistern holding 85,000 gallons. Over the clear water cistern there is a substantial house with roof and purlins, supported by malleable iron principals. There are twenty-five wells to supply the town, but great numbers have made house connections. The probable estimate (including house over cistern, land, and way-leave) was about £6600; but owing to the difficulties met with in the tunnel contract, the actual cost is expected to be about £7300. The population is 3800, with a rental of £8700, and the assessment is expected to be about 11d. per £1 on net rental.

RAILWAYS & TRAMWAYS.

REPORTED PROJECT FOR A RAILWAY TO CABUL.—It is stated from Glasgow that an engineering firm in Scotland had received from the Indian authorities an order for a reach of railway intended for a mountainous country, and that it was to Cabul the line was to be laid down.

THE GREAT NORTHERN RAILWAY.—Mr. Christopher Beckett Denison, M.P., has been elected deputy-chairman of the Great Northern Railway Company in place of Lord Colville, who recently, in consequence of the death of the late Colonel Duncombe, succeeded to the chair.

THE MANAGER OF THE MIDLAND RAILWAY.—It is stated, that owing to continued ill-health, Mr. Allport has resigned his position as general manager of the Midland Railway, but it is understood that he will be placed upon the directorate if he feels himself able to serve there.

NEW CENTRAL STATION AT ALTRINCHAM.—It is stated that the Manchester, South Junction, and Altrincham Railway Company are about to expend the sum of £20,000 in the erection of a new central station at Altrincham and the works connected therewith. The result will be the abolition of the present Altrincham and Bowden stations, which are about half a mile apart.

ANOTHER ACCIDENT AT THE SEVERN TUNNEL.—A fortnight ago the breakdown of one of the enormous Cornish pumps fixed at the Severn Tunnel works to reduce the volume of water that has entered the shaft through the bursting of a spring into the heading was reported. On Friday, last week, another of the pumps broke, and consequently only one remains in use. The water, which had been reduced to 130 feet, has again reached 170 feet. A much larger pump is in course of construction, but some weeks must elapse before it can be fixed.

NEW LINES.—The Midland Railway Company is about to open its new line between Nottingham and Melton Mowbray. The line has been already inspected by Major Marindin on the part of the Board of Trade.—An extension of the Yarmouth and North Norfolk Railway, from Martham to Catfield, had just been opened for traffic, having been previously inspected by Major-General Hutchinson on behalf of the Board of Trade. The line is being further extended from Catfield to Northam. The newly-completed section comprises a bridge of some extent over the Thirne at Potter Heigham.

ELECTRICITY, TELEGRAPHY

MR. EDISON'S LATEST.—A New York telegram states that Mr. Edison finds his carbon horse-shoes for the electric light liable to break, and has stopped making his lamps until he discovers the cause.

THE TELEPHONE IN CHICAGO.—As showing the extent to which the telephone is being adopted in the United States we are informed the Bell Telephone Company of Illinois have in use in Chicago about 1400 miles of wire. About 1200 offices are connected with the system, involving the employment of 150 clerks, operatives, and construction men; and, on an average, about 12,000 persons are daily placed in communication over the wires. The longest line in daily use to Chicago is that to Milwaukee, a distance of 85 miles.

NAVAL ARCHITECTURE.

LAUNCHES.

ENGLISH.

Asia.—On the 10th Jan. the Asia built for E. Carr, Esq., Hamburg, by Messrs C. Mitchell and Co., Low Walker, on the Tyne, was launched. She is a screw-steamer, built of iron, capable of carrying 2200 tons deadweight, and is fitted with all the most recent appliances for economy and efficiency in working. She is in all respects a sister vessel to the *Lyria*, which was constructed by Messrs. Mitchell and Co. for the same owner.

Author.—On the 15th inst. there was launched from the

shipbuilding yard of Messrs. C. Mitchell and Co., Low Walker, a vessel of the following dimensions:—Length 250 feet, beam 32 feet, depth 21 feet. She is built to class A 1 at Lloyd's to the order of Messrs. T. and J. Harrison, of Liverpool, by whom she will be employed in their general trades to the West Indies and South America. The vessel, which was named the *Author*, was, immediately after the launch, taken to the Wallsend Shipway and Engineering Company's Works, Wallsend, by whom she will be fitted with compound engines of the latest type.

Good Design.—On January 13th a fishing yawl was launched from the yard of the Whitby and Robin Hood's Bay Graving Dock Company. The vessel is about 42 tons register, and is intended to form the first of a series of high-class boats. She was christened *Good Design*.

Stakesby.—On the 12th January there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson and Sons, North Sands, Sunderland, the *Stakesby*, an iron screw-steamer of 1900 tons burthen, built (under special survey to class 100 A 1 at Lloyd's) to the order of Mr. John H. Barry and Partners, Whitby. The vessel will be fitted with a pair of compound surface-condensing engines, of 130 horse-power nominal, by Mr. John Dickenson, of Sunderland. She is constructed with water ballast in the fore and aft holds, which are also divided into six watertight compartments; four horizontal steam winches, by Rogers, of Stockton, and Harfield's patent windlass. The *Stakesby* is intended for the Mediterranean and Baltic trades.

SCOTCH.

Fokien.—On the 12th Jan. there was launched from the building yard of Messrs. Hall, Russell and Co., Aberdeen, an iron screw-steamer, named the *Fokien*, of the following dimensions:—Length, 210 feet; breadth, 29 feet; depth, 21 feet; and 850 tons gross. This vessel has been built under special survey, and classed A 1 at Lloyd's, and will be fitted with compound surface-condensing engines of 135 horse-power nominal, steam winches, water ballast, patent windlass, and all the most approved appliances for facilitating the loading and discharging of cargoes; and has accommodation for about 50 first-class European passengers and 250 steerage passengers. The *Fokien* has been built to the order of Messrs. Douglas, Lapraik and Co., and is intended for the China coasting trade, where she will be commanded by Captain Ashton. As the vessel left the ways she was named *Fokien*, and was afterwards taken to the sheer poles for the purpose of receiving masts and machinery.

Jeune Amiral.—On the 15th Jan. there was launched from Messrs. Dobie and Co.'s yards Govan, a screw-steamer of about 500 tons measurement, built for the Brazilian trade to the order of foreign owners. As the vessel left the ways she was named *Jeune Amiral*. The machinery for this vessel is being supplied by Mr. Wm. Kemp, engineer, Govan.

Montgomeryshire.—On the 13th January, the London and Glasgow Engineering and Shipbuilding Company (Limited) launched from their shipbuilding yard at Govan an iron screw-steamer, built to the order of Messrs. Jenkins and Co., of London. Her dimensions are 330 feet by 35 feet 6 inches, by 25 feet 8 inches, and class 100 A 1 at Lloyd's. She will be fitted by the builders with a pair of compound surface-condensing engines of 300-horse power nominal, and is supplied with all modern improvements, including steam steering gear, Napier's steam windlass, &c. The vessel was, as she left the ways, named *Montgomeryshire*.

Scotia.—On the 14th January the Messrs. H. M'Intyre and Co. launched from their shipbuilding yard at Merksworth, Paisley, the largest paddle-steamer which has ever been built on the banks of the River Cart. The vessel is 212 feet long, 21 feet 6 inches broad, and 8 feet deep. She has been built to the order of Captain Wm. Buchanan, the owner of the *Eagle*, *Brodick Castle*, and several other river steamers; and she is intended to run between Glasgow and Rothesay. The steamer, as it left the ways, was named the *Scotia*. The vessel was immediately taken in tow by a tug steamer and proceeded to Glasgow, where she will be fitted with a pair of powerful steeple-engines by Messrs. William King and Co.

TRIAL TRIP.

Engadine.—The trial trip of the screw-steamer *Engadine*, which has been built by Palmer's Company for Messrs. Wilson and Co., of London, took place on Jan. 15. The dimensions are: Length, 240 feet; breadth, 33 feet; depth, 18 feet; her carrying capacity (deadweight) being 1850 tons. The vessel has iron decks throughout, and she is supplied with steam winches, and all other recent improvements whereby she can be easily and economically worked. After the trial run the steamer returned to the Tyne, and was moored in Shields Harbour, to take in a general cargo for the Mediterranean and Constantinople.

WHITEHAVEN.—A movement is on foot in this district to purchase the Whitehaven Shipyard which is at present in the hands of the liquidators.

MARYPORT DOCK.—Every effort is being made, with a view to commencing the making of the new dock as early as possible. Two land surveyors are employed to assess the value of the site of the new docks.

SHIPBUILDING.—Messrs. Williamson of Harrington, propose to build a steamer on the yard which they have recently occupied. They have offered to rent the shipyard at Warrington but have not as yet come to any satisfactory terms with the owners.

SILLOTH DOCK.—At Silloth, the sinking of cylinders is being satisfactorily proceeded with, and building will be shortly commenced. The second well on the site of the new dock was very successfully carried out, and the making of the dock will, it is expected, be soon proceeded with.

DISASTERS AT SEA.—There were 21 British and foreign wrecks reported during the past week, making a total of 61 for the present year, or a decrease of 75, as compared with the corresponding period of last year. The approximate value of property lost was £300,000, of which £270,000 was British.

MARYPORT.—The new tug boat named the *Florence* which a few weeks ago the Messrs. Williamson launched from

their yard at Harrington, has been at Barrow getting her boilers, funnel &c., and returned to Maryport on Wednesday. A trial trip has been made with very good results, making about nine knots. Her engines are about 80 horse-power.

BARROW DOCKS.—A contract has just been let to widen the entrance between the Buccleuch and Devonshire Docks to 80 feet, its present width being 40 feet, and to increase the depth of water from 22 feet to 26 feet. The widening of the passage will enable vessels of 80-feet beam and drawing 26 feet of water, to be admitted. The Buccleuch and Ramsden Dock will admit vessels of 100-feet beam, and 30-feet draught of water. Mr. W. Gradwell is the contractor.

THE CARDIFF SHIPOWNERS.—The shipowners of Cardiff held their annual meeting on Monday night. The directors referred in their annual report to the depression in trade and congratulated the members upon signs of revival which had lately been apparent, and which they believed to be the commencement of a healthy state of things. Shipping had partaken of the revival, and an important increase in value had been the result. It was stated that upwards of 2000 tons of new iron vessels were now in course of construction, a fact suggesting caution against over-production.

GREAT LOSS OF LIFE AT SEA.—A report prepared at Gloucester, Massachusetts, states that the loss of life among the fishermen from the port in 1879 has been unprecedented. In all 30 vessels, aggregating 1980 tons, comprising over a tenth part of the fishing tonnage of the port, and valued at 118,789, dols. all of which were insured on the mutual system for 95,185, dols. sailed to return no more, and 240 lives have been lost, leaving 88 widows and 219 fatherless children. Since 1830, when the George's fishery commenced, there have been lost from this port 118 men, and 405 vessels, valued at 1,696,360 dols.

THE NEW INMAN LINER.—The Barrow Shipbuilding Company have commenced the work of constructing the largest steamship in the world, with the exception of the *Great Eastern*. The new steamer is being built to the order of the Inman Line Company, and is intended for the Atlantic service. She will be named the *City of Rome*, and will be of 8300 tons burthen, while her engines will be 8500 nominal horse-power. It is expected she will steam 16 or 17 knots per hour. Special arrangements for the comfort of passengers are to be made in the saloon as well as in the steerage of the steamer, and she is to be fitted with Siemens' electric light. The *City of Rome* will be on her station early in 1881. Her keel will be laid in a few days.

THE ALLEGED SCUTTLING OF A SCHOONER IN SOLWAY FIRTH.—The Board of Trade inquiry at Liverpool into the loss of the schooner *Wepre Lass*, in Solway Firth, on the 30th September, has been concluded. The Court decided that the vessel was not proved to have been scuttled, as alleged. There were undoubtedly suspicious appearances about the pieces of wreck which turned up, near Maryport, three weeks after the vessel foundered, but there was not sufficient evidence to lead the Court to the conviction that the master and mate had wilfully destroyed the vessel; and on the probabilities of the case it was difficult to find a motive on the part of either for the criminal act, both of whom produced certificates of good conduct. The Court therefore found that the loss of the vessel was still a matter of conjecture.

THE "DUILIO."—The Italian monster ironclad, *Duilio*, has just been put in commission. She represents 22,000,000 francs, and the Italian navy waits the experiment of her performances for its definitive systematisation. She is now at Spezia. Her displacement is 11,500 tons; nominal horse-power, 7500. All heavy work aboard, as steering, regulating ventilators, removal of cinders, weighing anchor, is done by steam. There are thirty-three special engines. She carries four 100-ton guns, worked by special and, in part, newly-invented machinery; also twelve smaller guns and four mitrailleuses. A broadside of her four great guns throws 8000 lb. weight of metal, consumes 2000 lb. of powder, and, comprising projectiles, costs 4000 fr. At each broadside a force is developed sufficient to raise 48,000 tons to the height of 1 metre. She is expected to attain a speed 12½ knots, and doing so will consume 15,000 lb. of coal an hour. She carries a Thorneycroft torpedo boat, 22 metres long, which has attained a speed of 21 knots. She starts on her trial trips immediately.

THE IMPROVEMENT OF WHITBY HARBOUR.—A recent special meeting of the Whitby Harbour Trustees was held, to examine and consider a plan and report respecting the improvement of Whitby Harbour, from Mr. Abernethy, C.E., Westminster. Mr. Abernethy's scheme consists of taking down the whole of the new portion of the east pier, which was erected at a cost of £3000, the widening and extending of the quay at the dock end so that it may be made available from the bridge to the Scotch Head, an improvement which, in conjunction with the deepening and widening of the channel of the harbour, Mr. Abernethy considers will immediately increase the trade of the port, and ultimately bring general prosperity to the town and port. He estimates his work to cost about £26,000; but with respect to the proposed sewerage scheme, which relates to the town particularly, he proposes that an intercepting sewer be built at the new quay, and an inverted syphon across the harbour and below the bridge, connected therewith by a large main sewer along the foreshore under the Spa ladder, emptying itself on the scar at the position known as low-water mark. After the reading of Mr. Abernethy's report, which was a long and elaborate one, the Board of Trustees, without expressing any idea as to the advisability of the scheme, came to the conclusion to ask for further information with regard to the division of the expense between the Harbour Trustees and the Local Board.

THE SHIPS AT OUR PORTS.—The Board of Trade Returns relating to vessels entered or cleared with cargoes in the year 1879, including repeated voyages, state that the vessels entered from various countries were of 21,099,344 tons in all, and the vessels cleared to various countries were of 12,849,357 tons. The entries inward are 200,000 tons less than in 1878, and above a million tons less than in 1877; but the clearances outward are 1½ million tons more than in 1878, and above 1½ million tons more than in 1877. The vessels of foreign nationality were of 6,056,765 tons entered, and 5,754,211 tons cleared, both numbers showing a decline when compared with 1878 and 1877. In the vessels arriving

from foreign countries in 1879 there is also a decline to 17,746,842 tons, and the tonnage of vessels from British possessions is less than in 1877, though rather more than in 1878. The tonnage of vessels departing to foreign countries, namely, 18,670,277 tons, shows an increase, but the tonnage departing to British possessions is a little less than in 1877, though more than in 1878. Roumania appears in the list for the first time as distinguished from Turkey. The shipping entered from the United States increased to 4,981,317 tons, and the shipping cleared for that destination to 3,038,411 tons, the bulk of both being of British nationality. In our coasting trade the ships employed in 1879, entrances and clearances, show an increase. The entries inward amounted to 25,658,680 tons, of which 9,754,682 tons were employed in the intercourse between Great Britain and Ireland.

OPERATIONS AT THE GOVERNMENT DOCKYARDS.—Eight gun-vessels of the *Foxhound* class, 455 tons, 470 horse-power, now building by contract, are to be delivered and completed for sea at Devonport yard during the ensuing financial year. The *Prince Albert*, turret ship, 3105 tons, 2128 horse-power, is to be prepared for commission early next month. She was thoroughly repaired two years ago at a cost of £11,750, and with the exception of four months' commission under Capt. L. F. Jones during the war scare in 1878, has not seen service for the past eight years. After Capt. Jones paid her off, £1700 was spent in making her again fit for service. No repairs whatever are therefore needed previous to the pendant being hoisted. An order has been received at Chatham Dockyard from the Admiralty directing that the *Nelson*, 12, double screw armour-plated ship, 7323 tons, 6000 horse-power, is to be immediately brought forward for commission. The vessel is contract-built, and has not previously been in commission. She was to have been docked this week to have her bottom cleaned and coated with an anti-fouling composition, as well as to have her valves put in order. The steel despatch vessel, *Iris*, Lieut. Wood, the completion of which has been pushed forward at Portsmouth in accordance with Admiralty instructions, was towed out of the repairing basin on Thursday morning last week, and berthed alongside the ship jetty. She is now out of dockyard hands and is ready for the pendant. It is expected that she will be commissioned in connection with the Mediterranean Fleet. Having already coaled, she is slightly deeper in the water than her load-line. Since she was previously got ready for sea she has been provided with a new crank-shaft and had her rig altered. The mainmast is now made of steel, and as it is fixed in close proximity to the funnels, it carries neither yards nor sails. Hitherto she has been coaled by tackle from the yard-arm, but as the yard has been dispensed with it has been necessary to furnish her with gun-ports, through which the coals are taken on board with movable derricks, with intermediate derricks for over-board coaling where time is a consideration. The billboards have been raised so to keep the bower anchors well above the wave line; and the guns have been fitted with eccentric trolleys to relieve the friction.

HARBOUR WORKS ON THE NORTH-EAST COAST.—The large docks which the North-Eastern Railway Company are constructing between Hartlepool and West Hartlepool will shortly be ready for testing by the gradual admission of water. The importance of these works can only be fully realised when it is borne in mind that they will enable laden line steamers to enter or leave at almost any state of the tide, so that there will practically be no hindrance in the way of continuous trade. When West Hartlepool was founded it was believed that what is known as the West Harbour was sufficiently deep. There is, however, only about 22 feet of water in it, and, as the commercial status of West Hartlepool as a coal exporting and timber and grain importing port increased, it was found to be inadequate. The new works which were first undertaken by the North-Eastern Railway Company eight years ago, are so planned as to take advantage of a natural deep-water channel at Hartlepool, where a mean of 27 feet of water is obtained. The upper reach of this channel has been converted into a tidal harbour, from which the docks are reached by means of a tidal basin or lock. The lock which is 2½ acres in extent is 31 feet deep. It has double entrance gates from the harbour, the gates being massively constructed of plates with watertight compartments. They are worked by hydraulic pressure, but the effect of the watertight compartments is to make them exceedingly light in the water. There is a space of 130 feet between the first and second gates. The duplicate system has been adopted to avoid inconvenience in case of accident to either and prevent waste of water. The entrance is crossed by a swinging bridge weighing 700 tons, 40 feet wide, and 104 feet long from the pivot each way. It is constructed for foot passengers and railway traffic. At the extreme end of the tidal basin the entrance to the large dock is exactly similar to that at the harbour end. The new dock is 18 acres in extent, and will give a mean depth of 27 feet 6 inches of water. On its eastern side against the quay wall, a capacious warehouse for storing and bonding goods is to be built. From this dock there is access into another deep-water dock, which is connected with the Jackson Dock at West Hartlepool. What was merely swampy land is now converted into a series of splendid deep-water docks with two tidal entrances—the one at Hartlepool and the other at West Hartlepool. Nine hundred thousand yards of material have been excavated in the construction of the new works, and 6000 feet of quay wall excavated. The Hartlepool coast was formerly esteemed very dangerous, but with the harbour facilities it affords it is now the very reverse. A line of American steamers will commence to run regularly as soon as the new works are completed. In the two towns, which are practically one in everything but municipal government, there are 176½ acres under water as docks and timber ponds. Special attention is being paid to the development of the timber trade, which is increasing every year. The new works, with the necessary railway connections, are costing over £400,000. The erection of warehouses, and the formation of graving works, which are contemplated, will bring the amount up to half a million. The works are being carried out from the plans of Mr. T. E. Harrison, the engineer-in-chief to the railway company, and under the supervision of Mr. Charles Harrison, its resident engineer.

NOTICES OF BOOKS.

A History of the Precious Metals from the Earliest Time to the Present. By A. DEL MAR, M.E. London: G. Bell and Sons. 1880.

THE author of this work was a member of the United States Monetary Commission of 1876, and, as he tells us in his preface, its preparation is in some measure due to that fact. It having fallen to him to prepare certain reports and minutes relative to the production of the precious metals throughout the world, many observations obtruded themselves in the course of his investigations which could not properly be included in the official documents, but which were too valuable to be lost. Of the conclusions to which he came from the evidence thus laid before the Commission, which are as follows, and form the groundwork of the book, several are curious, and will be new to most people. The production of the precious metals upon a commercial basis only began with the era of free mining in 1849, and the previously existing stock, which greatly affects their purchasing power and has been accumulated from past times, has cost its present owners little or nothing, having been acquired through conquest and slavery; while in the long run, whenever obtained by free labour, gold and silver have always cost more than they were worth. Farther, the author maintains that additional and heavy loss is occasioned to the productive powers of gold and silver producing countries by the injury done to the soil, waste of timber, and interference with river courses, so much so that such countries have, in consequence, always fallen into political decay—all this being in addition to the moral evils introduced by the pursuit of the precious metals. Finally, he maintains that, owing to the cost of production, the purchasing power of gold and silver will tend in the future to be continually enhanced; but that such enhancement will be greatest in the case of gold, and that, therefore, quantity, apart from other considerations, will lead to the gradual widening of the ratio of value between the two metals. The first chapter is occupied with the early history of gold and silver, of the vast accumulation of which possessed by the existing generation it is shown that a considerable portion has been inherited from very remote times. In the early historic period Spain was the El Dorado of the nations, but was first utilised to any great extent by the Carthaginians, who seem to have worn out the aborigines much as the Spaniards afterwards exhausted the supply of native labour in South America, and then each replenished the labour market by the introduction of negro slaves. The proceeds of these Spanish mines were ultimately the means, first of placing the commerce of the world in the hands of the Carthaginians, whom it utterly corrupted, and ultimately of causing their destruction at the hands of the Romans. "Rome trusted to itself and its sword," says Heeren, "Carthage to its gold and mercenaries." The author attributes the persistent attacks of Rome upon Carthage to a desire of possessing the Spanish mines, and he traces the fall of the Roman State to the same cause as that of Carthage, finding a parallel to the action of both States in that of Spain, and in their subsequent and consequent fate to those of the Spaniards in Peru and Mexico. In the fourth chapter, which is headed, "The Roman Wars for Gold and Silver," we have a record of cruel wars waged, according to the author, for no other reason than plunder, and in illustration of the extent to which the Romans succeeded he states, on the authority of Plutarch, that by the conquests of Pompey the revenues of the Roman Empire were raised from nearly two millions to three millions sterling a year, the successful general's spoil amounting to 20,000 talents, besides the large sums he distributed amongst his soldiers. Next follows the sickening account of the proceedings of the Spaniards in the New World, a frightful record of blood and treachery. There are short but interesting chapters on the history and statistics of gold mining in the United States and Australia. The greatest production of gold in the former was in 1853, between twenty-five and thirty millions sterling; in 1878 it had sunk to about seven millions; but that of silver had risen to about the same figure. The highest figure reached in Australia was £14,000,000 in 1853 and 1856; in 1878 it had sunk to £4,000,000, the total production up to 1878 having been about £240,000,000. In a succeeding chapter, a subject of much present importance—the ratio of gold to silver—is very fully discussed; and in the concluding ones, the questions of the cost of free mining, and the social and political evils connected with the pursuit, are treated at length. As compared with agriculture, the author shows that grain-producing States will always support a larger population than those in which the main industries are gold and silver mining, and that, apart from the unproductive character of the latter, in the former the same field can be used over and over again perpetually, while Nature does not renew her deposits of the precious metals, or at least not within any period which renders the increment available to man. With regard to the probable future supplies of the precious metals, speaking from personal observation of those of the Pacific coast, he concludes that, whatever may be the merits and prospects of particular mines and districts, the total supplies of both metals, and particularly of gold, will not only fail to keep pace with the growth of population and commerce, but will absolutely diminish.

Report of the Committee of the Society of Telegraph Engineers on the Birmingham Wire Gauge, &c. London: E. and F. N. Spon. 1879.

THE importance of a standard of size or quality in any article of general use is indisputable, and in the case of iron wire the necessity of a standard gauge has long been felt both by manufacturers and consumers. For obvious reasons the Society of Telegraph Engineers was a suitable tribunal to settle the question, and the committee to whom the investigation was entrusted, appear to have gone into it carefully and completely. In their report, now before us, they refer to the action taken by private firms, Chambers of Commerce and the Board of Trade, in the matter, and then to the various standards at present in use in England and abroad, which are of two classes, empirical and geometrical, the gradations in the former being constituted by arbitrary differences, and in the latter by perfectly uniform decrements of weight and size. Fourteen of these scales are described in

the report, and the committee advise the adoption of one of the existing geometrical gauges, that proposed by Mr. Latimer Clark, which also conforms most closely to the existing Birmingham wire gauges, besides possessing a number of essential advantages which are specified in detail. Appended to the report are papers on the unit of the Birmingham wire gauge and on the Birmingham wire gauge, read before the Society of Telegraph Engineers and the British Association by Mr. V. Walker, and Mr. Latimer Clark.

Economie des machines et des manufactures. Par CH. LABOULAYE. Paris: 60, Rue Madame. 1880. Pp. 460. IN the position of M. Laboulaye, and in that of Mr. Babbage, relatively to works, the task of which is to generalise on all that is implied in mechanical production, there is a tolerably close analogy. The author of "The Economy of Machinery and Manufactures" found himself, sometime early in 1832, in possession of a large number of scattered facts concerning machinery and manufactures, which he had gathered during the ten years in which he had been occupied with the construction of his calculating machine. In the course of innumerable visits paid to English and Continental workshops and manufactories, he had gathered, by the aid of his keen observation and fine reflective faculty, a store of facts and inductions, the elaboration of which resulted in the "Economy of Machinery." M. Ch. Laboulaye, if he has not been so deeply engaged as Mr. Babbage in experimental research—and we cannot say that he has not—has been for many years employed in the compilation of his immense "Dictionary of Arts and Manufactures," has been himself a manufacturer, and is the President of the French Society for the Encouragement of Industry. He has thus in his grasp an infinity of detail, the systematisation of which, were he to undertake it, would lead to the production of a modern "Philosophy of Manufactures."

That M. Laboulaye, who is well able to think for himself, should not have done this, is rather matter for regret. It is interesting to see Babbage, who published in 1832, projecting himself into futurity; his boldness and sagacity are alike marvellous, and the "Economy of Manufactures," regarded from the only possible point of view which can now be taken of it, is a very satisfactory chapter in Mr. Babbage's autobiography. Had he been still living, he would have carried us on his strong wing into what is now the future, and M. Laboulaye, in not doing this, and not continuing Babbage, makes us only more sensible of his loss.

We do not forget, of course, that the office assumed by M. Laboulaye is chiefly that of ferryman to Mr. Babbage across the Straits of Dover. Charon, in the person of M. Laboulaye, has indeed been inexorable for our brilliant countryman, and has allowed his distinguished spirit no manner of privilege:—

"Nec ripas datur horrendas, et raucæ fluentæ
Transportare prius, quam sedibus ossa quierunt."
The "Economy of Manufactures" came out, as we have said, in 1832; Mr. Babbage died in 1871; not till 1880 is he "translated" across the Stygian waves of La Manche.

Not that the "Economie des manufactures" is quite a translation. Where Mr. Babbage ends, and his editor begins, we are never sure, in going through the book. It is one of the most curious literary conglomerates that we remember to have seen, excepting always the modernisations occasionally perpetrated by Mr. Tegg. Portions of the original work are given entire, other portions are replaced by the editor's own prose, and we pass at a single step from the first to the last quarter of the present century. There are parts of the original work which, no doubt, are good for all time, such, for example, as the chapter "On Contriving Machinery"; but so many of the first author's anticipations have been embodied in daily practice, or have been so completely falsified, that it seems hardly to have been worth while to put them before the world again.

While we rather regret the association of two economists, so distinguished, yet so remote from each other, and the curious bilateral effect of the new work, we own very cheerfully that M. Laboulaye's additions are, in themselves, of the highest possible character; and we hope our readers will verify for themselves how successfully the French author might have entered on our own countryman's heritage, and writing after, rather than with, his original, have produced a work valuable without alloy.

The East Anglian Handbook and Agricultural Annual for 1880. Norwich: P. SOMAN, Argus Office.

THE Eastern Counties are neither remarkable as seats of mining or of manufacturing industry, but they stand pre-eminent in agriculture—they are famous for their corn, horn, and wool, and for country recreations, fowling, fishing and hunting. The "East Anglian Handbook" is worthy of the district which it illustrates and informs. There seems to be scarcely a subject interesting to East Anglians which is not treated of in its pages, and the matter is, at the same time, excellently arranged, with every facility for reference. The book opens with an exhaustive review of the district occurrences during the past year; there is a local obituary, a municipal and legal directory, railway time-tables, &c.; and among the larger articles useful and interesting papers on Sewage-farming, the Agricultural Outlook, Fish-farming, Coursing in the Fens, Woodcock and Woodcock Shooting, Grayling and Grayling Fishing, Poultry Management and Cattle Shows.

NEW BOOKS.

Forbidden Land (The): Voyages to the Corea. By E. Oppert. 8vo. Low and Co.

Illustrated Biographies of Great Artists:—Leonardo da Vinci. By J. P. Richter. Crown 8vo. Low and Co.

Illustrated Biographies of Great Artists:—The Figure-Painters of Holland. By Lord Ronald Gower. Crown 8vo. Low and Co.

Economic Studies. By the late Walter Bagehot. 8vo. Longmans and Co.

Note-Book (A) of Solubilities. By John Eagle. 12mo. H. K. Lewis.

Commercial Telegraph Code (The). Compiled by H. K. Meyer. Royal 8vo., Hamilton and Co.

Biological Atlas: A Guide to the Study of Plants and Animals. By Dr. M. and A. N. M'Alpine. 4to. Johnston.

Geology for Students and General Readers. By A. H. Green. Part I. New Edition. Crown 8vo. Rivington.

Nautical Magazine (The). Volume for 1879. 8vo. Simpkin and Co.

Floral World (The). Volume for 1879. 8vo. Groombridge.

Traverse Tables: Computed to 4 places Decimals. By R. L. Gurden. Folio. Griffin and Co.

Easy Lessons in Light. By W. Awdry. Folschap. Macmillan and Co. (Easy Lessons in Science.)

Hérat: The Granary and Garden of Central Asia. By Colonel G. B. Malletson. 8vo. W. H. Allen and Co.

Engineer's, Architect's, and Contractor's Pocket-Book for 1880. 12mo. Lockwood and Co.

Lockwood and Co.'s Builder's and Contractor's Price-Book. 1880. 12mo. Lockwood and Co.

Introduction to the Science of Language. By A. H. Sayce. 2 vols. Crown 8vo. Paul and Co.

Chemistry: Inorganic and Organic. By C. L. Bloxam. Fourth Edition. Royal 8vo. Churchill.

Torpedos and Torpedo Warfare. By C. W. Sleeman. Royal 8vo. Simpkin and Co.

BOOKS RECEIVED.

The Need of Protection: Free Imports not Free Trade. By Alex. McEwen. London: R. Bentley and Son.

The Stars and the Earth. By R. A. Proctor. London: Transactions of the American Institute of Mining Engineers. Vol. XII. Published by the Institute.

How to Make Money by Patents. By Charles Barlow. London: E. Marlborough and Co.

A Treatise on Statics. By G. M. Minchin, M.A. Oxford: The Clarendon Press.

Torpedoes and Torpedo Warfare. By C. W. Sleeman, Esq. Portsmouth: Griffin and Co.; London Agents, Simpkin and Co.

Cooley's Cyclopædia of Practical Receipts, &c., in Arts, Manufactures, Professions and Trades, Part 16. London: J. and A. Churchill.

CORRESPONDENCE.

THE WEIGHT OF CAST IRON.

To the Editor of IRON.

SIR,—I shall be glad if any correspondent can inform me if there is any reason to suppose the weight of cast iron was greater 60 or 80 years ago, as manufactured then, than it is now, or not? The School of Naval Architecture at this time takes cast iron in its calculations as weighing 444 lb. to the cubic foot, but I find in Sir Howard Douglas's work on Gunnery that the size of cannon balls about 1815 infers a greater specific gravity for them. Thus, as given in his work:—

9 lb. cannon ball was of 4'00 inches diameter.	
18 " " " 5'04 " "	
32 " " " 6'11 " "	

Now the weight of spherical bodies is in proportion to the cube of their diameters, and calculating according to that rule, I find the actual weight of these shot would be only 8'60 lb., 17'22 lb. and 30'70 lb., or considerably less than their reputed weight, unless the castings were of greater specific gravity than is now reckoned. A difference of 14 lb. in a 32-lb. ball is of consequence, and could scarce arise from any mistake in so expert and learned an author as Sir Howard, who is precise to a fault.—I am, &c.,

London, 20th January, 1880. H. Y. POWELL.

THE JABLOCHKOFF SYSTEM OF ELECTRIC LIGHTING.

To the Editor of IRON.

SIR,—At the close of the article in last week's IRON in which you describe the latest application of the Jablochkoff system of electric lighting to a private establishment, you allude to the comparatively slow progress we are making in the practice of electric lighting. This remark is perfectly correct, but, if taken without any qualification, it hardly does justice to our efforts in this direction and is calculated to mislead the public. Under these circumstances, I shall be glad if you will allow me to explain through your journal why we have not done more than we have in England in the direction of electric lighting. In the first place, let me explain that ours is, strictly speaking, a company of demonstration. Since our first appearance in England, a little more than a year ago, we have upset many of the theories which threatened the very introduction of electricity as a practical means of illumination. We have proved that a line of electric lamps nearly two miles in length can be kept burning through all weathers; that, at a distance of nearly two miles from the seat of production, a railway station could be illuminated by a series of electric lamps with no more trouble or supervision than is required for ordinary gas lamps; indeed, from more recent experiments, we have proved the possibility of lighting the whole of London by electricity from two, or at most three, centres. So much for out-door illumination.

As to in-door illumination, I would say that the cause of slow progress is very simple, although we have so perfected our system already as to be able to supply a generator producing as many as forty lights, with an illuminating power equal to 200 sperm candles each (and on the same principle could supply generators for eighty lights equal to 100 sperm candles each), without any increase in the motive power beyond that required for our ordinary and already well-

known type. Few of the many who would adopt the light care, or are able, to lay out the amount required for the plant necessary for its production. Most of the applications for lighting which we receive are either for the light per contract or for the electric apparatus on hire; conditions which could only be accepted by a company with an adequate capital. This difficulty will soon be removed, as we have now entered into an agreement for the transfer of our patents to an English company about to be launched, the object of which is to introduce the electric light more generally.

We have often been reproached with our persistent silence on the question of cost; there are obvious reasons for this. Those interested, however, may rest assured that in this, as in all other commercial matters, the demand will regulate the price of the supply; and we should be happy, even in the present condition of affairs, to tender for the electric works necessary to the lighting of a town with, say, 1000 lights, at a price that would surprise the public.—I am, &c.,

JULES GAUDET, Managing Director,
Société Générale d'Electricité.

139, Cannon Street, London,
19th January, 1880.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE. CHANCERY DIVISION.

JAN. 15.

(Before Sir R. MALINS.)

IN RE THE CHATTERLEY IRON COMPANY (LIMITED).—Two applications were made in this matter. The first was a motion by certain contributories of the company, holders of more than 4000 shares, that all proceedings in relation to the winding up of the company might be stayed, and to give effect to a scheme of reconstruction whereunder the claims of all the creditors of the company would be satisfied, and further working capital be provided for carrying on the company's business, and that direction be given for holding all such meetings of the creditors and contributories of the company as might be necessary for that purpose. This motion was under the 89th Section of the Companies' Act, 1862. The second application was made by the liquidators of the company under the Act of 1870, and was ancillary to the first. It asked that a meeting of all the creditors of the company might be summoned to consider an arrangement or compromise to be submitted to such meeting, whereunder every such creditor should be entitled to receive in full discharge of his claim—either present payment of 10s. in the pound on his claim, or debentures for payment of 20s. in the pound on the 1st of January, 1885, with interest at 5 per cent. The Chatterley Iron Company, which was at one time in a very flourishing condition, having a nominal capital of £1,000,000, and a subscribed capital of £750,000, was at the close of the year 1878, in consequence of the depression in the iron trade, in considerable difficulties, and an order was made on the petition of a debenture-holder for the winding-up of the company under supervision, and the sanction of the Court was given to the continuance by the liquidators of the iron and coal businesses of the company, in the hope that the revival in trade would at a future time enable the company to work at a profit, and so enable it to discharge the claims of its creditors in full. These expectations have been fully realised, and the works of the company are now being carried on at a considerable profit. The prices of pig-iron, which in 1878 was as low as 38s., has risen to 70s., and ironstone, in like manner, has risen from 9s. to 20s. It was now hoped that the company might be resuscitated, and the creditors paid eventually in full. Hence the present application. The Vice-Chancellor said he should make one order on both motions, namely, that it should be referred to Chambers to settle the resolutions which were to be submitted to the proposed meetings, and also to settle the classes of shareholders and creditors who were to vote at such meeting, and that in the meantime and until the result of such meetings were known, all proceedings in the winding-up should be stayed, except for the purpose of ascertaining the amount of debts, and for carrying out the present arrangement. The costs of both motions were to be costs in the winding-up.

JAN. 16.

(Before the MASTER of the ROLLS.)

IN RE SKERNE IRONWORKS COMPANY (LIMITED).—In this case a motion was made last sittings to confirm a scheme for the reconstruction of the company, which is now in course of liquidation. The motion was then ordered to stand over for the purpose of enabling the official liquidator to summon a meeting of the contributories specially to consider the scheme proposed by the shareholders' committee. This meeting was held on the 6th of January, 1880, at the Cannon Street Hotel, when fifty-one shareholders, representing 2122 shares, were present in person, and the committee held proxies in favour of the reconstruction scheme to the number of 4649 shares, the total capital of the company consisting of 10,000 shares. The question submitted to the meeting was whether the contributories wished that all proceedings in relation to the winding-up should be stayed, with a view to carrying out the scheme of reconstruction mentioned in the second report of the committee, dated December 4th, 1879. From the evidence before the Court, it appeared that the proposition was, after a long discussion, carried *nem. con.*, and in those circumstances it was thought unnecessary to take a formal poll. Mr. Davey, Q.C., and Mr. A. R. Kirby now asked that the scheme might be confirmed, that all proceedings in the winding up might be stayed, and that the official liquidator might be ordered to hand over all the assets of the company to the directors, with the exception of £5000, to be retained by him until he should have passed his accounts, and that the committee might be at liberty to call a meeting of shareholders to appoint new directors. Mr. C. McLaren, who

appeared for nearly all the creditors of the company, consented. Mr. Chitty, Q.C., and Mr. Buckley appeared for the official liquidator. His Lordship, after hearing the result of the meeting, said he could now confirm the scheme, and made the order asked for.

JAN. 17.

(Before Vice-Chancellor Sir JAMES BACON.)

IN RE STAPLEFORD COLLIERY COMPANY.—This was an application by summons in the winding-up of this company to make Mr. Langdale Barrow refund a sum of £250, which he, being the secretary and solicitor of the company, charged as a commission of 2s. 6d. in the issue of 2000 £5 shares in the company. The shares in question were purported to be issued to a Mr. Kimpton, who was the company's engineer, and these were transferred for a nominal consideration of 5s. to the late Mr. Richard B. Barrow, who was the managing director of the company, and father of the respondent. Sir H. Jackson, Q.C., and Mr. Cracknell, for the official liquidator, urged that Mr. Langdale Barrow, standing in a fiduciary position towards the company, had no right to charge commission which an outsider might have charged, especially in a transaction which was carried through by disguise. Mr. Nathmore Lawrence appeared for Mr. Langdale Barrow, and contended that though the transaction was an indirect one, the company were just as much benefited by the advance of this £10,000 by Mr. Barrow, senior, as by anybody else, and that Mr. Langdale Barrow was entitled to the commission. The Vice-Chancellor said that Mr. Langdale Barrow being the paid agent or servant of the company, could not charge this commission. The transaction was clearly the transaction throughout of the elder Barrow, who was the chairman of the company, and the name of Kimpton was used as mere machinery. The money must be refunded, and the respondent must pay the costs.

EXCHEQUER DIVISION.

JAN. 20.

(Before the LORD CHIEF BARON and Mr. Justice LOPES.)
THE GOVERNMENT AND THE TELEPHONE COMPANIES.

THE ATTORNEY GENERAL V. THE TELEPHONE COMPANY (LIMITED).—The Attorney General said he wished to mention this case, but not to make a motion in it. He had filed an information against the Company with the view of restraining them from using certain wires which the Postmaster-General said were telegraph wires, and of which that Minister had a monopoly, which he had purchased at an enormous sum. He had been instructed to move for an interim injunction against the Company, but he was happy to say they had made the following arrangement. The Company had agreed with the Postmaster-General to the effect that the motion in the case should be postponed until a day to be subsequently appointed for hearing. Affidavits in reply were to be furnished by the Company on or before the 27th January, and the Postmaster-General would have ten days to reply to them. The case would then be brought on as soon as their lordships would be able to fix a day. The information had been filed in the Exchequer Division. In the meantime the Company had agreed to keep an account of the number of telegraph messages they sent, and of the earnings they made. Mr. Macrory represented the Company, but was not present, as he understood the arrangement had been agreed to. Their lordships granted the application, and so allowed the motion to be postponed upon the conditions mentioned.

THE ATTORNEY GENERAL V. THE EDISON TELEPHONE COMPANY.—The Attorney-General said he was instructed in this case, with Mr. Kay, Q.C., Mr. Simpson, and Mr. Karalake, to move their Lordships for an interim injunction to restrain the company from carrying on their business. An information had been filed by him in this court supported by affidavits by the Postmaster-General. From those affidavits it appeared that the Company used the telegraph wires for sending messages throughout London for the purposes of reward, and the Postmaster-General said they were telegraph wires within the meaning of the Acts 1863, 1868, and 1869, and that the use of them by means of the telephone was an infringement of the statute. He asked for an interim injunction to last until the hearing of the cause; but he would be quite ready, with the consent of his learned friend who appeared on behalf of the company, that the same arrangements should be made in the present as had been agreed to in the former case.—Mr. Cozens Hardy, on behalf of the company, said his clients were very anxious that the motion should not be delayed. His affidavits would be filed by Thursday next, when the motion could be disposed of.—The Lord Chief Baron asked the Attorney-General whether he asked that the motion should be considered now or that the motion should be postponed.—The Attorney-General replied that he would be quite willing that the latter course should be adopted if the Company would keep an account of the messages sent by their wires. The Postmaster-General wished to reply to the affidavits which would be filed by the company.—Mr. Cozens Hardy said his clients were quite ready to keep an account of their receipts and expenditure, but he was instructed that they had no means for keeping such an account as the Attorney-General had mentioned.—The Attorney-General said the account required was of the following nature. Supposing a person in Brompton wished to send a message to a person in Broad Street by means of the telephone, the former would request the authorities at the central office to connect him with the office at Broad Street. The connection was made, and the two persons carried on a conversation as long as they liked. All that was asked for was that an account should be kept of the number of times a connection was made.—Mr. Cozens Hardy said his clients instructed him there was no means for doing so.—The Lord Chief Baron said it must be possible to keep such an account without the slightest difficulty. It was to the advantage of the company to accede to the application. The Attorney-General had a perfect right at any time to come into court and obtain a postponement of a motion, whether it was opposed or not.—Mr. Cozens Hardy then agreed to speak with the Attorney-General, and arrange with him for the motion to stand over, upon the

conditions mentioned.—The motion was postponed accordingly.

IN RE THE STANDARD IRON AND STEEL COMPANY.—In the Chancery of the County Palatine of Lancaster, before Vice-Chancellor Little, this week, this case was heard. A petition for the winding-up of the company was before his honour in 1878, but was dismissed on proof of the death of Mr. Garforth, the petitioner. The company now presented its own petition for winding up its affairs, and a provincial liquidator had been appointed. Mr. Robinson, Q.C., on the part of the company, asked that the usual compulsory order might be made, and that the provincial liquidator appointed by the registrar might be appointed official liquidator, or that the appointment might be made through the customary reference. The company, he stated, was registered in 1876 with the object of carrying on the business of iron and steel manufacture, and also of working certain patents. Some of the shares were vendors' shares issued as fully paid-up under a contract duly registered, and upon the shares not so issued calls had been made from time to time to such an extent that all the capital had now been called up with the exception of 2s. 6d. a share on 9370 shares which would produce £1170, in addition to which £4000 was due from shareholders who had not yet paid the calls that had been made. The company were indebted to various people in considerable sums, including £6000 upon a mortgage of its property. It had ceased to carry on business for more than six months, and the whole of the plant had been sold, so that practically it was a defunct company. Under the circumstances it was thought that a liquidation by the Court was the simplest way of enforcing the calls already made and getting in the rest of the assets, and the application had the support of the holders of between £50,000 and £60,000 worth of shares, exclusive of the shares held by the directors. Mr. Palmer, for creditors for £8000 out of £8700, supported the prayer of the petition; and Mr. Bradford, who appeared for the holders of £4600 shares, did not object to the order being made. Mr. Robinson suggested that it would save expense if the official liquidator were then appointed; and Mr. Palmer asked that the provisional liquidator should take the office. The Vice-Chancellor, however, pointed out that upon the facts disclosed the company must be presumed to be solvent, and the contributories, and not the creditors, would therefore be the proper persons to have the conduct of the winding-up. He inquired whether the actual majority of the contributories was represented on the petition? Mr. Robinson was afraid not. The Vice-Chancellor made the usual winding-up order, and continued the provisional liquidator until the appointment of the official liquidator in the usual manner.

EMPLOYERS' LIABILITIES.—The following is the text of the proposed "Bill to extend and regulate the liability of employers to make compensation for personal injuries suffered by persons in their service:—1 Where after the passing of this Act personal injury, whether resulting in death or not, is caused to a workman by reason of—(a) Any defects in the works, machinery, plant, or stock used for his employer's business; or (b) The wrongful act, neglect, or default of any person of any superior grade in the service of the employer, whether in the same department of service with the workman injured or in any other department; or (c) The wrongful act, neglect, or default of any person in the service of the employer, being a person to whose orders or directions the workman injured was bound to conform; or (d) The wrongful act, neglect, or default of any person in the service of the employer, done or committed in obedience to the employer's rules or by-laws, or in obedience to instructions given by any person to whom the authority of the employer in that behalf was delegated; the workman injured, and, in the event of his death, his executor or administrator on behalf of his family, shall have the same right of compensation and remedies against his employer as if the workman injured had not been a workman of, nor in the service of, the employer, nor engaged in his work. Provided that this section shall not apply where the workman injured materially contributed by his own negligence to the cause of his injury. (2) Every action by a workman or his executor or administrator for the recovery of compensation under this Act, in which a sum not exceeding £200 is claimed, shall be brought in a county court and not elsewhere. Upon the trial of any such action in a county court, one or more assessors may be appointed for the purpose of ascertaining the amount of the compensation. For the purpose of regulating the conditions and mode of appointment and remuneration of such assessors, and all matters of procedure relating to their duties, rules may be made, varied, and repealed from time to time in the same manner as rules for regulating the practice and procedure in other actions in county courts. (3) "County court" shall mean, with respect to Scotland, the Sheriff's Court, and with respect to Ireland, the Civil Bill Court. (4) This Act may be cited as the Workman's Compensation Act, 1880.

PRIVATE BILLS IN PARLIAMENT.—Friday, last week, was the last day for depositing the memorials on Standing Orders against private Bills for the Session of 1880. Fifty-one memorials have been presented, and thirty Bills will be opposed out of 211 deposited in the Private Bill Office. Three memorials have been presented against the Rathmines and Rathgar Township (Vatry Water Supply) three against the Liverpool Tramways, and three against the Metropolitan and Metropolitan District Railway (City Lines and Extensions) Bills; two each against the Glenariff Railway and Harbour and the Taff Vale, Great Western, and Merthyr Junction Railway; and one against the Dublin Central Tramways (Amendment and Extension) North Dublin Street Tramways (Amendment and Extension), Cobham Railway, and Edinburgh Suburban and Southside Junction Railway Bills. On Tuesday, Mr. Robinson, one of the Examiners, sat to consider the Standing Order proofs of the private Bills for the ensuing Session. Mr. Robinson stated that Mr. Frere, the senior Examiner, was unable to attend owing to a severe cold, and that he would take up the list of Bills assigned to that gentleman. The following Bills were declared passed, having complied with the Standing orders:—Earl of Aberdeen's Railway; Tralee and Fenit Railway; Black Sluice Drainage; Rathmines and Rathgar Township (Milltown Extension); Southwark and Vauxhall Water; Great

Western Railway; Accountants' Institute; Stapenhill Bridge; Yeaton and Guisely Gas. In the case of the London Steamboat Company (an opposed Bill), the Examiner decided, after a protracted argument, that the Standing Orders had not been complied with. The Belfast, Holywood, and Bangor Railway (an opposed Bill) was proceeded with and adjourned, at a late hour, until Wednesday. The Phoenix Gas Light and Coke Company; the Midland Railway; the Bayswater, Marylebone, King's Cross, and Islington Tramways; the London Tramways Company; and other Bills were postponed. Mr. Robinson also decided on Wednesday, after some formal proofs, that the Standing Orders had been complied with in relation to the following Bills:—Swindon, Marlborough and Andover Railway; Kensington Improvements; Exmouth and District Water; Pagenham and District Farmers' (Optional) Sewage Utilisation; Oldham Improvement; Gas Light and Coke, Commercial Gas and South Metropolitan Gas Light and Coke Companies; London, Tilbury and Southend Railway; Caledonian Insurance Company; Greenock Harbour; Sligo, Leitrim and Northern Counties Railway; Liverpool Borough Extension; Liverpool Corporation (Loans, &c.); Liverpool Corporation Water; Midland Railway. In the case of the Belfast, Holywood and Bangor Railway the evidence was continued, and there was an adjournment until next day, the Bill being opposed at almost every point. The following Bills were postponed:—South London Tramways (Extension); Rathmines and Rathgar Township Water; Dublin Southern District Tramways Act Amendment; Liverpool and Birkenhead Subway; Shrewsbury (Kingsland) Bridge; Medway Conservancy; Rochester Corporation. The case of the Nantlle Vale Drainage and Tramway Bill, which is opposed, was entered into at a late hour, and adjourned until Thursday morning.

FACTORY NOTES.

It is affirmed that the Furness Railway Company intend to spend £80,000 in new rolling stock for passengers and goods. The order is to be given to a firm in Barrow.

SUBSIDENCE OF GROUND NEAR CLEATOR.—Through the mining operations in the district, a further subsidence of land has occurred at Fallen Cross, near Cleator. Several houses have been given way.

THE TIN TRADE.—The Cornish smelters have advanced the tin standards £2 per ton, making an advance of £7 per ton during the year. The standards now are:—Superior common, 91s.; and superior fine, 92s. per cwt. The standards for tin are now £37 per ton higher than they were in August last.

NEW IRON FOUNDRY AT MARYPORT.—It is proposed to erect a large iron foundry on the vacant ground occupied by the Messrs. McGowan, and called Halliday's Sawyard, close to the Maryport and Carlisle Docks and Railway. Mr. Graham, of Carlisle, and Mr. Tate, of the Solway Ironworks, are the promoters.

TAMPERING WITH A SAFETY-VALVE.—At the Bristol Police-court, Henry Vowles, engineer of a river steamer, was recently fined £25, with the alternative of three months' imprisonment, for tampering with the safety-valve of the boiler, by which, the Board of Trade Surveyor said, it was quite a miracle he had not caused an explosion.

THE COAL TRADE IN CUMBERLAND.—The accountant appointed under the sliding-scale arrangement has just issued his quarterly report, from which it appears that the average selling price of coals for the three months, October, November and December, 1879, was 5s. 0 1/4d. per ton, being an increase of 7 1/2d. per ton on the previous quarter.

THE IMPERIAL IRONWORKS COMPANY.—The scheme for the reconstruction of the Imperial Ironworks Company—Jackson, Gill, and Co.—has apparently failed. It may be remembered that at the creditors' meeting some four weeks ago, no confirmatory resolutions were arrived at by way of response to the scheme proposed by the liquidator, Mr. W. B. Peat. The works at Southbank are to be offered for sale.

EXPLOSION AT AN IRONWORKS.—A singular explosion recently occurred at Messrs. Glover's ironworks, at Longton. Sulphur and gas are conveyed under the forges, and used for heating purposes. One of the valves burst, and the whole body of gas came in contact with the fire. An explosion took place, the whole of the forges being enveloped in flames to the height of 40 feet. Fortunately no men were about, as it would have been impossible for any to escape.

FORTH BRIDGE CONTRACT.—We are enabled to state that Messrs. Vickers and Co., of Sheffield, hold the contract for the supplying of high-class steel for the chains &c., in the new Forth Bridge. It has been publicly announced that Messrs. Krupp had obtained the work, such is not the case. Messrs. Krupp have we understand, undertaken to supply the second-class quality of steel to be used in the bridge, but had they been so disposed, Messrs. Vickers might have taken that contract also.

LOWTHER IRONWORKS.—These works were put into operation last week, after standing idle for a considerable length of time. Great improvements have been made in the plant, for some time the work of re-constructing the furnaces on the newest principles and enlarging them has been going on under the direction of Mr. Crum, the works manager. A furnace was blown in last Thursday, and a second will be ready in a few days, and the erection of a third is spoken of. Mr. Wilson is the new manager of the Lowther works.

RAPID ADVANCE IN NORTH OF ENGLAND IRON SHARES.—A return made up to Wednesday shows an extraordinary upward movement in the shares of iron companies in the North of England. In the case of Bolckow, Vaughan and Company, the Consett Iron Company, and the Consett Spanish Ore Company a rise of more than 50 per cent. has taken place since the end of last summer. Shares considered almost valueless, and which were sold at £1 per share, advanced to £6 at the end of the year, and since to £10, £11, or £12.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending 17th January:—On Monday, Tuesday and Saturday (free), from 10 a.m. to 10 p.m., Museum,

11,762; Mercantile Marine, Building Materials, and other Collections, 2121. On Wednesday, Thursday, and Friday, (admission 6d.) from 10 a.m. till 4 p.m., Museum, 1558; Mercantile Marine, Building Materials, and other Collections, 93. Total, 15,534. Average of corresponding week in former years, 16,219. Total from the opening of Museum, 18,660,831.

THE NEW MANCHESTER COAL EXCHANGE.—The first meeting of the new Manchester Coal Exchange was held on Tuesday in the large arcade of the Victoria Building, and was numerously attended, general satisfaction being expressed as to the suitability of the building for the purposes of the trade. The arcade has now been registered at the Post Office as the Manchester Coal Exchange, and arrangements have been made for the delivery of telegrams in the arcade, where it is also proposed to take suitable offices for the convenience of the trade.

RE-OPENING OF NORTHERN IRONWORKS.—A scheme for the re-commencement of the large rolling mills at West Hartlepool has been approved, and the works, which have been idle for five years, will be immediately re-started. They include no less than 110 puddling furnaces, and when in full work give employment to no less than 1000 workmen. It is believed that, with a continuance of the demand that now prevails for manufactured iron in the North of England, it is only a question of a few months before every idle ironwork in the North will be in full operation.

THE SKERNE IRON COMPANY (LIMITED).—The liquidation, it is understood, in the case of this company has now been stayed, and some gentleman from London has been in Darlington this week making arrangements for restarting the works, having engaged a staff for that purpose. It is not exactly known how soon they will be started. Messrs. Labouchere and Stanhope have contributed, it is stated, the £20,000 towards paying off debts mentioned in the reconstruction scheme. The works give employment, when in full operation, to some hundreds of men. The leading production is ship plates.

THE CARLTON IRONWORKS.—On Wednesday last week the half-yearly meeting of the Carlton Ironworks Company was held at the North-Eastern Hotel, Darlington. Mr. Henry C. Briggs (chairman of the company) presiding. There was a fair attendance of shareholders. The half-yearly report was taken as read, and the chairman stated that the prospects of the company were highly satisfactory. The blast-furnaces were turning out about 700 tons per week, and they had relined and reconstructed No. 1 furnace for the purpose of making hematite iron. They are erecting a new engine to create the blast for No. 1 furnace, and are booking orders at fair prices. There is every prospect that this year will be productive of good commercial results.

THE FINISHED-IRON TRADE AT WORKINGTON.—Messrs. Kirk Brothers, of Workington, have purchased the Ellen Rolling Mills, near Maryport, with the view of extending their premises, which at present are of considerable extent. The works have been stopped for a length of time, but every effort is being put forth to again have the machinery in motion. The puddling would be started at once, but a difficulty is experienced in finding sufficient men to work it. The old furnaces are to be replaced one by one with Kirk and Valentine's patent. Two of the mills will be pulled out and others of a better class put in their places. The firm have made a great many improvements in rolling mill trains. The Marshside Works, Derwent Rolling Mills, and New Yard are all owned by this firm, and are actively employed.

RAILWAY ROLLING STOCK COMPANY.—In the report of this company to be presented at the forthcoming half-yearly meeting, allusion is made to the recent revival as having already affected the waggon trade, although it occurred too late to exercise any material influence on the half-year's accounts. The profits for the six months' working have been £3721 13s. 7d., which will allow the usual dividend to be paid on the Preference Shares, and at the rate of 3 per cent. per annum on the Ordinary Shares, and a balance of £101 will be carried over to the credit of next half-year. A considerable balance of cash is reported to remain uninvested owing to the difficulty of finding sufficiently profitable investments; but since the turn of the year some fairly good investments have been made in the purchase of waggons on deferred payments, and it is to be hoped that in the future contracts will be more readily obtained.

MESSRS. TANGYE BROTHERS, AND THE OLDBURY LOCAL BOARD.—The Oldbury Local Board who are about to erect new gas-works for the supply of their district invited in November last, tenders for the work which was subdivided into several contracts. For No. 3 contract, for the engines the tenders were as follows:—Messrs. T. Piggott and Co., Spring Hill, Birmingham, £1483; Messrs. Newton and Co., Thorncliffe Ironworks, Sheffield, £1383; the Horseley Iron Company, £1400; Messrs. A. M. Donald and Co., Paisley, Tipton, £1230; the Engine Company Exeter Works, London, £1950; Messrs. D. Adamson and Co., Dukinfield, Manchester, £1815; Messrs. May and Mountain, Birmingham, £1429; and Messrs. Tangye and Brothers, £1245. On the publication of the tenders and the announcement that Messrs. May and Mountain have received the order to supply the engines. Messrs. Tangye Brothers, have written to the Board pointing out that the tender of the accepted firm was 15 per cent. in excess of their own, and asking whether their tender was submitted to the whole Board, and whether a suggestion made by them in an accompanying letter as to the adoption of their type of engine in lieu of that set forth in the specification was submitted to the Board's engineer. They also point out that even if they had made new patterns exactly to the old type of engine on the specification, which was what they made nearly twenty years ago, there would still have been a difference in their favour of something like 10 per cent., and that consequently their tender should have been accepted. This Board have replied through their clerk that Messrs. Tangye's tender was submitted to the whole board, and that the design and suggestion of Messrs. Tangye's type of engine was brought under the notice of their engineer who could not deviate from the specification.

AMERICAN GLEANINGS.

THE AMERICAN CENSUS.—The exhaustive character of the coming census is still further shown by the arrangements made to obtain all kinds of information as to the mines of the States. Not only will the industrial character of each mine be ascertained, but also its yield and the character and value of the ores. The chemical differences and the metallurgical capabilities of each will be accurately given; and for this purpose one of the departments of the Geological Survey is now engaged in gathering the statistics, by a careful system of sampling and analysis, carried on at the laboratory at Newport, R. I. The mass of information thus gathered will be of a most unique kind, and it is almost needless to point out its immense value to all those who are engaged in the industries of the States.

RAILWAY ACCIDENTS IN MASSACHUSETTS.—The railway commissioners of Massachusetts have just published their report of the railway accidents in that state last year, showing that 405 persons were killed and injured. Of this number 189 were due to the Wollaston disaster. Of the total number 208 were passengers, 83 were employes, 82 trespassers, and 32 were injured at highway crossings and stations. The fatally injured number 115; those not fatally, 290. Only 25 of the injured and killed were children. Twenty-five accidents occurred in coupling cars, and seven are attributed to overhead bridges; 21 employes were injured or killed by falling from trains, and five deaths are supposed to have been suicides. The accidents of the preceding year numbered 304, or 88 more than the present year, excluding the Wollaston disaster.

THE AMERICAN POST OFFICE.—From the report of the Postmaster-General of the United States for the year ending June 30, 1879, we learn that the receipts were 30,041,982 dols., and the expenditure 33,499,899 dols., leaving a deficiency of 3,407,916 dols. The States that returned revenues in excess of a million dollars were as follows:—New York, 5,710,310 dols.; Pennsylvania, 2,732,593 dols.; Illinois, 2,398,627 dols.; Massachusetts, 2,087,228 dols.; Ohio, 1,976,440 dols.; Missouri, 1,124,553 dols.; Michigan, 1,004,487 dols. The estimates for the present year ending Midsommer, 1880, are, for expenditure, 39,920,900 dols., and receipts, 32,210,000 dols., leaving a deficit of 7,710,900 dols. The receipts for the last year on the newspaper and parcel post were 110,418,563 dols., which showed an increase of 7,800,369 dols. in this branch of the department for the previous year, a very satisfactory result, considering that a reduction in newspaper and periodical postage came into force on May 1.

THE IRON TRADE OF PITTSBURGH.—The city of Pittsburgh will soon be happy in the fact that every rolling mill made idle by the panic of 1873 will be again in operation. Within the past two years one by one these idle mills have resumed, until but two were cold, the old Wood's mill, at Saw Mill Run, last operated by Mullins and Mallory, and the old Vesuvius mill, of Lewis, Dalzell, and Co. The latter, as previously announced in our Industrial Items, has been purchased by John Morehead, the well-known pig-metal broker of that city, and will be at once put in operation, and it is understood that what of the Wood's mill can be run will be put in operation to make muck bar. What is known as the New Etna Mill, of Spang, Chalfant and Co., was never finished, and is, of course, idle and not included. This means not simply that Pittsburgh will now make as much iron as ever before, but a large percentage more. During the panic the mill-owners of the Smoky City learned the secret of increasing output, and, though a number of the mills were idle, the make of rolled iron in 1878 exceeded that of 1874. In addition to this, some of the mills have increased the number of furnaces and trains of rolls. Altogether it looks as though Pittsburgh will show in 1880 a very great increase in tonnage of iron manufactured.—*Iron Age.*

IRON AND COAL TRADE REPORTS.

BARNESLEY AND SOUTH YORKSHIRE.—The iron trade in this district is just now better than it has been for some time past. At many of the works full time is being run. This is the case at Milton and Elsecar, and, as a new lease has just been granted, it is believed that a prosperous trade will be carried on. The repairs at the Yorkshire Steel and Ironworks, Penistone, having been completed, the works are again in full motion, and are turning out a large tonnage of Bessemer steel rails, tires, axles, &c. Some of the foundries are rather better off for work, owing to the upward tendency of iron. Throughout the district, the make of pig-iron is fully an average one, all the available furnaces being now in blast. A large tonnage of North Lincolnshire ironstone is being imported in the district, where, of late years, the yield of native ironstone has considerably decreased. The coal trade is now in a very critical state and difficult to report upon. The attendance of colliery representatives at Barnsley, on Wednesday was very large, but few sales were effected, although prices are low. The position of the house-coal trade is a very indifferent one, business with London and the South has fallen off, and the tonnage of both Silkstone and Barnsley house-coal is very moderate indeed. This is attributed to the high tonnage-rate which is being charged from the district collieries, and to the low rate at which seaborne coal is now being sold in London. On the other hand some of the collieries between Wakefield and Barnsley have done better during the week than they have done since Christmas. The trade, however, is for the most part confined to Lancashire and Yorkshire. A very fair demand continues to be had for steam and locomotive coal, and prices are somewhat higher than they have been, a fair quantity is being sent to Hull, from which port there has been an increase during the week. Business with Grimsby and Goole is only moderate at both places the shipments show a decrease. There is also rather more doing in small coal, suitable for engine purposes, but prices do not increase, a lively business is being transacted in coke, which for many

years was not so largely produced as at the present time. The long ranges of ovens at Hoyland Silkstone, the Oaks, Earl Fitzwilliam, Church Lane, and other pits as well as at Silkstone Common are kept fully going, and a free sale is being realised. The district is in an unsettled state, and the establishment of two additional unions is likely to make matters worse. It is stated that at the Barrow Colliery, Worsborough, the men have given fourteen days' notice to leave their employment. Although nothing is attached to the notice to indicate the men's intention, it is understood that they are about to apply for an advance of 10 per cent. which they conceded some months ago. At Houghton Main Colliery it is said fourteen men have been discharged because they are connected with the union, and efforts are being made to get them reinstated, and to push forward an arbitration respecting prices paid for work done. The movement at the Barrow Collieries will be looked upon with considerable interest seeing that the men are firm supporters of Mr. P. Casey, late secretary of the union, who is now leading one section of the district miners. The position of the sliding scale is a somewhat hopeless one, the miners having resolved not to accept a higher basis than 5s. 3d. per ton, or 5s. 7d. per ton for the first advance of 2½ per cent. This in all probability will not meet the views of the employers, who as yet have not even been consulted. The state of trade, and the division of the men by the establishment of additional associations, point out greater difficulties with regard to the adoption of a sliding scale than have hitherto existed.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—There is no practical change to report in connection with the iron trade of this district. The demand is still very considerable, and the ability of makers to compete with it is still observable. Indeed, how it could be otherwise in the face of the fact that many of the makers are sold forward for six months or more, it would be difficult to say. Both in the Bessemer and the forge departments there are large deliveries to make, and buyers are anxious to make arrangements for new deliveries now that there is every prospect of the market going up still further with the opening of the spring and shipping season. The quotations this week show an improvement of fully 10s. per ton all round on the week. 12½s. to 130s. per ton on trucks at makers' works, were the quotations for best Bessemer iron on Monday, while forge iron was offered at from 120s. to 127s. per ton; but since then 130s. has been refused for best qualities of Bessemer iron, and it is affirmed that some makers, who are especially well placed, are asking as much as 140s. per ton. There is as good a demand for forge hematites as for Bessemer iron, and the prices of these descriptions are relatively well maintained. The output has been further increased by the lighting of a few furnaces, and in a short time there will be a further increase in the output. Large foreign orders are held, and it is already evident that a large trade with America and the colonies will be done this year. On our Continental account there is not such a good look-out, probably owing to the tariffs which are imposed on metal imports. Iron ore is in an especially favourable condition, and as the consumption is continuing to increase and the raw material finds a ready market, prices are creeping up. This week ore at the pits is quoted at 28s. to 37s. per ton, according to terms of delivery. Many raisers have no iron ore to sell, as they have to such a large extent disposed of their output for several months to come. The steel trade is fully employed, chiefly in the production of steel railway material, for which very large orders are held. Iron shipbuilders are more briskly employed. Engineers and ironfounders are very busy on both local and general contracts. Boilermakers are in receipt of large orders. Railway rolling-stock works are fully employed, and several new orders have lately been booked. Coke is 15s. to 16s. per ton at the ovens.

BIRMINGHAM.—There is continued buoyancy in the iron trade of the district, orders having been fairly plentiful, although somewhat unevenly distributed. The leading articles in demand have been hoop iron, chiefly for the United States, galvanised iron for Australia and some of the South American markets, common sheets, nail and tube strip, and wire rod. Hoop iron manufacturers have their books full, owing to the heavy American demand, and in other departments makers are indisposed to accept orders for delivery beyond the close of the current quarter except on special terms. Prices continue firm all round on the quarter-day basis. There have been some extensive transactions in tin-plates for the Australian and American markets, at 30s. for I. C. coke. The trade with these markets generally must also be reported as exhibiting a decided improvement, though the orders to hand are not at present of any great importance. In addition to the increased demand in the branches already specially alluded to, there is a fair request for iron wire for the United States, while the last Australian mails have brought a very good supply of orders for iron tubes, axles, screws, railway material, and locomotive tubes and fittings. A few good lines have come to hand from Russia for screws and other hardware, but the Russian trade generally has been recently very quiet. The home trade exhibits little variation from the state of things reported a week since, nor is there any general anticipation on the part of manufacturers that a marked revival will take place until the season is well advanced, when such a result may reasonably be looked for, should harvest prospects be favourable. At present there is scarcely any demand either for agricultural tools or building hardware; but in the more populous manufacturing districts an improving enquiry is reported for furnishing hardware, and also for nails, screws, iron sheets, &c. Since the holidays local stove-grate makers have been very quiet, and probably this department of trade will remain somewhat inactive until the open weather of spring favours the commencement of the building operations. Notwithstanding the fact that enquiries from the United States for large quantities of hoop-iron, old rails, scrap and iron ore were being made throughout the district on Tuesday, the Wolverhampton market on Wednesday was not marked by any special animation, and prices were simply maintained. Buyers evince the same anxiety to buy for forward delivery, which has been the characteristic of recent meetings; but makers generally decline to accept orders on these terms. Within the past week advances in price have been announced

in several branches of local trade. The rise in copper has induced metal-rollers to put up brass and copper sheets one halfpenny per lb. Messrs. Nettlefold, the house that rules the screw trade, have given notice of a reduction of ten per cent. in the discount from list prices of iron wood screws, and the local frying-pan makers have announced that gross discounts will be reduced 5 per cent, making ordinary best quality 60 per cent. and second quality 65 per cent. off the list. Messrs. A. Kenrick and Sons, of West Bromwich, have issued new price-lists for rim and mortise lock furniture, which show a general advance. The firm also announce, as the result of the continued improvement in the price of pig-iron, an increase of 10s. per cwt. in the price of all goods sold by weight. Messrs. T. C. Clark and Company, of Wolverhampton, and other firms here, made a similar increase. Although the ironworkers in the district have loyally accepted the recent award of Mr. Chamberlain on the wages question, they are not backward in showing that it has not satisfied them, and that they are looking forward to the early adoption of the plan of regulating wages by the selling price of iron. Mr. Copper, their secretary on the Wages Board, tells them that efforts are being made, and will be strenuously continued, to bring this principle into operation, on the basis that the puddler shall be paid 1s. per ton on each pound of the selling price of every class of iron. The men are engaged in reorganising with a view to attempting once more to form a union for the Midland Counties. As there are some 20,000 ironworkers in Staffordshire, Worcestershire, and Shropshire, it is urged that if only one-half of them joined and paid a contribution of no more than 1d. per week, the new association would be placed in a prosperous condition, and additional strength would be gained in meeting the employers on wages questions. The horse-nail makers of the district are demanding an advance of 3d. per 1000 on the present prices of 3s. 3d. They are altogether a separate branch of the trade, and do not, it seems, come under the scope of the newly-formed Conciliation Board.

Thursday Evening.—Business was quieter to-day, but prices all round were fully and firmly maintained. The heavy American orders for special classes of iron are still on the market makers of these descriptions having their books full. The general American demand continues good, and Indian trade is developing to some extent. Merchant demand quiet, and home consumers are not buying freely having covered requirements for the present. Wire rod is in good demand and scarce some North Staffordshire makers are said to have booked a few good orders for bars, hoops, and plates. Messrs. Kenrick and Sons state that the advance previously notified as made by them does not apply to lock furniture, but only to frying pans and goods sold by weight. The nailmakers have resolved to give notice for an advance of about ten per cent. on wages which will be considered by the newly-formed Conciliation Board.

CARDIFF.—The most important event of the past week is the reconstruction of the Board which is to reconcile the conflicting interests of capital and labour in South Wales and Monmouthshire. Six representatives of the masters, and eight of the men, after severe contentions, have signed an agreement which pledges them and their clients for two years. The clause of vital significance at the moment is that which gives an advance of five per cent. to the men from February 1st, and provides for its permanence, irrespective of price, for twelve months. This has been granted by way of returning the bonus which the men conceded to the masters two years ago, and there has been the less difficulty over it, in view of the experience of the last six months, when, after the faithless conduct of certain masters had brought about a further reduction of ten per cent. below the minimum, was found that price fell without the slightest improvement in the demand, and, as a consequence, at the lowest computation, £100,000 has been given away from the district, while if this benevolence be calculated upon the quantities yet to be delivered under the contracts thereafter made, the loss cannot fall short of a million of money. Those trade doctors who believed above all things in bleeding, having pressed the cupping-glass against the men, found it slip from their hands into those of the buyers, who pressed it with even greater effect against them. This untoward catastrophe has produced a revulsion of feeling, and such confidence is now felt in the success of an opposite practice, that if some prudent colliers thought best to decline the advance for fear of reducing the number of working days, it is not improbable they would be threatened to close the pits unless they agreed to accept the shilling. The news of these events has whipped a number of straggling and dilatory buyers simultaneously into the market, who have been met in an uncompromising spirit, and coal has advanced ninepence to one shilling a ton for immediate sales, and more for contracts. Unfortunately, however, for the trade, such heavy quantities are already booked at pessimist prices that comparatively little remains to be operated with for the next six or nine months. An influx of steamers has put pressure upon the dock accommodation and management under which it has broken down. Things are not so disorganised just now, but in view of the great additional output to be expected additional facilities will certainly be required, and the dock trustees be driven to undertake the extensions for which Parliament has given them powers. The iron trade continues to exhibit vigorous prosperity. The fleet of steamers lately loaded at Bilbao has been delivering its ore at Cardiff and Newport. Iron and steel rails are a good 10s. better during the week, and Bessemer pig is now quoted at 65s. Those railway companies which precipitately sold off their scrap at the first indications of a demand are now regretting the loss of nearly £1 a ton; but the impression gains ground that in the raw material things are going too fast, and the finished-iron and hardware trades, which are still in a very poor way will be throttled by the first cast. Coke has been going mild, and is likely to continue so until the means of production are extended. This, however, is being looked after. This trade, like that of coal, is hampered by long unprofitable contracts. The other essential provisions of the new sliding scale are that by it both the bituminous and the steam-coal trades are regulated by the same scale. There is neither a maximum nor a minimum, though, as we have seen, for the next twelve months, there is practically a minimum. Wages will rise and fall by a 2½ per cent. upon the rate paid at the respective collieries for every 4d. per ton in the price of coal. This price shall be ascertained by the accountants every four months, and shall

rule the wage for the ensuing four. The starting point of prices is taken at 8s. 6d. for the steam-coal pits, and 8s. for the house-coal, and the average is to be obtained by getting at the equivalents L.o.b. at Cardiff, Newport and Swansea. But when prices reach 13s. 2d. in steam and 12s. 8d. in house coal, then additional 2½ per cent. will be given, and the same for every 1s. 4d. advance thenceforward. This provision makes the Association scale the most liberal in the most prosperous times, as compared with two private scales which have been set going by members of the Association, who for some months will be in it and yet not of it. These employers are placed in rather a curious position. An advance of 5 per cent. will begin in their vicinity on the 1st of February, which their scales do not provide for, and until March their pits are still Association pits.

CLEVELAND.—There was quite a crowded attendance on Change at Middlesbrough on Tuesday. Prices had receded 2s. since the previous market-day, which reaction was but natural, considering the rapid rise of late. From 60s. to 60s. 6d. were given and taken for No. 3 prompt delivery, and 62s. 6d. to 64s. from March to June. More blast-furnaces are talked of being blown in; amongst others, four of Messrs. Hopkins, Gilkes and Co.'s. This was decided at a meeting held after Change, when it was also decided to go on with the reconstruction of the Company. Since market-day prices have again stiffened to what they were on the previous market-day. Indeed, prices are fluctuating so much that a daily market is talked of as highly desirable. Shipments are fairly up to the average, the season being so far favourable. The finished-iron trade may be said to be *in statu quo*. Prices range as the pig market dictates. The value of those works has of course kept pace with their fortune. Some months ago the Darlington Iron Company's shares were sold as low as 30s.; now they realise £11 10s. on the £15 share, £12 being paid up. Makers' prices are, bars, £8 to £8 10s.; angles, £6 10s. to £9; plates, £9 to £9 10s.; puddled bars, £6 5s. to £6 10s. Merchants' quotations are a few shillings less. The coal trade is advancing with the continued demand. More collieries are being opened out. There is an increasing demand for coke, and prices are advancing—for immediate delivery, 15s.; over the first three months, 17s. 6d.; and over the next six months, 20s. The revival does not yet seem to have materially affected the general business of the district apart from the iron industries, but no doubt it will soon feel the benefit.

DERBYSHIRE.—The district iron trade is now in a much more satisfactory state than it was a few months ago, and there are now not wanting indications that the revival which set in is likely to remain, if not increase. The works in several parts of the district are doing a pretty fair stroke of business in most kinds of manufactured iron and steel. In several instances, the output of pig-iron has been materially increased by the blowing-in of additional furnaces. As an indication of the revival, it may be stated that the shares of several of the large local companies have greatly increased. Just before the revival set in, at the latter end of September, the shares of the Sheepbridge Coal and Iron Company were quoted at 50 discount; whilst last week they were at a fractional premium. The shares of the Staveley Company, which were down to 5 premium in September, have recently been quoted at from 28 to 30 premium. Other companies have been placed in a similar position by the change. The coal trade is active, and a very large quantity of house-coal is being sent to London and the South, the rates by rail being much lower than those levied on South Yorkshire coalowners, owing to the district being nearer the metropolis. There is also more doing in house-coal for local and district markets, but prices are still low. Steam-coal meets a fair sale for locomotive and other purposes; but small-coal is not over good to quote. Makers of coke are well employed, and seem likely to be—at least, for some time to come—owing to the increased demand for pig-iron. The district is being agitated by the movement for an advance of wages, which the men believe they are entitled to, notwithstanding the low prices which prevail for fuel. The North Derbyshire part of the coalfield has been canvassed by means of ballot-papers, on which the men are asked to express their opinions respecting an application being made for an advance of ten per cent. It is said that a large number of the men are favourable to such a course being adopted; but as reports had not been received from the Staveley or Eckington Collieries, the promoters are waiting for their answers before taking action. In all probability, the masters will be able to show that, although the demand may have somewhat increased, prices are still low, and many collieries are being worked with but little if any profit.

DURHAM.—The iron and coal trades of the district are showing a wonderful degree of energy and recuperative power. Week by week higher rates are being obtained for pig-iron, manufactured iron, and coke, until the latter is now sold ahead, as is pig-iron, at double the rates of a few months since. Pig metal was then 32s. 6d. No. 3; now makers ask for forward delivery 65s., but for present delivery about 60s. 6d. is taken. The chief demand in the district is, however, for forge iron, to keep the manufactured iron works in operation. Works which it was currently prophesied a few months since would never manufacture another ton of iron are again in full swing, and not only that, but companies whose shares were *nil*—such as the Skerne Iron Company at Darlington—are worth £4 to £5 each. Then the shares of the Darlington Iron Company, which, with £15 paid out of £20 liability, were sold at £1 a piece in some cases last August, have this week commanded £12, though they have rather gone back since. All these cases are perfectly marvellous, considering the conditions which prevailed but such a short time since. In Darlington, in the iron and allied trades, 1000 more hands are already employed, while probably 300 or 400 more will be started on the 2nd February, when the Skerne Iron Company again begin to make plates under local management of exceptionally promising character. At Bishop Auckland and Wotton Park plates are being turned out, but the shipbuilders complain that they are not supplied fast enough. These are works which until lately were idle, and no account is taken of the magnificent large works of the Consett Iron Company (Limited), where the tonnage of plates turned out exceeds any three or four other works in the North of England. But though the

pressure is chiefly for plates, there is an exceedingly brisk trade being done in other classes of iron bars and angles, whilst the once despised iron rail is once more in vogue, and has been manufactured on a considerable scale at Darlington, though just now one mill is temporarily standing through some hitch which has occurred. The figure for iron rails is £8 10s. to £9, according to quality. Like steel rails, iron have doubled in price since the revival set in. One feature of the trade of the district is the enlarged production of hematite pig-metal. The Consett Iron Company are turning out more of this class of iron from Spanish ore; while the Carlton Iron Company are about to put a furnace on to make this higher class of iron. With hematite pig at 120s. or 130s. per ton, we may expect to see every effort made to extend the production. Blast-furnaces in the county of Durham were not able to compete in many cases with those on the seaboard, where prices of iron were at such a low ebb, but now a different state of things prevails, and at Middleton, near Darlington, the furnaces are being prepared for blowing-in, while at Tudhoe furnaces were lately added. It is also expected that, if the arrangement for reconstruction can be carried out, the furnaces at Ferry Hill will be again put in operation. Ship plates are from £9 to £9 5s.; bars, £8 10s.; angles, £8 15s., less 2½ per cent. The household coal trade is dull, and has been all through the season. Manufacturing coals are:—Screened 6s. to 6s. 6d. at the pits; unscreened, 5s. to 5s. 6d. ditto, though 7s. 6d. and 8s. is asked for the former where there is a desire to buy forward for the last half of the year. Coke is a very excited business just now. Best coke is 16s. at the ovens; secondary sorts 2s. less present delivery. For forward delivery 17s., 18s., and 20s. is asked, the latter being for the last half of the year. The cost of ironmaking will by this rapid advance of coke be considerably enhanced.

FOREST OF DEAN.—A trade war is prevailing in this district between colliery proprietors and merchants, hence the industry associated continues in a painfully depressed and unfortunate position. The rock upon which the parties have split, is the advance of 1s. per ton, in the quotations of December. Unhappily the position of affairs entails loss to our proprietors, and suffering among their employes, many of the latter only making half time. Aiding the masters is the return of severe weather, and the upward course of prices in competing districts adds also to their favour. From enquiries at various centres of our Forest on Wednesday there were found large accumulations of coal, and still "no orders." The advance in South Wales can hardly have material effect in the matter, at least just now, because it applies to steam instead of domestic coal. Quotations f.o.b. at Lydney for best classes of block coals, are 12s. per ton. The merchants are urging the misfortune that North of England vessels arriving with pig-iron are returning to Newport for cargoes of coals, but something should be said by way of meeting the statements, viz., in present instances at least the orders only applied to steam-coal to meet which the Forest is in no favourable position. A few days ago the Foxes Bridge Colliery Company loaded a bark at Sharpness, for Barbadoes, which is the first shipment of local coals across the Severn Bridge. The district pig-iron trade continues brisk and Messrs. Crawshaw, Brothers, are contemplating at an early day, increasing their production by blowing-in another furnace. This will bring about a necessary increased output of iron ore which will be beneficial from a labour point of view. Forest ores are in active request and prices continue to harden. At the Forest Vale forges the puddlers have been advanced 1s. per ton in their wage rate, and the mill men ten per cent. For many months the mills in question have been fully employed. Some American orders during the period constituting a portion of the trade. The tin-plate manufacturers are in regular work and orders are apparently abundant. Imports of pig-iron for Forest tin-plate making was again taken place this week, viz., four cargoes from Whitehaven, and Barrow districts, exceeding an aggregate of 700 tons. It will be interesting to the engineering readers of IRON to add that in consequence of the Tay Bridge disaster some improvements are in contemplation in regard to the Severn Bridge.

GLASGOW.—The warrant market has been in an excitable condition during the past week, and prices have fluctuated up and down, seemingly with the varying humours of the chief operators. Efforts were made to depress prices, but any reduction brought out fresh buying, and a rally took place. Many diverse opinions are held as to whether the Americans will continue buying iron at the present high rates, but amongst outsiders a strong feeling prevails that prices will rise higher. The American demand continues active, last week 2050 tons of pig-iron went to the States, 1700 tons to Canada and 2960 tons to Liverpool, nearly all for America. On Thursday, owing to some large owners clearing out, prices fell from 72s. 9d. to 70s. 9d. cash and 73s. 3d. to 71s. 3d. a month, remaining quiet next day at 71s. 3d. to 70s. cash and 72s. to 70s. 9d. a month. On Monday 69s. 9d. to 70s. 9d. cash was paid, on Tuesday there was a rally from 70s. 3d. to 72s. 1½d. cash and 71s. to 72s. 9d. a month. On Wednesday, 71s. 9d. to 72s. 9d. cash and 72s. 6d. to 73s. 6d. a month paid. Closing sellers, 72s. 4½d. cash and 73s. 1½d. a month, buyers 3d. per ton less. There is still a good demand for No. 1 special brands, but as the masters now hold little they are not anxious to sell. The shipments of pig-iron from Scotland last week were, foreign 6431 tons, coastwise 5857 tons, total 12,288, against 9291 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 6735 tons, against 2643 tons in the similar period of last year. The total imports till January 17th, 1880, are 30,390 tons against 12,363 tons till January 18th, 1879, showing an increase for this year of 18,027 tons. Pig-iron is still going into Connal's store, and the stock there amounts to 429,962 tons, an increase since last week of only 2436 tons. The manufactured iron trade is in a flourishing condition, all the works are busily employed, and buyers have the utmost difficulty in placing orders for early delivery. Few new orders for shipbuilding iron are being given out, but the Americans have been buying bars freely. The exports last week were considerable, the chief items being bar iron for New York valued at £2183, for the East valued at £2523. Cast-iron pipes for Civita Vecchia at £1900, for Melbourne at £1410, and machinery for the Mediterranean

valued at £1935. Some new orders for vessels of various sizes have been secured by Clyde shipbuilders during the past week. Many engineers and foundries still complain of slackness, but all look upon the future with hopefulness. A new industry has been started in Glasgow this week, viz., the making of crucible steel castings. There are already two works making cast tool steel; but this is said to be the first to make crucible castings; already they have got some good orders for wheels. The coal trade seems to be improving, the masters nearly everywhere have agreed to advance wages, and the men are now working more steadily.

LANCASHIRE.—There has been less animation in the iron trade of this district during the past few days, the advance in prices last week having tended to produce rather a lull in the market, with an easier tone, so far as some of the outside brands are concerned. As pointed out in previous reports, present prices are altogether dependent upon the foreign demand. Local users of either pig or finished iron want comparatively little, most of them being supplied up to the end of June, and the general complaint is that orders cannot be secured based on the present price of the new material. There is no diminution in the demand for forge iron, as the American orders which are still coming in for bars, rails, &c., are keeping the local forges busily employed. Lancashire makers have now so little No. 4 Forge to sell for several months forward that they are averse to moving at present, and considerable stocks of lower qualities which a short time back were almost unsaleable are now being rapidly cleared off. For foundry iron, however, there is not such a pressing demand, and of this description of iron there is still much less than the average quantity going into local consumption. Prices are without change from last week, No. 3 Foundry and No. 4 Forge being both quoted at 20s. per ton less 2½ per cent. delivered into the Manchester district, but quotations are subject to alteration from day to day, and as local makers are now below the average market price it is not improbable that some advance may be made before long. There has been some underselling in outside brands owing chiefly to a good deal of consumers' iron having been put upon the market; but makers generally seem to anticipate still higher prices, and will not sell forward at present rates. Scotch iron has been offered at about 4s. per ton under makers' quotations, and North-country irons have been very irregular in price, some makers asking as much as £73 4s. per ton net cash, delivered equal to Manchester, whilst there have been sellers at as low as £68 4s. per ton. There is not very much doing in Lincolnshire and Derbyshire irons, and prices are nominally the same as last week. In finished iron there is a continued upward tendency in prices, and some makers are now so full of orders that they decline to quote at all. For bars delivered into the Manchester district £8 15s. per ton would be readily given; but makers are asking £9 per ton and upwards, and many of them would have no difficulty in selling the whole of their make over the present year at the full prices now ruling in the market. A few of the boiler-makers are now tolerably busy, and makers of engines and plant for ironworks are getting more orders; but generally throughout the foundry, engineering and machine-making branches of trade there is still an absence of activity. In the coal trade, also, there is still an absence of any very marked improvement, for although considerable quantities of outside coal have now been withdrawn from the market consequent upon the activity in the large iron-producing districts there is still no scarcity of local supplies, whilst the output from the Lancashire collieries could be considerably enlarged to meet any increased demand. Prices consequently, although generally steady at late rates, are prevented from moving upwards at present; but there is more confidence in the future, and although colliery proprietors could sell readily for forward delivery, there are very few who would enter into contracts at present prices. The average quotations at the pit mouth remain about as under:—Best coal, 8s. 6d. to 9s. 6d.; second, 7s. to 7s. 6d.; common coal, 5s. 6d. to 6s.; burgy, 3s. 9d. to 4s. 3d.; good slack, 3s. to 3s. 3d.; and common, 2s. 3d. to 2s. 6d. per ton. There has been a falling off in the shipping trade as compared with last week. The slightly better prices which were obtained have brought a considerable quantity of coal into the market, and rather easier rates have been ruling, best steam-coal delivered alongside not realising more than 8s. 6d., whilst at the high level, Liverpool, there are sellers at from 7s. to 7s. 6d. per ton.

LEEDS AND WEST YORKSHIRE.—The common iron trade, as distinguished from the manufacture of the best Yorkshire iron, is busy enough. At one large forge, which may be taken as representative of the rest, business has already increased this month to the extent of 30 per cent. But there is ample room left for further expansion. The fact is that the trade is not moving so fast as prices. The small inland consumers have not as yet been reached by the rising tide of prosperity. The house-building trade is so quiet that comparatively little iron is absorbed for that purpose; and although the cut-nail makers are apparently well employed, it is more than likely that, to some extent, they are working to stock, in anticipation of that briskness which seems inevitable sooner or later. The demand for Belgian iron is, however, larger in this neighbourhood, and sometimes it is difficult to get the necessary supplies. Our ironmasters are anticipating a very much better demand on colonial account. They are keeping a good look-out after what may be required by New Zealand, which country has negotiated a loan of five or six millions, avowedly for the purpose of railway construction; and there being good prospects of large outlays upon railways in Canada and Australia, it is felt to be quite certain that a large portion of the money wherewith to buy engines, rails, and rolling-stock will find its way to England, America not only being preoccupied now, but is likely to be so for a long time to come. The best Yorkshire iron makers are not so busy now as it seemed probable a fortnight since they would be; and now it is not likely they will experience much improvement until about March, when the directors of railways will have better dividends to announce, and will feel at liberty to provide all kinds of new ironwork which is necessary for the stocking of their lines. It deserves to be mentioned that the Leeds Chamber of Commerce have elected Mr. Jas. Kitson, jun. (of the Monk Bridge Ironworks),

as their president, and that gentleman has accepted the office as a compliment to the iron trade, which, he remarked, paid a much larger amount in wages than the other trades of the town. The prices of coals have not gone up in this district, and are not likely to do so until it is found necessary to work all the pits full time. The advance of prices in Staffordshire gives an opening for the South Yorkshire and South Wales, and it is naturally expected that before long such a movement will react beneficially upon this district. The representatives of the West Yorkshire coalowners, and of the West Yorkshire Miners' Association, met again on Tuesday, and came to a final and amicable arrangement as to the sliding-scale by which, in future, wages are to be regulated.

LONDON.—More activity has prevailed in this market during the past week, and prices have been rising steadily. Iron has taken a good part in this advance, America still being open for purchasing. Pig-iron closes to-day for G.M.B. at 71s 6d. Glasgow makers. Iron firm at list prices, and in some cases at an advance. Second-hand parcels are still to be obtained. Copper retains its improved position. Chili bars £73 to £73s. 10s., with every prospect of advance. Tin is again excited at enhanced values. Straits and Australian freely bought at £97 10s. to £98; English ingots, £103. Lead slightly easier. English, £19; Spanish £18 10s., without silver. Tinplates—Manufacturers are firm in prices. The advances of hematite pig-iron keep up prices.

NORTH LINCOLNSHIRE.—It is some time since the district around Frodingham presented so much activity as it does at the present time. Those who looked upon the sudden revival which set in early in the month of October as of a momentary nature are beginning to entertain the opinion that the improvement is likely to be a lasting one. This is evident from the work which is going on at most of the places where pig-iron is produced. Additional furnaces have, during the past few months, been blown-in; and at the present time all available efforts are being put forth to blow-in additional furnaces, and repair those which are not fit for work. Up to the beginning of October, only ten out of the twenty-one furnaces created in the district were at work. Up to the middle of the present week, there were sixteen out of the twenty-one in blast. This has been brought about by the blowing-in of one additional furnace belonging to the Lincolnshire Iron Smelting Company, who have now all their furnaces at work. The North Lincolnshire Iron Company have also started another furnace, so that they have now all four in blast. The Trent Iron Company, who were the first to erect two furnaces in 1864, and who own seven furnaces, are pulling down three old ones, with a view of erecting two new structures as soon as possible. The Frodingham Iron Company, who own four furnaces, have three in blast. They are also busy repairing the idle furnace for the purpose of putting it in blast with all possible speed. It will thus be seen that the output of the district, which has been of late largely increased, will shortly be considerably added to—thus showing the belief that the improvement is likely to be a lasting one. Some good orders are known to have been placed, and a large tonnage is leaving the district daily. The animation is not confined to the iron trade alone; for the ironstone pits, which are within a short distance of the furnaces, also betoken signs of an extensive revival. In addition to the quantity of ore required at the district furnaces, a large tonnage is being forwarded to South and West Yorkshire, as well as to Derbyshire and other places, where it is mixed with other stone and produces capital pig-iron. The railway companies are very busy, for, in addition to the traffic from the district, large consignments of coke are coming to hand daily from South Yorkshire and the North of England. The improvements which have of late taken place in the make of Yorkshire coke, together with the fact that the tonnage-rates show a difference of between 4s. and 5s. per ton when compared with those charged from the north, is causing a large quantity of coke to be drawn from the South Yorkshire district, from whence a special train is chartered daily.

NORTH STAFFORDSHIRE.—Activity continues to prevail at all the ironworks in this district, most of them being employed in clearing the order-books. The receipt of new orders, which was interrupted by the unsettlement of prices a week or two back, has not, however, resumed its former fullness, and the falling off is especially observable in the home trade. At the same time, inquiries are as numerous as ever on foreign account, and a revival of American demand is expected very shortly to set in. Prices continue to advance, and the feeling that they have not reached their maximum is indicated by the caution exercised on both sides, manufacturers, indeed, having discontinued open quotations, and entering only immediate specifications. The demand for heavy sections is quieter, but for plates it is again more active, the plate mills being well provided for several weeks to come. Iron rails are being much inquired for just now, no doubt owing to the rapid advance in the cost of steel. The pig-iron trade is very active, and some more furnaces are about to be relighted. Ironstone finds a rapid sale, all the output being taken into consumption. Most of the coal pits are fully employed, and the demand is equal to the supply. The miners of the district are asking for a further advance in wages, although a month has hardly elapsed since they received a rise of ten per cent. There are two unions in North Staffordshire, and one of them has addressed a respectful appeal to the employers for an increase of ten per cent., and the other has decided to make a formal demand for an increase of 12½ per cent. As the rise in the value of coal has by no means kept pace with that of iron and ironstone, this fresh demand will be regarded as inopportune and somewhat unreasonable.

SHEFFIELD.—The iron market still remains active and there are further advances to record, particularly in hematites, which are 2s. 6d. per ton dearer since last week. Manufactured irons are likewise subject to change. Circulars have been sent out by the leading houses, which show advances of from 5 to 7½ per cent. on the prices of last week. Bar irons are commanding a fair sale, a fact which has not been noticed for four years past, and we hear of additional hands being, in consequence, employed at the mills. All descriptions of manufactured iron are selling freely, but there is a disposition to increase prices. The

advice which have come to hand for the North, show confidence in that direction, and the future of the iron trade is regarded as one of prosperity. A very peculiar feature is the "run" of public investors on the limited companies interested in the iron trade. Confidence has been restored, and a large amount of capital is at the disposal of those who again are willing to advance the iron interest. The calamities of the past five years, together with the depression experienced, has not had a deterrent effect on investors, and to-day shares are purchased in iron and steel companies at rates 33 per cent. above the closing prices of last year. It is noticed also that the heaviest investors are those who are engaged in these leading industries, and the future of the heavy trades in this district may therefore be regarded as a hopeful one. At the foundries there is much more doing, especially in heavy castings. The engineers are likewise busy, and all hands are engaged, but there are rumours of increased wages being likely to be demanded. Bessemer steels are selling freely, but there is an indisposition to book forward large orders for marked ingots, even though £9 2s. 6d. be offered. Rails are realising £6 15s. for ordinary sections, but leading makes are realising 5s. per ton more money. In the coal market there is this week a slight stir. There has been a division amongst the unionists, and about 10,000 of those who have receded from the old association demand a rise in wages. The masters appear indisposed to grant the concession, but the miners are inclined to strike and have pledged themselves to do so unless they receive their terms. It may be said that there has only been a fortnight's real improvement in the coal trade, and no sooner do the men get full work than they demand an advance. It is feared that the improvement in the coal business will be interfered with by a resumption of strikes, which destroyed it during the years 1863-4. The men, however, may claim that they are generally working at rates below those of 1868. Rates for coal are as follows: at the pit bank, best branch, 14s. 2d.; best Silkestone, 12s. 6d.; seconds, 8s. 6d.; nuts, 8s.; slacks, 4s. to 6s. These prices show an advance of 1s. 6d. per ton on the rates of the 1st December. The cutlery market is becoming brisk on foreign account. Large orders are coming to hand for heavy cutlery for the Antipodes, but rates are low. Advances which are being sent out are to the effect that prices must advance between now and March. Ivory is comparatively cheap, but hard woods are dearer, and there are speculative investments which will tend to the further increasing of prices. File, edge-tool, and sheep shear trades are better, and the electro-plate and Britannia metal branches are much busier.

SOUTH STAFFORDSHIRE.—In many branches of the hardware trades, there is more doing this week, consequent upon the travellers having begun to send home orders again. The galvanising department still keeps the lead. Spelter continues in an upward direction, and consumers of galvanised sheets display an anxiety to buy forward where it is at all possible. The new tariff arrangements with New Zealand are somewhat retarding business in this quarter. The chandelier and gasfitter makers are better off than a year ago; and the safemakers are expecting a good run of orders for the next season. In cramps and vices, and smiths' tools generally, some good orders are coming to hand. Makers of wrought-iron frying-pans have just announced a further reduction in discount of five per cent. off the gross; and certain rim and mortise lock-furniture manufacturers have issued new advanced lists. The light iron-founders have put 1s. per cwt on all goods sold by weight. This is brought about, they say, by the continued advance in the price of pig and other irons. The tray-makers of Bilston are very slack as a whole. One firm has, however, this week booked a heavy United States order. The United States people are also still making inquiries for heavy lots—2000 and 4000 tons—of hoop-iron; as likewise for large consignments of old rails, scrap iron and iron ore. Prices of pig and finished iron are firmer this week than last, as a rule. Sheets (singles) are £11 to £11 10s.; plating bars, £9 to £9 10s.; plates, £10 10s. to £12.

WEST CUMBERLAND.—The iron trade is still progressing towards a more and more active state of things. The furnaces in the district which have been idle for a few years past, are one by one being put in blast, and at the present moment there are very few not producing iron; but efforts are being made in every instance to put out blast and to increase, as far as possible, the production of metal, at a time when the demand is of such an overwhelming character. Makers have, in many instances, ceased to be sellers, except for consignments of metal, the delivery of which is distributed over several months. But a good number of sales have been made during the past few weeks for delivery towards the close of the season at current prices. Values of metal still continue to ascend, and this week as high a figure as 140s. has been quoted for best qualities of Bessemer iron. Sales have certainly been made at 130s. per ton, and some makers have offered, during the week, to sell at this price, while others are asking an advance. 125s. has been paid for No. 3 forge iron, and in some instances 130s. has been asked. All descriptions of hematite pig-iron finds a ready market, and there is not a very great margin between the value of the best Bessemer and of white and puddled qualities. Stocks, of course, are non-existent, except in cases where tonnage is being accumulated with the object of shipment when the season is fairly opened. The iron ore trade has improved considerably, and the yield of the Cleator district has of late been greatly increased. Many of the mines which were closed are now in full work, and as several of the miners who left the country during the depression are returning, there is not such a scarcity of skilled miners as was the case a few months ago. Iron ore sells at from 27s. to 37s. per ton at the pit's mouth, and the supply cannot yet be said to be equal to the demand. The steel works in the district are not only fully employed, but makers, having large orders in hand, with prospects of a continuance of a brisk market for several months to come, are making extensions in their producing plant, to facilitate the output of their works. There are indications of a revival of ship-building in several of the yards which have been closed for some time in the district. The coal and coke trades are very well employed, and the consumption of native qualities increases with the augmented output, but the district is still largely dependent on the Durham coke owners.

CONTINENTAL MINING AND METALLURGY.

SEPARATED as they are by seven years of leanness, 1872 and 1880 will probably be found to have many characteristics in common. One of the most striking of these is the resistlessness of the rise of rates: it is steadier now than it was eight years ago, but in its persistence and its refusal to submit to the causes which ordinarily give check to trade the two years are very much alike. In both years makers find themselves in the presence of empty markets and exhausted stocks, both equally are characterised by the absence of the year-long contracts given in steadier times which made business much less harassing than it is at present. The competition is no longer for quality or quantity merely but for time as well, and orders which at one time would have kept mills going for half a year are clattered through now in a fortnight. This is a condition of modern manufacture which has still to be accepted: the joint-stock idea has not yet run its course. But it is well to recognise the presence of this condition to save us from wondering at the sudden heights and depths of trade, and to reconcile us to seeing high prices paid for goods in busy periods. If the public find it convenient to let its wants accumulate, it must be prepared to pay for the prompt satisfaction of them which it demands.

FRANCE.—This week the price of bar iron is the same in France as in Scotland and Belgium, namely £8 to £8 10s. Usually, French prices are some £2 a-head of those of England and Belgium; the inference is that the rate of increase is more rapid in the two latter countries than in the former. Still, the rise is going on in France, in spite of frosts, insufficient supplies of fuel, and difficulties of carriage. At the meeting of Nord forgemasters held on the 8th inst., the rate of 210 fr., or £8 8s., was declared official. It had been quoted before already, and there was a disposition to rise to 220 fr., on account of the dearness of raw material and the increase in general expenses. In February, no doubt 220 fr. will be acknowledged; for the present the lower rate was recommended for adoption. Champagne and the Centre are both now keeping step with the Nord, so that prices are practically equal in each of the great districts of production. Foreign specifications are coming into the French market, so it is said, at rates higher than those current in France. Steel rails, however, are still, as usual, about £2 per ton dearer in France than in competing countries. The entire make of the Nord for beam irons is engaged for the present. One company alone has a contract for more than 30,000 tons to be delivered at La Chapelle at 180 fr. (£7 4s.). Scrap iron is being swept up all through the department, and is shipped at Havre or Dunkirk for America. Prices at Paris follow those of the Nord, and are well maintained, although the actual consumption is just now very restricted. Merchant irons are quoted 210 fr. (£8 8s.), and beams 220 fr. (£8 10s.). For common plate, 250 fr. (£10) for Paris, and 260 fr. for the provinces is quoted. The Montataire Forge has just raised the price of its plates. With the opening of spring, or the advent at any time of fair weather, a considerable strengthening of the present demand is anticipated. The three to four thousand men who had been thrown out of work at Maubeuge, Hautmont, and other places in the Nord, in consequence of the scarcity of fuel caused by the strikes at Mons, have all gone back to their posts.

Pig is becoming scarce in France, foundry pig especially. Supplies of the latter from Luxembourg, Germany, and the Moselle, are getting scarce, and hence the demand for English and Scotch is rising. The members of the Luxembourg Ironmasters' Association were to have met recently to fix 75 fr. (£3) as the rate for their make (25,000 tons in all) for the second half of 1880. Some thousands of tons of British foundry pig are said to have been recently placed in France at the rate of £4 2s. 6d. per ton, duty free and carriage paid. In Meurthe and Moselle makers are asking 110 fr., or £4 8s., at the works, for foundry pig, and a further rise is expected. At Longwy there is no forge pig for sale. The price of the latter has been tolerably steady at Longwy during the year just past; in January last it stood at 53 fr. 50, and in November had only reached 55 fr. Foundry pig, on the other hand, rose considerably, as is seen from the following table:—

	1879	No. 3 Foundry.	Forge pig.
January..	71 fr.	53 fr. 50
February	70	52 00
March	69	51 50
April	68	51 00
October	72	53 00
November	74	55 00
December (1st half)	70	—
“(2nd half)	90	—

There was no forge pig sold at Longwy in December; at Nancy some lots were re-sold at rates rising from 52 fr. 50 to 67 fr. 50. Early this month the manager of a Nord forge, being at the Brussels Exchange, offered 1500 tons of pig, which were at once taken and at once resold. Extensive sales of French ferro-manganese, made in the south, have been made to Russia, America and England.

In spite of protective duties the fine irons of Franche Comté are being replaced by German and Swedish brands, or are worked up from good coke pig. The charcoal-pig of Franche Comté is much appreciated, but it is costly, and, practically speaking, none is now made for sale. The following is a comparative statement of the apparatus at work in Comté in 1878 and 1879 (Dec 31st of each year):—

	1878.	1879.
Charcoal smelting furnaces ..	6	3
Puddling furnaces ..	17	65
Refinery hearths ..	19	52

Heavy orders for rolling-stock continue to flow into the Centre from the French railway companies, and the arrival of heavy specifications for rails is considered imminent, the market having a firmness which does not appear to have been hitherto realised by its recently-deposed tyrants. An effort is being made to realise 250 fr. (£10) at the works as the standard rate for steel rails, and it may

very possibly be reached, and if reached, will be maintained for some time, as there is little likelihood of any recklessness occurring in over-producing. No. 1 irons are quoted 210 fr. to 220 fr. at Lyons and St. Etienne, and as the Loire ironmasters are acting in common, a further increase may be expected.

The new Minister of Public Works, M. Varroy, has issued a new regulation calling for quarterly accounts of the progress made in the execution of the new scheme of railway extension inaugurated by M. de Freycinet. These reports will be published in the *Journal officiel* about three weeks after the close of the quarter reported on. The regulation opens with the curiously un-English prologue: "Le public s'intéresse avec passion au développement des voies ferrées."

The Nantes Tramway Company (running Mékarski's compressed air locomotives) proposes to carry its share capital up to £160,000, and reconstitute itself as The Compressed Air Tramway Company. It has in order the building and working of a second line at Nantes, of two lines at Angers, of a line at Clermont-Ferrand, and one at Zürich—in all, about 19 miles of road. Mr. L. Mékarski is one of the managers of the Nantes company.

The *République française*, continuing that movement in favour of opening foreign markets which has begun to acquire momentum on the Continent, while it is content to see what has been done and what is doing by France in Africa, urges the authorities to cultivate Central and South-America, to multiply consulates, and especially to re-open diplomatic relations with Mexico. Our neighbours, it will be seen, are rapidly acquiring the Anglo-Saxon art of pushing.

M. Haton de la Goupillière, the well-known professor at the Paris School of Mines, has just republished, in a separate form, his review of recent progress in mining and steam-engine construction.

Tenders will be let at Nantes, on February 2nd and 4th, for 1000 tons of foundry coke. The specification contains a large number of conditions. *La Houille*, finding that foreign coal rose in price during the late frosts, when the cost of transport increased, argues against the use at any time of foreign coal. There was a short strike a few days since in the Loire coalfield. About 1000 men belonging to the Firminy collieries struck for a franc a day more. The movement, however, quickly subsided, and is now completely over.

BELGIUM.—There is no halt in the advancing prices. No. 1 irons are quoted at Belgium at 220 fr., or £8 16s.; plates at 270 fr. (£10 16s.); and at both Liège and Charleroi £8 is asked for merchant bars. Hainault pig is scarce at 95 fr. for forge, and 100 fr. for foundry; English pig is quoted at 85 fr. to 95 fr. at Charleroi, split irons being 190 fr. to 195 fr., but the supply is limited. A fresh rise is anticipated all round for February. Orders from distant markets, such as China, Turkey, and the Spanish American States, are now coming in again on the new terms. These orders alone will suffice to give a fresh impetus to business. The Monceau Ironworks are about to blow in a furnace for commercial pig-making, the fuel used to be washed coke, and the make to be of a high class. On the side of Liège the *Semaine Industrielle* counts up nine furnaces which have been blown in during the course of the last fortnight. The sale of the Zône mill has been postponed till next month, when it is supposed metallurgical shares will have become still more valuable than they are now. The state of a few of the more prosperous metallurgical companies is shown by the course of quotations current on the Brussels Exchange on the 19th inst.:

	Nominal Value of Share.	Quotations on April 19.
Cockerill ..	1000	1175
Sclèsin ..	375	375
Athus Ironworks ..	1000	1875
Forges d'Eich ..	1000	2300
Monceau ..	500	895
Providence ..	1000	1600
Forges de Sarrebruck ..	1000	3600
Thy-le-Château ..	1000	1975

On the other hand there are several well-known works which the public is not even yet giving full support to, so that the general situation is still widely different from that of 1872-3, thus:

Esperance ..	500	219
Forges d'Acoz ..	500	395
Luxembourgeois (h.f.) ..	1000	850
Répliss ..	500	290
Vezin-Aulnoye ..	500	450

The Department of Public Works has published a defence of its action in the matter of the celebrated rail adjudication of Dec. 17th. The department, harassed by demands for work, rather than in actual need of rails, invited tenders for 12,000 tons of steel rails for Sept. 3rd. The average price of these tenders was 129 fr. On June 7th the department had done business at 112 fr., and could see no reason for this rise of 17 fr. per ton. It therefore put off letting the tenders till Oct. 15th, when non-Belgian firms were admitted to compete. The average rate of tenders at that date was 139 fr. Trusting to the sagacity of which it has already been a victim, it resolved to defer once more the letting of the tenders, and on December 17th offered 21,400 tons, for which the offers were 189 fr. steel, and 170 fr. iron. By this time the department found that in endeavouring to conciliate the interests of the iron trade and its own it had failed to do either, and must pay the penalty of its want of firmness and foresight. Tenders were therefore let on the basis of the offers of December 17th, the department comforting itself as it best might with the unhelped-for profits it had been able to make in the meantime on the sales of its old rails. A new adjudication is announced for the 28th. This time it is for iron rails—10,000 tons. Part of the price will be paid in cash, part in old iron rails. This new proposal of the department is severely criticised, and not a word can be found in favour of iron rails. Yet last autumn the Charleroi forgemasters were begging, through the press, for a return to the use of iron rails—as there are no steel rail mills at Charleroi. Besides the 10,000 tons of iron rails, the

State means to invite tenders for 100 locomotives and 2000 vans and trucks. These rapidly-following additions to the rolling stock of the Belgian railways shows how heavy traffic is increasing on them.

The State Railway has published an account of its traffic for 1878. Speaking of the pig it has carried, it states:—The larger bulk of the pig made in Belgium is consumed on the spot. Chatelineau, Charleroi and Marchiennes alone send away any noteworthy quantity, the total sent, amounting to 600 up to 1200 tons per month. The Nord Belge gives us, at Namur, 2000 tons. England brings us 6000 tons per month by way of Antwerp. Of this, 3000 tons go to the district of Liège, and 3000 is variously distributed, going to Tabize, Braine-le-Comte, La Crèye, La Louvière, Haine-St-Pierre, and Jemappes. We also get 3000 tons of English pig by way of Terneuzen. This is mostly transferred to the Nord Belge. Athus and Prince-Henri pig is worked up by our metallurgists. The pig of Alsace-Lorraine is mostly consumed in Germany. The imports of ores are mostly from the Grand Duchy of Luxembourg. The Belgian State Railway has made several changes in its regulations lately in order to benefit the condition of the iron trade and the trades allied to it.

The *Cote libre* gives 225 fr. to 235 fr. as the quotations for No. 2 bars, and 240 to 250 fr. for No. 3, with an intimation that No. 2 bars will be 260 fr. in February.

On Jan. 5 a Belgian firm (Dyle et Bacalan) was lowest at La Haye with 80,650 fl. for 48 bridges for Java. The Harkort works (Duisburg) came next, with 81,930 fl.

The *Journal de Liege* reports as follows on the present state of the dephosphorisation process:—"We have had news from several works where the Thomas process has been adopted. Although all difficulties are not yet over, the experience obtained has thrown light on certain points and determined certain conditions. White pig should have 2 per cent. phosphorus, which M. Kupelwieser recommends should be added, where necessary, by charging-in slag from the Thomas process. The Rhenish Steelworks have made about 300 blows of 55 tons each. So far as results are concerned, analysis leaves nothing to be desired. The steel made by the new process is wonderfully malleable, and rolls well. We have by us several results of supposed tests, which show a breaking load of 40 to 45 kilos the square millimetre, with an elongation of 28 to 30 per cent. on bars 10 centimetres long. These are very like the terms of the specification of the English Admiralty for ship plates in mild steel. A piece of news of great importance, if confirmed, is that steel has been made from phosphoretic pig in an ordinary Martin furnace lined with basic brick. The several firms of Stumm and De Wendel are about to build 'Thomas' steelworks in Alsace-Lorraine; it is rumoured that similar works will shortly be erected in the Grand Duchy and in France, not far from the frontier, near Moyeuvre."

THE LABOUR MARKET.—A large and important meeting of ironworkers was held in Wolverhampton on Monday. It was claimed that puddlers' wages should be 1s. per ton on each pound sterling, representing the selling price of every class of iron. The employers, it was intimated, would fight against this mode of payment, but the meeting affirmed their intention of securing it; wages would advance simultaneously. Mr. Chamberlain's award did not give them all they were entitled to, but the meeting determined to abide by it, pending the arrangement of a sliding scale. The strike of riveters in the employment of Messrs. Henderson and Co., Meadows Shipbuilding Yard, Partick, has been settled, and the men have all returned to their work. The deputation of the men, along with Mr. Rothwell, ironworkers' representative, had an interview with Messrs. Henderson and an arrangement was come to, the notice of reduction being withdrawn. The men have resumed work on their old terms. An advance of 5 per cent. has been made in the wages of the employees of the Furness Railway Company. The employees of the Barrow Hematite Steel Company have asked for 15 per cent. rise, but the masters only offer 5 per cent. till the unfavourable contracts now held are cleared off. The strike of miners at Huddersfield has terminated, the men resuming work on the masters' terms, which represent an increase of 10 to 15 per cent. There is an upward movement of wages on the West Coast, but makers still hold many unfavourable contracts. On Saturday a meeting of the South Wales Joint Sliding Scale Committee was held at Cardiff, at which the sliding-scale agreement was amended and accepted for two years. Under this agreement the house and steam colliers belonging to about 70 collieries, most of which are very large, receive an advance of 5 per cent. in wages on February 1. The prices of coal obtained in December last are to be considered the standard prices of coal on which reductions or advances in wages are to be calculated according to net prices existing at the end of every four months. Six months' notice is to be given on either side to determine the scale. An adjourned meeting of colliery proprietors and delegates representing the miners in the Ashton district was held on Tuesday, at the Albion Hotel, Manchester, to further the question of an advance of wages, of which the men had given notice. The masters again informed the delegates that they did not at present see their way to paying higher wages; but that as soon as there was an improvement in trade to justify such a course they would be quite willing to give an advance. This, it may be stated, is the position taken by colliery proprietors throughout Lancashire, and it seems probable that the men will display sufficient prudence to accept the situation at present. An important gathering of coalowners and representatives of the miners of West Yorkshire was held at the Queen's Hotel, Leeds, on Tuesday, under the presidency of Mr. H. C. Briggs (of Briggs Son and Co.). After a lengthy conference an arrangement by which the wages of the miners will be regulated by a sliding scale, and based on the average selling price of coal, was adopted. That average is to be ascertained from time to time by dividing the net amount realised at certain collieries selected, each four months, and by the total tonnage brought to bank. The average selling price for the twelve months ending December, 1879, is to be taken as the standard price, and the rate of wages now being paid at each

colliery for coal-getting, straight work, and underground labour, to be taken as the standard rate of wages at that colliery. Either men or masters, notwithstanding this agreement, will be at liberty to claim any local adjustment of wages rendered necessary by special or altered circumstances of the mine, a joint committee to adjudicate. The agreement is to operate for two years certain, from Jan. 1st, 1880, and afterwards to be terminated by six months' notice. The Amalgamated Miners' Union of North Staffordshire have convened a conference to take steps for a further advance of wages, and the other miners' unions are also agitating for a 10 per cent. advance. The Amalgamated Society of Engineers of North Staffordshire have unanimously resolved to take steps for a 10 per cent. advance in wages, and the operative builders of the Staffordshire potteries have given notice of an advance of 1d. per hour. The men employed at the Barrow Hematite Colliery, near Barnsley, have given notice to quit their employment. They do not assign any reason for so doing in the notice served, but it is understood that they are going to demand the 10 per cent. that was taken off their wages about six months ago back again. The men are not connected with the South Yorkshire Miners' Association, but belong to the "Barrow Union," which is conducted by Mr. Philip Casey. There appears to be very little likelihood of the men's demand being complied with, in consequence of the unsettled state of affairs.

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 138 to No. 237, being the entries from Jan. 13th, to January 19th, 1880.

NEW APPLICATIONS.

- Aortic Power of Light.—L. Warnerke, London. [185]
Appliances for Support in Water.—W. C. Brown, Sheffield, Yorkshire. [186]
Attachments for Wire and Bars.—F. Brady and B. Scarsley, London. [123]
Beer Engines.—W. C. Edwards, London. [159]
Bicycles.—J. Bonner, Coventry. [165]
Bicycles.—T. Warwick, Aston, near Birmingham. [204]
Billiard Markers.—J. Hope, Liverpool. [198]
Bollers.—B. Harlow, Macclesfield. [161]
Bottle Stand.—G. Gibson, London. [220]
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Bottles and Stoppers.—J. Deane and J. Winfield, London. [160]
Braceholders.—J. Hill, London. [166]
Car Starters.—A communication.—B. J. B. Mills, London. [150]
Charging Shells.—A communication.—C. Pieper, Berlin. [175]
Chimney Sweeping Apparatus.—J. Downes, Jaffa, Midlothian. [177]
Coal and other Screens.—C. Armstrong, London. [226]
Combined Slide-block and Cross-head.—J. T. Abel, Cannon Street, London. [105]
Cornices, Mouldings, &c.—A communication.—L. Holombe, London. [166]
Driving Bands.—A communication.—J. A. R. Hildebrandt, Manchester. [226]
Dynamite.—A communication.—W. Brierley, Halifax. [203]
Elastic Bands.—C. H. Eden, Manchester. [212]
Elastic Metallic Packings.—J. Willis, Sheffield. [228]
Electric Light.—J. Clark, London. [203]
Feeding Apparatus for Young Animals.—A communication.—C. D. Abel, London. [191]
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COMMERCIAL.

NEW COMPANIES.

ATLANTIC FIRST LEASED LINES RENTAL TRUST.—The object of this company is to take over the securities of the Atlantic and Great Western Railroad Company's Leased Lines Rental Trust, 1872, and to issue fully-paid debentures and shares in the company in exchange for the bonds issued by virtue of the trust deed, dated 1st of February, 1872. It further proposes to raise money by debentures or otherwise, for the purpose of paying off or taking an assignment of the Bonded Debt of the Cleveland and Mahoning Valley Railway Company, or for otherwise improving the earning or dividend-paying power of such company. The company was registered on the 12th inst., with a capital of £805,500 divided into 16,110 shares of £50 each, to be issued as fully paid up. In exchange for each bond it is proposed to issue fully paid-up debentures to the amount of £150, and three fully paid-up shares, which shares will immediately upon their issue become converted into stock. The debentures are to bear interest at the rate of 4 per cent. per annum, and will entitle the holders to a first charge upon the property and assets of the company.

BORDEAUX TRAMWAYS AND OMNIBUS.—Upon terms of a provisional agreement of 7th inst., between the Tramways and General Works Company (Limited) and Lord Richard Howe Browne, this company proposes to acquire and carry out a concession for the construction and working of tramways, and a system of traffic by tramway and omnibus in the City of Bordeaux and the suburbs thereof. The company was registered 9th inst. with a capital of £350,000 divided into 40,000 5 per cent. preference shares, and 25,000 ordinary shares of £10 each. The purchase includes land, plant, horses, equipment, &c., the consideration being £31,000, payable by the allotment of 10,000 preference shares, and 21,000 ordinary shares, fully paid.

LIVERPOOL SUBURBAN TRAMWAYS.—Registered 10th inst., with a capital of £100,000 in £10 shares, to carry on the ordinary business of a tramway company.

NORTHERN STONE AND MARBLE.—This company proposes to acquire and work quarries in the United Kingdom and abroad, and to prepare marble, granite, and other stone for import and export. It was registered 9th inst., with a capital of £50,000 divided into 640 ordinary and 300 preference or ordinary shares of £50 each. Power is taken to issue debentures to the extent of one-third of the amount of share capital issued.

NORTH-WEST AFRICAN.—Upon terms of an agreement of 29th ult. this company proposes to acquire the commercial station in the neighbourhood of Cape Juby, opposite the Canary Islands, on the North-west coast of Africa, established by Mr. Donald Mackenzie, and all benefit arising from a concession, dated 26th July, 1872, granted to him by his Highness the Sheikh Mohammed Ibn Bairuk. The company further proposes to improve the natural port called Port Victoria, situate between Cape Juby and Stafford Point, the next promontory southward, by deepening the channel, erecting sea walls, landing-stages, and other works, so as to render the said port available for all kinds of vessels. Also to erect buildings, to work mines, and quarries, to sink wells, to capture and cure fish for home consumption, to form roads, canals, and other public works, and to trade in goods and merchandise. The company was registered 12th inst., with a capital of £150,000 in £10 shares. The purchase consideration is £30,000 in fully paid-up shares. These shares are denominated B and C shares, and for the first 10 years are not available for dividends until £5 per cent. shall have been paid to the holders of the A or ordinary shares, and for a like period no dividend is payable upon the C shares, unless £10 per cent. shall have been paid upon the A and B shares. The company will also purchase the property and effects purchased by the said Donald Mackenzie and by Messrs. Allen, for the purposes of such station, and will reimburse them for the outlay incurred in connection with voyages from England to Cape Juby from the 14th of June last. The consideration for these matters is £3856 2s. 9d.

TEILO TIN PLATE.—With a capital of £10,000 in £50 shares, this company was registered 9th inst. for the purpose of erecting tin-plate works at Pontardulais, in the county of Glamorgan, for the manufacture and sale of tin, terne and Canada plates.

PARTNERSHIPS DISSOLVED.

J. and T. S. Beardshaw, Sheffield, file manufacturers.—Pickles and Rawnsley, Halifax, brush manufacturers.—Garside and Quayle, Bold, near Widnes, nickel platers.—A. L. Tottenham and F. Barry, Victoria Street, Westminster, contractors for the construction and equipment of the works at Sligo, Leitrim, and Northern Counties Rail-

having reduced the discounts off ordinary wood screws from 75 to 65 per cent. Messrs. Nettlefold's also have issued their reduced lists of discounts off other articles of their manufacture, but these do not show the same advance as in the case of screws, and only average, on the whole, from 6 to 10 per cent. on the net, while some articles are not advanced at all, notably their bright-head carriage-bolts and nuts, screw-eyes, stocks and dies, and Weston's ratchet-braces; their best round and pan-head rivets are now quoted as follows:— $\frac{1}{2}$ inch, 20s.; $\frac{3}{4}$ inch, 17s.; $\frac{1}{2}$ inch, 16s.; $\frac{3}{4}$ inch, 14s.—all at works. Chains, cables and anchors have advanced from 2s. 6d. to 5s. per cwt. all round, according to the sizes, the latter advance being on the smaller sizes. The patent wrought-iron hinge makers have reduced their discounts again 2½ per cent. all round, and advanced the price of hinges sold per cwt. 25s. per ton. This is the third advance on patent iron hinges which has taken place the last two months. Smoke stack and other wrought rivets are likewise greatly advanced, and wrought rails of the heavier description have gone up fully 20 per cent. Owing to the continued advances in copper, brassfounders are obliged to withdraw most of their special quotations, and a general reduction of discounts is looked for in this trade; in fact, one or two brass cock foundries have already sent out circulars to this effect, reducing their discounts 2½ per cent., or equal to a net advance of nearly 5 per cent. Frying-pans are again advanced, and 60 per cent. is now the utmost that can be quoted off a fair quality, whereas 70 could be had two months ago. In heavy castings and nails, Messrs. Kenrick and other makers have advanced all round 1s. per cwt., and the same may be said of malleable nails, which are also again advanced this week 1s. per cwt. for hobs, slate and moulders' and chaplets. Papered ironfoundry and hollow ware as yet are unchanged, but box irons are reduced 2½ in discount; sash pulleys advanced 6d. per gross; axle pulleys 1s. per gross; hat pins and hat and coat hooks 4d. per gross; flat iron weights 2½ less discount, and bar, ring, and bell weights 5 less discount. Makers of sheet iron goods are withdrawing them. Bright and other latches are advanced 5 per cent. on the net. Curry combs, 10 per cent.; Norfolk and Suffolk latches, 2½ per cent. less discount. Brass shoe rivets advanced ¼d. to 1d. per lb. Iron shoe rivets advanced 3s. per cwt. Brass escutcheon, gimps, and panel pins, ¼d. per lb.; and cut copper tacks, ¼d. per lb. Stair rods are again reduced in discount, and now stand at 7½ per cent. in place of 80 per cent. Kitchen fenders are advanced ¼d. per foot, and common kitchen fire-irons ¼d. per lb.; and makers of the commoner sorts have put 2d. a set on. Brass and copper wire, and brass sheets and tubes, are all advanced ¼d. per lb., and brass bells from ¼d. to ¼d. per lb. Copper and zinc sash chain is reduced in discount 2½ per cent., discount off copper now 50½ to 60 per cent. Following cut nails, tacks and brads in paper are reduced in discount 2½ per cent. all round, and wire tacks, and Paris points are advanced from 2s. to 2s. 6d. per cwt. on prices ruling two months ago. On the whole there is great probability of all sorts of hardware being again considerably enhanced in value, especially if these first advances produce those stock orders which buyers have been hesitating to place, and for which they will now have to pay so much more. We should advise those who have not placed their orders to do so as soon as possible. Lancashire locks and latches are all reduced in discount 2½ per cent., and hinges 5 per cent.

ABRIDGED LIST.

Axles, 15 to 25½; coach ironwork, 10 to 15½; coach and waggon springs, 15 to 20½; Augers, 10 to 20½. **Axes**.—Ship carpenters', 7½ to 10 per lb.; Kent and house carpenters', 7½ to 10; ditto, steel polished, 15 to 17; felling axes, 14 to 17; polished, 14 to 16; bright and blood solid steel, 17 to 18; American felling or wedge axes, steel polished, 17 to 18 per lb.; common Anvils, 84 lb. and upwards, 18½ to 20 per cwt.; best warranted, 22 to 24½; ditto, and ends warranted not to break off, 27 to 35½.

Basins, shallow galvanised, 10 inch, 7 to 7½ per doz.; deep Basins, galvanised, 12 inch, 10½ to 12½ per doz.; Bastard Bellows, 4½ to 5½; Best extra small Bastard, 3½ to 4½; Best improved long Bristol, 3½ to 4½; casters' or moulders', best extra small, 12 inch, 30 per doz. net; common Bimth's Bellows, 4½ to 5½; Best warranted, extra leather double ended, 30 to 40½; with movable pipe for shipment, 2½ less discount. Bed screws, 6 and 7-10 and 1 inch, 10½ to 11½ per gross for London black heads; London heads with bright turned collar, 6 and 7-10 and 1 inch, 12½ to 13½; Black welded heads, 6½ to 10½; common slit heads, 6 and 1 inch, 6½ to 10½; Bright turned notched heads, 6 and 7-10 and 1 inch, 12½ to 13½; black notched heads, 10½ to 11½ per gross; Brass head nails, 40 to 42½; star head, 35 to 40½; Brass plated countersunk head, 25 to 30½; Blacksmiths' tongs, 20 to 28 per cwt.; real fine wrought Box irons, 20 to 25½; fine cast, 42½ to 60½; middle cast, 42½ to 60½; charcoal box irons—Victoria, 45 to 50½; ordinary charcoal box irons, 35 to 40½; Bolts—Straight tower, solid end tower, 65 to 67½; end tower, solid tower, 60 to 65½; solid end barrel brass knobs, 60 to 62½; jappaned Scotch tower bolts, 45 to 50½; painters' brushes, 45 to 65½; Best, 10 to 40½; light galvanised Buckets, 12 inch, 18 lb. to the doz., 10½ per doz. net; Blind cord, list price net; Bed hooks and eyes, 50 to 55½ malleable, 62½ to 67½; Brass chain Bending, 30 to 35½; Brass and plate coach heading, 30 to 35½; ashpan moulding, 20 to 30½; Bottle jacks—Linwood's, 15 to 20½; Salter's, 30 to 35½; Nicholas's, 15 to 20½; common painted Beams, 35½ to 65½; Bright round end beams, 40½ to 55½; Bright box and beams, 40 to 55½; deep Copper scales, 45 to 65½; Steelyards, 40 to 60½; pocket steelyards, best counter weighing machines, Avery or other best make, 25 to 30½; common, with round copper scale, 7 lb., 3 to 5½; 14 lb., 3½ to 5½; 28 lb., 5 to 8½; net Bedsteads, cheap stumps, 6 feet by 3 feet 6 inch, 7-6 to 9-6 each; cheap French, 6 feet by 3 feet 6 inch, 8-6 to 10-6 each, rising 10 for every 6 inches. Brass—Rolled brass, 2 to 12 inches wide, to 30 W.G., 10 to 11½ per lb.; Brass sheets, 24 by 48 in., 8 lb. and upwards or 27 W.G., 10 to 11½ per lb.; House bells, brass rough, 10 to 11½ per lb.; turned edge, 11½ to 12½; turned, and lacquered on edge, 12 to 13½ per lb.; cattle and sheep bells, with brass loops, 12½ to 16 per lb.; clock bells, 1½ to 1½; ship and turret bells, best, 1½ to 1½; Battery kettles, 150 per cwt.; Brass composition sheathing and slating nails, 10½ to 11½ per lb.; Brass Escutcheon pins, 1 by 1½ inch, W.G., 10½ to 11½; Brass jelly pans, with balls, 1 to 1½; without balls, 1½ to 1½ per lb.; Maolin kettles, cast, 4 to 10 inch, 10½ to 11½ per lb.; Pinpoints, 1¼ to 1½; Brass Rivets for boots, 12 to 17, W.G., 10 to 11½ per lb.; Brass Shoe Bills, 1½ to 1½ per lb.; Brass Scale pans, 2 to 2½; Brass Toddy kettles, 15 to 20½; Brass Tubes, plain rough, 1 inch and above, 10½ to 11½ per lb.; Locomotive and marine boiler tubes, seamless from 1½ to 4 inch outside diameter, to 14, W.G., 7½ to 9½.

Copper.—Copper boat nails, wrought 12 by 12 inch, W.G., and upwards, 10½ to 11½ per lb. Copper boat Rivets, 1 inch and upwards, 12½ to 13½ per lb. Copper Brads and bills, same price as tacks. Light round Copper Kettles, bare rivets, 11½ to 12½ per lb. Light round covered rivets, 1½ to 1½; loaded, 1½ to 1½; oval Copper kettles, bare rivets, 2½ to 2½ per lb.; oval bare rivets raised down, 2½

to 2½ per lb. Copper Rivets and washers, 1 to 1½ per lb.; Copper Slating nails, cut, 1 to 1½ inch and upwards, 11½ to 12½ per lb.; Copper Scale pans, 1½ to 2½ per lb.; cut Copper Nails and tacks, 1 inch and upwards, 1½ to 1½ per lb.; wrought Copper nails and tacks, 1½ to 1½ per lb.; Copper Wire, 20 to 20 W.G., 10½ to 11½. Brass cupboard turns, 45 to 50½; Chair webbing, No. 9, 4½; 10, 4½; 11, 4½; 12, 4½; 13, 4½; 14, 4½; 15, 4½; 16, 4½; 17, 4½; 18, 4½; 19, 4½; 20, 4½; 21, 4½; 22, 4½; 23, 4½; 24, 4½; 25, 4½; 26, 4½; 27, 4½; 28, 4½; 29, 4½; 30, 4½; 31, 4½; 32, 4½; 33, 4½; 34, 4½; 35, 4½; 36, 4½; 37, 4½; 38, 4½; 39, 4½; 40, 4½; 41, 4½; 42, 4½; 43, 4½; 44, 4½; 45, 4½; 46, 4½; 47, 4½; 48, 4½; 49, 4½; 50, 4½; 51, 4½; 52, 4½; 53, 4½; 54, 4½; 55, 4½; 56, 4½; 57, 4½; 58, 4½; 59, 4½; 60, 4½; 61, 4½; 62, 4½; 63, 4½; 64, 4½; 65, 4½; 66, 4½; 67, 4½; 68, 4½; 69, 4½; 70, 4½; 71, 4½; 72, 4½; 73, 4½; 74, 4½; 75, 4½; 76, 4½; 77, 4½; 78, 4½; 79, 4½; 80, 4½; 81, 4½; 82, 4½; 83, 4½; 84, 4½; 85, 4½; 86, 4½; 87, 4½; 88, 4½; 89, 4½; 90, 4½; 91, 4½; 92, 4½; 93, 4½; 94, 4½; 95, 4½; 96, 4½; 97, 4½; 98, 4½; 99, 4½; 100, 4½; 101, 4½; 102, 4½; 103, 4½; 104, 4½; 105, 4½; 106, 4½; 107, 4½; 108, 4½; 109, 4½; 110, 4½; 111, 4½; 112, 4½; 113, 4½; 114, 4½; 115, 4½; 116, 4½; 117, 4½; 118, 4½; 119, 4½; 120, 4½; 121, 4½; 122, 4½; 123, 4½; 124, 4½; 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573, 4½; 574, 4½; 575, 4½; 576, 4½; 577, 4½; 578, 4½; 579, 4½; 580, 4½; 581, 4½; 582, 4½; 583, 4½; 584, 4½; 585, 4½; 586, 4½; 587, 4½; 588, 4½; 589, 4½; 590, 4½; 591, 4½; 592, 4½; 593, 4½; 594, 4½; 595, 4½; 596, 4½; 597, 4½; 598, 4½; 599, 4½; 600, 4½; 601, 4½; 602, 4½; 603, 4½; 604, 4½; 605, 4½; 606, 4½; 607, 4½; 608, 4½; 609, 4½; 610, 4½; 611, 4½; 612, 4½; 613, 4½; 614, 4½; 615, 4½; 616, 4½; 617, 4½; 618, 4½; 619, 4½; 620, 4½; 621, 4½; 622, 4½; 623, 4½; 624, 4½; 625, 4½; 626, 4½; 627, 4½; 628, 4½; 629, 4½; 630, 4½; 631, 4½; 632, 4½; 633, 4½; 634, 4½; 635, 4½; 636, 4½; 637, 4½; 638, 4½; 639, 4½; 640, 4½; 641, 4½; 642, 4½; 643, 4½; 644, 4½; 645, 4½; 646, 4½; 647, 4½; 648, 4½; 649, 4½; 650, 4½; 651, 4½; 652, 4½; 653, 4½; 654, 4½; 655, 4½; 656, 4½; 657, 4½; 658, 4½; 659, 4½; 660, 4½; 661, 4½; 662, 4½; 663, 4½; 664, 4½; 665, 4½; 666, 4½; 667, 4½; 668, 4½; 669, 4½; 670, 4½; 671, 4½; 672, 4½; 673, 4½; 674, 4½; 675, 4½; 676, 4½; 677, 4½; 678, 4½; 679, 4½; 680, 4½; 681, 4½; 682, 4½; 683, 4½; 684, 4½; 685, 4½; 686, 4½; 687, 4½; 688, 4½; 689, 4½; 690, 4½; 691, 4½; 692, 4½; 693, 4½; 694, 4½; 695, 4½; 696, 4½; 697, 4½; 698, 4½; 699, 4½; 700, 4½; 701, 4½; 702, 4½; 703, 4½; 704, 4½; 705, 4½; 706, 4½; 707, 4½; 708, 4½; 709, 4½; 710, 4½; 711, 4½; 712, 4½; 713, 4½; 714, 4½; 715, 4½; 716, 4½; 717, 4½; 718, 4½; 719, 4½; 720, 4½; 721, 4½; 722, 4½; 723, 4½; 724, 4½; 725, 4½; 726, 4½; 727, 4½; 728, 4½; 729, 4½; 730, 4½; 731, 4½; 732, 4½; 733, 4½; 734, 4½; 735, 4½; 736, 4½; 737, 4½; 738, 4½; 739, 4½; 740, 4½; 741, 4½; 742, 4½; 743, 4½; 744, 4½; 745, 4½; 746, 4½; 747, 4½; 748, 4½; 749, 4½; 750, 4½; 751, 4½; 752, 4½; 753, 4½; 754, 4½; 755, 4½; 756, 4½; 757, 4½; 758, 4½; 759, 4½; 760, 4½; 761, 4½; 762, 4½; 763, 4½; 764, 4½; 765, 4½; 766, 4½; 767, 4½; 768, 4½; 769, 4½; 770, 4½; 771, 4½; 772, 4½; 773, 4½; 774, 4½; 775, 4½; 776, 4½; 777, 4½; 778, 4½; 779, 4½; 780, 4½; 781, 4½; 782, 4½; 783, 4½; 784, 4½; 785, 4½; 786, 4½; 787, 4½; 788, 4½; 789, 4½; 790, 4½; 791, 4½; 792, 4½; 793, 4½; 794, 4½; 795, 4½; 796, 4½; 797, 4½; 798, 4½; 799, 4½; 800, 4½; 801, 4½; 802, 4½; 803, 4½; 804, 4½; 805, 4½; 806, 4½; 807, 4½; 808, 4½; 809, 4½; 810, 4½; 811, 4½; 812, 4½; 813, 4½; 814, 4½; 815, 4½; 816, 4½; 817, 4½; 818, 4½; 819, 4½; 820, 4½; 821, 4½; 822, 4½; 823, 4½; 824, 4½; 825, 4½; 826, 4½; 827, 4½; 828, 4½; 829, 4½; 830, 4½; 831, 4½; 832, 4½; 833, 4½; 834, 4½; 835, 4½; 836, 4½; 837, 4½; 838, 4½; 839, 4½; 840, 4½; 841, 4½; 842, 4½; 843, 4½; 844, 4½; 845, 4½; 846, 4½; 847, 4½; 848, 4½; 849, 4½; 850, 4½; 851, 4½; 852, 4½; 853, 4½; 854, 4½; 855, 4½; 856, 4½; 857, 4½; 858, 4½; 859, 4½; 860, 4½; 861, 4½; 862, 4½; 863, 4½; 864, 4½; 865, 4½; 866, 4½; 867, 4½; 868, 4½; 869, 4½; 870, 4½; 871, 4½; 872, 4½; 873, 4½; 874, 4½; 875, 4½; 876, 4½; 877, 4½; 878, 4½; 879, 4½; 880, 4½; 881, 4½; 882, 4½; 883, 4½; 884, 4½; 885, 4½; 886, 4½; 887, 4½; 888, 4½; 889, 4½; 890, 4½; 891, 4½; 892, 4½; 893, 4½; 894, 4½; 895, 4½; 896, 4½; 897, 4½; 898, 4½; 899, 4½; 900, 4½; 901, 4½; 902, 4½; 903, 4½; 904, 4½; 905, 4½; 906, 4½; 907, 4½; 908, 4½; 909, 4½; 910, 4½; 911, 4½; 912, 4½; 913, 4½; 914, 4½; 915, 4½; 916, 4½; 917, 4½; 918, 4½; 919, 4½; 920, 4½; 921, 4½; 922, 4½; 923, 4½; 924, 4½; 925, 4½; 926, 4½; 927, 4½; 928, 4½; 929, 4½; 930, 4½; 931, 4½; 932, 4½; 933, 4½; 934, 4½; 935, 4½; 936, 4½; 937, 4½; 938, 4½; 939, 4½; 940, 4½; 941, 4½; 942, 4½; 943, 4½; 944, 4½; 945, 4½; 946, 4½; 947, 4½; 948, 4½; 949, 4½; 950, 4½; 951, 4½; 952, 4½; 953, 4½; 954, 4½; 955, 4½; 956, 4½; 957, 4½; 958, 4½; 959, 4½; 960, 4½; 961, 4½; 962, 4½; 963, 4½; 964, 4½; 965, 4½; 966, 4½; 967, 4½; 968, 4½; 969, 4½; 970, 4½; 971, 4½; 972, 4½; 973, 4½; 974, 4½; 975, 4½; 976, 4½; 977, 4½; 978, 4½; 979, 4½; 980, 4½; 981, 4½; 982, 4½; 983, 4½; 984, 4½; 985, 4½; 986, 4½; 987, 4½; 988, 4½; 989, 4½; 990, 4½; 991, 4½; 992, 4½; 993, 4½; 994, 4½; 995, 4½; 996, 4½; 997, 4½; 998, 4½; 999, 4½; 1000, 4½.

Door springs, X, 75 to 80½; XX, 70 to 75½; XXX, 65 to 70½; XXXX, 60 to 65½; brass circular and iron circular, 55 to 60½; brass radiance, 10 to 15½; climax, 5 to 10½; universal, 50 to 60½; paragon, 10 to 15½; smith's, 5 to 10½; O'Connor's patent lever hinge springs, 10 to 15½; O'Connor's vertical spring hinge door spring, 15 to 25½; Gerish's spring hinges, iron, 20 to 25½; brass, 10 to 15½; jappaned Door chains, 10 to 60½.

Files, 25 to 50½; Frying pans, best, 50 to 55½ common, 55 to 60½; kitchen Fireirons, in sets, 15 to 17 per lb.; tongs only, 10½ to 12½; poker only, 15 to 16 per lb. Fish hooks, 30 to 35½; best; common, 50 to 55½; light kitchen Fenders, 5 inch assorted, 2 feet

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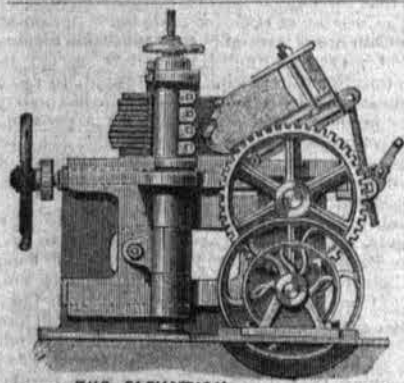
For Sale in all parts of the country, also Bessemer Billets and Blooms of any size and for all purposes, Old Steel Tyres, either whole or broken, Old Springs, Old Files, Cut Bessemer Scrap and Spring Ends for remelting, English and German Spiegeleisen, Swedish and Russian Steel Iron and Box Ends, Swedish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

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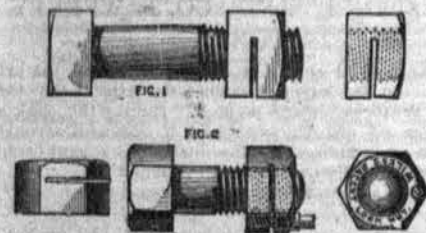
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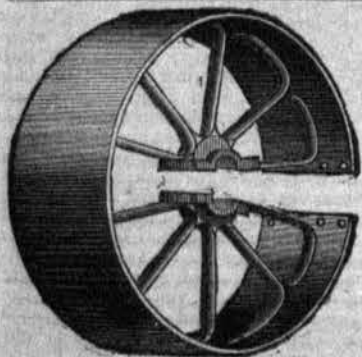
The advantages of this Lock Nut are as follows:—Simplicity, cheap-
ness, strength, locking on any portion of the bolt without injuring the
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closed, having been previously tapped, and it is only necessary to screw it
upon the bolt in the ordinary manner, when the cut opens and exerts a
sufficiently strong spring friction to secure the nut from slacking back by
vibration. Fig. 2 shows a nut fitted with set screw, which is more appli-
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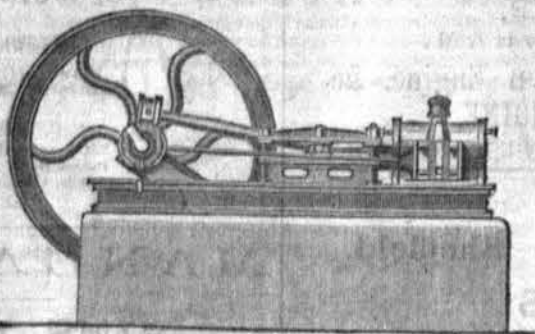
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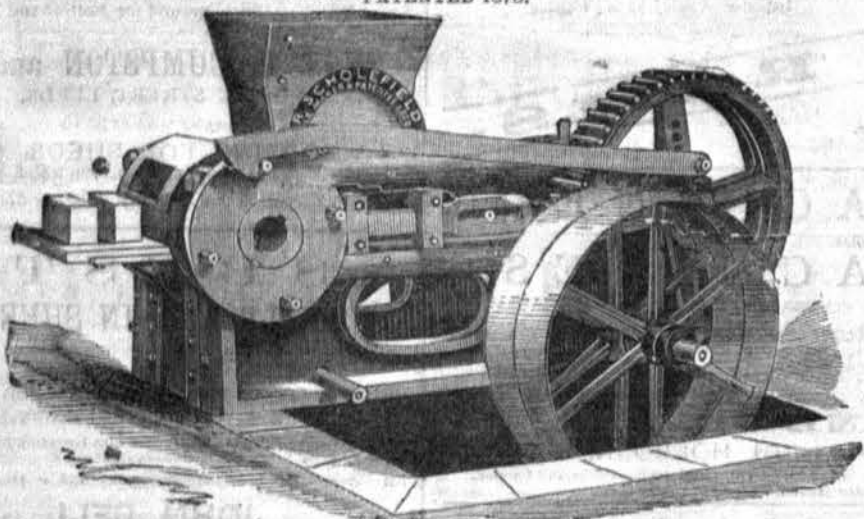
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1 man digging, each 4s. per day	£0 8 0
1 man grinding, 4s. 6d. per day	0 4 6
1 boy taking off bricks from machine, and placing them in harrow ready for the kiln, 2s. per day	0 8 0
1 boy greasing, 1s. 6d. per day	...	...	...	...	0 1 6
1 engine-man, 5s. per day	...	...	...	...	0 5 0
1 man wheeling bricks from machine to kiln, 4s. 6d. per day	...	...	...	...	0 4 0
Total cost of making 10,000 pressed bricks					1 5 0, or 2s. 6d. per 1000

(SETTING AND BURNING SAME PRICE AS HAND-MADE BRICKS.)

N.B.—Where the material can be used as it comes from the pit, the cost will be reduced in digging. As the above Machinery is particularly adapted for the using up of shale, bind, &c., it will be to the advantage of all Colliery Owners to adopt the use of the said Brick-making Machinery.

The Machines can be seen in Operation at the Works of the Sole Maker and Patentee daily.

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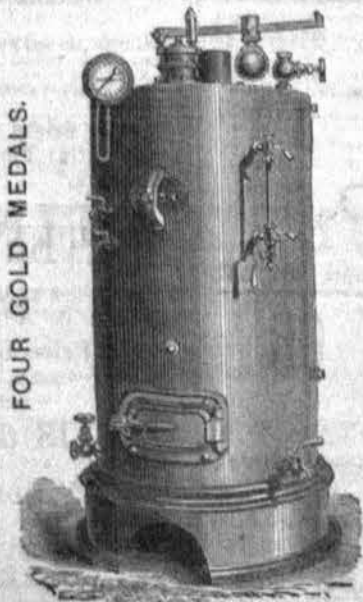
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THE year 1879 will be marked as showing the largest stock and lowest price of Chili bars on record. The depression continued more or less until £53 per ton was touched in the autumn. From that time, probably from sympathy with the revival in the demand for all metals, a very large business has been done at advancing rates, culminating in £70 10s. per ton being paid for spot good ordinary brands.

Furnace material was influenced by a like impulse, and after receding to 10s. per unit slowly advanced until 14s. was attained in December, since when two cargoes sold at 14s. 6d., there being still buyers thereat. English copper, of course, participated in the improvement, and extensive contracts have been negotiated for home consumption and export. This fact has emboldened speculators, who are now very largely interested in the article, and are sanguine of a yet further rise in value.

The average price of Chili bars for 1879 was £58 per ton, against £62 in 1878, and £69 in 1877. Total Chili copper charters for 1879 were 59,900 tons fine, against 47,050 tons in 1878, and 44,300 in 1877. Transactions so far this month comprise a very large business in bars at £65 10s. up to £72 per ton; 1000 tons New Quebrada ore at 13s. 6d. to 14s.; 1700 tons Bell's Cove ore at 13s. 7½d.; 624 tons Cape ore at 14s.; 770 tons Chili ore at 13s. 9d.; 1770 tons Chili regulus at 14s. to 14s. 6d.; 125 tons English precipitate at 14s. to 14s. 3d.; 1450 tons Spanish precipitate at 15s. 3d. to 14s.; and at the Swansea sale by tender on the 6th inst., 2033 tons ore average produce 10 per cent. realised 13s. per unit. Import of Chili copper during the past fortnight, 454 tons fine, against 4525 tons fine same time last year; delivery of Chili copper during the past fortnight, 1527 tons fine, against 898 tons fine same time last year.

Quotations are:—To-day—Chili bars, £70 10s. to £71 10s.; Chili ingots, £75; Chili ore and regulus, 14s. to 14s. 6d.; Coro Coro Barilla, 15s. 15th Jan., 1879—Chili bars, £57 to £58; Chili ingots, £64; Chili ore and regulus, 11s. 4d. to 11s. 6d.; Coro Coro Barilla, 12s. 9d. 15th Jan., 1878—Chili bars, £66 to £67; Chili ingots, £72; Chili ore and regulus, 12s. 9d. to 13s. 4d.; Coro Coro Barilla, 14s. 6d. 15th Jan., 1877—Chili bars, £74 to £76; Chili ingots, £82; Chili ore and regulus, 14s 9d. to 15s.; Coro Coro Barilla, 16s. 3d.

Liverpool, 15th January, 1880.

J. B. SPENCE AND CO.'S WEEKLY REPORT.

CHEMICALS.—The condition of the chemical market continues to be one of improvement notwithstanding the substantial advances already secured. During the week a sustained demand on American and Continental account generally has been noticeable—that for the Continent being rather more brisk, particularly for Alkali. Buyers are displaying more anxiety to cover their forward requirements. The inquiry on this account also is consequently larger. As a rule, makers are chary of quoting in such a manner as to bind themselves. As matters are at present it is difficult to determine what will be the aggregate of the advance, manufacturers therefore prefer a cautious policy, and are not disposed to sell for delivery far ahead at prices at present obtainable. The quantities offering are easily placed, so that buyers are without much choice of selection, and the tendency of prices continues upwards. The home trade demand for prompt delivery still increases, though rather slowly, one or two branches of consumption being as yet only indifferently employed. Bleaching-powder is again slightly dearer, and parcels are eagerly competed for. Ash has a larger sale and quotations are firmer. Caustic soda is also firmer. Metallic salts have a larger inquiry, and advances seem imminent. Acetates and acid are sustained. Arsenic stocks are low, and sellers require higher prices.

MINERALS.—A marked increase in the requirements of minerals has been noticed during the week, and in respect to many articles, the stocks of which have hitherto been overwhelming, these stocks are now fast disappearing, and channels of supply latterly closed are again being opened in order to meet the demand. The inquiry for iron ore continues most brisk, and the question of obtaining adequate supplies is becoming one of moment, notwithstanding the quantities coming forward from abroad; as a consequence prices are rapidly advancing. Brimstone holds the slight advance with tolerable firmness in sympathy with foreign

advice, and sellers are more disposed to hold their stocks for the present. Manganese is in larger request, but supplies are less easy to obtain. Ochres are rather more active, especially the finer descriptions, as also are China Clays.

METALS.—The week has been one of considerable activity as regards pig-iron, and has further developed the principal features observable in the trade during the past two or three months. The general tendency of prices is still upward, though the highest rates have not been maintained in every case. Glasgow warrants rose rapidly to 73s. 6d. per ton early in the week, but the heavy realisations checked sales, and a gradual retreat to 71s. 6d. per ton has ensued. Middlesborough No. 3 has risen to 65s. per ton, with No. 4 Forge at the same figure, being an advance of about 2s. 6d. per ton over last week's prices. So far these figures are fairly maintained, notwithstanding the large stocks and the contemplated increase of production. Hematite is firm at last week's rates, business being restricted only by inadequate supplies. Merchants with stocks of hematite are rather disposed to hold them than quit just at present. Derbyshire iron is dearer by 5s. per ton, and Lincolnshire brands have advanced in the same ratio. Tin has fully recovered, and is selling at full prices. Copper has become excited, and was at £76 per ton on Thursday. Lead, particularly foreign, is, if anything, a shade easier.

GENERAL ITEMS.—The stocks of fine copper in London on the 31st December, were 4781 tons, and in Havre 4511 tons against 5953 tons and 6595 tons respectively on the 31st December, 1878.

Manchester, Jan. 17th.

NOVEL CASE OF COLOUR BLINDNESS.—The *Marquette Mining Journal* is responsible for the following:—“The employees at the Winthrop mine were paid off in gold the other day. This was quite a surprise to them, and as many had never seen a gold piece, was also a puzzle to some of the men. A look of disappointment spread over the countenances of many a hardy labourer as he received his envelope over the counter with not a greenback in it. One of them, after getting his pay, came back to the office with a woebegone look on his face, and asked the paymaster if he had been garnished, and was informed that he had not. ‘Then surely there must be some mistake,’ he said, ‘for here I’ve worked hard all the month and only get two silver dollars for it!’ and he laid two double eagles on the counter with a disgusted air. ‘That’s all the money you earned,’ replied the paymaster. ‘All the money I earned! and do you think I’ll work a month in the mine for two dollars!’ cried the miner, in a rage. He was quietly informed that there were forty dollars instead of only two; that each of the pieces he had mistaken for silver dollars were twenty-dollar gold pieces. The miner took up the pieces, looked at them closely in a suspicious manner, and went away satisfied that he had his forty dollars, but hardly as contented and happy as he would have been with the greenbacks. In the course of the afternoon half a dozen men came into the office wanting to know why they had only received two or three dollars in silver for their month’s wages. It is an actual fact they didn’t know gold by its colour.”

THE MONSTER PLOUGH.—A Chicago journal, the *Factory and Farm*, gives an account of the largest plough that was ever known to be made, recently turned out by an Illinois firm of agricultural machinery makers, for use on the St. Louis, Iron Mountain, and Southern Railway. It is calculated to cut a ditch 30 inches wide and 2 feet deep, and is worked by attaching it to a platform car of a construction train by means of timber framed and extending out, so that the plough cuts its ditch a sufficient distance from the track. It cuts a furrow 8 inches deep each time, requiring three of them to reach the proper depth, and it will make one mile of ditch 2 feet deep and 3 feet wide every four hours, thus doing the work of about 1000 men. The beam is made of swamp oak, and is 8 inches by 14 inches, the land side being made of bar iron 8 inches wide and 1½ inch thick, which had to be forged especially for the purpose. Its total weight is 1700 lbs. The use of this plough will mark an era in all ditching work, especially in connection with railways, and will go far to supersede the navy.

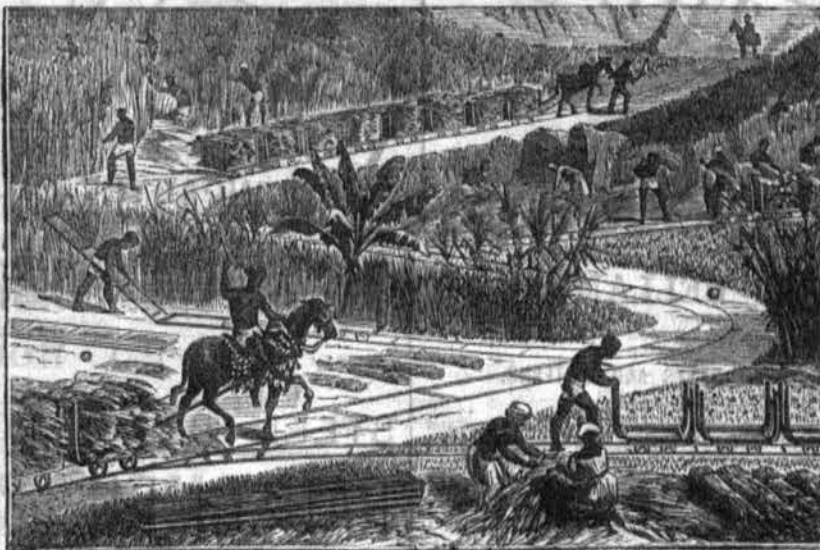
THE LEADVILLE SILVER MINES.—The production of this great Colorado mining centre is quite taking the lead in the mining of the precious metals. During the month of October last the yield was 34 tons of pure silver, of the value of £1,384,104. This amount was greater than the production of the whole State of Nevada. The richest mine in the district is the Robert Lee, from which was lately extracted silver ore which realised 10,300 dols. per ton. The ore is a chloride of silver, of which, indeed, the majority of the Leadville ores are composed, about one-third of the production being carbonates. It is not, however, every mine that is so rich as the one just mentioned; for, as a matter of fact, the low grades predominate over the richer ones. A new gold deposit has been recently discovered in Montana. The lode, which is 6 feet in width, is described as being literally filled with gold, a hatful of the ore panning out an ounce of good gold.

LARGE RAILWAY BRIDGE.—The Baltimore Bridge Company is building a 300,000 dols. wrought iron bridge for the Short Line Railroad, at Minneapolis, Minn. Total length, 1150 feet, divided into two spans of 325 feet each, one of 240 feet, and one of 260 feet. It will be the second highest structure of its kind in the country, the highest being over the Kentucky river in Kentucky. Its distance above the Mississippi will be 143 feet, while the Kentucky bridge is 132 feet higher. The approach on the western end is a trestle work 1200 feet in length and 18 feet in height. Underneath the railroad track will be a wagon bridge.

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JAMES H. WEAGER AND CO'S METAL
REPORT.

CONSIDERABLE excitement prevails in the metal market here, leaving prices still higher than at our last issue. The demand from America for iron continues good, and manufacturers are enabled to sustain the advanced rates. It is true there are middle parcels to be obtained, but not much in marked iron. Good Staffordshire bars are quoted £9 10s. London. Copper in fair demand, with higher prices. Tin is again on the move, and much business has been done at £97 to £98 for foreign. English smelters have kept well ahead, quoting from £103 for common ingots. We are inclined to think there is more likelihood of their being on the right side. What with but very small shipments from the Straits, and America buying largely of foreign and English, we can with reason look for still higher prices. Lead is easier. English, £10 per ton for pigs. Tin plates: Prices in many cases stand in the way of business, and will do so as long as second-hand lots are about. The price of iron chiefly maintains the advance. Quicksilver a little firmer, £7 5s. to £7 10s. per bottle.

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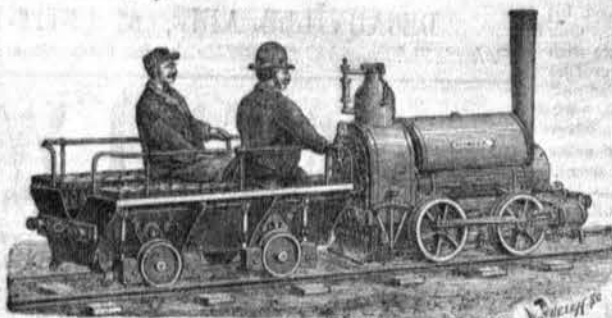
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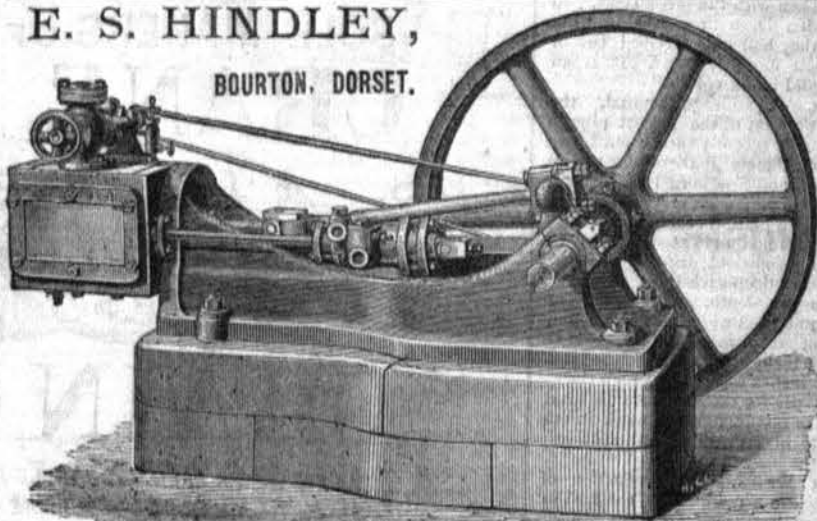
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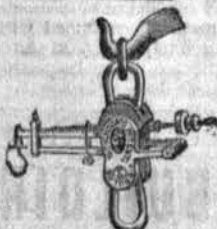
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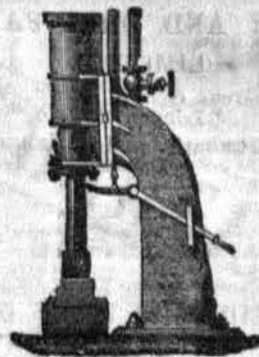
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FROM CAPTAIN TOWNSEND, WINEHAM, FEB. 10, 1877.

"In answer to your enquiry, I am glad to say the Hydraulic Ram you sent me in November, 1875, is working exceedingly well, and gives no trouble. It will work when quite immersed, as it has been several times during the floods this winter, forcing up water through a delivery pipe 900 yards long at the rate of 80,000 gallons per day, although you only promised 50,000."

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AUG. 22, 1878.

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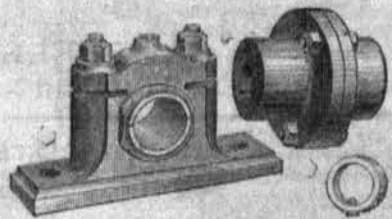


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Diameter	in	6	8	10	12	15	18	21	24	28	32	36	42	48	54	60	
inches	...	6	8	10	12	15	18	21	24	28	32	36	42	48	54	60	
Width, ditto	...	2	2	2	3	3	3	3	4	4	4	5	5	5	6	6	
Price, Split,	...	8	9	10	11	14	17	20	25	32	38	45	55	66	85	110	
Do. Plain do.	...	5	6	7	8	10	13	16	20	25	30	38	45	55	80	90	



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Bore, in inches to standard	...	1 1/2	2	3	4	5	6	8	10	12	14	16	18	20	24	30	36
PLUMMER BLOCK, each	...	6	7	8	10	12	14	16	18	20	24	28	32	36	48	60	72
COUPLINGS, pair	...	7	8	10	12	14	16	18	20	24	28	32	36	48	60	72	84
LOOSE COLLARS, each	...	2	2	3	3	4	4	5	5	6	6	8	8	10	12	14	16
SHAFTING, sup. qual. foot	...	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3

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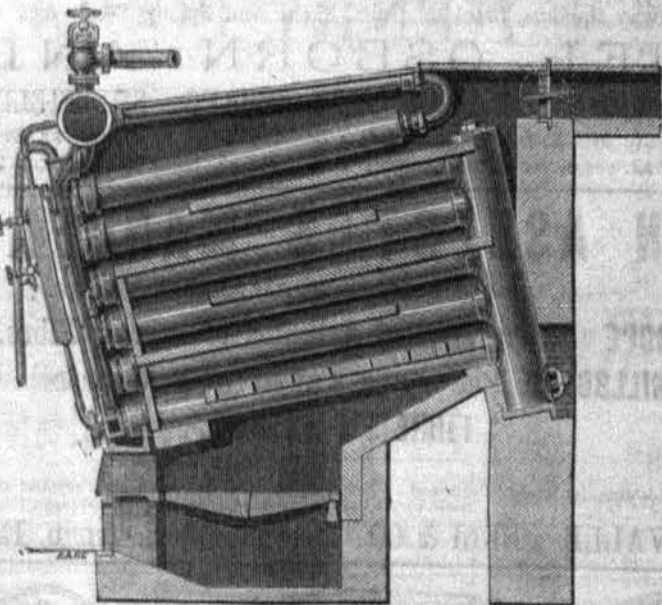


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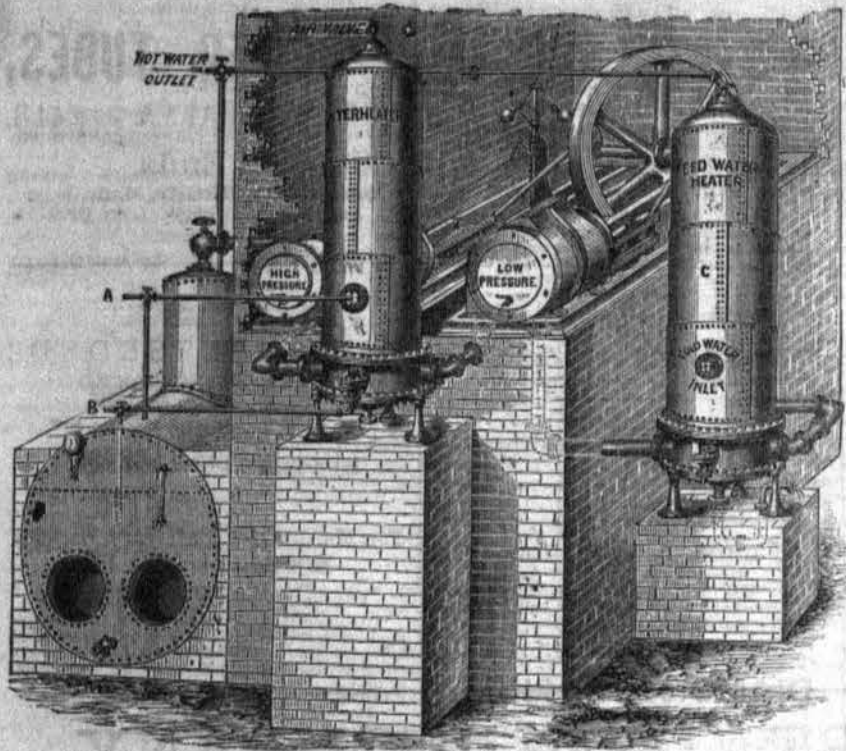
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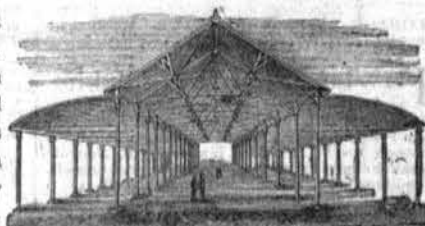
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CARLIN HOW, NEAR LOFTUS, YORK-
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Auction, in one lot, as a going concern, by
Mr. CHARLES WILLMAN, C.E.M.E., in the
Board Room of the Royal Exchange, Middle-
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eleven o'clock for noon precisely, subject to such
Conditions of Sale as will be then produced.

All that Valuable concern known as the "Loftus
Ironworks and Mines," situate at Carlin How,
near Loftus, in the County of York, consisting of
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the output of a maximum make of Cleveland pig-
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All the land appertaining to the Blast-furnaces
is Leased for 99 years (and consists of 40 acres or
thereabouts), from June 30th, 1873, at the agree-
gate rental of £435 per annum.

The surface land appertaining to the Mines for
the due working of the same, comprises two acres
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1st December, 1867.

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proximity to the works, Leased for 99 years from
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Bank buildings, Skipton.

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DUMFRIES.**

In consequence of the
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Death of one of the Partners, the well-known
DENNYSTOWN FORGE WORKS, Dumfries,
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These Works have been established upwards of
26 years, and have enjoyed a large share of public
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The Ground extends to 4 Acres 15 Poles, or
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The value of the ground has largely increased
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Machines in Lathes, Slaters, Screwing Machines,
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complete and ample.

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the raw material and the despatch of the finished
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the country, as well as by water with the various
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In the locality there is a large demand for for-
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commands a superior class of workmen both skilled
and labouring. The Works are now in full
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N.B.—The late tenants having dissolved part-
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turning out 800 to 1000 tons of shipbuilding iron,
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space for large increase.

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freehold land, on part of which 174 workmen's
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The Town Council do not bind themselves to
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SATURDAY, the 31st day of January instant.

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No. 368. VOL. XV.

LONDON, FRIDAY, JANUARY 30, 1880.

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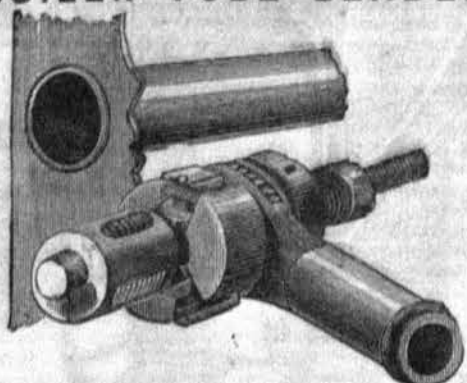
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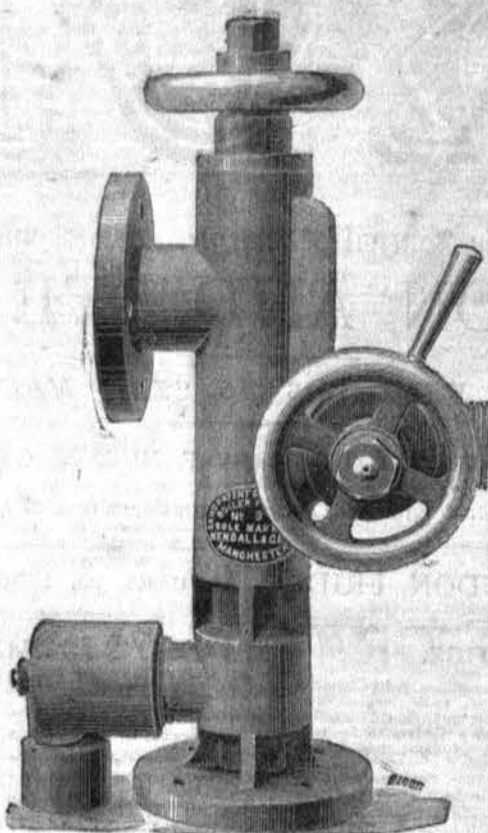
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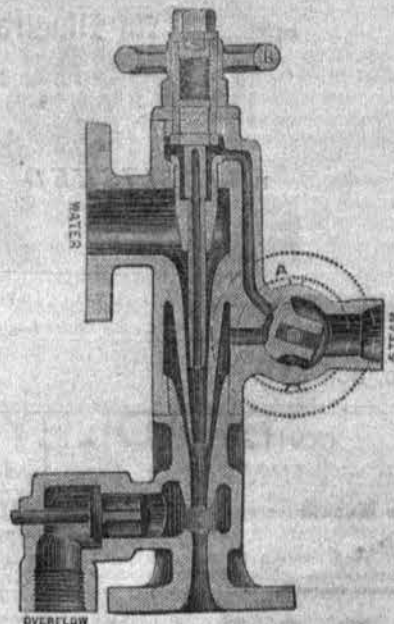


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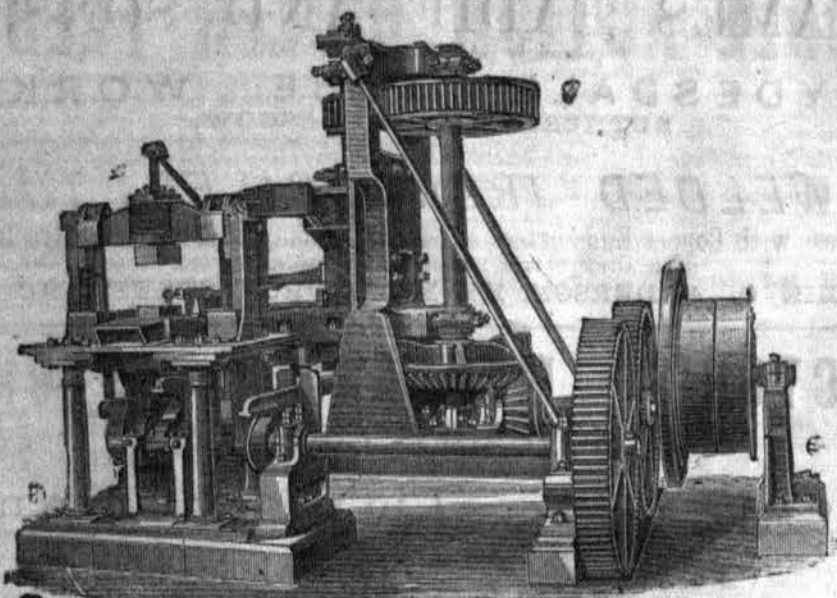
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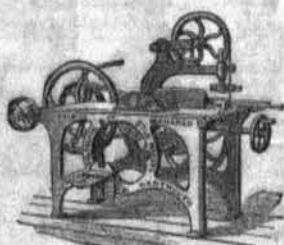
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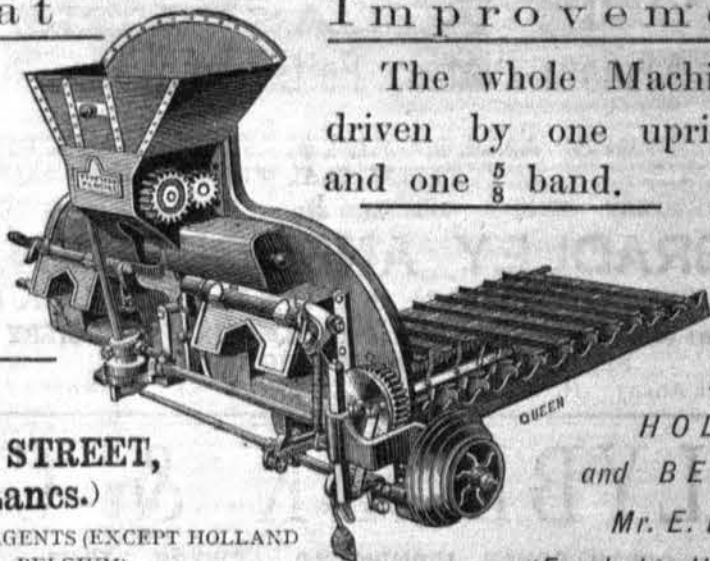
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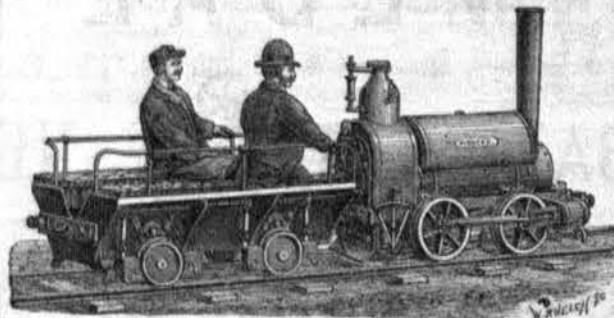
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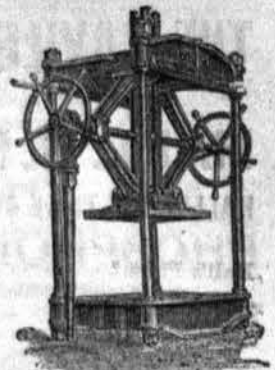
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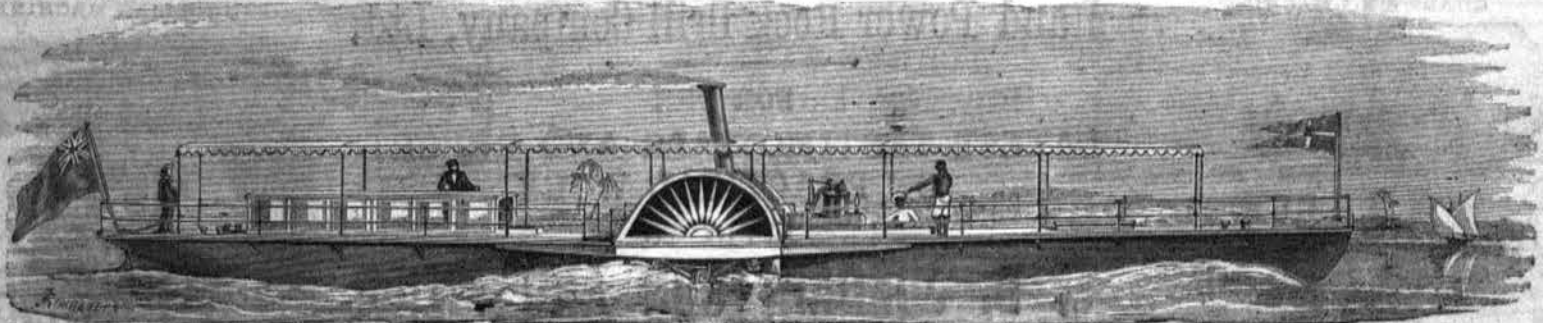
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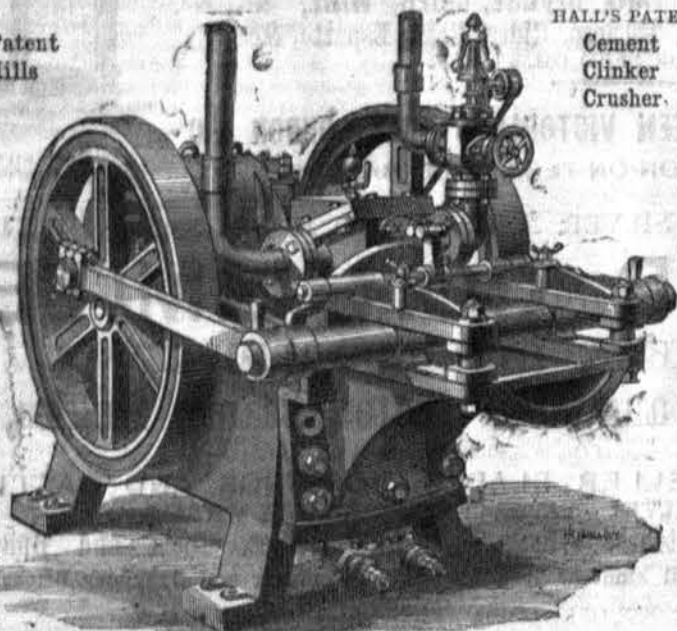
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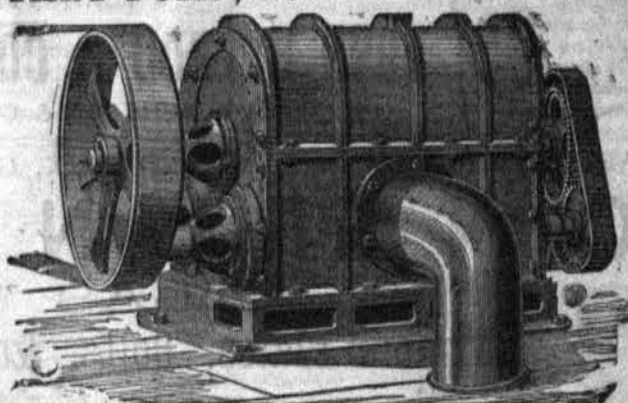
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IRON.

LONDON, FRIDAY, JANUARY 30, 1880.

AMERICAN PROTECTION.

IN an article entitled "The boot on the wrong foot" which appears in the *American Manufacturer*, of the 19th of December last, an attempt is made to controvert the statements contained in the article on American protection which we published on page 673 of our last volume, and in which we described the embarrassments of the American ironmaster which are due to the continual migration of their best workmen to the more profitable and healthful occupations which the vast areas of cheap and fertile land lying close to their doors afford. We showed how this operates in draining away the provident workmen during periods of depression, and leaving their employers in the lurch when a time of prosperity arrives, *i.e.*, how scarcity of workmen is most developed just when their work is most needed. The gist of our contemporary's reply is that the boot is on our foot not theirs, or, otherwise, that we, not they, are suffering from scarcity of labour when an improved demand for iron arises. This remarkable view of the subject is curiously enforced by the statement that "there is more inducement for the English ironworker to leave the works in his own country and seek employment in those on this side, than there is to leave the works here, and go to the farms of the West."

There can be no mistake about the strength of the inducement to go to the farms of the far West. The multitudes that leave ironworks, and all other such industries both of America, and Europe, to do so, proves this. If, then, the inducement to leave English for American ironworks is still greater, what does this prove? Simply what we stated, *viz.*, that there is an excess of such labour here, and a scarcity there, so great a scarcity that American ironmasters have in times of good demand to offer wages so high as to overpower, first, the powerful inducements "to go to the farms of the West," and, second, the cost and risk of emigration of British workmen. In the single sentence we have above quoted, the writer completely refutes himself, and laces the boot still more tightly to the foot upon which we placed it, in spite of the obvious pinching and wincing that accompanies the operation. He simply confirms what we stated generally, and illustrated specially, by quoting the instance of Mr. Stone's visit to Sheffield. The writer repeatedly speaks of "the good wages which protection enables" the American manufacturer to offer to ironworkers, and exults in the contrast of these with the wages of the British ironworker. He also admits that American ironworkers do migrate westward in the way we state, but cannot tell how many, and he adds that "there is not a shadow of doubt that, taking one year with another for every one who does, several from England take his place." This is precisely what we affirmed, only that we went into the subject a little further, and showed what becomes of the "several" Englishmen that take the place of each American. They go to the American ironworks as a convenient half-way house to their ultimate destination in the West. They avail themselves of the necessities of the American ironmaster when he is crippled for want of labour, and they obtain, as we stated, higher wages at the expense of the poor republican citizens who submit to the despotism of protection, and pay double value for the necessities of civilised life, in order that a sickly industry, incapable of self-support, may be artificially sustained. These high wages that tempt our men across are paid by American ironmasters out of the pockets of American buyers of iron, and of all that it is concerned in producing; not because the ironmasters love the British workman, but because the making of finished iron is so unnatural, so exotic an industry in America, that the United States, in spite of their abundance of unrivalled mechanical ingenuity, are incapable of supplying workmen, on account of the exodus which takes place at the time and in the manner we described.

It is rather curious that our second article on this subject should have appeared on the same day as this American commentary on our first, and still more so, that the American writer should, in attempting to controvert the first, have anticipated and confirmed the main argument of the second, which, as our readers will remember, was that the Americans, by perverting or forcing artificially the capital available for iron industry into an unnatural channel, have prevented it from taking the natural and desirable course into which it would have flowed had the laws of natural selection been allowed to operate freely by means of the unhampered action of supply and demand. We have not, and do not, assert that the United States should not be an iron-producing country, but have asserted the contrary as forcibly as we are able to do so. In our last we showed that, with a wiser application of its metallurgical capital, America is capable of supplying us with iron ores, and possibly with pig-iron, and that with free trade

it would, ere this, have done so on a large scale; so largely, that we should never have had the motive to unearth our phosphoric Cleveland ores, and erect for their smelting the giant blast-furnaces of Middlesbrough; that instead of struggling as we have done with the difficult and costly problem of dephosphorising these ores, we should have been content to work the rich American ores of Lake Superior, &c., and supply the States with finished iron in exchange for these or American pigs.

The *American Manufacturer* confirms this estimate of protectionist perversion by stating that "The impression on this (the American) side has been that the scarcity of raw material has been the sole trouble," and again, he assures us that "There is no idleness except among the blast-furnaces, and this is caused by a present scarcity of ore." Such a scarcity in such a country of unbounded natural resources is the most striking conceivable illustration of the failure and foolishness of protection. The old proverbial illustration of commercial absurdity "sending coals to Newcastle" is no exaggerated simile of the importation of iron ores by American ironmasters. That such men should be capable of investing capital in the erection of blast-furnaces before becoming assured of abundant supply of ores obtainable at once on the spot, shows to what a miserable condition the commercial enterprise and sagacity of an otherwise enterprising and sagacious people may be reduced by habitual reliance on the feeble device of legislative spoon-feeding by means of protective tariffs.

If we had had no similar experience in this country we might be led to infer from such a spectacle that the Anglo-Saxon race is degenerating under the influence of the hot summers and cold winters of the American Continent; but there is no occasion for the intrusion of such a theory, seeing that in an earlier stage of our own commercial civilisation we passed through the same ordeal. We are able to compare the protected British "Farmer Giles" of a previous generation with the skilful and scientific agriculturist of the present day, who even in the midst of the terrible struggle now forced upon him by a succession of bad harvests, and competition with foreigners who till better land than his at one-fiftieth of his rent, still scorns to follow the few advisers who would have him come begging the Government to tax his fellow citizens for his support, and thereby to help to drag him down, and the pauperised condition of the British farmer of the last generation and the American ironmaster of the present. Even our landlords, the "pampered aristocrats," as brother Jonathan is wont to call them, refuse to exercise their overwhelming parliamentary power for so degrading a purpose as maintaining their rentals by taxing the necessities of life. Seeing that they have the whole of the House of Lords, and that about two-thirds of the members of the House of Commons are landowners, they could form a "ring" immediately; but nothing of the kind has been attempted, although they are forced to make wholesale remissions of rent which they know must be permanent, in consequence of the prices of grain, beef, mutton, bacon, cheese, &c., being so much reduced by American and other foreign competition. Even the cry for "reciprocity" is unheeded. We know that to reciprocate with any protectionists of any country would be to sink to the level of their own barbarism, and to suffer with them the enervating effects of such degradation.

Forty years ago we were no better than our Transatlantic cousins of to-day, and we now look back upon that dark period and speak of it with the same repentant wonderment as we do of the time when we had negro slaves in our West Indian colonies. Such being the case, we have no doubt that ere long the United States will make similar progress in commercial civilisation, and will follow our example in the liberation of trade, as they have already done in the liberation of negroes. We believe that when they do this they will benefit thereby as we have, for there is no period in the history of Great Britain during which our general commercial progress has been so great as that which has elapsed since we erased from our statute book the last vestiges of protectionism, and declared ourselves for ever after committed to free trade with all the world, retaining only such custom house duties as were necessary for purposes of revenue. This simple principle, however, appears to be unintelligible in America, or the "American Manufacturer" could scarcely have dared to make such an attack upon the intelligence of his readers as he perpetrates in the following question and answer. He says "Does our contemporary call the American iron industry an exotic because it is protected by an import duty? Then beer is an exotic in England, for John Bull has placed an import duty on that favourite English beverage." The readers of "American Manufacturer" must have queer notions of our fiscal policy if this can pass among them. They must be ignorant of the fact that our beer is taxed all round for revenue purposes whether manufactured at home or imported from abroad, and that if any brewer or brewer's friend were to propose the taxation of German or other beer for the purpose of maintaining the price of London porter or Burton ale, he would be laughed at as a political imbecile.

We have dwelt so long on the suicidal aspect of

the subject, that is, the effect of iron protection on the iron industry itself, that we have little space left for discussing its murderous action upon other industries, and therefore can, at present, only refer to one, *viz.*, the shipbuilding interest. We well remember the time when an American yacht crossed the Atlantic and challenged all the yachts of Britain to a contest on their own favourite waters of the Solent. The interest excited on both sides was intense, and the result was an American triumph. Then came forebodings of the destruction of our shipbuilding interests. The skill of American builders was proved. Their supplies of timber, vastly in excess of ours; their enormous line of sea-board, with ports at the mouths of great rivers, down which the timber of primeval forests could be floated for nearly nothing at all, were shown to give them overwhelming advantages. How did we encounter this formidable threat of competition? Did we increase the stringency of our navigation laws, or impose protective duties on American ships? Nothing of the kind. On the contrary, we have since that time materially relaxed our navigation laws, cutting away their merely protective elements. What has followed? Do we go to America to buy ships for our own use? Nothing of the kind. On the contrary, our shipbuilding trade has grown immensely, and we build ships for nearly all the nations of the world, especially ships of the highest class. One of the last examples of this is the splendid monster yacht built for the Czar of Russia while we were practically at war with him. Why did he come to us for this instead of going to his American friends and admirers? Simply because the famine prices of iron, artificially created in the States by protective duties, has crushed that modern development of this important branch of natural industry which is now so greatly dependent on the supply of good and cheap iron. The practical result, as regards shipbuilding, is, that the citizens of the United States are paying a heavy tax on every bit of iron or steel they use in order to protect the shipbuilders of the Clyde and other parts of Scotland and England from the possibility of American competition against them, either at home or among our foreign customers. Our shipbuilders dance to the tune of American protection, and the submissive citizens of the United States pay the piper.

OUR TRADE SUMMARY.

FOR all but the best descriptions of iron the rise in prices seems to have reached its highest point for the present; doubtless on account of the slackening of the American demand, and the increased rates of freight. A downward tendency was apparent during the past week in Glasgow warrants, owing to the holders of special brands forcing them on the market much under makers' prices, who, in consequence, reduced their rates from 2s. 6d. to 6s. per ton. No. 1 Gartsherrie has fallen to 84s., and No. 1 Coltness and Summerlee to 87s. 6d. per ton. Nevertheless, more furnaces have been put in blast, making now 108 against 89 at the corresponding period of last year. There is less inquiry for manufactured, although the works are busily engaged with old orders. All the large shipbuilding yards are well filled, but new orders are coming slowly in, and some of the smaller establishments have little to do. A number of engines are being turned out from the locomotive mills, both on home and colonial account, but many of the engineers are slack. At Middlesbrough, on Tuesday, an inclination to sell was evinced by weak holders, but strong holders were more confident. Makers are sold so far forward at early and lower rates that they are at present in a worse position than the merchants, and it will be some time before they can realise all the benefits of the revival. The finished-iron trade is becoming busier, with a more extended field. Steel are more and more taking the place of iron rails, and the manufacturers of the former are exceedingly busy. The output of shipbuilding material has largely increased, and the workmen are clamouring for an increase of the wages which were repeatedly and greatly reduced during the times of depression. A rise of 10s. was demanded, but the half of that has been accepted. The extension of the new steel-making process is going on rapidly in the district. Engineering and ironfounding are participating to some extent in the improvements in other branches. In the North-west there is still a very active inquiry for all qualities of hematite iron, the American demand for which is unabated. There are also large orders on hand from the colonies and Europe. Notwithstanding hostile tariffs, the demand this year is expected to exceed that of 1879. Prices are also still rising, as such as 140s. per ton having been asked, and orders booked as high as 135s. The higher figure will, however, probably be reached before long. A quieter tone prevailed in the South Lancashire market during the week, the advance in prices being checked for the present, and buyers holding back in anticipation of a fall. In makers' quotations, however, there is no change. Some of the large foundries are busy, but in the case of those depending on local demand, and in the machine and engineering trades there is little improvement. The manufacture of plates for ship-

LACOUR'S DIRECT-ACTING STEAM PILE-DRIVER.

MANUFACTURED BY MESSRS. S. OWENS AND CO., WHITEFRIARS STREET, LONDON.

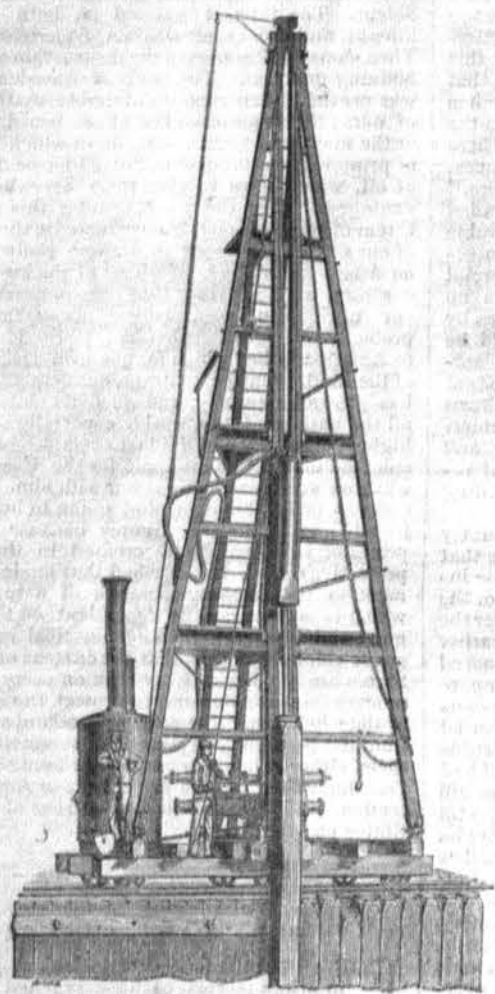


FIG. 1.

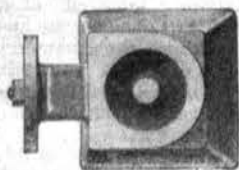


FIG. 4.

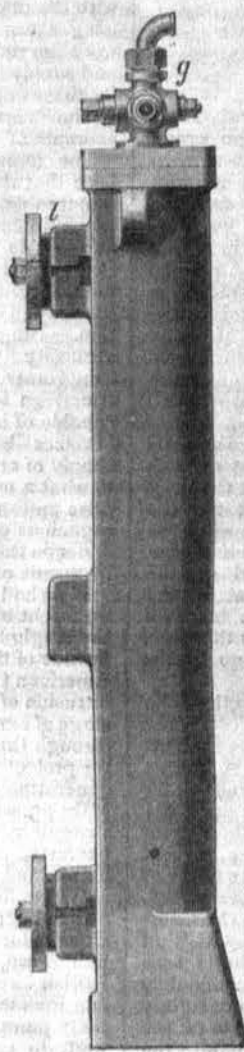


FIG. 2.

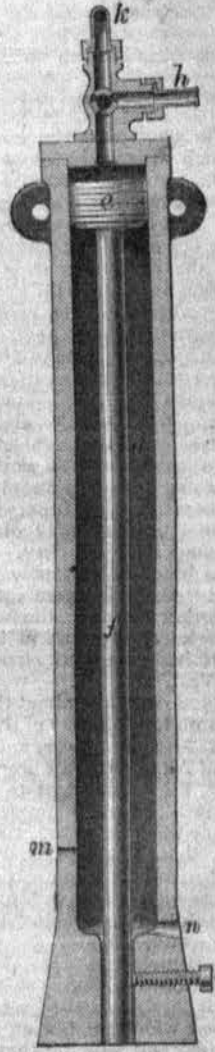


FIG. 3.

building purposes is the industry most active at present in West Yorkshire, although in the railway department matters are far from dull generally. In South Yorkshire there is no change to report in the iron trade, either as regards employment or prices; but works are being re-opened. From Sheffield we learn that while the advance in price has been checked, there is a steady development of activity in the manufacture of all descriptions of iron. The Bessemer steel department is especially brisk. The cutlery and other special trades of the town are, however, dull. The local trades of Birmingham are in a similar category, although business at this period of the year is generally flat. The same remarks apply to the kindred industries of the Wolverhampton district. The severe weather has to some extent stimulated the demand for domestic qualities of coal; but there is little if any advance in price. The market for coke, on the other hand, is somewhat brisker, with slight tendency to enhancement of value.

DIRECT-ACTING STEAM PILE-DRIVER.

WE have occasionally had to direct attention to improvements which have been effected in pile-driving machinery, but it is long since we had the opportunity of bringing under the notice of our readers such a decided innovation upon all preconceived notions, as regards this class of apparatus, as in the present instance. It is an inversion of ideas in steam engineering, inasmuch as the cylinder itself is made to deliver the blow and consequently to do the work, instead of the piston-rod or its attachment, the piston-rod merely acting as a guide to the cylinder. The apparatus in which these changes are embodied is the direct-acting steam pile-driver of M. Lacour which is being introduced into this country by the manufacturers Messrs. S. Owens and Co., of Whitefriars Street, London. This novel machine is illustrated in the accompanying engravings, which show at fig. 1 a perspective view of the complete pile-driving apparatus as at work, Figs. 2, 3, and 4 being respectively an elevation, a vertical section and a sectional plan of the monkey. In the latter figures, *d* is the cylinder, *e* the piston, *f* the piston-rod, *g* a three-way steam-cock, *h* the steam supply pipe, *k* the steam-exhaust pipe, *l* guides, *m* the exhaust escape-passage, *n* an

air-hole, and *o* a screw for holding up the piston at any point where and when necessary.

It will be seen that the monkey consists of a cast-iron body or cylinder, with lugs for raising it, the cylinder being bored to suit the maximum length of stroke required, and fitted with a cast-iron metallic-packed piston and steel rod, passing through a hole in the base. There are also a cast-iron top cover and a three-way valve to regulate the admission and exit of the steam, and which is operated by a hand-lever, balance-weight and chain. With regard to the boiler we need only observe that it is of the ordinary vertical type, with cross tubes, having a heating-surface of about 10 square feet for every two hundredweight of the monkey. The steam connection between the boiler and the monkey is made direct by means of special flexible tubing. It will be seen from fig. 1 that the framing is of timber, and of the usual type. It is provided with a winch, which serves to raise the monkey and to place the pile in position, and also to move the whole machine, when portable, on its rails. This winch, in the smaller sizes, is worked by hand, and in the larger ones by steam taken from the same boiler that supplies the monkey.

The method of working the Lacour pile-driver is exceedingly simple. The pile having been placed in position, the monkey is slightly raised to disconnect it from its attachment and is allowed to rest upon the head of the pile. Steam is then gently admitted to warm the monkey, an operation which is only necessary after each prolonged rest. The warming having been effected, steam is turned full on, and rushes between the cover and the piston, forcing the lower end of the piston-rod against the head of the pile. This bearing having been found, the cast-iron body is raised until the exhaust escape-passage in its base allows the steam free exit. At this instant the steam port is closed, the exhaust port opened, and the steam escapes freely into the atmosphere, allowing the monkey to fall a dead weight upon the head of the pile. This movement, when regulated automatically by the chain and counterweight, allows of a speed of from eighty to one hundred blows per minute being delivered. Experience, however, has shown that the operation of the lever by hand by means of a cord is preferable, as it allows the stroke of the monkey to be varied to suit the gradual drift of the pile.

Lacour's system presents several special advantages which it may be well to point out. It ensures the rapid delivery of a number of strokes by a heavy

monkey, with a moderate fall, which experience has shown to give a steadier and more even blow than when these conditions are reversed, as in the case of the ordinary pile-drivers, except in the Nasmyth machine, which, however, is far too costly for any but very special uses. The height of the fall and the number of blows delivered in a given time by the Lacour machine can be regulated with ease, and the monkey may either be operated by hand or worked automatically, as already pointed out. Another advantage is that any existing pile-engine can be fitted with Lacour's steam monkey, and steam may be taken from the boiler of an ordinary portable engine. As an example of work performed by one of these pile-drivers, we may mention that at the Pont de Bordes (sur la Baise), a 14-cwt. monkey drove home to depths of from 6 to 8 feet, pine piles 10 and 12 inches in diameter, at the rate of two minutes per pile, through sandstone and close gravel. In France, and on other parts of the Continent, a large number of these machines are in use by Government departments and contractors, with certified results of such a satisfactory character as to leave no doubt of the practical value of the invention, which, we conceive, can hardly fail to have a successful run in our own country.

THE HOWE WEIGHING MACHINES.

IT may be conceded that the Howe Scale Company have inaugurated a new era in appliances for weighing the larger kind of goods, by three distinct improvements, viz., the introduction of chilled iron balls between the platform and the levers, the construction of bearings of such a form that they will not slide over the knife edges so as to wear them out, and, in drop lever machines, the raising of the platform clear of the levers instead of lowering the levers away from the platform. In the old form of weigh-bridge, the platform is supported on knife edges formed on the main levers, the fulcrum of which are hung from the fixed framing. On a waggon being brought upon the platform it would cause the bearings to ride over the knives, but that check rods are introduced, which, however, only lessen, without absolutely overcoming the difficulty. On the other hand, they tend to impair the accuracy of the machine, for if they should rust, or the timber swell, the consequent friction opposes so much resistance

THE HOWE WEIGHING MACHINES.

MANUFACTURED BY THE HOWE SCALE COMPANY.

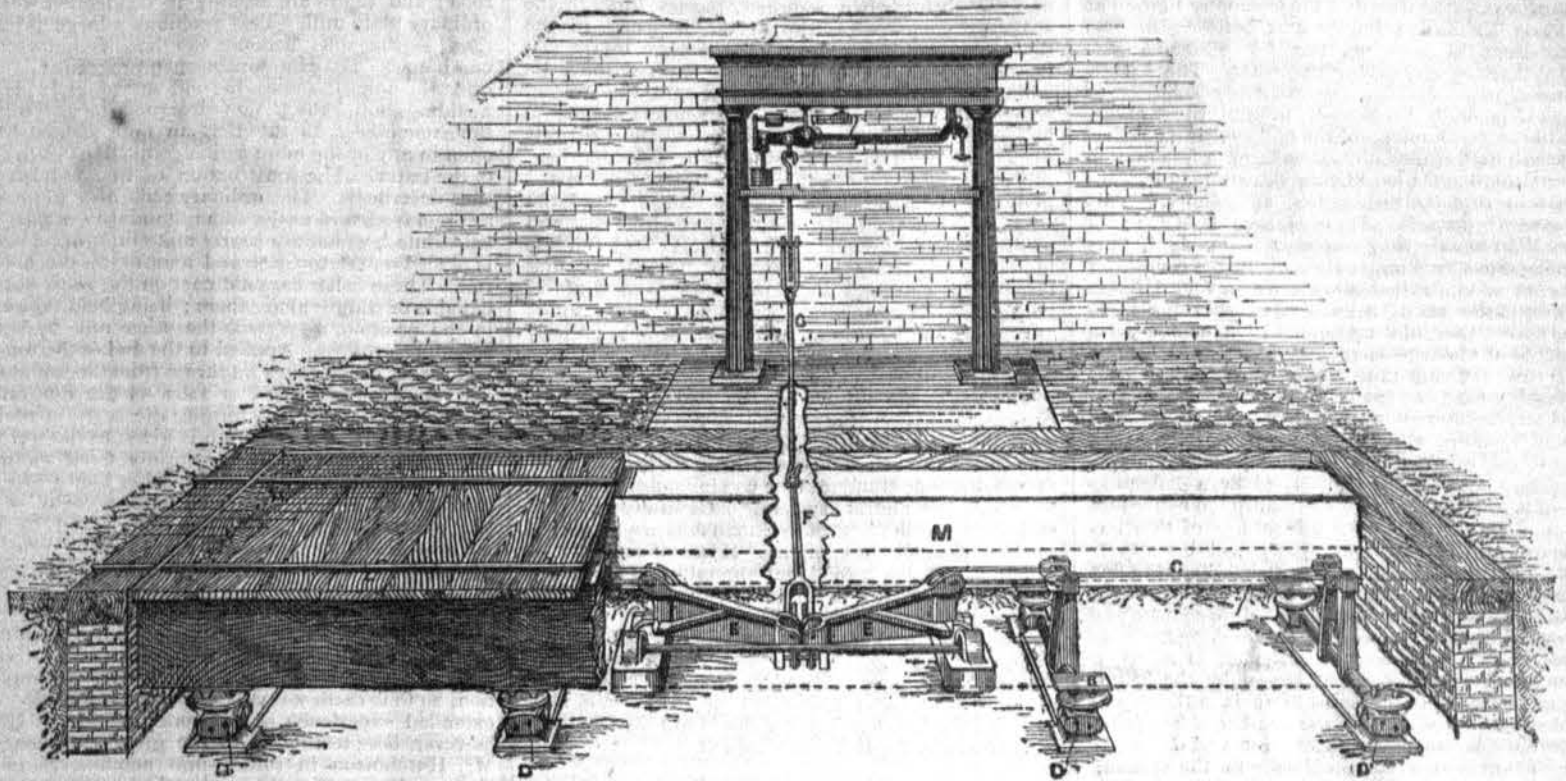


FIG. 1.

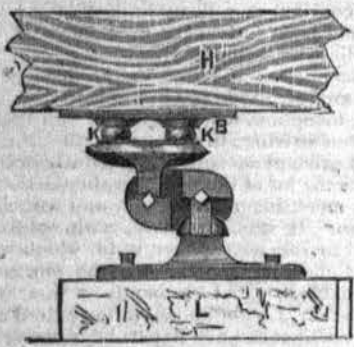


FIG. 2.

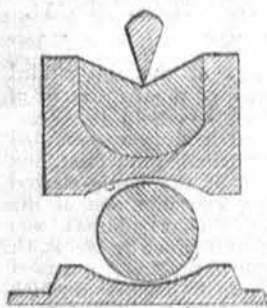


FIG. 3.

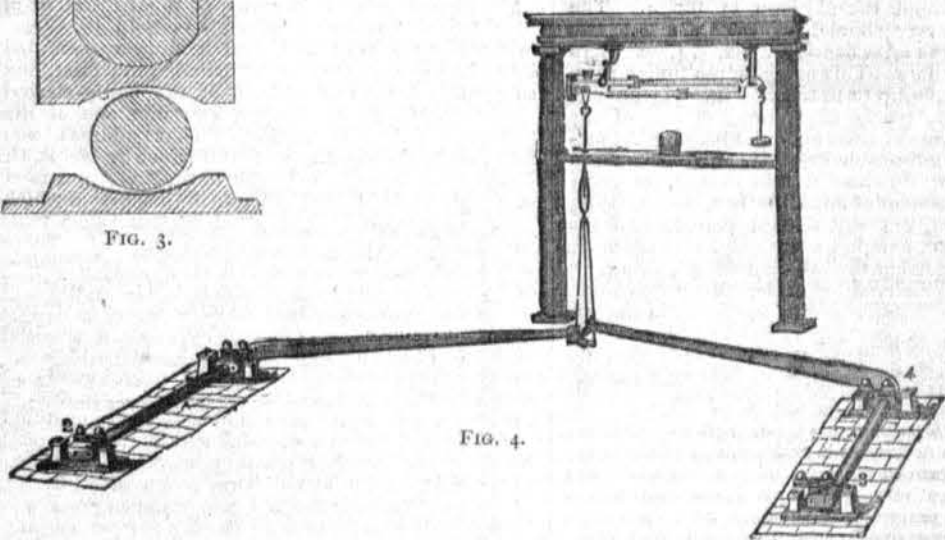


FIG. 4.

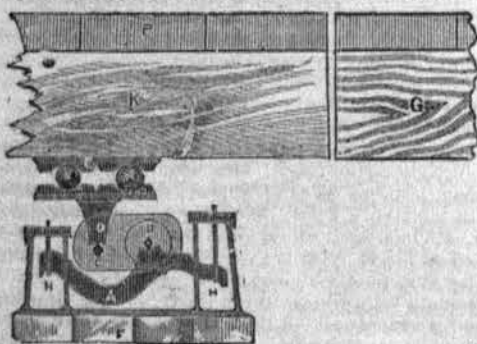


FIG. 5.

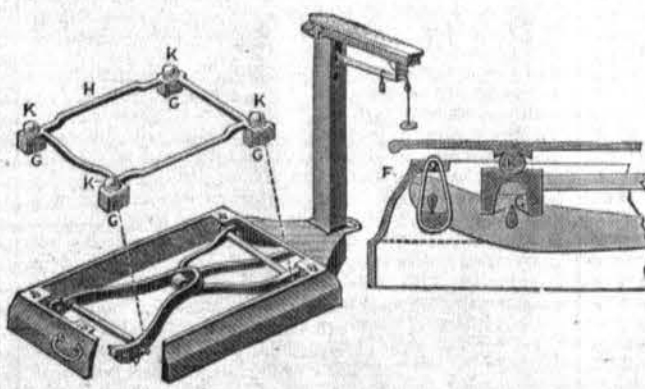


FIG. 6.

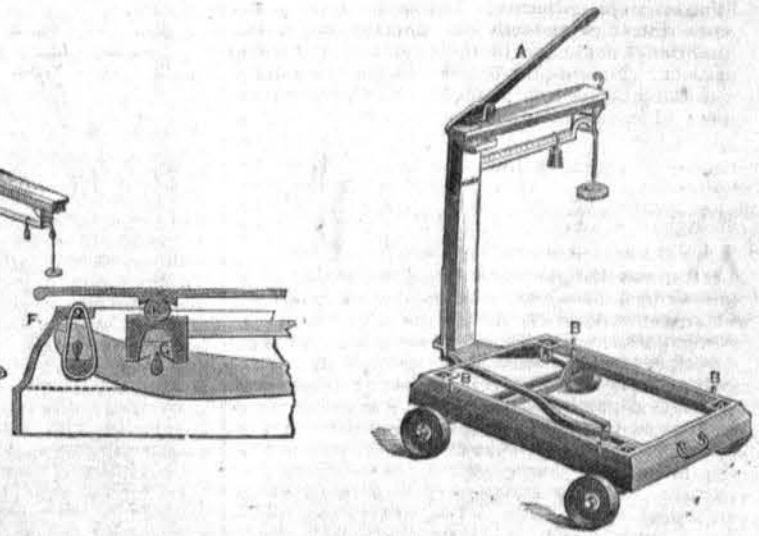


FIG. 7.



FIG. 8.

to the load, and consequently diminishes from the weight shown upon the beam. In the Howe weighbridge, or "track scale," as it is called in the States, the platform is entirely independent of the pit framing, but is carried by a series of main levers connected by rods to the central levers, from which, through an extension lever and rod, motion is communicated to the beam.

Fig. 1 of the illustrations on the present page shows a perspective view of this weighbridge, part of the platform being removed to show the arrangement of working parts. There are four main levers, A, A, A, A, carrying, by means of ball plates, B, B, the longitudinal timbers, M, M, of the platform. The four main levers are linked together and connected by the transmission rods, C, to the central levers, E, E, from

which, by the transmission lever, F, and the adjustable rod, G, motion is imparted to the scale beam. The fulcrum pivots of the main levers are knife-edges, shown at D, D, D, D, and will be seen more clearly in the end view, fig. 2. Here the short end of the bell-crank lever is seen resting by its knife-edge on the chilled bearing bolted down to the foundation, L, while it also supports a similar chilled bearing in the

shoe carrying two balls, K, K, on which rests the ball plate, B, supporting the platform timber, H. The balls, ball plate, shoe, knives and bearings, an enlarged detail of which is given at fig. 3, are all of cast iron, chilled to a depth of $\frac{1}{2}$ inch; and such is the hardness of the iron that the Company showed at the Paris Exhibition knives and balls certified as having been in constant use for sixteen years without showing any perceptible wear. The hollow V form of the bearings prevents any rubbing or change of position between them and the knives, while the larger diameter of the ball cavities, as compared with that of the balls, permits of a free motion of the platform on a load being drawn upon it, until brought to rest by the action of gravity. This arrangement permits of the levers being made shorter than usual; they are also more rigid, thus rendering truss rods unnecessary. As the weight on the beam is multiplied 4000 times, a very delicate weighing is the result, a 100-ton weighbridge indicating correctly within a pound. In a comparative test, made at Chicago in 1876 by Mr. R. M. Hunter, M.E., it was found that, while an old-style lever broke with a load of 1300 lb., after showing a deflection of 1.17 inch, one of the Howe levers stood a strain of 1500 lb., with a deflection of only 0.1825 inch. When it is remembered that the useful length of a lever is appreciably diminished by a deflection of an inch, and that this error is multiplied never less than a hundred times, the advantage of this improvement of the Howe Company will be appreciated. Moreover, in the old system, where the flat bearings shift on the knives when the load is brought on to the platform, they are most unlikely to come to rest on exactly the same spot; so that, on weighing the same articles several times in succession, it is merely a chance to see the same weight shown by the beam. For a given length of platform, there is in the Howe weighbridge only about half the number of bearings, thus diminishing the chances of error and derangement. There is also this peculiarity in the system, that the platform may at any time be increased or diminished in length by the addition or subtraction of a pair of levers, without rendering any change necessary in the remainder of the mechanism.

The waggon or farm scale, a simpler arrangement of the weighbridge, with only two levers, is shown in perspective without the platform in fig. 4. The foundations are very simple, being confined to two cross walls for the lever bearings, 1, 2, 3, 4, and piers for the beam pillars. This machine multiplies 1000 times, and weighs up to 10 tons. Fig. 5 is an enlarged end view, partly in section, of one of the levers. The pivot, B, rests upon the bearing, A, suspended by the adjustable links, H, H, from boxes in the corner iron, F; and if this should, from any cause, be thrown out of level, the bearing, A, being freely suspended, will still remain plumb, and the machine continue to weigh accurately. C is the other knife-edge supporting the self-adjusting bearing, D, which, with the intervention of the chilled iron balls, carries the shoe, E, attached to the platform timber, K. The platform planking is marked P, and G is the outside frame timber. It will be seen that the scale beam is double, one portion being for taring the cart and the other for weighing the load.

Fig. 6 shows a perspective view, with the platform removed, and fig. 7 an enlarged section of the bearings, of the improved platform or portable scale, the levers of which are hung in loops, F, suspended from the frame, for giving great freedom and elasticity, and thus relieving the knife-edges from all friction and shock. The adjustable bearings, G, G, G, G, are formed in the legs of an intermediate frame, H, running round the inside of the machine, and each corner has a cavity on the upper side for containing one of the chilled iron balls, K, K, K, K, which receive all the friction or shock caused by placing a weight on the platform. Owing to a simple arrangement of levers, this machine has three knife-edges less than those of the old arrangement. A modification for the army or commissary service is made to close in half a minute, so as to form a very strong box, which protects the working parts.

Fig. 8 shows the portable drop-lever scale, with the platform, frames and weighing levers removed. The levers shown are for lifting the platform off the cast-iron balls in the frame by means of the four pins, B, B, B, B, when actuated by the lever, A, and its connecting rod. By this arrangement of supporting the platform while being loaded, the working parts are always maintained in their proper position, never being thrown out of balance or line, nor subjected to any strain or friction.

The miners' scale, for weighing small trucks of coal or ore, has an improved multiple charging beam, the upper bar graduated in pounds for taring the truck, and the other in bushels for weighing coal, or in pounds for weighing ore. The weighing machine for ironworks has two platforms separated by rubber springs, which, with the patent drop-lever, permit of hot blooms being flung on to the platform without injury to the mechanism. Special adaptations are also made for foundries, furnace charging, and other purposes connected with the iron trade. A suspension scale is made for weighing rails and other bars hot from the rolls, while being transported from one part of the mill to the other. It consists of a length of overhead single-rail tramway, being

hung upon a system of levers suspended far above like a weighbridge reserved.

In the machine for elevators and mills, the beam and weights are graduated so as to indicate the number of bushels of corn weighed at any one draft; and the grain, when weighed, passes through the scale by means of a trap in the hopper. In the flour-mill machine, a drop lever worked by the foot raises the platform off the working parts of the scale while the barrel is being packed. In the market scale a double beam allows the whole capacity to be weighed by the poises or peas, thus entirely dispensing with loose weights. For weighing fish, salt meat, and other wet merchandise, a galvanised platform is provided, with wide flange round the edge, which protects the working parts from rust and obstruction. Machines for dairies and cheese factories frequently have several beams, for first taring the can and then weighing each draft of milk poured in by separate vendors. Counter scales are protected by the patent case, which entirely covers in the working parts and protects them from dust, rust and obstruction.

The beams are adjusted to the scales of England, France, Germany, Russia, Spain, Sweden and Norway, Denmark, Turkey, Egypt, British India, China and Japan; and in some cases the beam is graduated to two different standards for use in countries about to adopt the metric system. Carefully selected materials and the best of workmanship are employed in the manufacture of the Howe "scales," of which 30,000 are turned out annually. The works, started in 1856, are at Rutland, Vermont, U.S., and employ about 500 hands. Beside a large number of first prizes and gold medals carried off by the Company at various shows and exhibitions, they were awarded one gold, two silver, and two bronze medals at the Paris Exhibition of 1878. We may add that the London depot of the Howe Scale Company is at No. 16, Holborn Viaduct.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE opening proceedings of the thirty-third annual general meeting of the Institution of Mechanical Engineers, which was held in Westminster on the 22nd and 23rd inst., were recorded by us last week. Our record included the brief, but suggestive inaugural address of the newly-elected president, Mr. E. A. Cowper, who was one of the founders of the Institution. That address was followed by the reading of first a paper by Mr. B. C. Browne, on Brown's tramway locomotive, and next of a reply by M. Leon Francq to the discussion which took place upon his paper on fireless locomotives which had been read at a previous meeting. There was a well-sustained discussion on the general subject of tramway locomotive practice, the main bearing of which was to the effect that the introduction of steam-power on tramways was more or less only a question of time. It was also pointed out by more than one speaker that in order to meet the requirements of steam haulage in this connection the construction of the tram-roads would have to be materially modified and improved before successful working results could be attained. Another position advanced was that successful competition with horse-power would be out of the question until the first cost of the engines was brought down to somewhere about £300 per engine. The cost of the Brown engine was estimated by one speaker at a very much higher figure than this, nearly double, in fact, no doubt with the view of eliciting the actual figures from the author for comparison. He did not however "draw," as the author only dryly observed that the rules of the Institution forbade the introduction of prices in papers, whereat he raised a smile. Mr. Browne, however, pointed to the figures in his paper as evidence that the engine was doing well and giving satisfaction wherever it had been adopted, and the instances of its adoption on the Continent are certainly rather numerous. The paper, however, exhibits somewhat heavy items for renewals. Mr. T. R. Crampton was especially strong on the road question, and he observed that there need be no fear of steam-worked tramways failing through the locomotives—the roads, as at present constructed, formed the great source of apprehension in that respect. He favoured the fireless locomotive, which, he pointed out, was stated to be making runs of fifteen miles each, with one charge of steam. The cost of fuel was but slightly in excess of that for good ordinary engines, whilst the accounts showed a great saving in the item of maintenance. During the discussion, objections were taken to various points of constructive detail in the Brown engine, which, however, were met by the author in his reply, at the close of which he received a vote of thanks for his paper.

At the concluding sitting on Friday the proceedings commenced by the reading of a paper by Mr. E. Hutchinson, of Darlington, on improvements in machinery for rolling iron and steel plates. The author first described the Belgian rolling mill, with its pair of vertical side rolls placed behind the horizontal rolls, and which catch the plate as it leaves the horizontal rolls and compress the edges sufficiently to close and solidify them. The surfaces

of the vertical rolls move a little faster than those of the horizontal rolls. Most Belgian mills, probably with a view to avoid expensive complications, consist of only one pair of horizontal rolls working in combination with vertical rolls; and these are usually in connection with an ordinary plate mill. This prohibits a large production, as the rolls become too hot if the work is continuous. Mr. Hutchinson then proceeded to describe the improvements he had introduced. His is a sliding mill, which was designed to accomplish the same object as the Belgian mill without being open to any of the more serious objections to the use of the latter. The construction of this mill may be thus described:—The ordinary rolls of a plate mill are removed, and in the same standards a pair are substituted, which are nearly alike in form. A collar is placed on the top roll and another on the bottom roll. These collars are not cast on the rolls, but are capable of sliding along them; being held, however, in one position, as regards the other roll, by corresponding grooves. Applied to the end of the top roll is a screw, which takes its thrust from the top chock, and consequently rises or falls as the top roll is adjusted in height. By turning the screw a motion in the direction of its length is given to the top roll, whilst the bottom roll remains firmly fixed endways between the standards. End motion being given to the top roll, it will carry with it one collar, whilst the other collar remains stationary; and by this means the distance apart of the two collars is adjusted, being limited only by the travel allowed to the top roll in the direction of its length.

In the discussion which followed, the fact was elicited that Mr. Hutchinson's system had been used in practice for a short time only, as the works where it was adopted were closed shortly after its application, so that there was no opportunity for any very extended experience of its working. Mr. J. Head, however, bore testimony to the great experience of Mr. Hutchinson in rolling-mill machinery, and to the practical nature of his invention. The President suggested that a difficulty might arise from the iron getting into the grooves in which the collars worked, and after a few observations from Mr. D. Adamson and one or two other speakers upon detail questions of rolling-mill practice, the discussion was closed, a vote of thanks being accorded to Mr. Hutchinson for his paper.

We had imagined that the question of the necessity of continuous railway brakes being also automatic had been settled for ever amongst us. From the earliest inception of this class of brakes, the one ruling condition required—namely, insisted upon—by the Board of Trade was automaticity. From the earliest inception, too, this is the end that inventors have been striving their utmost to attain, and the coveted prize of success has generally been expected to fall to the lot of the one who should the most adequately meet this requirement, and we believe it has so fallen. It was, therefore, with surprise that we listened to the next paper read, which was by Mr. T. H. Riches, of Cardiff, with the questioning and questionable title, "Is automatic action necessary or desirable in a continuous railway brake?" The author commenced his paper by observing that his desire had been to see the subject thoroughly discussed as one deserving the careful consideration of the Board of Trade, the railway companies, and the general public before any definite instructions were issued by the Board of Trade with regard to the railway brake to be finally adopted throughout the kingdom. Besides making inquiries among those officially connected with railways, the author had compiled from the Board of Trade returns on continuous brakes four tables, which showed the total number of failures recorded against the Westinghouse, the Sanders or Sanders and Bolitho, and the Steel-M'Innes automatic brakes, and in comparison with these the failures recorded against the Smith vacuum brake as a non-automatic brake. The conclusion drawn by Mr. Riches was, that there was not yet in existence any automatic brake sufficiently reliable to justify its use in preference to the best descriptions of non-automatic brakes.

We need hardly observe that the reading of this paper was followed by a very spirited discussion, during which facts and figures were given which, it is not too much to say, put Mr. Riches and his conclusions utterly to the rout. The whole fraternity of continuous brakemen were very properly up in arms, and, with Sir Henry Tyler, showed most conclusively that Mr. Riches had misapplied and misconstrued the Board of Trade returns in a most hopeless manner. The very points he had seized upon to support his arguments were shown to tell point blank against them, and accidents which he had attributed to continuous brakes were shown by the very reports quoted by him to have been due to entirely different and extraneous causes. Never before was a greater muddle made of a subject with such purely unselfish and disinterested motives appearing on the face of it. The discussion was opened by Mr. Sanders on behalf of his brake, and he was followed by Mr. Gutch, of the Westinghouse brake, who simply turned Mr. Riches' paper inside out, and reversed it, on a showing of facts and figures, from beginning to end. He pointed out the very great differences in the number of failures reported by different companies, and showed that many of the so-called

failures were merely trifling derangements which did not in any way interfere with the action of the brake. Sir Henry Tyler said that from the first he, on behalf of the Board of Trade, had maintained that automaticity was an important element in all continuous brakes. In dealing with such a question as this it was not quite fair to base conclusions upon the figures of one year only, as the author had, so he had prepared a table from the examination of the causes of all reported accidents that had occurred during the last seven years. The average showed that in 176 accidents continuous brakes had been required in 137 cases; 111 showed the necessity for the brake being under the control of the engine-driver; 10 showed a necessity for the brake being in the hands of the guard; and 14 a necessity for automatic action. Mr. Westinghouse said the question raised by the author of the paper was being practically answered by railway companies in the United States and on the Continent, where the non-automatic brakes were fast being made automatic.

In replying upon the discussion Mr. Riches abandoned his position altogether. He admitted his errors, but explained that they were quite unintentional, and stated that his sole object in writing the paper was to provide material for discussion. This he certainly succeeded in doing, although at the expense of accuracy. After this recantation, Mr. John Robinson, the late president, explained on behalf of the Council of the Institution that Mr. Riches had been particularly requested by them to prepare a paper with a view to originate a discussion in which the merits of the vacuum brake might be heard in order that, as papers on two of the automatic brakes had been read, the Institution might not be supposed to have shown any partisanship for the automatic system. Mr. Riches' special method of treating the subject, however, led to whatever merits the vacuum brake possesses being utterly ignored, whilst those of the Westinghouse automatic brake were brought prominently into the foreground. Practically, therefore, the object of the council was defeated, and had they been capable of partisanship for the automatic brakes—as they feared some might think they were—they could not have devised a more ingenious and successful plan than they did for trotting out the automatic continuous brakes. The discussion brought specially into prominence the advances the Westinghouse automatic system is making on railways in our own and other countries. The Brighton Company are now adopting it generally on their lines, and in the United States—the land of its birth—it is everywhere replacing the non-automatic principle. The proceedings of the meeting were brought to a close with a vote of thanks to Mr. Riches for his paper—a vote which, under the circumstances, was certainly well merited.

GOODWOOD WATERWORKS.

A FEW months since we briefly referred to a waterworks, which had then just been commenced at Goodwood for the supply of water to the estate of the Duke of Richmond and Gordon, K.G., and at which a new system of softening and purifying water in quantity was to be introduced. These works have now been completed and at work for some months past, and a short description of them can hardly fail to interest all who take an interest in the question of improved water supply. The water is obtained from a well in the chalk about 120 feet deep and is lifted by two sets of pumps to a large reservoir placed on the hill close to the road to the race course, whence mains branch off to supply the estate. This reservoir, which is larger than that erected recently for the neighbouring city of Chichester, forms a splendid reserve for use in case of fire, and is built at a sufficient elevation to enable the fire hydrants placed at intervals round the mansion, to throw jets of water well over the building; the pressure on the mains at this point being about 200 feet head of water. The total lift is somewhat over 300 feet.

The most noteworthy feature in connection with these works, however, is the method adopted to soften and purify the water, which is a new invention recently patented by the engineers who carried out the works, viz., Messrs. F. H. Atkins and Co., of 62, Fleet Street, London. The invention consists in an improvement upon the process known as the lime process of softening (Dr. Clarke's) the difference consisting in the circumstance that the water passes through in a continuous stream. It enters the apparatus at one end, having 24 degrees of hardness, and emerges at the other nearly as soft as rain-water, and so pure that when seen in the large reservoir it exhibits a beautiful blue tint, the natural colour of pure water. The quantity softened in this way is 2500 gallons per hour, and as the process can be worked without intermission, the apparatus is capable of treating between 60,000 and 70,000 gallons per 24 hours. These results are obtained by means of a novel kind of filtering apparatus, which is cleaned by the engine, and as the large precipitating reservoirs hitherto considered necessary in carrying out the lime process of softening are completely done away with, the inventors state the first cost to be less

by half or two-thirds than that of the old system, while the after-working is also more economical on account of the mechanical cleaning arrangement.

It will be remembered that the Royal Commission on River Pollution recommended the adoption of the lime process as the cheapest and most effectual means of solving the question of water supply in London and many of our principal country towns, but the question of expense has always been a formidable obstacle in the way. If the cost can be reduced as greatly as Messrs. Atkins and Co. say it is under their patent system, there may now be a better hope of the recommendation of the Royal Commissioners being carried out. We are informed that since the Goodwood Waterworks were completed Messrs. Atkins have erected another apparatus at Henley-on-Thames for Colonel Makins, M.P., which is now in daily work, and have at the present moment orders in hand for several other places, some of them being for very large supplies, so that the system will shortly be at work in many different directions, and under such varying conditions and circumstances as will enable its practical working to be very conclusively tested. We shall take an early opportunity of furnishing our readers with a more detailed description of this important invention, in connection, we hope, with its application on a very extended scale.

THE PRODUCTION OF MANGANESE- AND SILICON-IRON ALLOYS IN THE BLAST-FURNACE.

By Prof. RICHARD ÅKERMAN, of Stockholm.

SO long ago as 1839 Mr. J. M. Heath showed that an addition of manganese may be of great use in the manufacture of crucible steel, and more recently Mr. R. Mushet first pointed out its great value for the Bessemer process. Manganese has thus for a long time played a very important part in the iron manufacture, and the reason of this is that it exerts a very powerful influence, especially on such varieties of iron and steel as have been produced from impure raw materials, partly by its purifying from oxygen and sulphur, and partly by its diminishing the injurious effects of the phosphorus, silicon, and sulphur which remain in the finished iron. The enormous advantage which has been found to arise from treating impure materials with manganese has often given rise abroad to the incorrect idea that the superiority of the Swedish ores in general depends on their great content of manganese, while the fact is, as is well known, that they in general are, on the contrary, very poor in manganese, but distinguished on the other hand by their great freedom from phosphorus. It is even doubtful whether manganese is at all desirable in iron and steel, which are as good as free from phosphorus, silicon, sulphur and oxygen; but on the other hand, it has been clearly proved, as has been already stated, that manganese is of great use, indeed indispensable for such iron and steel as are rendered impure in any noteworthy degree by these substances. We are also quite justified in saying that it is just with the assistance of manganese that success has been obtained abroad in using, for so many purposes for which Swedish iron was formerly considered indispensable, their own raw materials of inferior quality as compared with ours. Especially has the use of ferro-manganese been in recent years injurious to the sale of our iron, at the same time that it has also been beneficial to us in Sweden by facilitating the production of soft ingot iron. The use of ferro-manganese has become more general since success was attained in making it in the furnace, and it has thus become so much cheaper than formerly.

Seven or eight years ago, indeed, ferro-manganese was made in Schishytte blast-furnace, with 20 per cent. manganese; but it was the Krainische Eisenindustrie-Gesellschaft that had the honour of beginning to produce rich ferro-manganese in the blast-furnace, for this company showed at the Vienna Exhibition of 1873 ferro-manganese made with charcoal in the blast-furnace. Further, M. Jordan deserves great credit in connection with the manufacture of ferro-manganese in the blast-furnace, having since 1862 in the blast-furnaces at St. Louis produced with coke first spiegeleisen and more recently ferro-manganese. At the Philadelphia Exhibition of 1876 the Krainische Eisenindustrie-Gesellschaft already mentioned had ferro-manganese with up to 50 per cent. manganese; but they were then surpassed by several French ironworks. Thus, at the same Exhibition, Terrenoire showed ferro-manganese made with coke in the blast-furnace with up to 75 per cent. manganese, and at the Paris Exhibition the same work reached a content of manganese of 85 per cent.; but the blast-furnaces at St. Louis had then advanced somewhat further, or to 87.4 per cent. manganese. At this point we may consider the competition ended in this respect, for experience has shown that a larger content of manganese than 80 to 85 per cent. is not at all desirable, inasmuch as still richer ferro-manganese or pig-manganese is easily decomposed by the air and crumbles too much during transport.

Rich ferro-manganese cannot, of course, be pro-

duced from any maganiferous iron ores, but for this purpose are required true manganese ores, with a limited content of iron, and when it is to be made in the blast-furnace the charge must besides be very basic, without reckoning the protoxide of manganese, and the temperature of the furnace particularly high. Most manganese ores are, however, somewhat phosphiferous, and as the phosphorus in the presence of carbon, and at the high temperature which is necessary for the reduction of the manganese, notwithstanding that the slag is very basic for a blast-furnace, is itself completely reduced, most of the rich varieties of ferro-manganese contain 0.15 to 0.2 per cent. and sometimes still more phosphorus; but this, however, is not the case with the ferro-manganese from St. Louis, Marseilles, which, according to the analysis shown at the Paris Exhibition, only contains from 0.01 to 0.04 phosphorus.

As is well known, we cannot in our charcoal blast-furnaces with the blast-temperature here used maintain an equal fusion with a slag so rich in earthy bases that its composition corresponds to the single silicate ($2\text{RO}, \text{SiO}_2$); but such, and preferably a still greater basicity are necessary to prevent the silicic acid from retaining too much protoxide of manganese in combination with itself and thereby counter-acting the desired reduction. As a very basic, and consequently a very infusible, slag, is thus requisite, it is clear that on this account the furnace temperature must be kept very high in the production of rich ferro-manganese; but this is, besides, in itself a necessary condition both for the more complete reduction of the manganese, and on account of the infusibility of the product increasing with the content of manganese. A certain high temperature is, however, as experience has sufficiently proved, much more difficult to attain in the reduction of manganese than of iron, and the reason of this is that so much more heat is combined or consumed in the former than in the latter case. For it is not enough that manganese, as being more difficult of reduction, is reduced later than iron, and that consequently the reduction of manganese, more than of iron, takes place with carbon, or, in other words, under such circumstances that the carbonic acid developed during the combustion of carbon is changed into carbonic oxide, occasioning as is well known a great loss of heat, even in the case of iron; but this loss of heat is, for the same quantity of oxygen, taken in one case from manganese and in the other from iron, so much greater in the former than in the latter case, as the oxidation-heat of manganese is greater per unit of oxygen taken up than that of iron; and that the oxidation-heat of manganese, though not yet accurately determined, is very considerably greater than that of iron, is well ascertained by many circumstances and among others by experience gained in the Bessemer process. To this there is to be added that according to Jordan*, a portion of the manganese is volatilised at the high temperature to which it is subjected, and this must of course occasion great loss of heat.

All these great losses of heat notwithstanding, a very high temperature must be attained if the manganese is to be reduced with considerable completeness; and it is, therefore, not to be wondered at that this complete reduction, especially in a charcoal blast-furnace, cannot be attained merely by diminishing the burden of ore, for the less ore there is on the same volume of charcoal the smaller quantity of fused material comes down per unit of time into the furnace hearth with a given driving, and the more does the cooling action of the furnace walls make itself felt per weight-unit of fused material. Coke has in this respect a great superiority over charcoal, for as a volume-unit of the former contains $2\frac{1}{2}$ times as much carbon as one of the latter, it follows that the burden of ore on a certain volume of coke can be kept at least twice as great as on the same volume of charcoal, and therefore with the same driving the quantity manufactured per unit of time will be at least twice as great in the former as in the latter case. Even with coke, however, it is not possible merely by diminishing the burden of ore to attain a temperature sufficient for the purpose; but on this account it is also necessary to employ a very hot blast (700° to 800° C.), which, again, is attained by means of regenerative heating apparatus, according to the Siemens-Whitwell or the Siemens-Cowper system.

To succeed in reaching such results (up to 50 per cent. manganese) as those attained by the Krainish works at Sava and Jauerburg, must thus be considered as something extraordinary, especially for charcoal blast-furnaces; but the manufacture of ingot iron has already, as we have seen, made still greater demands for high contents of manganese, and charcoal blast-furnaces do not serve for the production of 80 per cent. ferro-manganese, but only coke furnaces with very powerful heating apparatus. With what difficulties and costs the production of such ferro-manganese is still attended, even in coke furnaces, appears from M. Jordan's statement that the consumption of coke for an 85 per cent. ferro-manganese is about four times greater than for common pig-iron, at the same time that a day's production of the latter is about four times greater than of the former. With this agree the statements of M. Pourcel, of Terrenoire, who

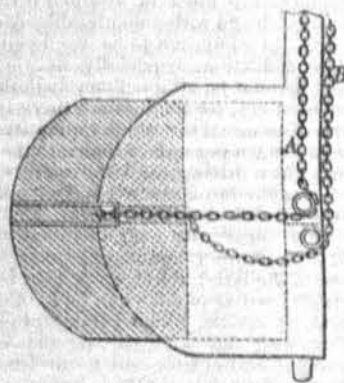
* Comptes rendus des séances de l'Académie des sciences, 1878, T. 86, p. 1374.

adds that we cannot count on reducing more than 65 per cent. of the manganese contained in the furnace charge.*

For the production of the most siliceous iron possible there is, as is well known, nothing else required than a very acid charge and the highest possible furnace-temperature; but, as we can never get so high a temperature in a charcoal as in a coke blast-furnace, it follows that in this respect, too, coke is superior to charcoal. This must be the case in a still higher degree if we wish to produce, as at Terrenoire, manganese-silicon-iron, for in that case the greatest weight lies on the furnace temperature being as high as possible, excepting that the charge must of course be rich in manganese. As for the addition of lime it must be adjusted altogether according to the proportion which is wished for between the manganese and silicon; for the greater the importance that is attached to the former the more basic must the charge, for reasons already stated, be kept, and the greater content of silicon that is desired the more acid, on the other hand, must the mixture of ore be. Only a very high blast-temperature in combination with a limited burden of ore and moderate basicity can bring about a great reduction of both these substances, which, as we have seen, in order that their reduction may be as complete as possible, have quite opposite requirements on the contents of lime and silica in the furnace charge. On the other hand, a rather large content of alumina may possibly in this case be attended with some advantage, as it may serve, according to circumstances, either as a base or an acid, and in the latter case may permit more silica to be reduced.

STEWART'S TELESCOPIC RUDDER.

WHEN a collision is imminent between two vessels, all that can be done by those in charge as regards steering, is to port or starboard their helms, as the case may be. It is this action which alters the course of the vessels, as the mere fact of the helms being kept hard to port or starboard exerts very little subsequent effect in proportion. It is, therefore, very important that the rudder-power of a vessel should be considerable; but a large rudder is found to require too much power in working, and generally to be impracticable. Mr. Scott Russell's rule for rudders is that their breadth shall equal one-fiftieth of the vessel's length plus 1 foot. Mr. Charles Stewart has devised a method whereby the rudder-power of a vessel may, in any emergency, be almost instantaneously increased from 30 to 50 per cent. The rudder is formed of two iron plates bolted or riveted together, with distance pieces between them at the top and bottom, leaving a clear space in the middle for containing a supplementary rudder which is projected by a chain when required.

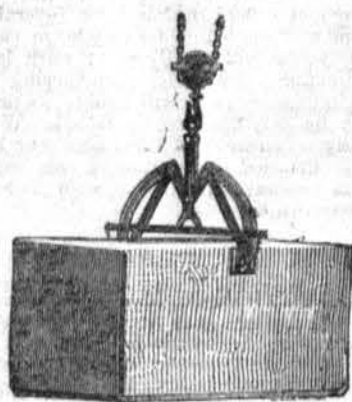


The annexed illustration shows this appliance with the extra rudder drawn out by the chain, A. To bring back the extra rudder to its normal position, the chain, B, passing between the two plates composing the main portion, must be pulled. When extra rudder-power is required, the order might be given, "Double hard a-port, or starboard," as the case might be. This arrangement is chiefly intended where the steering is effected by steam-power, when the engineer would only have to throw into gear an extra friction-clutch. It is evident that on the receipt of such a comparatively unusual order as the above, the engineer would apply the lever for working the extra rudder with the same alacrity that the guard of a train applies the brakes on seeing a danger signal. In these days of frequent collisions it is absolutely necessary that something should be done to increase the steering power of the vessel, and if, as alleged, it is inconvenient that ships should carry large rudders, some such method as that described should be made compulsory. A model of this invention was shown at the ordinary meeting of the Society of Arts on Wednesday evening last.

* Comptes rendus mensuels des réunions de la société de l'industrie minière, September, 1877, p. 2.

SELF-ADJUSTING STONE-DOG.

THE accompanying engraving represents a stone-dog which has been designed to take the place of the lewis in quarries and stoneyards, and for lifting stone generally. It consists of an arrangement of levers acting on a pair of clamps, which grip the stone, the weight of the stone itself tightening the grip. The clamps, which are roughened on their faces to prevent slipping, are hinged to the curved arms of the apparatus, and these again to the top to straight links which meet at the centre, which is the point of suspension. Here they are connected with the vertical suspending-link, which is hooked on to the tackle above it. The horizontal pin which connects the suspending link with the radiating straight links works in a vertical guide in which it



has free play. The lower ends of the curved arms are hinged by means of pins in a transverse bar, seen just over the top of the stone. These pins are moveable, and the bar is provided with several holes, so that the curved arms, and consequently the clamps, can be adjusted nearer to or further from the centre according, as may be necessary to suit the size of the stone to be lifted. It will thus be seen that, upon the clamps being adjusted to the stone, as in the engraving, and the hauling power applied, the strain will be conveyed up the straight links and down the curved arms to the clamps, and a firm grip obtained on the stone. There is no preparation necessary with these dogs, which are made of steel, and of sizes capable of lifting from 1 to 100 cwt. They are being introduced by Messrs. Selig, Sonnenthal and Co., of Lambeth-hill, Queen Victoria Street, London, and, we understand, are rapidly superseding the old masons' lewis.

OCCASIONAL NOTES.

ARTIFICIAL DIAMONDS.

BESIDES the diamonds which Mr. Mactear is trying to make, there is another class of stones, known as false, imitation, or Parisian diamonds, composed of silica in combination with other ingredients, which have now been brought to such perfection that it is claimed for some of them that they will stand the closest examination and criticism, either by gaslight or daylight. Most people are familiar with the story of the gentleman who, designing to pawn his wife's jewels, took them to a tradesman to have false diamonds substituted for the real, but found that the lady had anticipated him. Still, the old imitations, the manufacture of which dates from the Middle Ages, could easily be detected by an expert. Besides silica, they consisted mainly of oxide of lead; but they were soft and glassy, and often became dull through wear or exposure to moisture. Two years ago, however, a preparation of gold was substituted for the oxide of lead, and an expedient was found for increasing the refractive power of the product, so that when properly cut it is said to be undistinguishable from the finest Indian or Brazilian gems, even when placed in juxtaposition with them. The artificial stones are cut as carefully and mounted as expensively as the real diamonds, but their cost is only about a three-hundredth part of the latter. So that, even if the Glasgow alchemist were to succeed in his experiments beyond what he is at all likely to do, the "diamanté brilliants," as the new stones are called, would probably drive his more genuine articles out of the market.

THE FOOD OF THE PEOPLE.

Probably the squeeze which the country has just passed through has something to do with the lessons of thrift and management which are being read to the people. If so, the economists are rather wise behindhand, as they say in the north, although, even with better times, a good deal of economy will be required in many cases before things are made square. Clothes are, perhaps, as moderate in price as can be hoped for, unless with the help of the co-operative system; but there is still a good deal of waste and

extortion connected with our food supply. The restaurant system, in large towns, greatly needs reform. Even when the material is good, its preparation often reminds the guest who it is that sends cooks; and the materials are not always good and wholesome, even in pretentious establishments. The charges are always exorbitant. Mr. Ernest Hart, in a recent number of the *Sanitary Review*, has commenced a series of articles on the hygiene of food. Dr. Richardson, like the Court physician of Barataria, waves off the table everything in the shape of fermented drink. A German savant of repute recently denounced coffee almost as strongly as a teetotaler does gin, and now Dr. Hart expresses a wish to see the teapot banished from the breakfast-table, proposing, as Dr. Richardson did some time ago, cocoa as a substitute. Dr. Hart, however, ardently prefers oatmeal or hominy porridge; but whatever their dietetic merits, it will take a long time to train the British workman to this height of Arcadian simplicity. There is no doubt, however, that a working man, especially if burdened with a large family, might save a good portion of his income by more judicious providing—that is, by more artistic cookery, and using a greater proportion of vegetable food, to his own benefit and that of the country at large. The other day, a cheap vegetarian "banquet," as the local papers call it, was given in Manchester to five hundred of the poorest children in the city. The provisions consisted of soup, bread, and pudding; the soup, which was evidently the *pièce de résistance* consisted mainly of peas, onions, flour and water, seasoned with pepper and salt. The total cost per head was less than 2d, and the repast is said to have been heartily enjoyed by the children.

DOMESTIC POISONING.

The baneful effects of wallpaper and wearing apparel coloured or dyed with arsenic and other poisonous minerals, or with imperfectly prepared aniline products, have been insisted upon until the public must be well-nigh tired, especially as that patient ass can do little to help itself. Even if the manufacture had ceased, the instincts of the tradesman would prompt him to get rid of his stock; and in the case of wall-papers the householder is entirely at the mercy of his landlord, who is not likely, in the majority of cases, to withstand the temptation of a cheap and showy lot. The remedy is to be looked for from Parliament, when that august assembly can spare time from its imperial business to attend to the needs of its constituents. It is, therefore, gratifying to find that the Society of Arts has taken up the question; and in Mr. Henry Carr's paper, read at a meeting of that useful institution last week, and in the discussion which followed upon it, those interested will find abundance of authentic facts upon which to proceed. The use of arsenic in the arts is shown by Mr. Carr to be of even wider application than most people have imagined. On the back of a single pack of playing-cards, 38 grains of arsenious acid have been found—a very dangerous application; but its use in colouring sweets is still more so. Another class of poisons in general use is even more dangerous. The high pressure at which modern life is carried on induces neuralgia and other diseases of nervous depression; and chlorodyne, chloral, and other powerful narcotics are getting into general use without the supervision of a medical adviser. The result of this is bad in every way. In many cases it ends in speedy death from an overdose, in many more in broken constitutions and mental imbecility. Here the remedy must be applied by the sufferer; in the other class, the Legislature, as suggested by Dr. Brunton, ought to make it penal in a colour manufacturer to sell arsenical and other poisonous pigments without declaring their character.

THE POST OFFICE AND THE TELEPHONE.

There is a universal consensus of opinion throughout the press with respect to the attempted interference of the Telegraph department with the telephone companies. The telephone bids fair vastly to improve our means of communication, and there is a general agreement that if the department succeeds in laying hands upon it improvement will be practically at an end. In one of his recent addresses to the Society of Telegraph Engineers, Dr. Siemens showed that when Government acquired the inland telegraphs invention in telegraphy came to a sudden stop, and the monopoly of improvement was transferred to the United States, while telegrams now cost double what they did when the wires were in the hands of private companies. Loud complaints also come from correspondents regarding the delays of delivery in cases sometimes of life and death, and the number of hours the offices are closed. Of course, complaints made to a Government department are more negligently dealt with than if the management of the wires were in the hands of private individuals. There is also reason to believe that this action of the department is the result of a settled policy of which the ultimate ends sought are not quite obvious, which is another reason for watchfulness on the part of the public.

LONDON HOUSES.

The fall of nine newly built houses in the neighbourhood of Finsbury Park ought to open the eyes

of metropolitan vestries and their surveyors. Probably, only by the greatest good fortune, in this case, has the most frightful loss of life been prevented. There were 150 workmen employed on the block, of which the brickwork had been finished; but fortunately there were premonitory signs of the walls giving way, and the men left in time. The passengers in a fully-laden tramcar had, however, a hair-breadth escape. The fall is believed to have been occasioned by the weakening of the foundations of the block in consequence of drainage operations by the Board of Works, who opened up the street along the front of and about six feet from the buildings. So far as investigation has gone there appears little blame attachable to the builder. It is, however, a fact that many of the houses built of late years in London are run up in the most flimsy way, and of very inferior materials. A resident in the Finsbury district writes that during the recent intense frosts the bricklayers were hard at work in his neighbourhood, and perhaps the mortar they were using was of the customary description, mixed with road-sweepings and other refuse. To those who know how, in spite of sanitary enactments, houses are constructed in the metropolis, the wonder is not that some of them fall, but how any of them stand.

LAST YEAR'S HARVEST.

In a letter to *The Times*, Mr. Thomas C. Scott shows that during the four months since the completion of the cereal harvest of 1879 there has been a deficiency in the home deliveries at the rate of five and a half million quarters per annum. Mr. Scott doubts whether the wheat area this year will be equal to the last, on account of so much land having become foul and poor; and the wheat sowing has been late, and the seed-bed unfavourable, so that the farmers, he thinks, will have to look to other crops and returns to retrieve their past losses. In farther illustration of the leanness of the last harvest, Mr. Mechi reports that his farm balance is on the wrong side for the first time in the last fifteen years. His accounts show a deficiency of £750, which would have been at least £1000 but for the produce of some 50 acres of light soil, and this on a farm well drained, highly manured, and deeply and cleanly cultivated. Another proof of the deficient harvest is to be found in 120 additional applicants on the new list of the Royal Agricultural Benevolent Institution, many of them, Mr. Mechi observes, having been in a most respectable station of life as agriculturists.

ON THE HARDENING, TEMPERING, AND ANNEALING OF STEEL.*

FIRST REPORT OF THE COMMITTEE.

Members of the Committee:—William Anderson, Esq. (Chairman and Reporter); A. Paget, Esq.; Prof. F. A. Abel, C.B., F.R.S.; P. Brotherhood, Esq.; Herr D. Chernoff; W. Hackney, Esq.; G. H. Ogston, Esq.; J. Vavasseur, Esq.; R. Price Williams, Esq.; Prof. Alex. W. Williamson, F.R.S.

Annexed to this report is a list of the books and detached articles relating to the subject which have been examined and considered. It does not appear that any attempt had been made in this or any other country to discover the theories of the constitution or properties of steel, till Karsten in 1827 investigated the conditions of carbon in iron, and Jullien in 1852 deposited at the Academy of Science, Paris, a paper termed "L'Explication de la Trempe." From that period a good deal has been written chiefly by French metallurgists.

I.—Nature and Composition of Steel and Cast Iron.

Karsten in 1827 says that carbon is contained in iron in three different ways:—(1) As free carbon or graphite. (2) Combined with the whole mass of iron. (3) In the state of polycarburet, dissolved in the mass. In 1852 Jullien advocated, if he did not originate, the theory that iron and carbon do not combine (as true chemical combinations), but that the compounds formed by the two substances are what he terms "solutions," or, as we should translate it into English, only mechanical mixtures. Following Karsten, Berzelius, and others, he holds that amalgams and alloys are definite combinations dissolved in excess of one of the components. He defines "combination" to be a union of elements in definite proportions, the resulting body being different from either component and from any of their other definite combinations. "Solutions," or mechanical mixtures, on the other hand, may occur in any proportions, and the resulting mixture participates in the properties of each component in proportion to its quantity. Your committee find it difficult to acquiesce in the latter portion of this statement. For example, the addition of increasing proportions of tin to copper results in producing harder compounds, instead of softer. Under certain circumstances the addition of a small proportion of tin to cast iron greatly increases its hardness. Barba adopts Jullien's view, and defines steel to be a solidified solution of carbon in pure iron: (Les aciers sont des dissolutions solidifiées de carbone dans du fer chimiquement pur.) Osborne seems to think that carbon exists both in a combined form and uncombined, disseminated in the latter case as graphite; but he does not define clearly what he means by the word "combined." Caron considers the union of the two substances to be a mixture. Gruner takes the same view. Akerman adopts the view that carbon occurs both in combination and as graphite; and also the view of Rinman, that combined carbon may be partly intimately combined, when it may be

called "hardening carbon," and partly incompletely combined, when it may be called "cement carbon." He does not define what he means by combination, whether in definite proportions or not. Your Committee have not found any modern author holding the opinion that the various combinations of iron with carbon, and with other substances found in steel and cast iron, are definite chemical unions with excess of either one or other of the component bodies. The elaborate evidence adduced by Jullien, which does not appear to have been combated, makes it highly probable that steel and cast iron are only mechanical mixtures of carbon and some other substances in pure iron.

II.—Quantity of Carbon in Steel and Cast Iron, and its State.

Barba considers that the solution of carbon in molten iron follows the ordinary laws of solution, that is:—(1) The quantity of carbon which iron can contain in solution increases with the temperature. (2) By slow cooling a part of the carbon separates from solution and is brought into a state of mixture. (3) With rapid cooling, or sufficient exterior pressure, the greater part of the carbon remains in "solution;" rapid cooling acting by the pressure it produces; and, if the carbon is merely mixed, exterior pressure producing solution more or less complete according to the intensity of the pressure. (4) The temperature at which steel solidifies decreases as the quantity of carbon it contains augments. He remarks that experimental demonstration is wanting to show that pressure is favourable to preserving "solution" when cooling. Osborn says that rapid solidification favours the retention of carbon in the combined state, and by that means it is possible to change grey cast-iron into white. Jullien states (1852) that the properties which the solutions of carbon in iron exhibit are due exclusively to the rate at which the hot solutions are cooled. Following Karsten, he says that the liquid solutions of carbon in iron are homogeneous, because rapidly cooled solid "solutions" are found to be so. He considers that:—(1) Melted cast-iron is a solution of liquid carbon in liquid iron. (2) Grey and soft cast-iron is a solution cooled slowly, and converted into a mixture of mild steel and amorphous carbon or graphite. (3) Grey cast-iron heated cherry-red and plunged into cold water is a mixture of hardened steel and graphite. (4) White cast-iron is a solution cooled rapidly, and consists of a mixture of crystallised carbon in amorphous iron. (5) White cast-iron reheated, while protected from the atmosphere, and become grey and soft, is grey and soft cast-iron. (6) White cast-iron heated in contact with air, and grey or white iron reheated in closed vessels in a cement of metallic oxide, become mild steel. (7) Steel heated cherry-red is a mixture of liquid carbon in solid iron. (8) Mild steel is a mixture of amorphous carbon in iron either amorphous or crystallised. (9) Hardened steel is a mixture of crystallised carbon in amorphous iron. He further states that iron absorbs carbon at temperatures ranging from cherry-red to welding heat, and up to a quantity equal to 5.25 per cent. of the mixture; that the properties of steel approach those of iron in inverse proportion to the quantity of carbon; and that the presence of carbon not only increases the fusibility of the alloy, but communicates to it, in certain cases, properties belonging exclusively to crystallised carbon or diamond. He also states that the temperature of fusion of grey cast iron is higher in proportion as the quantity of graphite is greater, while the temperature of solidification is lower in proportion as the quantity of dissolved carbon in the fluid mass is greater. The lower, therefore, the temperature of solidification of grey cast iron, the higher is its point of fusion; it is only steel that has the same temperature of fusion and solidification. This property of cast iron is common to many bodies, such as bismuth, tin, sulphur and water, under favourable conditions of cooling. Caron states that steel, if hardened by being heated to redness and cooled rapidly, and then dissolved in strong hydrochloric acid, leaves no residue; that the same steel, if raised rapidly to a red heat, and allowed to cool slowly, will, if dissolved as before, leave a residue of carbon, which dissolves on being heated; and that the same hardened steel, if annealed by being kept at a red heat for a long time, and allowed to cool slowly, dissolves more easily, but leaves a residue of carbon insoluble even in hot acid. The conclusions he draws are, that in the first case the iron and carbon are intimately united and dissolve together; in the second case the union is not so intimate, therefore the more soluble body dissolves first, and the carbon, which is not quite modified, yields last; and in the third case the carbon is free, and shows it by its property of resisting acids. What Caron terms a solution of iron or carbon in hydrochloric acid appears to your committee to be probably a "double decomposition." Carbon is very unchangeable, resists the action of acids and alkalies, and bears the most intense heat in close vessels without fusing or undergoing any perceptible change. Baumhauer confirms these statements with respect to diamond, and relates the experiments by which they are proved. He also states that a diamond, when heated for a long time to whiteness in carbonic acid gas, showed prismatic colours on some of its facets. Akerman states that graphite is only mechanically incorporated in pig-iron, and can be separated by dissolving the iron in acid. The combined carbon, on the other hand, when the iron is dissolved in boiling hydrochloric acid, escapes as carburetted hydrogen, provided proper attention is given to the dissolving process, so that the boiling commences almost immediately after the addition of the iron to the acid, and is continued uninterruptedly for a sufficient length of time without access of air. When dissolved in cold acid, and warmed a little time after, a part of the combined carbon remains as a black residue, especially if air has ready access. He also quotes Caron's and Rinman's statements with respect to the solution of steel in acid. Gruner states that each temperature corresponds to a maximum of solubility, and that this solubility rises and falls both in the fluid and solid states. Whenever a carburetted iron (steel or cast iron) cools slowly, an intimate mixture of iron and particles of graphite is produced, as in the case of untempered steel and grey cast iron. When carburetted irons are cooled quickly, the separation of carbon is rendered impossible for want of time, and carbon remains dissolved in the iron at ordinary temperatures; saturation then results. The mixture then becomes hardened steel when the proportion of

carbon is below 1.5 per cent., and white cast iron when above that quantity.

III.—Substances other than Carbon entering into the Composition of Steel.

Dr. Siemens is of opinion that high-class steel should contain only iron and carbon; the hardness, temper, ductility, elasticity, toughness and strength depending upon the relative proportion of these elements. But as it is almost impossible to produce such pure metal, other substances, which must, however, be considered as impurities, have to be admitted: these impurities have a certain influence in rendering steel hard, or rather in making it brittle; thus if phosphorus is allowed, a certain dose of manganese has to be added to prevent cold-shortness, and a smaller quantity of carbon must be used. Manganese is a treacherous element in steel, as its distribution is not uniform, and thus a homogeneous compound is not produced. According to Fernie, a sample of Krupp steel contained 1.18 per cent. of carbon and a trace of manganese, and a sample of American steel 0.23 per cent. of carbon and no manganese; the latter constituted soft metal fit for fire-boxes. Frémy (1864) advanced the theory that nitrogen was an essential component of steel; that steel was, in fact, a nitro-carburet of iron. Caron, however, considers it proved that all kinds of iron contain feeble quantities of nitrogen, 0.00011 per cent., and considers that it must be looked upon as an impurity just like silicon, sulphur, and phosphorus. According to F. C. G. Müller, it has been proved that hydrogen, nitrogen, and carbonic oxide are to be found in the pores of Bessemer and Siemens-Martin steel. Cyanogen, tungsten, chromium, platinum, silver, and other substances, have been mixed with steel with a view to give it certain high qualities; but Chernoff, Dr. Siemens, and many others are of opinion that true steel is a mixture or combination of carbon and pure iron alone, and that all other substances are impurities necessarily injurious in pure steel, though sometimes apparently beneficial if they exclude or neutralise more injurious substances. Boman states that Bessemer steel No. 1 (which is necessarily impure), containing only 2 per cent. of carbon, is hardly malleable; while Anosoff found that the hardest "boulat" (the sabre steel of the Tartars), which is perfectly pure, retained its malleability though it contained 3 per cent. of carbon.

(To be continued.)

SCIENCE AND ART.

GEOLOGICAL SURVEY OF JAPAN.—The Japanese Government are about to establish a geological staff, to whose care will be committed a geological survey of the whole of Japan, founded upon the geological survey of the United Kingdom.

MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.—On Friday last the members of the above society, on the invitation of the Health Committee of the Manchester Corporation, visited the sanitary works at Hall Town, where all the refuse matter which is now collected from all the closets throughout the city is dealt with. Mr. Whitley, the superintendent, conducted the members over the works and explained the various processes carried on. He stated that the Corporation had now to deal with 1600 tons of refuse matter every week, and out of this 240 tons of manure were manufactured which was sold at £3 per ton; the expenses connected with the manufacture and sale amounting to 30s. per ton.

BUILDING EXHIBITION.—An exhibition of building appliances and manufactures is to be held in April. The support of many gentlemen of influence in building circles has been given to the movement. The idea has, it is said, met with such warm approval from the moment of its projection that there is every prospect of its complete success. Many interesting novelties in labour-saving machinery are to be shown, and American and Continental productions are promised. The collections will be divided into five sections, viz.: (1) Architecture; (2) Construction; (3) Engineering; (4) Decoration; and (5) Furniture—each under the charge of a steward of department. The section of building construction is in the hands of Mr. Henry Reid, C.E., the author of the standard works on Portland cement, concrete, &c., while that of engineering will be arranged by Mr. M. Powis Bale, C.E., M.I.M.E., &c. The subdivisions are arranged so as to include nearly every appliance of house building and furnishing, and many exhibits prepared for the Melbourne Exhibition are expected, so that they may be seen here before their despatch.

THE SOCIETY OF ARTS.—In connection with the Section of Applied Chemistry and Physics, a lecture was delivered on Thursday evening last week, in the hall of the Society, by Professor Perry, on the Teaching of Technical Physics. The Professor remarked that the object of teaching physical science is to give all men the same language in which to express their experience, so that all may employ the best methods of simplifying the phenomena which they have to study, and give their results to other people. Technical physics might be regarded as the application of the principles of natural philosophy to practical trades. English workmen were acknowledged to have greater manual dexterity than workmen of any other country. If they wanted a really perfect piece of work of any kind, where patience and honest painstaking labour were of chief importance, they must get it from an English workshop. What, then, was the nature of the improvement which they wanted to see effected in English trade? There was none of that perfection of workmanship, on which we vaunted ourselves, which might not be done as well and cheaper by regular machinery. The hope should be to use the brains as well as the hands of our English workmen, as they are doing in the United States. What was wanted in England was a good system of technical education, so that English workmen might be fitted to investigate the phenomena taking place before their eyes every day in the workshop. He believed that it was possible for children in the primary schools of England to acquire good notions of the principles of natural science, and that they would be in a position on leaving school to take up the study of technical physics as specialists. His opinion was

* Reports to Research Committees of the Institution of Mechanical Engineers.

that advanced natural philosophy had not hitherto in this country been given a fair chance.

BRIDGES OVER THE THAMES.—An interesting discussion took place at the adjourned meeting of the Civil and Mechanical Engineers' Society, Westminster Chambers, on the paper on the above subject, read at the previous meeting by Mr. A. T. Walmisley, A.M. Inst. C.E. Mr. William C. Street, the president, who occupied the chair, remarked that when the foreigner said London might be proud of her bridges, he scarcely knew whether such a statement was to be considered as made in earnest or not. Some of the bridges were most unsightly structures, and the only two thoroughly good bridges were London Bridge and Waterloo Bridge. With regard to a bridge below the Tower, of which so much has been said and written of late, he did not think there was that great necessity for it which some people seemed to imagine, the traffic across the Thames being principally directed to a centre, and below the Tower ferries would suffice for the traffic. The fact that the existing steam ferry did not pay was, he considered, a proof of the correctness of his views on that subject. He was in favour of Mr. Walmisley's proposed foot-bridge just below London Bridge, but he should be more in favour of it if it were constructed to accommodate carriage traffic also. Mr. J. B. Redman said that since the extension of the South-Eastern line from London Bridge to Cannon Street it had considerably relieved the traffic of London Bridge, and he advocated the erection of a bridge opposite St. Paul's, which he considered would greatly accommodate the traffic from the north and north-west of London, and relieve both London and Blackfriars Bridges, while the levels of the approaches at that point were most favourable. Mr. Watson advocated the construction of a bridge between London and Southwark Bridges. An interesting exchange of opinions took place regarding the comparative value of stone or iron for the construction of bridges, the advocates for either being pretty equally divided on the point, and one gentleman caused amusement by remarking that Macaulay's New Zealander will contemplate the ruins of London from a stone bridge long after the iron bridges are oxidised and destroyed. A cordial vote of thanks was passed to Mr. Walmisley for his able and interesting paper.

SOCIETY OF TELEGRAPH ENGINEERS.—On Wednesday evening Mr. W. H. Preece, the newly-elected president of this society, delivered the inaugural address. The meeting was held at the Institution of Civil Engineers, 25, Great George Street, Westminster. Mr. Preece first examined the nature of electricity, with the view of ascertaining whether it was a form of matter or a form of force, and his conclusion was that as gravity, light, sound, and heat were known forms of force, electricity, which was similar to them in many properties, must be of the same category. The cycle of changes of energy involved in the production of the electric light, and in the operation of the telephone, were, he thought, conclusive in establishing the fact that electricity was a form of energy, and a peculiar mode of motion of the molecules of matter. After referring to the facilities possessed by the society for furthering the advancement of electrical science, Mr. Preece said there were now 97,568 miles of submarine cable working, and that during the past year over 12,000 miles of cable were made and laid. A fleet of twenty-seven ships was employed in connection with these cables. On the subject of the proceedings taken by the Government against the telephone companies, he said that the litigation was not undertaken to restrict or in any way interfere with the use of the telephone, but to prevent the establishment of a particular branch of the telegraph business of the Post Office without its license or consent. Referring to the electric light, Mr. Preece remarked that the Brush light was certainly the most advanced form which that light had yet taken; and he added that the proper function of gas was to generate heat, 94 per cent. of the ingredients of gas being consumed in producing heat, and only 6 per cent. in producing light. The great advances made at home in telegraphic apparatus were shown by the fact that an increase in the number of messages per week represented by 586,000 in 1879, against 273,000 in 1870, was provided for by a very trifling addition to the mileage of wire. A surplus over dividend would be shown by the Post Office Telegraph Department this year for the first time. But a limit had been reached; the system was actually gorged with messages; and the erection of additional wires had become essential. It was hoped that a new trunk line to the north and many additional wires would be erected during the ensuing summer. A vote of thanks was passed to Mr. Preece for his address.

STEAM FIRE ENGINE AT HAMPTON COURT PALACE.—Some short time since Messrs. Merryweather and Sons received instructions from H.M. Office of Works to make a powerful quick-raising steam fire-engine for Hampton Court Palace. The engine is similar in design to those supplied to the Admiralty, used also in the Russian war vessel, *Peter the Great*, and by the French Marine Department. It is erected in an engine house, and connected to the present system of water supply from plans of Mr. Lessels, the engineer to H.M. Works Department. The water for the supply of the engine is led into a well close to the engine house through 12-inch and 10-inch supply pipes, the first pipe is from the canal in the gardens, and the other from the water supply three miles distant. The water pumped by the engine is carried through 10-inch cast-iron mains, with branches about the grounds and palace, having hydrants at suitable distances. By attaching a hose to a hydrant at any part the full force of the water can be made available. The official trials of the machinery took place on Tuesday last in presence of Mr. Lessels, several other officials and gentlemen interested in the matter. Although the water was frozen in the boiler through the severe frost, steam was generated in four minutes from lighting the fire, and had increased, in a second or two under ten minutes, to a working pressure of 100 lb. on the square inch. The first performance of the engine was to work the large fountain (which is supplied from the 10-inch main), consisting of nearly 200 jets, which it did satisfactorily, throwing the water about twice the usual height. In the second experiment, two large jets were employed, one of 1½ inch, and the other of 1 inch in diameter, the hose being attached to the hydrants 300 feet from the engine-house, and the water projected across the basin; after this four jets were thrown

over the great hall with good effect, the height reached considerably over 100 feet; a spray nozzle was then used, which threw the water in a very gentle stream, such as would be desirable to use for the protection of pictures, tapestry, &c., from fire. The whole of these trials were accomplished in a manner highly satisfactory to the officials. The steam pressure throughout was maintained at 100 lb.; the pressure on the main varied from 50 to 100 lb., according to the number of jets of water played. The engine-house is a handsome structure of brick, with stone facings, being designed to conform somewhat in architecture and appearance to the old palace buildings.

COAL.—On Saturday afternoon Professor T. Rupert Jones, F.R.S., delivered the second of a course of three lectures on "Coal" in the theatre of the Royal Institution, Albemarle Street, Piccadilly. He proceeded to state the conditions under which coal is found in the earth, explaining that for the purpose of popular exposition it might be classified in about half a dozen groups. First came those containing a maximum of bitumen, or mineral pitch, many of which sorts were extensively used in the manufacture of gas. The albertite, found in large quantities in New Brunswick, and sometimes met with in Scotland, belonged to this group. Next was a variety made up of vegetable spores, such as club-mosses and puffballs, examples of which were the white coal of Tasmania and a variety of Bradford coal. Analogous to this was the true canal coal, closely compacted of vegetable tissue. The common bituminous coal, which was used under many names as fuel in our parlours and kitchens, formed another group, to which might be subjoined the semi-bituminous kinds of coal, containing much charcoal. To the anthracite group belonged the best steam-coals. They were smokeless, burnt with little flame, but developed heat very rapidly, converting water into steam in a minimum of time. Approaching the subject of the coal-measures, the lecturer showed that all the geological formations connected with them contained stratified accumulations of organic remains, mostly vegetable, and often of great economic importance. The underlying beds represented the soil in which grew the forests afterwards fossilised into coal, and in these geological soils plenty of rootlets were accordingly met with. The shales, occurring in masses or laminated, were sometimes of a clayey nature, sometimes of decomposed granite, such as the London traffic ground out of our macadamised streets, or like the fresh soil now in process of natural formation by the weathering of the rocks on Dartmoor. The carbonaceous admixture in the shales was often turned to good account, mineral oils, &c., being extracted from them. The materials of other soils were arenaceous or sandy, running into gritty, pebbly, and conglomerate masses, often testifying to the action of water, mostly fresh. Sometimes the strata were calcareous, limestones being pretty frequent, with streaks of ironstone, often containing the rarest fossils. The organic remains found in the ironstone were some of them marine, and others indicated a fresh-water formation. Some account was given of the geographical distribution of coal throughout the world, and particularly in our own island, the descriptions being illustrated by reference to specimens, diagrams, and geological maps. In conclusion, the lecturer acknowledged that much had yet to be learned about the natural history of the coal-measures, the order and extent of the special kinds of their animals and plants, the time occupied in their formation, and the geographical and hydrographical conditions.

FIRTH COLLEGE, SHEFFIELD.—Firth College, which was formally opened by Prince Leopold some weeks ago, is now carrying on its educational work. On Tuesday there was a large gathering in the lecture-hall, the whole staff of professors and lecturers being present, as well as the more influential inhabitants of the town. The endowment fund is now more than £16,000, and in addition to the £20,000 which Mr. Mark Firth has extended in the erection of the building he has also presented a chair of chemistry worth £150 a year, while Mr. Henry Firth and Mr. Edward Firth have furnished a laboratory at a cost of £1000. The college is for those students who intend hereafter to graduate at one or other of the universities, or intend to make education their profession, but do not aim at a university degree; for schoolmasters, schoolmistresses, and teachers generally; and for those who have already commenced business but are still willing to give a few hours a week to systematic study. At present the following will be the courses of study:—Mathematics, experimental physics and mechanics, modern history, modern languages, and chemistry; but lectures and classes in English literature will not commence until May. It is stipulated that persons entering the college shall not be less than 17 years of age. Very great interest is taken in the new system of education, and already there have been many applications from students desirous of availing themselves of the advantages of the college. The inaugural address was delivered by Professor Bentley, the principal of the college. Mr. Mark Firth presided, and on the platform were Professor Carnelly, Professor Hutton, Mr. G. Harding Firth, Mr. Eugene Joel, Mr. T. T. Trimmell, the Rev. S. Earnshaw, Mr. S. Roberts, Mr. B. P. Broomhead, Mr. Skelton Cole (Chairman of the School Board), Dr. Clifton Sorby, Mr. Henry Stephenson, &c. Mr. Mark Firth, in introducing Professor Bentley, said he had great pleasure in meeting those present on the opening of the college for practical purposes. An able and competent staff of professors and lecturers had been engaged, and it only remained to be hoped that those for whom the college had been erected would show their appreciation of it by availing themselves of the opportunities of culture it would afford. Professor Bentley then delivered his inaugural address on ancient universities and modern colleges, showing what a remarkably small beginning the present Universities had and how useful they had now become. Coming to speak of the aims of the college, he said it was to provide means whereby all persons, whatever their sex, position, or occupation, could pursue, under careful and competent direction, some study or studies which would cultivate their tastes, their powers, or both. While they would strive by classes of a strictly academical character to satisfy the requirements of those whose opportunities and tastes prompted them to devote all their energies to study, they would, nevertheless, welcome with the utmost cordiality those with whom study must perforce be subordinated to other duties. They did not desire to see the

college degenerate into a more or less popular lecture-hall, and for this reason, if for no other, they would always struggle to keep the strictly academical work at as high a level as possible. All they asked was a fair field and no favour. The novelty of their scheme and imperfect appreciation of its aims, with the unavoidably imperfect state of their preparations, must long tell against them; but they were not discouraged, being prepared to trust all their fortunes to those potent allies, time and patience.

WEST LONDON SCHOOL OF ART.—The new building of the West London School of Art, 155, Great Titchfield Street, was opened last week, when Mr. S. H. Marks, R.A., after delivering an inaugural address, presented prizes to the students of the school who had been successful in the South Kensington and school examinations. The report of Mr. G. A. Stewart, the head master, showed that 581 students had attended the school during the year—an increase of 80 above the number of students in 1878. The receipts from fees were £704, of which £308 was derived from the Government grants. In the Government examinations testing the year's work, the school had gained one silver medal, two national book prizes, 23 third grade prizes, 18 second grade prizes and six free studentships. For these examinations 372 students sent 2860 works to South Kensington. At the examinations conducted on the school premises 176 students competed, and 91 were successful. Two of the students—Miss Hoskyn and Mr. Carroll—had gained first certificates of the third grade at South Kensington, and Mr. R. Rickatson, another, had gained admission to the schools of the Royal Academy. At a competition of members of a sketching club formed of students from five of the principal art schools of London, two out of five prizes were gained by students of this school—Mr. Tidmarsh for the best landscape and Mr. Breach for the best sketch from animal life. Mr. Marks remarked upon the fact that the committee had on this occasion requested an artist to preside instead of a lord, a bishop, or a member of Parliament, who, however learned and eminent they might be in their respective spheres, were apt to have notions about art as crude as they were original. The facilities for the cultivation and study of art had within the last forty years become so numerous that we were in danger of having too many painters of pictures. Everybody who had good eyesight could be taught how to paint and draw up to a certain point, but invention, feeling—all the qualities that go to make the painter as distinguished from the mere mechanist—could not be taught, but must be born. Our exhibitions, he grieved to say, were full of specious and bad pictures, painted by men who, with more humbleness of aim, might have been admirable art workmen. Good art might be shown in an infinite variety of ways, and the man who designed a good paper-hanging, an effective piece of metal-work, or a good tile or pattern, was as much an artist, though in a lesser degree, as a painter or sculptor. It was much better to do a little thing thoroughly well than a great one badly, and he who could produce a well-designed chair or book-cover did more real service to art than he who painted an inferior picture. It had been urged that students should curb their ambition and be contented with the lot which had been cast for them in their callings. The doctrine was to his mind one of rather cruel discouragement. He could not forget that in the son of a common sailor, a journeyman house-painter, a carver and gilder's apprentice, a mason's boy, the son of a small shopkeeper selling plaster casts, and a barber's son, the world had discovered a Clarkson Stanfield, a David Roberts, a Sir Francis Chantrey, a John Gibson, a Flaxman, and a Joseph Mallord William Turner. The Scott Monument in Edinburgh, which suffered little in comparison with late efforts of the kind, was the design of a journeyman carpenter. The list might be indefinitely prolonged if it were necessary to show that contentment and rest were hardly virtues when art called, and that it was by enterprise, unflagging industry, tenacity of purpose, devotion to nature, and high aims that the goal was won. After giving some practical advice to the students, he recommended them to draw whenever and whatever they could. We had had, he observed, a good many men remarkable for bad drawing, but he never remembered in the whole history of art to have heard of one who drew too well. He did not wish to be misunderstood. He would say, "Let your aims be high, for whatever work you do will be better in consequence, but pause and consider well before you determine to be an artist." The struggle for success was a very hard one, and became harder every year on account of increased competition. The path was indeed hard to follow, and the obstacles to be overcome must be vanquished by indomitable will, untiring perseverance, and last, but by no means least, strong and vigorous health. A vote of thanks, on the motion of Mr. W. Graham, seconded by Mr. R. W. Edis, F.S.A., was cordially given to Mr. Marks for presiding. The works have been carried out by Messrs. Watson Brothers. The school, it is hoped, will be of great service, more especially by affording means of art training to those employed in the industries of the populous districts in which it is placed.

MEETINGS FOR THE WEEK.

MONDAY, FEBRUARY 2.

ROYAL INSTITUTION.—5 p.m. General Monthly Meeting.

LONDON INSTITUTION.—5 p.m. Professor Armstrong on the Chemical History of Chlorine.

NATIONAL SOCIAL SCIENCE ASSOCIATION.—8 p.m. Mr. Stephen S. Alford on the Habitual Drunkards Act of 1879; How it may be administered; the American Inebriate Homes.

ROYAL ACADEMY.—8 p.m. Professor Church on the Chemistry of Pigments.

INSTITUTE OF CHEMISTRY.—5 p.m. Anniversary.

VICTORIA INSTITUTE.—8 p.m. Mr. Hormuz Rassam on Late Assyrian and Babylonian Research.

SOCIETY OF ENGINEERS.—7 p.m. Address by President, Mr. Bernays.

SOCIETY OF ARTS.—8 p.m. Cantor Lecture. Mr. Thos. Bolas on the Manufacture of Indiarubber and Gutta.

Percha. Sources, Chemical and Physical Properties of Indiarubber, Effects of Heat, Cold and Light.

ROYAL UNITED SERVICE INSTITUTION.—8.30 p.m. Mr. B. Tower on his Evolution Indicator.

INSTITUTION OF SURVEYORS.—8 p.m. Discussion on Mr. Huskinson's paper, On the present Depression in English Agriculture: its real and assumed causes.

TUESDAY, FEBRUARY 3.

CHRISTIAN KNOWLEDGE SOCIETY.—2 p.m.
ROYAL INSTITUTION.—3 p.m. Professor Schäfer on the Physiology of Muscle.

SOCIETY OF BIBLICAL ARCHEOLOGY.—8.30 p.m. Professor T. Hayter Lewis on Excavations made in Tel-el-Yahoudeb, the Mound of the Jew, near Cairo, and on Antiquities therefrom now in the British Museum.

INSTITUTION OF CIVIL ENGINEERS.—8 p.m. 1. Discussion on Fixed and Movable Weirs. 2. Mr. John James Webster on Iron and Steel at Low Temperatures.

ZOOLOGICAL SOCIETY.—8.30 p.m.
BIRKBECK INSTITUTION.—7 p.m. Anniversary. Address by Lord Aberdare.

GRESHAM HALL.—Lecture, 6 p.m. The Rev. Professor Burdon on Divinity.

TRINITY COLLEGE, LONDON.—8 p.m. The Rev. W. J. McMichael on the Value of Mathematics in Cultivating Intellect.

SOCIETY OF ARTS.—8 p.m. Foreign and Colonial Section. The Rev. G. Blencowe on Social and Commercial Prospects in the Transvaal.

WEDNESDAY, FEBRUARY 4.

ROYAL AGRICULTURAL SOCIETY.—Noon.
SOCIETY OF ARTS.—8 p.m. Mr. Henry Seebohm on Trade and Commerce with Siberia via the Kara Sea.

GRESHAM HALL.—6 p.m. The Rev. Professor Burdon on Divinity.

BRITISH ARCHEOLOGICAL ASSOCIATION.—8 p.m. Mr. John Brent, On Dogmore Pool, Cornwall.

GEOLOGICAL SOCIETY.—8 p.m. 1. Professor John W. Judd, On the Oligocene Strata of the Hampshire Basin. 2. Mr. George R. Vine, A review of the family *Diastoporidae*, for the purpose of Classification. 3. Mr. W. H. Twelvetrees, on a new Theriodont Reptile from the Upper Permian Cupriforous Sandstones of Kargalinsk, S.E. Russia.

THURSDAY, FEBRUARY 5.

MEETING OF PARLIAMENT.—To be opened by the Queen in Person.

ROYAL INSTITUTION.—3 p.m. Professor Dewar on Recent Chemical Progress.

GRESHAM HALL.—6 p.m. Lecture. The Rev. Professor Burdon on Divinity.

LONDON INSTITUTION.—3 p.m. Mr. H. H. Statham on the Elements of Architectural Design.

ROYAL ARCHEOLOGICAL INSTITUTE.—4 p.m.

ROYAL SOCIETY CLUB.—6.30 p.m.

ROYAL ACADEMY.—8 p.m. Mr. E. M. Barry on Architecture Allied with Colours.

ROYAL SOCIETY.—8.30 p.m.

SOCIETY OF ANTIQUARIES.—8.30 p.m.

INVENTORS' INSTITUTE.—8.15 p.m.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—7 p.m. Mr. H. Ellis Hill on Corn-mills.

CHEMICAL SOCIETY.—8 p.m. 1. Mr. R. W. Atkinson, Contributions from the Laboratory of the University of Tokio, Japan, On Persulphocyanate of Silver. 2. Mr. H. F. Morley, On Methylated Dioxethylenamines.

FRIDAY, FEBRUARY 6.

ROYAL UNITED SERVICE INSTITUTION.—3 p.m. Colonel C. B. P. Nugent on Aspects of Home Defence.

CITY OF LONDON COLLEGE.—6 p.m. Dr. Heinemann, on Political Economy, Land Tenure, Peasant Proprietors, Ryot Tenure, Primogeniture and Entail, Recent Views on the Subject.

ROYAL INSTITUTION.—8 p.m., Weekly Meeting; 9 p.m., Dr. W. Huggins on Photographic Spectra of the Stars.

GEOLOGISTS' ASSOCIATION.—7.30 p.m., Anniversary. Elections and Conversation.

ROYAL ACADEMY.—8 p.m., Professor Church, on the Chemistry of Pigments.

GRESHAM HALL.—6 p.m., Lecture. The Rev. Professor Burdon on Divinity.

WOLVERHAMPTON AGRICULTURAL SHOW.

LIBRARY ASSOCIATION.—8 p.m. 1. Mr. J. B. Bailey. Catalogues of Transactions and Periodicals. 2. Mr. R. Harrison, Dr. Priestley and his Relation to Proprietary Libraries.

SATURDAY, FEBRUARY 7.

ROYAL INSTITUTION.—3 p.m. Professor Ernst Pauer, The Life and Works of G. F. Handel.

METALLURGY AND MINING.

ACCIDENTS IN MINES COMMISSION.—A meeting of the Commission was held at its offices, 2, Victoria-street, Westminster, on Wednesday and Thursday last week. There were present the Chairman, Mr. Warrington W. Smyth, F.R.S., Professor Abbot, C.B., F.R.S., Mr. Burt, M.P., Professor Clifton, F.R.S., Mr. W. Thomas Lewis, Professor Tyndall, F.R.S., Mr. Lindsay Wood, and the secretary, Mr. Arthur J. Williams. In the month of October last the Commission visited the Monmouthshire and South Wales coal district, when the Dinas and Abercarn Collieries, at which the two last serious explosions occurred, were descended and the working pits inspected.

THE SCHOOL OF MINES.—The absurd proposal, says the London correspondent of the *Leeds Mercury*, of the Office of Works to close the School of Mines in Jermyn Street, where it was of real use in showing the practical value of the Geological Museum, has collapsed, or, at least, is deferred. The idea was to transfer the laboratory, where Dr. Percy had done so much good service, to South

Kensington, and this was supported by its proposers on the ground of economy. They asserted that the land in Jermyn Street might be sold for such, and that there was already accommodation at South Kensington. When everything was decided, Dr. Percy's generous offer was refused with scant courtesy, and the scientific authorities snubbed. It was discovered that the so-called laboratory at South Kensington was not only unfit for the purpose required, but if altered would probably endanger the whole of the building and the treasures amassed there. The persons appointed to report on the new laboratory rather tersely than politely described the place to the Chief Commissioner of Works as more suited for "a coal cellar, a workhouse, or a charnel-house."

THE DAMPOSCOPE.—At the meeting of the Glasgow Philosophical Society on Wednesday last week, Professor Forbes, of Anderson's College, exhibited and gave a description of an instrument called the "Damposcope," which he had recently constructed. The object of the Damposcope, he explained, was to detect the presence of fire-damp and measure the quantity of it in mines. He had been induced to give attention to the subject by Mr. Young, of Kelly, shortly after the explosion at Blantyre in 1877. The idea suggested itself to him that the principles of acoustics might be applied to the matter, and from the first rough tests made with the instrument it was evident that it was capable of very great accuracy. The principle which he employed in the Damposcope was that if we sounded a tuning-fork and brought it into the neighbourhood of a tube of a certain length, and this tube full of air, it would resound to the noise of the tuning-fork. Then by measuring the length of the tube, which resounded to the note of the tuning-fork, we got the means of ascertaining the density of the gas being used. By this instrument they were enabled to estimate the fire-damp to the amount of about one-half per cent. From the experiments made the Damposcope seemed to be accurate enough for all practical purposes, and the Professor mentioned in reply to a question that although the instrument had scarcely become known yet, it had been adopted by Messrs. Merry and Cuninghame.

SANITARY ENGINEERING, GAS AND WATER.

DOMESTIC POISONS.

ON Wednesday, last week, a paper on "Domestic Poisons in relation to Trade and Art," by Mr. H. Carr, M. Inst. C.E., was read at the rooms of the Society of Arts, John Street, Adelphi. The chair was taken by Mr. J. Simon, C.B. F.R.S.

Mr. Carr, in his paper, referred chiefly to arsenic as used in wall papers, cotton fabrics, artificial flowers, confectionery, &c. Several instances of arsenical poisoning, some of them having a fatal result, having been given, the writer asked why arsenic was thus used? The evidence seemed to show that low class bright green poisonous papers could be produced brighter and cheaper than non-poisonous greens. Arsenic was also said to give permanency, brilliancy, and body especially to the group of aniline colours. The cost of colour in low-classed papers bore an appreciable proportion to the total price of production, but in higher class papers the difference in cost between one green pigment and another was too small to be of material importance. Some paper-stainers asserted that there was no economy or advantage using arsenical colours. The colour in which arsenic was principally introduced was emerald green, but it was also used without absolute necessity in a great variety of colours—red, brown, some blues, pink, low-toned greens, French greys, black, and notably in magenta. There was no doubt that in any factory where arsenic colours were freely used for certain purposes, all the papers made would be more or less contaminated, thus accounting for the slight trace frequently found. After referring to the use of arsenic in dyeing, and remarking that large quantities of arsenic were undoubtedly used in the production of magenta, which was the foundation of all other aniline dyes—though it was generally abstracted in the subsequent processes adopted by first-rate manufacturers, Mr. Carr mentioned the employment of arsenic in card-board boxes, playing cards (Dr. Wallace, of Glasgow, found on the backs of a single pack 33 grains of arsenious acid), confectionery wrappers, sweets, size used by paper-stainers, &c. The subject of our domestic poisons, arsenic in particular, has been considered of such importance that the Medical Society of London has thought well to appoint a special committee to investigate the subject, with a view of bringing the matter under the consideration of the Local Government Board. Information gathered while pursuing the subject led to the conclusion that many persons suffer in an extreme degree from exposure to arsenical fabrics, not a few to the extent of loss of life, and that, judging from the number of cases brought under notice in a private circle of friends and acquaintances during the investigation, there can be no doubt that great injury to health is produced to a vast number of persons throughout the country. There is every reason to believe that a serious amount of deterioration of the constitution is going on all around, though each individual case might not appear severe; this remark applying especially to children. Great irritation is also frequently produced by articles of dress dyed with aniline colours being brought into contact with the skin. These aniline dyes produce this irritation when free from arsenic, though the injurious effect would be increased by arsenic being present also. The irritating effects of aniline dyes probably arise from unskilful management in the process of dyeing, the free dye being insufficiently washed out. The remedy suggested would be a law prohibiting the use of arsenic in the manufacture of all fabrics for domestic use, that is, in all those processes which leave the arsenic in the finished goods. The laws of France and Germany might be taken as a guide. The retail vendor to be liable to punishment, whether ill effects be produced or not. Such liability, however, might in many cases fall unfairly and unjustly on a retail vendor, who had taken all reasonable care to avoid arsenical articles; it is, therefore, further suggested

that facilities should be given to enable the retail dealer to throw the responsibility on to the wholesale manufacturer; as, for instance, with regard to paper hangings, the colour-maker is the real culprit, but the public have no means whatever of getting at him. If, however, the retail dealer be made responsible in the first instance, and facilities be given him, enabling him to throw the blame on the paper-stainer, and the paper-stainer again on the colour manufacturer, each offender only being allowed to escape on his substituting another, the real culprit would be reached. Otherwise, the manufacturer of arsenical colours would practically be safe from liability. It would be the paper-stainer's duty to note his purchases of colour, so as to be able to trace them, otherwise the responsibility would rest with himself. In conclusion, it was maintained that the whole subject was a matter of such importance as to demand Government investigation.

In the discussion which followed the reading of Mr. Carr's paper, Mr. Jabez Hogg said he could confirm a great deal of what had been stated by the writer. The number of authenticated cases which had come to the knowledge of the Medical Society was extraordinary. He was in favour of Government interference with the use of arsenic, and also with the wholesale trade, on which there was at present no restriction. Dr. Bartlett referred to the recent death of a young woman employed in dusting colours on metal plates, and said that large quantities of poisonous pigments that could not be used in Germany or Russia were brought to this country and sold without any restriction. Unless, therefore, the manufacturer caused every sample which he brought to be analysed, he might innocently disseminate poison. It was a question whether poisonous pigments should be allowed to pass the Custom House. Dr. Thudichum contended that if there was a case against arsenic there must also be a case against copper, because the poison in question was arsenite of copper. Mr. Botley having described an instance, in his own observation, of poisoning from arsenical wall-paper, Dr. Alfred Taylor expressed a general concurrence with the statements made by Mr. Carr. It was a fact that in cases of the poisoning referred to arsenic had been found in the excretions, showing its absorption into the system. It was true that all persons were not equally affected, and that was so in other kinds of poisoning. In the instance of lead poisoning at Clermont, only thirteen or fourteen persons—including Louis Philippe and the Princes—were affected, though there were thirty-five persons in the house. Dr. Brunton described his experience of arsenic poisoning from a wall-paper which he was assured was free from arsenic, but which analysis showed to be loaded with it, and he thought that a case had been made out for legislation. Mr. Aumonier, a paper manufacturer, said his firm had for many years given up the use of arsenic pigments, finding that they could get the tints without arsenic. If legislation were adopted on the subject he would suggest that it should be made penal for a colour manufacturer to sell arsenical pigments without declaring their character. The discussion was then concluded, and a vote of thanks was passed to Mr. Carr for his paper.

Exhibits, in illustration of the lecture, were hung on the walls, and, in the comparison of eleven arsenical wall-papers and eleven free from arsenic, of the same colour, it was claimed that all matched well except one blue.

THE THAMES NAVIGATION AND THE SEWAGE OUTFALLS.

THE Board of Trade inquiry into the alleged obstruction of the navigation of the Thames by the formation of mudbanks from deposits of sewage from the Metropolitan drainage was continued at Westminster Palace Hotel, during the end of last week, Wednesday being the eighteenth day of the sitting. Sir Charles Hartley sat as umpire; Mr. F. J. Bramwell as arbitrator for the Metropolitan Board of Works; and Captain Galton as arbitrator for the Thames Conservancy.

Dr. Edward Frankland stated that he had analysed samples of deposits taken from the natural bed of the river at Barking, at the Mole, the saltings at Broadness, the foreshores at Broadness, the mud above Hampton Court-bridge, at Victoria Docks, at the southern outfall, at Galleon's Reach, and other places. He had come to the conclusion that the mud of the banks in Galleon's Reach, Barking Reach, and Halfway Reach, were decidedly the discharge from the metropolitan drainage. He estimated the total quantity of suspended fecal matter brought down by the sewage to the outfall at 340,000 tons in the year, in dry weather. He based this estimate on twenty-one samples of sewage collected in 1869 from the mouth of the sewer, which then discharged itself near Scotland Yard. In wet weather 593,000 tons were carried down, making 933,000 tons of suspended matter per year poured into the Thames. He was sure that all that did not pass out of the Metropolitan outfall at Crossness or Barking. He thought a considerable volume of sewage found its way into the Thames through the northern outfall, which was not pumped at all; and all the middle and higher sewage went in without pumping.

Mr. Bidder, in opening the case for the Metropolitan Board of Works, pointed out that the arbitrators had, under the Act of Parliament, to deal only with such obstruction as might be caused by the sewage discharged from the outfalls at Barking and Crossness. He thought he should be able to satisfy them that these banks really differed in no way materially in character from the ordinary mud banks up and down the river. He should show that the total quantity of solid matter of all kinds which the sewers discharged into the river was somewhere about 60,000 tons per annum. He also contended that there was no obstruction to the navigation. It was in no sense reasonable to say that there was obstruction to navigation, when what had happened had been to remove the channel further north, undoubtedly improving it, and, for navigable purposes, increasing its dimensions.

Sir Joseph Bazalgette, engineer to the Metropolitan Board of Works, was then called. He said he designed and carried out the present main and intercepting sewers, and he gave an elaborate description of them and of the provisions for storm overflows. He stated that the amount of

sewage discharged at the outfalls in 1878 was, at Crossness 216,655,859,613 gallons, and at Barking Creek 30,177,765,147 gallons, and the average per day for the last ten years has been at Crossness 59,357,769 gallons, and at Barking Creek 63,236,346 gallons, together 122,604,115 gallons per day. In 1878 it was 155 millions in round numbers. Of that one-third would be discharged without storing at such times as the tide allowed. Catchpits were formed to prevent the detritus from the streets getting into the sewers, and it was to the interests of all concerned to prevent it getting in, as it would cost more to get it out of the gulleys than to take it off the surface, and the contractor had to keep them all clear and keep the streets clean for a lump sum. In some cases the gulleys had a double catchpit. There were 1710 miles of streets and courts in the metropolis and 67,500 catchpits. There were 307,700 tons of macadam flint, or hoggins, put on the roads last year. Taking the wear and tear at an eighth of an inch, which he considered excessive, the quantity worn off the roads would be 39,070 tons, making 346,770 tons in all. During the year 616,500 tons of scavenging was removed off the surface. About 40 per cent. of that would be water, 40 per cent. road detritus, and 20 per cent. garbage, horse droppings and extraneous substances. About 133,100 tons had been removed from the gulleys during the year. One-third of that would be water and two-thirds detritus. Twenty-six thousand five hundred tons had been removed from the sewers. That made from all sources 775,100 tons; giving an excess over that put on the streets of 428,330 tons of water and foreign matter. If the detritus got through the sewers, we should first expect to find it arrested at the gratings at the pumping stations, but practically there was none. He should next expect to find it in the reservoirs, but he had never found any there, though he had examined them from time to time. If by any possibility detritus got out at the mouth of the storm overflows he should expect to find it in the River Lea and at Deptford Creek. There never was any detritus in the sewers below the pumping station. They had never been cleaned since the opening, and did not require it now.

Mr. H. Laws, C.E., gave evidence as to the formation of the banks and the alterations in the bed of the river caused by dredging. He attributed the formation of the banks to the dredging operations of the Conservancy.

Mr. Thomas Hawksley, C.E., one of the engineers who made a report in 1858 upon the main drainage question, stated that only was he of opinion that the outfall works of the Metropolitan Board had not caused banks injurious to the navigation, but he entirely believed that great good to the river Thames had been the result of the main drainage works. Nothing more could now go into the river than before; therefore no harm had been done. Much less of what was injurious, now went in. The quantity of detritus was very much reduced, and of course the formation of banks was greatly diminished in consequence; therefore great good had been done. The three banks in question, were, in his opinion, attributable to dredging operations, which had disturbed the natural régime of the river. By deepening the river in the paths of vessels, in order that larger vessels than formerly arrived in the port of London could now come up with facility, a greater velocity had been obtained in the deeper section, but with the result of creating slack water in other places. The total amount of suspended matter in the sewerage was about 25 grains in a gallon. Taking 122,000,000 gallons as the amount of sewage passing into the Thames in a day, that gave 190 tons of solid matter, but one-third of that only was ground detritus. The rest was animal and vegetable matter. Detritus usually entangled with it about one-eighth of its weight of organic matter, chiefly vegetable. They had therefore a total of 75 tons a day of insoluble and indecomposable matter passed from the reservoirs of the Metropolitan Board directly into the river at high water, and four hours after on the ebb tide. It went into a large volume of water, and for the most part became lost and carried away with the same kind of matter that was brought down from the uplands and other parts of the river. But he would adopt the violent supposition that actually one-third of this could be projected to the other side of the river, that would give matter which might by possibility be a deposit of 25 tons a day. Then, taking the evidence of the Conservancy Board, that these three banks contained 1,368,000 cubic yards (or tons), dividing that by five they would get 54,720 days as the time which it would take to form these banks, or 150 years. Supposing, even, that all the matter went across the river, it would take 50 years; but it was not a reasonable assumption that even one-third went across, and even if it did, he did not believe it could remain there. It was so light and so fine that a flood or the action of a big steamer would remove it. Then it would be replaced, then it would be removed again, for these banks would not accrete beyond a certain extent. He had inspected the reservoirs and the outlets of the drainage, and he found a slippery, pasty deposit, containing a very fine floury substance of granite and flint. Similar mud could be found all up and down the Thames. It was not a new phenomenon since the opening of the works of the Board. If the Conservators had not done what they have done in the way of deepening the channel, and if the outfalls at Barking and Crossness had not been opened, he should have expected to find larger banks, because all the matter which was now carefully removed from the streets and gulleys and sewers would then have gone directly into the river.

The twentieth day of the sittings was occupied chiefly by the examination of Mr. Thomas Edward Keates, chemist to the Metropolitan Board of Works and the River Lea Conservancy Board, and superintendent gas examiner of the metropolis. He stated that he had examined 32 samples of the sewage of the main drainage, taken at the outfalls at Barking and Crossness, and from 11 of the London sewers, at the Fleet, London Bridge, Dowgate Docks, Earl Street, Falcon Brook, and other places. Premising that he should divide his evidence into three heads—first, as to the amount of matter suspended in the sewage; secondly, as to the composition of the banks in question; and, thirdly, as to the source whence these banks may have been derived—Mr. Keates dealt first of all with the quantity of suspended matter in the sewage water. The samples were taken at Barking and Crossness at 3 a.m. and 3 p.m. on different days in January and December, 1878, and October and December, 1879. The strongest London sewage was about

11 or twelve o'clock in London, and this reached the outfalls about 3 o'clock p.m. It remained strong until about midnight, and from that time till about 3 in the morning it grew weaker. The average of the whole of these estimations gave the suspended matter as 23.06 grains per gallon, composed of 14.88 grains of organic matter and 8.18 of mineral matter, the mean percentage being 64.5 of organic matter and 35.5 of mineral matter. He had made further experiments on samples of sewage which were duplicates of samples taken by Dr. Frankland and Dr. Tidy, the witnesses for the Conservancy. They were taken from the 17th to the 24th of December, 1879. He agreed almost entirely with Dr. Frankland as to their composition. The average suspended matter was 23.12 grains, divided into 14.18 organic matter and 8.94 mineral, the mean percentage being 61.4 of organic and 38.50 of mineral matter. On the 30th of December, after a very violent storm of hail, rain, wind, and thunder, the suspended matter was 95.65, consisting of 34.93 of organic and 60.72 mineral matter. Twenty-four hours afterwards it had fallen to 28.2, divided into 13.78 organic and 14.42 mineral. Then, on the next day, it had fallen to 20.62—viz., 9.60 of organic and 11.02 of mineral. On the 2nd of January it had further fallen to 17.05, divided into 9.45 organic and 7.60 mineral. On the 13th of January at Crossness the total quantity was only 8.35 grains at 3 p.m. At the same time at Barking it was 34.8. On the 9th of December at Barking the quantity was 9.51 grains at midday, and 21.8 grains at midnight. At Crossness the quantity was 16.24 at 3 p.m., and 42.67 at 3 a.m., showing that the strong sewage was running up to 3 in the morning. He took the gross quantity of sewage coming down at 120,000,000 gallons, and taking the average at 23 grains of suspended matter per gallon, it gave 1764 tons per day. Each grain represented eight tons a day of dry matter. To get the weight of wet matter he allowed 56 per cent. of water. It worked out to nearly 65,000 tons of dry matter annually. Two-thirds of that whole bulk would be organic matter and one-third mineral. A great proportion of the organic matter would decompose, passing into the gaseous and liquid state, and so would pass away. The whole of the organic matter was not destroyed, however, as the various mud banks up and down the river contained an average of about 10 per cent. If the mud banks were made exclusively from matter derivable from the sewers his calculation was that the sewers contributed 22,000 tons a year of mineral matter. Adding 10 per cent. for organic matter, made 24,000 tons. But that was assuming that every particle of the mineral matter from the sewers must of necessity have been deposited on the banks. In confirmation of these figures, Mr. Keates stated that in 1878 some experiments were made at Crossness with what is called the A B C process of converting sewage. The experiment went on for eighty days, and the quantity treated was 11,672,737 gallons, or 155,999 gallons daily. The quantity of A B C mixture used was 81 tons, and the quantity of manure produced was 142 tons, so that 61 tons of material was derived from the sewage. In that 61 tons of manure there were 37.5 tons of water, which would leave only 23½ tons of solid matter derived from the sewage. That gave 368,480,000 grains as derived from the sewage matter, or 39.7 grains per gallon. The object of the A B C process was to get something of value out of the sewage, and to defecate the sewage; and they succeeded fairly well in precipitating the matters in solution in the sewage, so as to make the effluent in a condition to be put into a running stream. By adding a solution of ordinary alum to clear sewage he got a precipitate of 8½ grains per gallon, but in that was included the aluminous matter. It might be assumed that five grains to the gallon was so brought down. That was matter altogether independent of this question. That would reduce the quantity of suspended matter relevant to this inquiry to 26 grains. Dr. Letheby made analysis of the dry sewage in 1857, which gave 38.15 grains of solid matter, divided into 17.06 organic and 21.09 mineral. The night sewage gave 3.99 as the total matter, 7.33 organic and 6.16 mineral. The mean of the two was 26.07 for the twenty-four hours. Dr. Letheby, Dr. Hoffmann and Dr. Witt analysed sixteen samples. The highest quantity obtained was from Northumberland sewer, 56.9—viz., 35.4 organic and 21.48 mineral. The minimum was at Earl Street, 2.88 divided into 1.42 of organic and 1.46 of mineral, but he had a strong impression that the water from the Times printing-office was coming down there then. Taking Dr. Frankland's figures of 64,347 cwt. of fecal matter per 100,000 persons per annum, it was equal to 50.910, 608,000 grains or 4,900,000,000 per day for 3,500,000 persons. This worked out to 41 grains per gallon of sewage upon 120,000,000 gallons. Deducting 75 per cent. for water and 5 per cent. of soluble matter, it left only about eight grains of solid matter to be present as suspended matter in a gallon of sewage. Allowing 51 grains per gallon instead of 41, it would give about 10 grains of solid matter per gallon of sewage.

The examination-in-chief of Mr. Keates was not concluded, but owing to other engagements of the arbitrators and counsel engaged in the case, the inquiry stands adjourned for five weeks.

THE GOVERNMENT AND THE LONDON WATER COMPANIES.—The *Daily News* hears that the negotiations between the Home Office and the Metropolitan Water Companies have made considerable progress, and that in more than one instance the sum proposed to be given as compensation has been fixed.

THE LIVERPOOL WATER SUPPLY SCHEME.—At a meeting held at Worcester on Tuesday it was resolved unanimously that the Liverpool Water scheme would be very prejudicial to the interests of the population in the valley of the Severn, and that the Bill promoted by the Liverpool Corporation should be opposed in Parliament. Mr. Rowley Hill, M.P., for the city, spoke in opposition to the Liverpool Bill.

THE METROPOLITAN WATER SUPPLY.—Lieutenant-Colonel S. Bolton, water-examiner, in his report for the month of December of the state of the water in the Thames at Hampton, Moulsey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are

situated), says that the water was good throughout the month, except on the 30th and 31st, when it was turbid and bad. The water in the Lea during the same period was generally good. This refers to the condition of the water previous to filtration. The water at all the intakes was generally in a good condition during December, and the filtration efficient, the supply by the whole of the metropolitan water companies having been clear, bright, and properly filtered. The report goes on to say that all the companies are moving in the matter, and giving constant supply under the provisions of the Metropolitan Water Act, 1871, in a portion of their districts, except the Southwark and Vauxhall and Grand Junction Companies. The Act provides power to compel the companies to give constant supply, as and when the public authorities may see fit to demand it; but no company is compelled to give such constant supply if it can be shown by them that after the expiration of two months from the time of service of the requisition, more than one-fifth of the premises in such district are not provided with the proper fittings, in accordance with the regulations made under the Act.

RAILWAYS & TRAMWAYS.

A NEW LINE OF RAILWAY.—The new line of railway between Castle Eden and Stockton will be opened for passenger traffic on the 1st of March.

NEW RAILWAY LINE.—The Metropolitan District Railway are busily engaged in extending their line to Fulham, and will shortly open it with a station near Fulham Bridge. The railway is to be supplemented by two new lines of omnibuses—the one between Fulham and Waltham Green, and the other from Fulham to the South-Western Railway Station at Putney. The new line will afford accommodation to a large and rapidly increasing neighbourhood.

THE TAY BRIDGE DISASTER.—Mr. Henry Law, of the firm of Law and Chatterton, Westminster, has proceeded to Dundee at the request of the Board of Trade, with instructions to report to them generally on the existing condition of the structure. On Monday afternoon, accompanied by Captain Robertson and Mr. Waddell, the contractor, Mr. Law sailed across the line of the fallen structure, in order that he might obtain a general idea of the wreck. He will have the services of two assistants, who are now in Dundee, and will report upon the following among other points—(1) the exact state and position of the girders and piers as they now lie in the water; (2) as to the nature and extent of the fractures and breakages of whatsoever kind, and the position of these as applicable to the broken piers and train; and (3) to select portions of the metal composing the columns and girders, to submit them to a test in order to ascertain the quality of the materials employed in the construction of the bridge. The manner in which the various parts were fitted together will be specially investigated, and until Mr. Law completes his survey Mr. Waddell will not be permitted to proceed with the raising of the girders. It is, however, expected that he will finish his examination this week. In the meantime Mr. Waddell will proceed with the lifting of the small pieces of the wreck, broken columns, and the like. The North British Company have intimated that it is thought likely that recovery of the bodies will be facilitated by the employment of the electric light, and they will arrange for its use. The relief fund now amounts to £5000. The Board of Trade has sent to Mr. Hay, town-clerk, a reply to the resolution of the Dundee Town Council forwarded to them regarding the height and reconstruction of the bridge, in which it is stated with regard to the reconstruction that the Board, so far as its powers are concerned, would take into its consideration the recommendations contained in the resolution, but that until the result of the inquiry going on just now at the bridge be known, no conclusion can be come to in the matter.

ELECTRICITY, TELEGRAPHY

THE GOVERNMENT AND THE TELEPHONE.—Messrs. David Mosley and Sons, telegraphic engineers, of New Brown Street, Manchester, write:—"It may be interesting to the public to be informed that the Postal Telegraph authorities do not intend by the infliction of a tax to interfere with private firms in the erection and use of telephonic lines, whether worked by magnetism or electricity, provided such wire communication be not intended to form part of 'telephonic exchanges.' The steps taken in the Exchequer Division of the High Court of Justice on the 20th inst. will not consequently interfere with or apply in such cases."

THE ELECTRIC LIGHT.—The directors of the London and St. Katherine's Dock Company have given notice that they invite tenders for lighting the Victoria Dock Extension with the new electric light, both internally and externally. They propose having fixed lights for lighting the quays and roadways, and also the interior of the sheds, where some of the lights will of necessity be movable also.

NAVAL ARCHITECTURE.

DISASTERS AT SEA.—There were twenty-six British and foreign wrecks reported during last week, making a total of ninety-seven for the present year, or a decrease of ninety as compared with the corresponding period of last year. The approximate value of property lost was £360,000, including British £280,000.

TORPEDO-MOORING STEAMERS.—On Wednesday, the Barrow Shipbuilding Company launched from their yard two torpedo-moorings steamers, built for the Admiralty, and intended for laying submarine torpedoes and mines in Government dockyards and harbours. The steamers, which are ready for sea, were named *No. 11* and *No. 12* by Lady Louise Egerton and Lady Frederick Cavendish. The same

company have also in hand another torpedo-mooring steamer of the same class, and five gunboats of the *Forward* and *Foxhound* type, for the Admiralty, and they will be ready for launching in a few weeks.

A SMOKE HELMET.—At the Devonport Dockyard last week, in the presence of the Mayors of Devonport and Plymouth and several others, Mr. Jenkins, boatswain of the yard, gave a trial of his smoke helmet, which a short time ago was officially tested at Chatham. With his head encased in a helmet of the shape and size of an ordinary diver's helmet, and supplied with air through a tubing similar to that used for divers, the air being forced through it by a small forge bellows, a man entered a large heating house, filled with dense smoke, and remained a quarter of an hour without any sign of inconvenience, and again a second time for ten minutes, with similar results. The Admiralty have ordered six of the apparatus for Devonport Yard. The apparatus is not only simple, but inexpensive, and will be invaluable in the case of ships or buildings on fire.

DANGEROUS SYSTEM OF COAL LOADING.—An important judgment was delivered on Thursday, last week, at Liverpool in the Board of Trade inquiry into the loss of the London steamer *Roscommon* while on a voyage from Liverpool to Havana with a cargo of coals. The Court held that the vessel when she left Liverpool was in a good and seaworthy condition as regarded her hull, machinery, and equipments, but that an error had been committed as regarded the stowage of the cargo in not entirely filling the lower main hold. The Court thought that the master, Captain Steel, did everything for his vessel that he could under the circumstances, and that no blame attached to him, or any of his officers, for the loss of life which had taken place. The Court could not but arrive at the conclusion, however, that the *Roscommon* was known to be a tender ship, and, as such, she carried too much top weight in cargo for a winter voyage, bearing in mind the vacant spaces left in the lower hold and in the ballast tanks. They could not conclude their report without drawing the special attention of the Board of Trade to the extraordinary circumstances attending the loss of the vessel. The fact that a ship nearly new, and only on her third voyage, being lost in weather which was certainly not exceptional, seemed to suggest that the system of coal loading, as now adopted, required serious consideration, at any rate for long voyages, especially in the Atlantic, during winter months.

THE PANAMA CANAL SCHEME.—The *Panama Star and Herald* of the 8th inst., publishes a long account of the arrival of M. de Lesseps at Colon on December 30th, 1879. On the following day he left for Panama, where considerable preparations had been made for his reception. He was met by the representatives of the State, accompanied by the prominent military and civil officials. From the railway station to the hotel the route lay through the principal streets, which were profusely decorated with flags. January 1st witnessed the formal inauguration of the works of completing and perfecting the surveys for the canal. On that day, by invitation of the reception committee, a large party of ladies and gentlemen made an excursion to the mouth of the Rio Grande, about three miles west of Panama. Here they landed and witnessed the turning of the first sod, a task assigned to Miss de Lesseps, which is to mark the beginning of the preliminary work, which is to end with the union of the Atlantic and Pacific oceans. An address was then delivered by M. de Lesseps, who said that he had fulfilled the promise he had made that he would begin practical work on January 1st, 1880. He expressed his entire confidence in the success of the enterprise, to which he had devoted the closing years of his life, and he had no hesitation in counting upon ample assistance in the financial world for the means to open another great highway to the commerce of the world.

A NEW DEEP-SEA SOUNDING APPARATUS.—In taking soundings at great depths, and in places where there are strong undercurrents, one difficulty is that the line being carried off by the undertow, the length paid out does not represent the vertical distance to which the weight has descended. A new apparatus, based on the effects of fluid pressure, has been recently described to the Lisbon Academy of Sciences by Senhor Henrique de Lima Cunha. It consists of a cone of sheet copper, having as its base a copper diaphragm, perforated with six small noles, and screwed to it. A vertical wire of pure silver occupies the axis of the cone. To prepare the apparatus for use the wire is moistened with nitric acid, producing a thin film of nitrate of silver. The base being screwed on, the cone is suspended by means of a ring at its apex, and sunk by means of two weights or stones suspended by cords or chains depending from three rings attached to the perimeter of the cone. To insure a vertical position, a small float is attached just above the ring at the apex. As the apparatus sinks the water penetrates through the holes of the diaphragm, and gradually rises in proportion as the pressure increases during the descent. The salt water acts on the thin coating of nitrate of silver on the wire, and turns it perfectly white by the production of chloride of silver as far as immersion has taken place. Thus is ascertained how high the water has risen in the cone, and therefore what the pressure has been, and from these data the depth can be inferred by simple formulae. The author suggested that by suspending the lower weight by means of an apparatus which would detach it on striking bottom, the instrument would ascend to the surface of itself, thus dispensing with the use of a line.

ARMS, ARMOUR AND EXPLOSIVES.

WORKING HEAVY GUNS.

IN order to reduce the difficulty experienced in mounting and working of heavy guns, a new arrangement is proposed by Mr. G. Fawcus of Tynemouth. His method consists in forming revolving pivots by means of rows of wheels in parallel lines on turnrails or turntables, for moving traversing platforms and gun carriages along straight lines. These pivots turn readily round and move steadily in any required direction, always taking the most direct and shortest route, that is a straight line. When a gun is required to sweep round any curve, the two sets of pivot

wheels can be placed at right angles to each other, and each pivot instead of following the circumference of a curve, crosses it on a straight diameter. Thus an elliptograph motion is thus developed. The positions of the pivots corresponding with half the minor axis and half the major axis of an ellipse, from any outer end. Hence, the nearer these pivots are placed to each other, the nearer the two axis diameters of the ellipse correspond, and the fuller and rounder the curve followed by the outer end will be, and *vice versa* the nearer the ends and further apart the pivots are placed, the flatter and more elongated the curve will be, hence, by regulating their distances any curvilinear motion can be obtained. Or any front or rear pivot can move along a straight line. Thus a salient diverging, or a direct and flanking fire can be combined on any front, and thus the whole action of trailing right or left, either on a front or rear pivot, is confined to a direct straight line, for which any mechanical application of motive power is available. Mr. Fawcus claims that the action is direct without waste of power, that the distance to travel is reduced, that the friction is diminished, that space, time and labour are saved, and that unnecessary exposure avoided in every detail. The application of these arrangements has been proposed with straight racers at right angles to each other, for traversing platforms or by the addition of straight racers where needed, with the present curved ones for barbettes firing, either partially or entirely all round. With or without racers for casemates or embrasures where port training or breeching gear can be applied in front or rear. The platform can be moved in any direction whatever, on any level or sloping ground without racers where the recoil can be retarded by various appliances. Traversing platforms can be guided by their motive power, in any straight lines, and the gun and carriage will recoil on the traversing platform as at present. A similar arrangement of parallel rows of wheels or turnrails can be used with standing guns, on truck carriages, where no traversing platform or racers are used, and the wheels of the pivots can lock or unlock in various ways, and turn or move in any direction, to suit any trailing right or left, either on a front or rear pivot as may be required; or for running backward or forward or moving sideways obliquely in echelon, wheeling on an imaginary centre, or on a moving or standing pivot. Much of the risk and danger of accidents in the repository practice of mounting and dismounting can be avoided in traversing platforms that can be turned thus round in their own length, by dismounting the gun and carriage from the front or lower end of the traversing platform when turned to a flank under cover of the parapet. All the advantages of the vertical movement for extreme elevation, and depression, and to facilitate loading under cover, can be obtained by the application of this double pivot motion to heavy guns, with four trunnions working in vertical plates, with intersecting grooves. We understand that working models of Mr. Fawcus' invention are to be seen at the Floating Dock, North Shields, and that the Admiralty have sanctioned its reference to the consideration of a special committee at Woolwich Arsenal.

THE THUNDERER'S GUN.—It is probable, before the final order is given to sacrifice the 38-ton gun brought from the turret of Her Majesty's ship *Thunderer* by double loading, that two or three more rounds will be fired under new conditions, in order to illustrate another aspect of the subject. The gallery, or splinter trap, erected in front of the embrasure to prevent fragments of the gun, provided it bursts, from scattering, has been greatly strengthened by the Royal Engineers; but no date is yet named for the next experiments. In the last two rounds fired the pressures on the bore of the gun were quite normal, and the velocity of the projectiles was unaffected by the jammed wads inserted in the bore of the gun.

THE PROOF BUTTS AT WOOLWICH.—The officials of the Trinity Board have been engaged at the proof butts in the Government marshes adjoining the Royal Arsenal, Woolwich, this week testing and improving their appliances for measuring the intensity of sound, with a view of ascertaining by their means the most effectual fog-signals for the lighthouses and stations round the coast. The proof trials of several 38-ton guns furnished suitable opportunity for making these tests, and the instruments being tried one against another in various ways were found to act very uniformly, and it is presumed correctly. It has been remarkable that the reports of the firing, as heard in the town adjacent, appeared louder than any that have lately been experienced, and that in some cases windows were broken by the concussion; but the recording instrument showed that the sound generated was no louder than usual, and the circumstance is attributed to the heavy and foggy state of the weather and the north-east wind, which combined to hinder the upward dispersion of the sound-waves and carried them towards the town.

CORRESPONDENCE.

THE THUNDERER'S 38-TON GUN.

To the Editor of IRON.

SIR,—Referring to the recent experiments with the 38-ton gun, permit me to observe that the report and verdict of the Committee which sat at Malta were wholly based upon the assumption that a gun, when fired, can only be burst by the direct internal pressure of the fired gunpowder, and that since the charge of powder is situated in rear of the shot, the commencement of the burst must likewise be situated in rear of the shot. While using it as the basis of their arguments, the Committee did not actually enunciate the above assumption, for they considered it to be so self-evident an axiom as not to require proof or even statement, and, having observed certain marks in the bore, situated in rear of the commencement of the burst, they were driven to the conclusion that there must have been a second projectile in the gun, and therefore, discarding all other solutions, they adopted the double-loading theory as the only one possible.

Since the above report was written, the results of experiments with barrels, burst by the jamming of elongated iron

projectiles, prove conclusively that the Committee were wholly mistaken in their assumption, and, consequently, that all the careful reasoning so powerfully accumulated upon it is of little value. A careful examination of the burst barrels will show that, in each case, the burst commenced in front of the projectile, and, consequently, that the marks which determined the Committee's verdict are, at least, as reconcilable with the jamming as with the double-loading theory. In view of the altered circumstances of the case, I submit that it is at all events as reasonable to assume that owing to the very heavy ramming which it was known to have received from the hydraulic rammer,—the full pressure of which amounted to near four tons,—the wad had been beaten into the shape of a saucer against the conical head of the shell in rear of it, and consequently (as it no longer fitted the bore) that it had fallen down in front of the projectile, as it is to assume that the gun had been loaded twice over and fired. The latter assumption necessitates (a) that the gun had missed fire, and that the crew had not noticed it; (b) that the absence of recoil had also not been noticed; (c) that the gun had been drawn back by an inadvertent use of the hydraulic lever; (d) that when the gun was sponged out the existence inside the bore of a charge 5 feet 4 inches long had not been noticed; (e) that a second charge 5 feet 2 inches long was then rammed on the top of the first, making the total length of the charges to feet 6 inches, without such a mistake having been observed. Moreover, the officers of H.M.S. *Thunderer*, whose duty it was to watch the practice, stated most positively in their evidence, that the gun did not miss fire, as they saw the shot from it strike the water near the target. It is true that some negative evidence was subsequently brought forward to a contrary effect. Negative evidence is, however, of little value as compared with direct and positive evidence. Under the belief that the marks in the gun could not by any possibility have been due to any other cause than the presence of a second projectile, the Committee had no other alternative than to admit the possibility of the extraordinary circumstances attendant upon the double-loading of such a large gun, and to reject the direct evidence of the officers. It was evident that the wads placed in the 38-ton gun on the 16th inst. were blown out by the flash of the powder before they had been overtaken by the projectile, and therefore the jamming theory has only been partially tried. A scientific witness, who went out to Malta for the purpose of giving evidence before the Committee, on being asked whether any damage would be caused to the gun by a shell jamming in the bore on a papier-mâché wad, replied (Answer 485), "Most certainly not;" and the Committee, by their remarks (Par. 31), implied that they were likewise of the same opinion. In view of all the circumstances of the case, it would appear to be most desirable that a considerable number of rounds should be fired from a gun, with wads placed in various positions in front of the projectile. Each wad should be placed so that the flash of the discharge should act on the edge, not on the surface of the wad; for if the Committee be right in their belief, no harm could result; and further, if the use of a papier-mâché wad in front of the projectile is to be continued in heavy guns, it would be well to ascertain by experiment whether a projectile can be made to jam upon it, and, if so, what the effect would be.

I have made a series of experiments by firing two 64-pounder converted (Palliser) guns with double charges, and measurements have been taken of the bore of one gun after each round. One gun has fixed six and the other four rounds of double charges. Owing to the plastic nature of the coiled wrought iron barrel, the pressure of each forward charge permanently enlarged or bulged the bore of the gun. The bulges are situated immediately above the place occupied by the powder charges and altogether in rear of the base of the projectile, and these bulges show that in each case the front charge had been fired and that the maximum pressure had become developed before the front projectile had perceptibly moved. In the *Thunderer's* gun, on the contrary, the burst is situated at a point considerably in advance of the place where the second charge would have been had it been rammed home. If, therefore, there had been two charges in the gun, the second charge could not have been rammed home upon the first. It is, however, in evidence that the charge had been well rammed several times, consequently the double-loading theory must be rejected. Thus, taking all the facts of the case into consideration, it would appear that the only and the true solution of the question must be that the shell jammed upon the wad.—I am, &c.,

W. PALLISER.

Army and Navy Club, January 22nd.

NOTICES OF BOOKS.

Letts's Popular Atlas. Part I. London: Letts, Son and Co. MESSRS. LETTS AND CO., who have made themselves a world-wide reputation by the cheapness and excellence of their diaries, have commenced the publication of an atlas of marvellous cheapness even in these days of cheap publications, and of a quality equal to many of the more costly works of its class. The first number, just issued, contains three sheets—the World on Mercator's projection in two; the third being a general map of the British Isles. All of them are coloured, and very clear and distinct—the ocean-currents, the Polar pack-ice, and the telegraph-lines being distinctly laid down on the former, while the British dominions distinguished by red tinting. Among the special features of these maps will be the avoiding of over-crowding by a careful selection of the most important names only, a more or less distinct indication of the physical features of the countries, the adoption of a uniform scale, judicious colouring, and a handy size. The first year's issue will consist of about forty sheets, and include a geological and a railway map of England and Wales; and, when it is added that the price of this fine atlas is only 7d. a part, some idea may be had of the assistance it is likely to render to popular education in a very important branch of knowledge.

PAMPHLETS.—*Bulletin de la société vaudoise des ingénieurs.* Lausanne: Bridel, 1879. This modest publication, the official organ of a Society of Swiss engineers, contains several papers

interesting from the thoroughness with which local feats of engineering have been studied. The "Correction of the Rhine" is reported on by M. Fraisse; the works connected with the regulation of the outflow of the Lake of Constance by M. Sarubac; and other engineering performances, at home and abroad, are reported on with great carefulness and precision. We may well congratulate the Society on its spirit and activity, as reflected in the pages of the *Bulletin*.—*Hanbuch für den praktischen Maschinen-Constructeur*. Leipzig: Baumgärtner. The commencement of this valuable work was noticed in our No. 350 (vol. xiv.). Three other parts are before us. They exhibit the same exhaustiveness as that which marked the earlier issues; and the rich promises of practical utility first made are abundantly confirmed.

NEW BOOKS.

- Aids to Physiology. By B. T. Lowne. Baillière and Co. Brain. Vol. II. (April, 1879, to January, 1880.) Macmillan and Co.
- Cooley's Cyclopedia of Practical Receipts. Sixth Edition, revised and enlarged by R. V. Tuson. 8vo. Churchill.
- Elementary Applied Mechanics. By T. Alexander. 8vo. Macmillan and Co.
- Free Land. By Arthur Arnold. 8vo. Paul and Co.
- Geological Magazine (The). Vol. for 1879. 8vo. Trübner and Co.
- Handbook of Therapeutics. By S. Ringer. Eighth edition, 8vo. Lewis.
- Handy Book of Villa Architecture. By C. Wickes. New Edition, 4to. Lockwood and Co.
- Mechanics, Machinists' and Engineers' Practical Book of Reference. By C. Haslett. 8vo. Routledge.
- Movable Atlas (A) for showing the Mechanism of Vision. By Prof. J. Witkowski. Folio. Baillière.
- Movable Atlas (A) for showing the Mechanism of Hearing and Masticulation. By Professor Witkowski. Folio. Baillière.
- Our Inheritance in the Great Pyramid. By Prof. Piazza Smyth. Fourth Edition, 8vo. Isbister and Co.
- Progress and Poverty: the Causes of Industrial Depression, &c. By H. George. 8vo. Layton.
- River (The) of Golden Sand: a Journey through China and Eastern Tibet to Burma. By Captain W. Gill. Two vols. 8vo. Murray.
- Spon's Architects' and Builders' Pocket-book, 1880. 32mo. Spon.
- Year's Art (The): an Epitome of matters relating to Painting, Sculpture and Architecture. Compiled by M. B. Huish. 8vo. Macmillan and Co.

BOOKS RECEIVED.

- A Tide-table of Swansea Harbour, &c. Swansea: Pearce and Brown.
- Biological Atlas: a Guide to the Practical Study of Plants and Animals. By D. and A. N. McAlpine, F.C.S. London: W. and A. K. Johnston.
- Builder's and Contractor's Price Book. 1880. London: Lockwood and Co.
- Chemistry: Inorganic and Organic. With Experiments. By C. L. Bloxam. Fourth Edition. London: J. and A. Churchill.
- Easy Lessons in Heat. By C. A. Martineau. Illustrated. London: Macmillan and Co.
- Geology for Students and General Readers. By A. H. Green. Part I. New edition. London: Rivington.
- Spon's Encyclopedia of the Industrial Arts, &c. No. 10. London: E. and F. N. Spon.
- The Shareholder's and Director's Companion. By F. B. Palmer. Second Edition. London: Stevens and Sons.
- The Theory and Practice of Ventilating Coal Mines. By W. Fairley, M.E., F.S.S. London: Colliery Guardian Office.

OBITUARY.

M. HIPPOLYTE WALTERDIN, who has just died in Paris at the age of 85, was the colleague of Dulong and Arago in investigating the central heat of the earth, and the inventor of vertical self-registering thermometers, as also of the thermometre a deversoir for ascertaining the temperature of water at great depths. He was a Republican deputy in 1848.

AN eminent German geologist and mineralogist, Professor Karl von Seeback, of the University of Göttingen, died on the 21st inst., of consumption. He was born in 1839 at Weimar, having only reached his 41st year. He was the author of a number of works, all more or less bearing on the chief subject of his investigations, the structure of volcanoes and earthquakes.

COLONEL H. R. TRAVERS, Commandant and Inspector-General of Musketry at the Hythe School of Musketry, died on Friday morning last week. Colonel Travers entered the army in 1845, served in the Punjab campaign of 1848-9, and was present with the 10th Regiment during the whole of the siege operations before Mooltan and the surrender of the fortress. He was also present at the battle of Goojerat. He was appointed to the post he filled at Hythe in May, 1878.

THE death is announced, at the early age of forty-six, of Mr. Alexander Forbes, who for about ten years has filled the post of secretary to the Great Northern Railway. Mr. Forbes attended the last meeting of the Board of Directors at King's Cross, was only absent from duty a short week, and died from a severe attack of pneumonia at his residence in Kent Gardens, Ealing, at midnight on Saturday. The deceased came of a railway family—was a younger brother of Mr. James Staats Forbes, managing director of the London, Chatham, and Dover Railway, and was for many years associated with the late Mr. Seymour Clarke. Mr. Forbes succeeded to the secretaryship of the Great Northern Railway Company upon Mr. Oakley's promotion from that office to the general managership, and his services have always been highly appreciated by the Board of Directors, who reposed great confidence in his judgment and sagacity.

PARLIAMENTARY NOTES.

PRIVATE BILLS IN PARLIAMENT.

ON Thursday, last week, the examiner, Mr. Robinson, decided, after some formal proofs, that in relation to the following Bills, the standing orders had been complied with:—Wrexham Water, Eastbourne Gas, Northampton Tramways, Portmadoc Water, Hounslow and Metropolitan Railway, Cathcart District Railway, Witham River Outfall Improvement, Freshwater, Yarmouth and Newport Railway; Letterkenny Railway, Burton-upon-Trent Corporation, Hundred of Hoo Railway (Extension), Caledonian Railway, Cork Improvement, Carrickfergus Harbour Gravesend, Northfleet; and London, Chatham and Dover Railway; Pontypidd, Caerphilly and Newport Railway. To the petitions for the Port Talbot and Rhondda Railway, the Glasgow South Suburban Railway (No. 2), and the Manchester, Halifax and Bradford Railway Bills, there was no appearance. The Caledonian Railway Guaranteed Companies' Bill was postponed until the 26th inst., and the Rathmines and Rathgar Township Water Bill (opposed) until the following day. As to the Belfast, Holywood, and Bangor Railway Bill, the examiner stated, after a great deal of argument, that several allegations against the Bill had been sustained, and, consequently, the standing orders had not been complied with. The Liverpool and Birkenhead Subway (opposed), the Medway Conservancy (opposed), the Rochester Corporation (opposed), and the South-Eastern Railway (opposed) Bills were postponed until the following day, with the exception of the last-named Bill, which stands for the 29th inst. In the case of the Nantlle Vale Drainage and Tramway Bill (opposed) there was another long argument. Ultimately the examiner decided that the standing orders had not been complied with. On Friday Mr. Robinson decided that in relation to the following Bills the following orders had been complied with:—Rickmansworth and Watford Extension Railway, Beverley and Barnstorn Drainage, London Gaslight Company, London and North-Western Railway, London and North-Western Railway (Sutton, Coldfield and Lichfield Railway), Huddersfield South and East Junction Railway, King's Lynn Corporation, Prescott Gas, Liverpool and Birkenhead Subway (opposed), Rathmines and Rathgar Township Water (opposed), Rochester Corporation (opposed). In the case of the Medway Conservancy Bill (opposed) the Examiner reserved his decision until Monday. The following Bills were postponed:—Hinckley Local Board Gas, Maidstone and Ashford Railway, Preston Improvement. The Maidstone and Ashford Railway Bill (opposed), came before the Examiner on Saturday, for Standing Order proofs, after a long argument, the Examiner stated that he would reserve his decision. The Preston Improvement Bill (opposed) was postponed. These were the only two Bills on the paper. On Monday, Mr. Robinson, decided that in relation to the following Private Bills the Standing Orders had been complied with:—London and South-Western Railway; Hull, Barnsley, and West-Riding Junction Railway and Dock; Wigan Improvement; Ackworth, Featherstone, Purston, and Sharlston Gas; Hull Lighting; London, Brighton, and South Coast Gas; Glasgow South Suburban Railway (No. 1); Aston (Liverpool-street) Burial Ground; Bristol Corporation; Wednesfield and Wyrley Bank Railway (Abandonment); Strathendrich and Aberfoyle Railway; Medway Conservancy (opposed); Maidstone and Ashford Railway (opposed); Bristol Port and Channel Dock; Caledonian Railway Guaranteed Companies; Preston Improvement (opposed). As to the petitions with regard to the Glasgow and Bothwell Extension Railways, and the Leominster and Bromyard Railway Bills, was no appearance. The following were postponed:—Chipping Wycombe Borough Extension; Southern Railway (Cashel Extension Abandonment); Belfast Central Railway (New Lines, &c.) (opposed); Belfast, Strandtown, and High Holywood Railway (opposed); East Norfolk Railway (opposed); Fakenham and Melton Railway (opposed); Glenariff Railway and Harbour (opposed); Rathmines and Rathgar Township (Vartny Water Supply) (opposed); Lynn and Fakenham Railway (opposed); Didcot, Newbury and Southampton Junction Railway. On Tuesday Mr. Robinson decided that in relation to the following Bills the Standing Orders had been complied with:—Loose Valley Railway; Clacton-on-Sea Special Drainage District; Cleveland Extension Mineral Railway; Cardiff Water; Mersey Railway; Swansea and Mumbles Railway; Aberdare Markets and Town-hall; Maidstone Gas; Worcester and Aberystwith Junction Railway; Lancashire County Justices; Swansea Harbour; Mersey Docks and Harbour Board; Liverpool United Gas; Preston Tramways; Chipping Wycombe Borough Extension. As to the Gateshead and South Shields Tramways Bill the examiner decided that the Standing Orders had not been complied with, and gave a similar decision with regard to the Dublin Central Tramways (Amendment and Extension) Bill (opposed), and the Dublin Southern District Tramways Act Amendment Bill (opposed), but as to the two latter Bills reserved some points. With regard to the Lynn and Fakenham Railway Bill, the opposition was opened and the case adjourned. The following were postponed:—Coventry and Nuneaton Tramways, South Metropolitan Gas Company, Benington and Wainfleet Reclamation, Wandsworth and Putney Gas, Wakefield Corporation Water, Devon and Cornwall Railway (No. 1), Devon and Cornwall Railway (No. 2), Taff Vale, Great Western, and Merthyr Junction Railway, East Norfolk Railway (opposed), Fakenham and Melton Railway (opposed), North Dublin Street Tramways (Amendment and Extension) (opposed). The examiner sat until 6 o'clock. On Wednesday the Examiner passed the following Bills:—Nottingham Corporation, Manchester and Milford Railway, Ely and Bury St. Edmund's (Light) Railway, Pegwell Bay Reclamation and Sandwich Haven Improvement, Neath Harbour Commissioners, Teign Valley Railway, Belfast Street Tramways, Great Western and Monmouthshire Railway and Canal Companies, Romford Canal, Skipton and Kettlewell Railway, Hendon Local Board, Sutton Bridge Dock, Stafford and Uttoxeter Railway, Glasgow Improvement, Stafford Borough, Haverfordwest and Saint David's Railway, Lincoln Gas, Manchester Carriage Company (Limited) and Manchester Suburban Tramways Company,

Metropolitan Railway, North Staffordshire Railway, North British Railway, North British and Glasgow, Yoker and Clydebank Railway Companies, Didcot, Newbury, and Southampton Junction Railway. The opposition to the Lynn and Fakenham Railway Bill was continued at great length, and the case was adjourned until the following day. As to the Dublin Tramway Bills, on which some points were reserved, the Examiner said he would confirm the allegations, the result being that the Standing Orders were found not to have been complied with. The following were postponed:—Alford and Sutton Tramways, Liverpool Tramways (opposed), Metropolitan and Metropolitan District Railways (City Lines and Extensions) (opposed), Belfast Central Railway (New Lines, &c.) (opposed), Belfast, Strandtown, and High Holywood Railway (opposed), East Norfolk Railway (opposed), Fakenham and Melton Railway (opposed).

FACTORY NOTES.

EMIGRATION OF MINERS.—During the past few days a number of miners and their families from the Durham collieries have taken their departure for America, New Zealand, and Australia.

HAMSTEAD COLLIERY COMPANY.—A circular has been issued to the shareholders in this company announcing that the sinkings during the last few days show changes in the measures very favourable to the discovery of coal. The present depth of the sinkings is 534 yards.

MIDLAND RAILWAY CARRIAGE AND WAGON COMPANY.—The directors of this company have declared an interim dividend for the half-year ending 31st December last, at the rate of 4 per cent. per annum on ordinary, and 6 per cent. on preference shares free of income tax, payable on the 1st March.

THE GLASGOW SHIPBUILDERS.—At a dinner on Monday night in Glasgow, Mr. Pearce, senior partner of the firm of John Elder and Co., the great shipbuilders, said that the heavy rise in the price of iron and steel, caused by the speculations of those unconnected with the shipbuilding trade, has seriously affected that branch of industry in the way of frightening shipowners making inquiries after contracts, and hoped that something would be done to prevent it.

THE TIN TRADE.—On Tuesday the Cornish smelters advanced the tin standards £3 per ton. The standards now are—superior common, 98s.; superior fine, 99s. per cwt. This makes an advance of £14 per ton in the standards during the present year. A parcel of black tin was sold the same day, realising £61 10s. per ton. The Banca tin sale was held subsequently, and passed off satisfactorily. The sale opened at 60½, but fell a little, the average price being 59½.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending January 24th. On Monday, Tuesday and Saturday, (free) from 10 a.m. to 10 p.m., Museum, 10,521; Mercantile Marine, Building Materials and other collections, 1551. On Wednesday, Thursday and Friday (admission 6d.) from 10 a.m. till 4 p.m., Museum, 1353; Mercantile Marine, Building Materials and other Collections, 68. Total, 13,493. Average of corresponding week in former years, 15,468. Total from the opening of the Museum, 18,674,324.

ATTEMPTED SALE OF LOFTUS IRONWORKS AND MINES.—At the Royal Exchange, Middlesbrough, on Tuesday, the Loftus Ironworks, comprising two blast-furnaces, &c., and the ironstone mines in conjunction therewith, situate near Carlin How, Cleveland, were offered by public auction. There was a fair attendance. No offer was made, but that of Mr. Crawdson, on the part of a Kendal banking firm, who, we were informed, are the first mortgagees. Mr. Crawdson bid £50,000, at which the property was knocked down.

DURHAM COAL TRADE.—The officials of Tursdale Colliery have received orders to relight forty more coke ovens in addition to the seventy-five now working; and it is expected that in a short while there will be 250 working. The miners who have been working on one day's notice have now been put on 14 days' notice. The manager (Mr. Ramsay) is getting places ready, and getting extra hands every day. Things are very brisk at the above colliery. Families are removing every day from Cumberland and west districts.

THE "INVINCIBLE" PUMPING ENGINE.—The steamship *Cosmos*, whose trial we recently reported, was fitted with the Invincible direct acting centrifugal pumping engine, which circulates water in the surface condenser, and also pumps from the bilge. Messrs. Gwynne, the manufacturers of this pump, also supplied the engine for driving the electrical machine direct. The Invincible pumping engines are supplied to the Royal Mail Steamers *Kinsfaun Castle* and *Grandhilly Castle*, for circulating through condensers and pumping from water-ballast compartments and bilge.

UNION ROLLING STOCK COMPANY.—The report to be submitted to the half-yearly meeting of the shareholders in this company shows a satisfactory and profitable business for the past six months. Applications for rolling stock have been numerous and covered large amounts. The directors have entered into contracts for about £21,470, of which only a part has come into the half-year's trading, and they have other proposals under consideration. The accounts show a profit on the half-year of £2928 19s., and after paying a dividend at the rate of 10 per cent. per annum on ordinary shares and carrying £1000 to the reserve fund, a small balance is carried forward to the credit of the next half-year.

RAILWAY ROLLING STOCK COMPANY.—At the fifty-second general meeting of this company on Tuesday the report (published in our last week's issue) was adopted. The chairman (Mr. S. Loveridge) explained that since July of last year the company had bought 409 waggons, which left 4289 in their possession. Amongst the rolling stock are several engines, and taking this into account their waggons had only cost them a fraction over £36 each, a very favourable state of things considering their present market value. In the course of the proceedings Mr. F. C. Corser stated that he had made an extract of the dividends paid by the company since its formation. The highest had been 12 per cent., and the average was over 9 per cent., a very satis-

factory remuneration, he thought, to shareholders for their investment.

SPENCE'S PATENT METAL.—This metal has been definitively adopted by the South Metropolitan Gas Company of London, and trial orders have been received from the London gas companies and also from Birmingham, Buxton, Hartlepool, Northampton and other towns, whilst fresh orders are daily coming in. Important advantages are claimed for the patent metal as a material for jointing water or gas pipes, and filling up holes in defective castings. It is run into the joints in the same way as lead, but without caulking. It will produce a hermetically sealed joint, which will stand a pressure of 500 to 800 lb. Its strength may be considered double that of any material now in use. The time occupied in making a joint is about one-fifth of the time usually employed; it is not affected by aqueous or atmospheric action; it can be used over and over again without losing any of its qualities; it is free from poisonous substances, and, not being acted upon by water, alkalies or acids can be used for lining cisterns for domestic purposes; and it can be used for jointing iron to stone or wood.

COAL CONTRACTS.—Since our last number was issued several contracts have been concluded with colliery proprietors in South Wales by the Admiralty and other large shippers for moderate quantities of coal, to be delivered over the present year, at prices ranging from 1s. to 2s. per ton above the contract figures of two or three months ago. Small and occasional buyers have not fared so well, their offers to contract being declined, unless at an additional advance of at least sixpence per ton. In the Tyne, the best steam collieries refuse to book ahead at 10s. 6d. per ton, which has been offered them, although 9s. was the price ruling only a week ago. The advance foreshadowed in our last week's leader has thus, to a considerable extent, become an accomplished fact. Coke has also risen in value, the best description of Newcastle to 18s., and of Cardiff to 22s. These prices are for ready shipment, orders for forward delivery being refused, or only taken at an advance. In the early part of this week the inland demand for this article was very strong, but the last day or two it has not been quite so good.

THE WESTINGHOUSE CONTINUOUS BRAKE COMPANY.—This company has hitherto been dependent mainly on its manufactory at Pittsburgh, U.S., for the supply of certain portions of the apparatus provided for its continuous brakes, but owing to its large and increasing European business it has now found it necessary to establish a manufactory in London. This manufactory, and a general warehouse in conjunction with it, are, for business purposes, conveniently situated near the King's Cross railway station. The company has thus greatly increased its railway capability promptly to comply with large orders, and supplied the means of testing for itself the articles it supplies, so as to avoid risk of defects or failure. A few months' experience has further demonstrated the very great inconvenience resulting from having the chief offices at Westminster and the works so far apart, and the former have now been transferred to the works, where the full-sized apparatus for showing the construction and illustrating the operation of the Westinghouse automatic brake, as ordinarily applied to a train of ten vehicles, has been re-erected, and may be seen at work between the hours of 10 a.m. and 5 p.m. on any working day except Saturday, on which day the hours will be from 10 a.m. to 1 p.m.

IN RE SWAN, COATES AND CO., MIDDLESBOROUGH.—IMPORTANT TO LIQUIDATING DEBTORS.—A decision on judgment, given by Mr. E. R. Turner, County Court Judge, *in re* John Hawksworth Legard, of the firm of Swan, Coates and Co., ironmasters, discharged bankrupts, Middlesborough, announced on Saturday, will be instructive to liquidating debtors. It appears Mr. Draper, solicitor, Stockton, made an application at the last court day on behalf of Mr. Legard, a member of the above firm, who was an undischarged debtor, while the other members of the firm had received their discharge. The application was for the registration of certain resolutions passed by Mr. Legard's creditors in March last, by which a trustee was appointed, and his discharge was arranged for. Since that date Mr. Legard had come in for a legacy, the protection of which was the object of the application. The amount of the legacy was stated to be some £1300; the file showing the unsecured creditors' claims in the estate to be £3500, and the assets £400. The official report of the case, after explaining that the application, if successful, would reverse a decision already given on the subject by the Registrar of the Court, runs thus:—"The principal objection of the Registrar to register was that there was not a quorum of creditors at the meeting. There were only three present, including a proxy, who, according to the registrar's opinion, did not 'prove,' owing to certain informalities in the legal document. Mr. Draper put in two affidavits to prove the nature of the error, and the Judge ruled in favour of Mr. Draper. But, after deferring his decision for a few days, the Judge has decided in favour of the registrar, and refuses to register the resolutions as requested." At the hearing of the case the Judge made objection to the probability that the creditors in the case had not heard of the legacy in any way.

THE LABOUR MARKET.—The first meeting of the Conciliation Board just formed in the nail trade was held on Thursday afternoon last week, and was attended by delegates of the masters and men. It has been constituted with the view of guarding against the recurrence of the strikes which have been so frequent in the nail trade. Committees were appointed on Thursday, and afterwards the nailers applied for an advance of wages, owing to their present low earnings. There was a friendly discussion on the position of the trade, and eventually the nailers withdrew their application for the present. The annual meeting of the Board of Arbitration for the North of England Iron Trade was held at Darlington on Monday. The report spoke hopefully of the improved prospects of the iron trade, and trusted that, as the Board of Arbitration had, during a long period of intense depression, successfully withstood the severe strain upon it, it would now, in more prosperous times, prove an efficient and reliable medium for dealing with the various wages questions. The number of members in connection with the Board was 5647, against nearly 15,000 seven years since.

The income had been £1287 for the year, and the expenditure £886. The advance of 12½ per cent. in wages till May next had been made with a sliding scale to follow from that date. As the Board could not agree upon the sliding scale, Mr. David Dale consented to arbitrate on the difference. The aspect of the iron shipbuilders' wages question on the Tees is becoming more serious. A meeting of the masters and the representatives of the men has been held at Stockton, Mr. Pearce, chairman of the Masters' Association, presiding. After considerable discussion, the masters proposed a settlement by offering the men an advance equivalent to the last reduction, which was made about September. The men declined this proposition, and claimed an advance of 7½ per cent., which is equivalent to a reduction made at the beginning of last year, there having been two reductions during the last twelve months. The position of matters now is, that at Messrs. Dixon's yard, Middlesborough, where about 1000 hands are employed, the men have given notice to terminate all engagements on the 21st prox. It is stated that the masters on the Tees and at the Hartlepool will lock out the men after that date unless they come to their terms. It should be added that in the meanwhile Messrs. Bolckow, Vaughan and Co.'s boilermakers, who are members of the Operative Shipbuilders' Society, have received from their employers an advance of 5 per cent. A strike or a lock out at the shipyards is imminent, and either, in the present state of the trade, will be most disastrous. All the yards are fully occupied with contracts. When a number of the workmen of the North British Railway Company agreed, in opposition to their union, to work 54 hours a week, a friendly society was established for them; and from its report we learn that, notwithstanding a large amount of sickness, the members will receive a dividend of 53 per cent. on their contributions. The miners employed at the Barrow Hematite Colliery, Worsborough, some three or four hundred in number, went out on Wednesday on strike. It is understood that their object is the return of the 10 per cent. reduction in wages agreed on some time ago. There are indications that the owners of the colliery will close the mine, as they threatened to do when the last reduction was objected to. A conference was held at Dunfermline on Monday, between the coalmasters of Fife and Clackmannan and the representatives of the miners, to consider the proposed sliding scale of wages. The masters offered to allow, as a basis for the scale, threepence per day on every sixpence per ton of advance in the price of coal. The men, on the other hand, proposed that the basis should be at the rate of fourpence per ton on every shilling advance in prices. The masters refused to accede to the request of the men, and the conference broke up without any decision being arrived at. At a meeting of the men, held after the conference, it was resolved to submit the proposal of the masters to a vote of the whole body of miners.

IRON AND COAL TRADE REPORTS.

BARNESLEY AND SOUTH YORKSHIRE.—Amongst the mining districts of the United Kingdom few, if any, are in a more precarious state at the present time than South Yorkshire. One of the most remarkable incidents of the coal trade is that steam-coal is in much better request than house-coal, notwithstanding the keen weather which prevails. The quiet state of the London trade is attributed by coalowners to several causes, one of which is the high rate which they have to pay. This, no doubt, has a good deal to do with the matter, for last week the falling off in the Great Northern traffic receipts from minerals and navigation amounted to £6079. It is, however, believed that this was merely an exceptional thing, and that with a continuance of the present severe weather, stocks which merchants have on hand will become so reduced as to call forth additional traffic. There can, however, be no doubt but that the output of the district is so large that the market is overstocked. The collieries are varying a good deal; some of the Silkstone pits last week only made from two to four days per week, although the coal is of good quality. The thick-seam pits are rather better off; most of them having secured large contracts last year, at low prices it is true. There is a lively business doing in steam-coal for smelting purposes as well as for exportation. The shipments last week from the three Humber ports showed a slight increase, and in addition to what is sent in that way, good consignments are being sent to Barrow and other places. There is rather more doing in manufacturing fuel, but prices do not increase. At collieries where a large percentage of slack is being made it is offered at 1s. per ton, but there is just now a very large demand for coke-making purposes. Makers of coke were never more busy, and at the Barrow, North Gawber, and other collieries, the number of ovens are being largely increased, whilst at Carlton Main and other places where ovens do not now exist arrangements are being made for building a goodly number. There is still a large and increasing tonnage sent to the North Lincolnshire iron smelting district, where the requirements in a few weeks will be even still greater. The miners in all parts of the district are in a very unsettled state. The leaders of the three miners' associations are propounding totally different views respecting the sliding scale, which is likely to fall through. That section led by Mr. Casey, for many years secretary with the late Mr. J. Normansell, is advising the men at the Barrow collieries to bring out their tools in accordance with the notice given unless the owners restore the 10 per cent. which they sacrificed some months ago. On the other hand, the old South Yorkshire Miners' Association are urging the men on strike at Monk Bretton to remain firm, and for the second time the union on Tuesday paid the men a week's pay. It is said the owners are advertising for non-union men. The iron trade remains in much the same state as when last noticed. A good deal of activity is apparent in most branches, and as a result of the revival it may be stated that the Wortley Ironworks, which have been closed five months, have just been reopened. At the Milton and Elsecar a lively state of trade is being enjoyed in nearly all branches. At these works six furnaces are in blast as well as two large

ones at Thorncliffe. Moulders, fitters, and makers of gas stoves and other kinds of castings, have no cause to complain. Most of the local foundries are better off for work; considering the quiet state of trade, this is to be wondered at. The Bessemer steel works are busy prosecuting orders, which are said to be large. The owners of the Thorncliffe Works have been experimenting with the electric light for illuminating the works at night, but it is said to have been abandoned.

BARNESLEY, WEDNESDAY.—To-day a large number of representatives belonging to the various collieries in South Yorkshire were in town, and the best qualities of house coal were freely offered at 1s. per ton less money with scarcely any response. Complaints as to the quiet state of the house coal trade were general. Gas-coal is in good demand and large quantities are being sent away from some of the pits. Steam-coal was inquired after, but the difficulty is in getting rid of the soft coal. The miners employed at the Barrow Colliery brought out their tools to-day, although the manager urged them to work on a fortnight longer, and he would lay the matter before the directors of the Barrow Hematite Iron Company, to which firm the pit belongs. This they declined to do, and will doubtless ere long know the result. The top and day men all received fourteen days' notice this afternoon to quit their employment.

BARROW-IN-FURNESS AND NORTH LANCASHIRE.—A very active demand still exists for all qualities of hematite pig-iron, and especially from America there is a very brisk request. Shipments are already commencing on a large scale from Barrow and other ports on the coast to America and other countries. Large deliveries have to be made during the year to the colonies, and on Continental account a larger business is likely to be done this year than last, notwithstanding the import tariffs now ruling. Makers of iron have lately done a very considerable business and have sold iron largely forward for delivery during the present and during next year. Prices have again advanced, and, at present, as much as 140s. per ton is being asked for all-round qualities of Bessemer iron. Orders have been booked in several instances at 132s. 6d. and 135s., but it is not reported that iron has been sold at the extreme figure of 140s. The market is, however, moving in this direction, and probably, during the ensuing fortnight, hematite of the best quality will exchange hands at £7 per ton. Iron ore has again advanced, and in some instances raisers have refused to sell at less than 40s. per ton, while the prevailing quotation is 35s. It is not too much to say that the market, both for pig-iron, iron ore, and steel, is very excited, and that makers on all hands are endeavouring to produce as much as possible before prices decline; and buyers, on the other hand, are pressing orders, as they think prices, under the circumstances, must advance still further. In the steel trade there is a most marked activity, and makers are full of work. Shipbuilders are busy, but there are still numbers of men out of work, and skilled and unskilled workmen who are flocking to this neighbourhood, owing to the news of better trade, are not able to find work except in occasional instances. Engineers are busily employed, and great activity is observable in the marine department especially, but in the general branch of this trade several large local orders are in the hands of masters. Ironfounders and boiler-makers are busy, and railway rolling-stock manufacturers are very busily employed having in hand several new contracts. In the coal trade prices are a trifle better, and especially so for coking qualities, and the demand for coke has greatly increased, owing to extended consumption of makers of iron and steel. Shipping is fairly employed, and plenty of foreign freights are offering.

BIRMINGHAM.—Although the annually recurring interval during which business is temporarily suspended, during holidays and stock-taking, may now be regarded as fairly over, trade can scarcely be said to have resumed its ordinary channel. Travellers, it is true, have been on the road for a fortnight past, but this is too brief a period to enable anything like a definite opinion to be formed of the trade of the new year. Taking the orders absolutely in hand throughout the various branches of the local hardware trade, it can scarcely be said that the aggregate comes up to the average of the month in a good season's trade, although it must be admitted that on all hands an improvement is exhibited, and there are indications of further progress in the same satisfactory direction. The distinguishing feature of local trade still continues to be that while heavy hardware goes off very freely, the orders on manufacturers' books for finished goods are only of limited extent. Still a hopeful tone prevails, more especially as the export trade has of late manifested increased activity. A good deal of bridge and girder work is in course of execution in the district a fair share of this being for the Indian market, and some good orders for carriage ironwork have also come to hand recently from the same quarter. Iron tube makers have large contracts under execution for India, Canada, Russia, and South America, and the leading houses in this branch will be pretty full of work to the end of the quarter at least, without any material addition to their existing engagements. The home trade is not so active, but a good deal of the best tubing is being taken for brake purposes. Trade with the Cape and particularly with the colony of Natal, has exhibited of late a marked activity, iron hollow ware and cast nails being in good demand. Orders for the same class of goods have also been coming to hand from the Australian colonies, accompanied by an improved request for axles and springs. For the latter there has also been a better home demand, owing to the growing activity in the waggon trade which has been stimulated by the rapidly increasing requirements of railways and collieries. The Canadian trade generally has shown signs of improvement, and there is a somewhat better tone about Egyptian advices as well as a fair sprinkling of Brazilian orders. The Continental trade also exhibits some improvement. Generally speaking the merchant trade is more active, but the continued upward movement in prices has necessarily tended to prevent the expansion which would probably have been experienced in this direction. From the metropolis and leading industrial centres, orders have begun to reach tin-plate workers and japanners somewhat more freely; but these branches are far from being fully employed at present. Prices, too,

have not advanced in adequate proportion to the enormous advance which has taken place in raw material. The local steel pen manufacturers are fairly busy on export orders, but report the home trade as quiet. Some fair orders have been recently booked for makers of galvanised iron brazier, and some extensive enquiries have been made both for the export and home markets, for light malleable ironfoundry. An improving demand is also reported by the leading local manufacturers of agricultural implements. The lock trade is very much depressed. In the wrought-nail trade the tendency to improvement shown at the close of last year induced the belief that a period of activity was close at hand. So far, however, not the slightest indication has been presented of the realisation of these anticipations. On the other hand, trade is unusually quiet, orders coming in very slowly. This is believed to be largely due to the sudden rise in the prices of raw material, nail rods having been recently advanced altogether from 60s. to 70s. per ton. Operatives' wages have also gone up since November from 15 to 20 per cent. Makers are not increasing stocks, and many of the men are only half-employed. In the rivet trade, on the other hand, orders come in steadily, and the hands are fairly well kept at work, though the improvement falls short of manufacturers' expectations. Under the influence of the strong and well-sustained American demand the local iron trade maintains pretty much the same position as at the date of our last report, and prices are firm. It is true that the heavy orders on offer from the States for special qualities of iron fail in meeting with acceptance at the hands of local makers, but most of the latter have quite enough on their books as it is for the current quarter. There is little animation in the general merchant demand for iron. Purchases have been made for India, where stocks are reported low; but buyers have negotiated these transactions on their own terms. Local consumers are only buying limited quantities to meet special demands, having covered ordinary requirements by contracts made some weeks since. The recent advances in ore, fuel, and labour keep up prices, and there is a general feeling that although the legitimate consumptive demand is at present only limited, sufficient employment will be found for producers for some months in restoring stocks, which have fallen to a very low level, more especially in foreign markets. Messrs. J. Bagnall and Sons have announced by circular that they are so full of orders for hoops and sheets that any further orders or enquiries for these descriptions of iron dated after the 24th inst. will be subject to special quotations. The new Board of Conciliation in the local nail trade has opened its career in a satisfactory manner. As announced last week, the men were determined on seeking an advance in wages, but at the meeting of the board, after an amicable discussion of the subject in all its bearings, their delegates were convinced that it would be undesirable to press the claims of the men at the present time, and they were withdrawn. It is satisfactory to find that the example set in the nail trade is likely to be followed shortly in the kindred industry of chainmaking. The men have unanimously adopted a resolution that arrangements shall be made for establishing a Conciliation Board in their trade, and in all probability these will be completed in the course of a week or two. Meanwhile the out-workers on small chain and traces have given notice for the 4s. 6d. new revised list of prices as from the 31st inst. A difficulty has cropped up again in the rivet trade. Some of the employers, it is alleged, having deviated from the arrangement under which the recent strike was brought to a termination by having all rivets made by "out-workers." The factory men are consequently either wholly or partially out of employment, and it is anticipated that they will have to submit to a reduction, a step which will eventuate, it is believed, in a strike. The horse-nail-makers, who are outside the pale of the new Conciliation Board, are endeavouring to obtain another advance of 3d. per 1000 from the employers, but the latter evince no disposition to make the concession, contending that the present state of trade does not justify the claim. The men, they assert, are better off than operatives in most of the other branches of the trade since the 3d. advance recently granted them, and have full work, whilst the general run of nailmakers are only as a rule working half-time. The men, who are said to be very desirous of avoiding a strike, intend, if the interviews with different employers warrant such a step being taken, to give notice for the advance as from the 31st inst. On the Wolverhampton Exchange on Wednesday there was less anxiety to make forward purchases, except so far as minerals and coke were concerned, these being still in brisk demand, and such sales as were made were only at an inconsiderable reduction from the terms asked by holders. There was some pig on offer there last week, some holders who had bought in anticipation of a further rise being evidently anxious to lessen their engagements. Smelters, however, fully maintain prices, and have no necessity to court sales. Finished iron was a shade easier to buy, and the marked bar houses are said to have room on their books for further orders. It is understood that one of the old-established firms in the iron and coal trades in the district, carrying on business at Darlaston, are about to convert their business into a limited liability company, and that arrangements for effecting the conversion are now in progress.

THURSDAY EVENING.—Demand for iron quieter, but makers prices firm, being full of orders. Some of the middlemen who bought heavily during autumn at low figures are selling job lots under quotations, but transactions are limited. Hoop-iron could not be bought, even at present high rates, to-day, and it was difficult to negotiate purchases of sheets which are strong at £11, and later on at £14. American buyers are inquiring for Staffordshire cold-blast pig-iron in place of hematites, prices of latter being prohibitory. Marked bars firm at £9, unmarked bars £8 to £8 10s.

CARDIFF.—An old Welsh ironmaster used frequently to say, "I have often seen trade sick, but never dead." It was confidently asserted some years back that the American demand for Welsh rails had gone for ever, and that was afterwards limited in meaning to iron rails. The present activity of all the works indicates the deceased ironmaster's adage. Some large stocks of puddled bars that were accounted almost worthless were allowed to go upon the first inquiries, but if held till now they would fetch double the price. The bulk of the work turned out is, unfortunately, in fulfilment of contracts which the 'cute Yankee fixed upon the hungry Welsh works in the early autumn. The outflow

of wages, however, is what chiefly concerns home traders, and the millers in the adjoining counties and provision dealers generally are beginning to feel the effect of the revival in iron. There has been quite an excitement in the freight market for Spanish ore. Some unfortunate boats are nailed under time charters at the losing figure of 7s. 3d. from Bilbao, and will not be free until the present spurt, which is estimated to last a twelvemonth at farthest, is gone. Others thought themselves fortunate in closing for the year at 9s. 3d., but since then chartering has been effected at 11s. and 12s., and the latest is 13s. 3d. Similar high freights are ruling to Glasgow and the North. The tin plate trade continues abnormally active, and a movement is on foot to settle wages by a sliding scale. The sliding scale for the coal trade has given general satisfaction, and it is now aimed at to extend the membership of the association so as to include every colliery enterprise of Glamorganshire and Monmouthshire. The Admiralty have invited tenders some weeks earlier than usual, for the supply of the foreign depots and home yards, an aggregate quantity of nearly 90,000; owing to the improvement in both freights and coal the figures will be higher than last spring. A pretty considerable quantity has been booked this week for one of the Indian railways. Buyers have for some time past been manifesting uneasiness, and the French operators for Transatlantic lines especially have been seeking for very long contracts. Some of the lines sailing from the Mersey are also unprotected for the year, and find that they are not masters of the position. In sympathy with coal, the patent fuel makers have established an advance, but not proportionate. The trade has not been a prosperous one for some time.

CLEVELAND.—There was a very good attendance on 'Change at Middlesbrough on Tuesday and considerable animation exhibited, although prices were somewhat lower than last week. Weak holders showed an inclination to sell, but strong holders were confident of an immediate recovery. Business was done for prompt delivery at from 60s. to 61s.; up till the end of June, 63s., and over the second six months 65s. Makers are sold forward as far as they care—they have not forgotten the lesson of former times. Although good times have now unmistakably come again, it is calculated that, bound as they are to delivery at old quotations, they are longer in reaping the benefit of high prices than the merchants, and that it will take well on to Midsummer to put them into a sound state of recovery. Meantime, with occasional fluctuations of the former, prices and confidence are increasing, and afford warrant for an immediate future of great prosperity. The finished-iron trade, somewhat changed in character, is becoming busier and more extensive. The old iron rail is well-nigh gone, but the steel rail is fast supplying its place, and the Eston Works are running day and night. There has been a material increase in the output of ship-plates and angles, the demand for these being much greater than the supply. In the face of all this sudden prosperity it is no wonder that those workmen who, in the unprosperous times, had reduction after reduction thrust upon them, are trying to regain their former wages. At Bolckow, Vaughan and Co.'s, in answer to a demand for 10 per cent. rise, the masters have conceded 5, and it has been accepted. The Tees shipbuilders are agitating for an advance also, and if 7½ be not granted them by the 31st, they have threatened to strike. The Erismu Ironworks, which were put down to manufacture a superior iron by the Danks process, are in process of being altered into steel works by the engineer of the Eston Steelworks so that the latest chemical and mechanical improvements may be looked for. All blast-furnace property is being turned to account as rapidly as possible. On Tuesday the Loftus Iron Company's furnace and mines were put up for sale, and knocked down to the first mortgagees, at £50,000. The Claylane and Lackenby are being hurried on for relighting as early as possible, as are also the Linthorpe and Tees-side Ironworks. The engineers and ironfounders are receiving to some extent the benefit of the general revival, but not to a proportional extent. Coal, with the exception of household, is advancing in demand and slightly in price, and coke also.

DERBYSHIRE.—The coal trade throughout this district will, as a rule, compare most favourably with neighbouring coalfields, the pits being just now very fairly worked. The demand for house-coal for London and the South, so largely supplied by rail from the district pits, is not over active. There is, nevertheless, a large tonnage passing over the Midland and some portions of the Great Northern system to the metropolis, but this, to a great extent is due to the existing contracts. Prices of house-coal do not average as they ought to do at this period of the year. A large proportion of what is raised is supplied at prices fixed some time ago, so that coalowners, as a rule, are not reaping much advantage even where they have been able to sustain a slight advance, which is done with great difficulty. The men, moreover, are pushing forward their demands for an advance of ten per cent. It is said that fully 4500 balloting tickets issued to the miners 4000 have been returned in favour of giving notice for an advance. At a conference held on Saturday at Chesterfield, where the above report was made, there was a general desire expressed to go in for an advance at once. It was suggested that the opinion of Mr. Macdonald, M.P., should be taken on the subject, and this course will no doubt be adopted. There is a fair demand for steam-coal and manufacturing fuel, considering the quiet state of trade, and the sale of house-coal to local consumers has been increased by the keen weather which prevails. A very lively, and to a great extent profitable, business is being done in coke. All available ovens are at work, and a large quantity of the slack and small-coal produced is converted into coke. There is a fair business doing in most branches of the iron trade where heavy goods are required. The high price of pig-iron has had a tendency to stimulate that important branch of industry, and has caused the output to become highly increased. The number of furnaces in blast at the present time, as compared with those at work early in the month of October, is large. There is a fair amount of animation with respect to the demand for gas and water pipes, for the make of which several firms in the district have almost a universal reputation. More work is being done at the lead mines and at the foundries in castings of various kinds. Wagon-builders are doing a better trade, as are also makers of Bessemer steel rails, tires, axles, &c.

DURHAM.—Both the pig and finished iron trades have fairly maintained their position during the week. Pig-iron was weaker early in the week in sympathy with the lower rates ruling in the Scotch trade; but a good deal of confidence seems to be shown respecting the continuance of the demand, and makers will not, as a rule, sell forward, either for the spring or till the end of the year, at less than about 55s. No. 3. Makers are in many cases compelled to ask high rates, as they find that coke is getting stiffer every day, and the agents of the Durham coke-makers ask 20s. per ton for delivery after August next, and 17s. and 18s. per ton up till that time from April at the ovens. This will cause a very large addition to the cost of making iron in the matter of fuel alone, indeed the prices given for the latter part of the year are just double those of last summer. There is not much rise reported in manufacturing coals in South Durham, which supplies all the Cleveland district both with coal and coke. This week at the meeting, at Darlington, of the Arbitration Board in connection with the regulation of wages of ironworkers between the Tyne and the Tees, every confidence was, we learn, expressed that the present year would be one of the best ever known in the iron trade. Some of the manufacturers present seemed to have no doubt that they would have full work for the whole year. The income of the Board was £1287 17s. 4d. and the expenditure £866 2s. 11d., leaving a larger balance than some recent years. There is increasing activity at the iron-works, both in the Tees-side district and also in the neighbourhood of Bishop Auckland, and we hear of another iron and steel company being projected in the latter district. The prices for manufactured iron are about:—Plates, £9 5s. to £9 7s. 6d.; bars (common), £8 10s. to £8 12s. 6d.; angles, £8 15s.; iron rails, £8 10s. to £9. At Darlington, the railway and other works are going on well. At West Hartlepool, the works of the North of England Wagon Company, which have so long been idle, are, it is stated, likely to be disposed of. There seems plenty of demand now for rolling-stock, and the North-Eastern Railway Company will have to add largely to their wagon power, as they cannot freely move the increasing mineral traffic of the district. The constant increase of traffic with the company, and the enlarged receipts, also the much better dividend than was expected, are causing a marked rise in the shares of the company.

FOREST OF DEAN.—The house-coal industry of this district has taken to itself wings, and may be said to have flown away. Proprietors are puzzling themselves as to the cause of the adverse position in which they find themselves. Had a trades union suddenly sprung into existence using its influence in sending up wages and quotations, the collapse could not have been more marked and certain than is now the case. In the month of January, with cold bristling weather, it is without precedent to find a condition of things corresponding with the present time. A year ago, with prices on a par with existing quotations, the local proprietors were unable adequately to meet the demands, whilst now the men employed at the leading pits are only averaging half-time. The plea recently advanced in regard to prices can scarcely be this week maintained, because as against from 12s. to 12s. 6d. per ton for best Forest house-coals, f.o.b. at Lydney, Welsh house-coals of corresponding quality are quoted 11s. 6d. f.o.b. at Newport. As an instance of the fickle character of trade, it may be mentioned that a year ago Welsh prices were 10s. 6d. per ton, viz., a shilling lower than now. Already the local unfavourable position of affairs has brought about a migratory movement among colliers, who are making their way to the North of England, where they affirm is regular work and higher wages. On the other hand the pig-iron trade increases in intensity and activity, prices at the same time strengthening. The iron ore trade also maintains improvement, and not only are old stocks being cleared but prospects are more bright than have been the case for a long time. The Easter Hematite Iron Ore Company have been fortunate in disposing of their stocks, approximately 7000 tons; having also booked orders, increasing their sales to 10,000 at prices averaging from 10s. to 12s. per ton. Very shortly it is expected the tin firms will re-open their mines, the intention being first to partly clear stocks. The same company have recently shipped a cargo of ore for North Wales, which may be regarded as a new district for Forest iron ore. Iron, wire and tin plates are maintaining the improved position attained, and at Parkend Mills the first consignment of plates, 20 tons, was a few days ago sent off. Some delay has recently arisen in these mills owing to an accident with the machinery.

GLASGOW.—In the warrant market during the past week a downward tendency has been apparent in prices; the American demand has slackened for the present, and the high rates of freight, and the difficulty in getting tonnage, have induced holders of special brands to force them in the market greatly under market price. Confidence in warrants, however, is not altogether lost, and good buying has set in at the reduced prices. On Thursday, from 72s. 3d. to 71s. cash, and 73s. to 71s. 9d. a month was accepted, a further fall taking place next day to 70s. On Monday, 68s. 9d. to 67s. 9d. cash, and 69s. 3d. to 68s. 3d. a month was accepted. On Tuesday prices fluctuated between 69s. 4½d. and 67s. 6d. cash, and 70s. to 68s. a month. On Wednesday there was a rally from 67s. cash, and 67s. 9d. a month, to 68s. 11½d. cash and 68s. 10½d. a month. Closing buyers, 68s. 1½d. cash, and 68s. 9d. a month; sellers, 1½d. per ton higher. The makers have not been selling so much iron this week, and as they were being undersold by merchants, they reduced their prices from 2s. 6d. to 6s. per ton. No. 1 Gartsherrie is now 84s.; No. 1 Coltness and Summerlee, 87s. 6d. per ton. Other six furnaces have been put in blast, making 108 in all, against 89 at this time last year. The shipments of pig-iron from Scotland last week were:—Foreign, 3040 tons; Coastwise, 3617 tons; total, 7566 tons. The Leith returns have been omitted this week, against 6331 tons in the corresponding period of last year. The imports of Middlesbrough pig-iron into Grangemouth last week were 3885 tons, against 3190 tons in the similar period of last year. The total imports till January 24th, 1880, are 34,275 tons, against 15,553 tons till January, 25th, 1879, showing an increase for this year of 18,722 tons. The stock of pig-iron in Connal and Co.'s store now amounts to 434,320 tons, about 4338 tons having been sent

in last week. The manufactured iron trade is busily employed on old orders; but now there is less enquiry for iron for forward delivery. The steel works here are very busy. The exports last week were large, chiefly of railway materials. Amongst the largest items were machinery for Australia, valued at £11,636, and for India at £7300, cast-iron goods for Australia at £2656, and for India at £6189, and galvanised iron for Australia at £3665. One or two new orders for vessels have been placed during the past week; all the large yards are well filled, but none of the smaller firms would take more orders. The locomotive works are well employed, and turning out a good many engines on Colonial account, as well as for home railways. It is reported that a large order for cast-iron pipes has been secured by Glasgow makers. Many of the engineers are slack; but a hopeful tone is maintained. The coal trade is quiet, prices are firmly maintained, and there is still some agitation going on for higher wages.

LANCASHIRE.—There is no very material change to notice in the iron trade of this district since last week. A quieter tone still prevails in the market, and the advance in prices seems to have been checked for the present, whilst buyers appear to be holding back in the expectation that values will give way. Some holders are exhibiting a little weakness, and second-hand lots of iron are offered in the market at prices under those which were being obtained a few weeks back, but in makers' quotations there is no material change to notice. In pig-iron, the business doing is chiefly in forge numbers, and for these local makers still report a strong demand, which is considerably in excess of the very limited supplies at present at their disposal, but for the small quantity of foundry iron now being produced, there is but little inquiry, as the requirements of local consumers continue very small, and they complain that they cannot secure orders at prices which will enable them to pay the figures now asked for the raw material. For Lancashire pig-iron, delivered into the Manchester district, the quotations remain at about 70s. per ton, less 2½ per cent. Outside brands, if anything, are rather easier. Lincolnshire iron has been sold at slightly under the price which was being obtained a fortnight back, and Middlesborough iron, for prompt delivery, equal to Manchester, is quoted at from 68s. to 68s. 6d. per ton net cash, but for forward delivery, 70s. to 72s. is being asked. The finished-iron trade continues in much the same position as last week. Manufacturers are still all very full of orders, and there would be no difficulty in booking large quantities up to the end of June at £9 per ton, but where makers are quoting at all, the average price asked for local bars delivered into the Manchester district is £9 to £9 5s. per ton, whilst hoops are quoted as high as £10 10s. per ton. Some of the large foundries are busy, but small firms who are mainly dependent upon local work continue, as a rule, slack, and in the machine-making and engineering trades there is still an absence of any general activity. The coal trade has not recovered the animation which was prevailing before the close of last year, and supplies generally are in excess of the demand, with a tendency towards less firmness in price for prompt delivery, although colliery proprietors still decline to quote forward at present rates. For best coal there is only a moderate demand, notwithstanding the severity of the weather, and at many of the collieries considerable stocks are accumulating in waggons. Common round coal meets with a tolerably good sale, both for house-fire and manufacturing purposes, and engine fuel also moves off pretty freely. The average quotations at the pit mouth remain about as under: Best coal, 8s. 6d. to 9s.; seconds, 6s. 9d. to 7s. 6d.; common coal, 5s. 6d. to 6s.; burgy, 4s. to 4s. 3d.; good slack, 3s. to 3s. 3d.; and common, 2s. 3d. to 2s. 6d. per ton. For coke there is a good demand, with better prices ruling. The shipping trade generally is dull, and there is a good deal of coal offering in the market, with prices rather weak and irregular.

LEEDS AND WEST YORKSHIRE.—There is nothing new to report concerning the best Yorkshire iron trade. Rolling plates for shipbuilding purposes seem to be the *piece de resistance* at many of the forges. Where there is scarcely anything else to do this sort of demand has to be provided for. But even as regards railway work, there are a few of the ironmasters who have nothing to complain of. A large Indian order, for instance, which has fallen to the lot of one firm will take a good deal of working out. But the favours which it was hoped the home railways would by this time have had to confer have yet to be waited for. There is a fair demand (especially from America) for the best brands of merchant iron at higher prices which were declared at the beginning of the month. The common iron makers are better employed than they have been for three years past, and no one appears to be aware that it would have been greater had not prices gone up. The Airedale Hematite Iron Company are intending to put another furnace in blast, which will make three altogether, they being the largest in the district. The West Yorkshire Iron and Coal Company are also enlarging their means of production at West Ardsley. The making of crucible steel castings is but a dull branch of the trade. So far as locomotive engines are concerned, those who make tank-engines are acquiring the most new work. A contractor for the conveyance of 1700 tons of iron-piping to the Leeds water-works extension at Eccup has ordered traction-engines in preference to employing horses. One firm in this branch is sending out a specimen engine to the Melbourne Exhibition. Special tool making remains stationary at the point of improvement which was noticed in one of our reports recently. Machinery for specimens is in steady request, but not so much on Yorkshire and Lancashire account as for the Irish and Continental flax industries. The domestic demand for coals has been greatly stimulated by the recent severe weather. There is no change in prices. The consumption of engine-coal is steady rather than brisk.

LONDON.—We have to report a better tone in the metal market here, prices have improved in most descriptions, and while good bona fide business is about there is, no doubt, also considerable speculation, especially in copper and tin. Iron is still commanding high prices, and makers are firm. Copper, better and large sales have been made at £72 to £73 for Chili bars, English £82 for sheets, ingots £78. Tin has had another spurt, and much has changed hands; £99 10s. to £100 foreign, English ingots £105, re-

lined £108 to £109. Lead quiet, but evincing no immediate sign of yielding; English pigs £19 10s. Tinplates quiet.

NORTH STAFFORDSHIRE.—Every week seems to strengthen the feeling that the iron trade of this district has entered upon a career of activity which will last a considerable time. It is true that this impression is hardly borne out by a progressive improvement in the home market; but this may be explained, as it is sought to be in some quarters, by the difficulty of placing contracts in consequence of the already overflowing condition of the order-books, and the disinclination of makers to enter into fresh engagements until they are in a position to fulfil them within a reasonable period. The demand from the United States continues in an unprecedented stream, and creates so much stress at some of the works that it has been found necessary to lay down additional merchant mills in order to keep pace with the requirements. A considerable number of orders have also come in from the colonies, and all the works are extremely busy. There is a good demand for iron rails, and the hoop mills are in full work, with orders accumulating on the books; but the larger sections of iron are not in any such active request as a short time ago. Prices for finished iron are firm, crown bars being quoted at £9 to £9 10s., and other articles in proportion. The pig-iron, ironstone, and coal trades are very brisk. The miners who applied for a 10 per cent. advance of wages have been informed that the employers are unable to comply with that proposal at present, but they will be prepared to give the subject further consideration when the selling price of coal warrants another rise in wages.

NOTTINGHAMSHIRE.—The ironworks in the county of Nottingham are just now pretty active, more particularly as regards the make and demand for pig-iron. A fully average number of furnaces are now in blast, and in other instances, where they have been out for some time, repairs are going on with a view of rendering them fit for work. At several places the demand for manufactured iron is increasing, and the mills and forges exhibit more animation. The coal trade is pretty active, and some of the collieries are sending a good deal of what they raise away by rail. This is the case with the pits along the Erewash Valley line of railway, and in other parts of the district. Prices of house-coal do not increase, as it was expected would be the case when the iron trade began to revive; yet the miners believe that there is an increased business doing, and are agitating for an advance of 10 per cent. without any reference to the state of the market. Manufactured fuel is in fair request, and prices, if anything, are in favour of producers. The improvement in the demand for pig-iron has led to a corresponding increase in the demand for coke, which is being more largely made, whilst the quality has been improved. The pits are, as a rule, making four or five days per week, so that miners and other workmen employed at them have but little cause to complain, considering the depressed state of trade generally.

SHEFFIELD.—There is little that is fresh to record in connection with the heavy trades, but they are steadily becoming more active. At last hematites appear to reach a point beyond which holders cannot force them, and this has occasioned relief to several firms, who have yet large contracts for last year to complete. The demand for South Yorkshire pig for shipments is still heavy and forge irons are obtaining a better market. The larger companies in this locality are full of orders both for raw and manufactured iron and a better sign is the freedom with which bar irons are selling. The feature of the day, however, is the enormous advance in value of the shares of limited companies in this district. Some shares have gone up 300 per cent. in two months, and an advance of 200 per cent. is common. It is well known that these fictitious prices are caused by speculative investments, yet there are no signs as yet of a retrogression. The aggregate improvement in the value of local shares during the past two months is nearly two and a half millions of money, yet the new orders booked by the houses most affected have not approached these sums. We notice a large accession of work in the Bessemer steel department, which is now very brisk, and the tyre market is advancing. This week there were a couple of wheels (engine driving) forged 11 feet in diameter, but we could not ascertain for what company they were intended. This indicates an attempt in some direction to build an engine of enormous proportions. The coal market remains dull. There is a full supply of fuel at the rates last quoted. The colliers are requiring more wages, but the advances are refused. In the iron trade there is some dissatisfaction amongst the men, who are not inclined to sit down with the last decision of Mr. Chamberlain. Before many days have expired it is expected that they will endeavour to resuscitate their unions, which have been crushed by the long depression. In the cutlery branches there is no great pressure of business. The "shops" are mostly engaged in Colonial and East Indian orders. Britannia metal and silver houses are a shade busier, but there is little real improvement to note.

SOUTH STAFFORDSHIRE.—The improved reports touching the wool and corn markets of Australia and South America are welcomed by merchants in this district as surely indicating a better business with those markets in hardware in the early future. The Indian and South African trade is interfered with, touching those hardware in which iron forms the chief item of cost, by the successive increased firmness of makers' quotations, as the referring back of orders is often necessitated. Some industries are doing a little more with the European Continent. Touching the home trade, the customary quietude of the month which opens the year is observable, and manufacturers in this district are not receiving as many orders as they would like. Factors too, who bought for stock, in anticipation of rising prices have now, in most part, filled up their shelves. Nevertheless some individual orders of large extent are arriving. A Wolverhampton firm has lately booked in one line through a merchant house, an order for 148 gross of galvanised buckets, destined, it is believed, for Melbourne and Sydney. So large is the demand for galvanised sheets, that new baths are being laid by some makers. In the commoner descriptions of plate-locks there is more doing than in the expensive sorts, and

makers are securing a rise on the minimum of some time back of 10 per cent. The iron trade is without change on the week.

WEST CUMBERLAND.—During the past fortnight a great improvement has taken place in the industry of this district. Some half-dozen furnaces have been blown in, and other furnaces are being got ready, while on the other hand makers of iron in many directions have determined to extend their works by blowing in new furnaces. The output of the district is going directly into consumption, and stocks have vanished altogether. The business in the market is of a very excited character, as prices continue to go up as makers of pig-iron are unable to supply. During the week sales of Bessemer iron have been effected at 135s. per ton, and in some cases 140s. has been asked by makers who have a little to sell for delivery in three or six months. Forge iron, which, like Bessemer qualities, finds a good market, has reached 133s. for No. 3 quality, and a large parcel has changed hands at 132s. per ton. Large preparations are being made for shipments of iron on a considerable scale to America, the Continent, and elsewhere during the year, while on home account Yorkshire, the Midlands, and Scotland are very good customers. The outlook is cheerful, so far as plenty of work and good prices are concerned, but a few have their doubts whether operations at any moment are at present commercially safe. So far as the present year is concerned, there is no doubt there will be great industrial activity, and makers of iron and steel will dispose of a greater tonnage of metal during 1880 than during any previous year. Shipbuilders are busy at the yards where any work is doing, but one or two yards, owing to special circumstances, are closed. Finished iron is in large request, and as makers have their works in full employ and are still unable to meet the requirements of the trade, extensions are going on on the one hand, and on the other the price of the manufactured article is going up. Iron ore is very scarce indeed, and so full of orders are raisers that they are asking 40s. in some cases for early deliveries of raw material, or 300 per cent. more money than it was selling at six months ago. The coal trade is well employed, and land sales are very considerable, both of steam and domestic qualities. Native coke is in considerable request, but the production is not nearly large enough to furnish the necessary supply for the district, and, as a consequence, large consignments of Durham coke are still used. The Irish market is taking an average, but not more than an average, amount of coal.

CONTINENTAL MINING AND METALLURGY.

FRANCE.

THE continuance of the movement upward of rates at so unusual a time of the year, and during so inclement a season as the present, is the best proof that can be offered of the altogether exceptional condition of trade. At Paris rates have advanced 10 fr., even for irons which must inevitably go into stock. The following are the prices now quoted by the Paris wholesale houses to ordinary buyers:—

	fr.	£	s.
Merchant irons—coke	230	9	4
—mixed	250	10	0
—charcoal	280	11	4
—hoop-irons	280	11	4
Beams—common profiles	240	9	12
Plates—puddled, for bridges	280	11	4
— " " boilers	310	12	8
—charcoal	570	22	12
—puddled, merchant	300	12	0

A further rise is certain to take place in most classes of irons as soon as the weather breaks. Indoors, work is going on very actively; machinery builders in Paris and the suburbs are full of business, and most of them have orders enough on their books to last them through the summer. Various public departments and railway companies are swelling the stream of business. On the 12th inst. the Prefecture of the Calvados gave a swing-bridge out; on Dec. 13th the Eastern of France gave out 50 signal discs; on the 17th inst. the Department of Marine bought 26 tons of grey foundry pig from Castel and Latta. On the 31st tenders will be opened for the steel rails required for the new railway between Châteaubriand and Rennes. The State railways have given out 400 covered goods vans hand-braked, and 200 goods vans screw-braked, to the Société de la Villette, two lots, of 200 and 140 coal trucks each, to Diétrich and Co., and 30 locomotives to Cail and Co. The latter firm would have had 50 locomotives but for the shortness of the time allowed; 20 have therefore gone to the Graffenstaden Works. Business withdrawn in consequence of the minimum of tenders being above the maximum of specifications, will speedily be replaced, there is little doubt. The comedy lately enacted in Belgium, in which the Minister of Public Works stood for Tarquinius Superbus and the rail trade for the Sibyl, offering the same goods at higher rates for each offer, contains a moral which can easily be taken to heart by all spectators. The only element of uncertainty, for business which is not pressing, is in the present more or less factitious prices of raw material. Where there is business in prospect which can safely be deferred for a twelve-month it will probably be deferred, in the hope that the cost of raw material will have found its level by that time. Meanwhile every iron-making department of France is making both iron and profits, and has a clear course before it up to the end of June—the great period of balancing accounts. North-eastern France, which for some few months lagged behind the North, is now as full of business as it can hold. Mills in Haute-Marne only take new business on condition of delivery at their own time, and subject to any rise of rates occurring in the interval between receipt of order and delivery of goods. Prices are on a level with those of the Nord; foundry pig is quoted 130 fr. (£5 4s.); rolled coke irons at 230 fr. (£9 4s.); rolled charcoal iron, £10; wire billets, £10 10s. Rates generally for manufactured goods have risen about 15 per cent. in Champagne, and this rise is considered moderate, seeing that forge pig has risen 100 per

cent. and foundry pig 50 per cent. Points at the beginning of January brought £12 (No. 18), they are now quoted at £14. Nails have risen, as they have also in the Ardennes. In Meurthe and Moselle there is really no stock of foundry pig, and current orders are taken on the basis of £6 per ton; large pig is 100 fr. to 110 fr. (£4 to £4 8s). Importation warrants fetch 12 fr.; enquiries are brisk for English warrants. No. 3 English pig has been sold delivered at 121 fr. (£4 17s.); a heavy lot of white Moselle pig changed hands last week at £4. Founders in Champagne and the Ardennes are working to prices agreed upon by the association to which the majority of them belong.

The demand for old rails on American account continues very brisk; the official quotation at Paris has been 120 fr. (£4 16s.); but at a sale by tender on the 21st, a London firm paid 136 fr. (£5 8s. 6d.). On the same occasion £3 4s. was paid for old castings by the same firm, and 115 fr. (£4 14s.) for scrap by an Antwerp firm.

In the Loire and Rhône districts in which, during the depression, lamentations were particularly poignant, the iron and steel masters have the market in their own hands, and the supplications are all on the side of customers. Here, as elsewhere, the rise in the cost of raw material has outstripped that of the rates of manufactured goods, and the latter are therefore getting scarcer, with no definite prospect of a limit to their advance. In the Centre and South the revival is attributed solely to buying on home account, which began as soon as markets became firm; and on home orders most of the Loire and Rhône mills are occupied. They hope, however, for business from neighbouring countries, more or less directly, in consequence of the more rapid rise of rates in them than in France. Extensions of means of production are not taking place to any considerable degree in France; but a new company has been just formed at Lyons for manufacturing railway plant and bridgework, and undertaking general engineering works. The new company, which has a nominal capital of £20,000, will direct its principal efforts to the acquisition of Italian business.

The Alfortville Ironworks, situated at Maisons-Alfort, on the Seine, will be offered for sale by tender at Paris on the 3rd February, at an upset price of £28,000.

The Paris Society of Civil Engineers met on the 9th inst. to hear from M. Farcot, the outgoing president, his farewell address, and from M. Gottschalk, the new president, his opening speech. This principally concerned itself with railway matters. At the same meeting M. Gautier read a paper on the progress of the dephosphorisation of iron and steel, giving a résumé of the results obtained at Eston, Hörde, and Witkowitz with the Thomas-Gilchrist process, and of those got with the hearth dephosphorisation process, and Krupp's process. The discussion was very brief.

M. Falies, a railway engineer and manager, has lodged with the authorities of the department of the Seine a proposal to construct an elevated railroad in Paris. The first part of this addition to the ornaments of the queen of cities would be made along the line of the boulevards from the Madeleine to the Bastille. One argument adduced in favour of the adoption of the New York scheme is the impossibility of finding a company to take up the construction of an underground railway in Paris.

The patriotic proposal of M. Joubert, to found a popular school of astronomy and optics, fitted with all necessary instruments, is now in the hands of a committee appointed to report upon it. The astronomical museum, founded at the Paris Observatory, and occupying part of the ground and first floors of the Observatory building, will shortly be opened to the public.

Coke is rising rapidly; it fetches 30 fr. (£1 4s.) at the ovens, and no guarantee is given as to percentage of ash. Even then coke-burners will not take forward business.

Belgium.—The market at Charleroi, according to the *Moniteur* published here, continues as brisk as ever, and prices do not appear to have reached their maximum. With the market as it is, with prospects as they are, there is every likelihood of the rise going on unchecked till the spring, when the business wave will probably reach its highest point. Preparations are being made for very active building operations, and there is a strong demand for beams and girders. The *Semaine Industrielle*, published at Liège, states that the mills are overdone with business and turn away specifications. It is characteristic that a complaint should be raised of the Government having given to an English house (!) a bridge to make at Antwerp. The antique wisdom contained in the fable of the old man and his sons might be meditated on with profit by the Government of Belgium, which is, perhaps, the best-harassed with contrary counsel of any in Europe. The illustration afforded by our Liège contemporary, with its italics and note of exclamation, of the Continental determination to take all and give none is a very good one. Side-by-side with the acknowledgment that Belgian mills can take no more work stands the complaint of work going out of the country. Next week the same paper will probably be quoting the yearly returns of the custom house, and exulting over the tonnage of profile irons sent from Belgian mills to the order of English buyers for use in England, the "classic country of the iron manufacture."

At Utrecht, on the 17th inst., the Angleur Steelworks were successful in a competition for 5000 tons of steel rails for the Netherlands State Railways. The Angleur tender was not the lowest in amount, but was the lowest tender which conformed to all the stipulations of the specification regarding time of delivery, &c. The offers received were as follows:—

Bochem Steelworks	117 fl.
Angleur	120 fl.
Hörde	125 fl. 60
Rhenish	140 fl.

The Angleur quotation is equal to about £10 delivered. No duty is levied on steel rails imported into Holland. The Brussels *Intérêts* states that the Angleur works have just started a second basic converter, the lining of the first having behaved very well, and that they have begun delivery of a lot of 3000 tons of wire billets, the quality of which is found satisfactory. A lot of 2500 tons of iron rails have been ordered on Belgian account in France, and will be delivered at Antwerp at 210 fr. (£8 8s.). Antwerp dealers are offering as much as £6 for old rails.

The Charleroi *Moniteur* gives the following quotations for pig-iron:—

	Forge.	Foundry.
Luxemburg	85 fr.	—
Longwy	85 fr.	—
Charleroi	95 fr.	105 fr.
English (Antwerp) ..	92 fr. 50	90 fr.
Athus	90 fr. to 95 fr.	102 fr. 50

The Luxemburg pig makers and those of Liège have sold their make forward to the end of next June.

The Stock Exchange movement of the past few weeks in metallurgical shares has been speculative rather than natural, and a decline has taken place from some of the high values recently quoted. The condition of the Brussels Exchange on the 26th inst. was as follows:—

	Nominal value of share.	Quotations on Jan. 26, 1880.
Cockerill	1000	1175
Sclaccia	325	375
Athus	1000	1850
Monceau	500	890
Forges de Sarrebruck ..	1000	3400
Thy-Je-Château	1000	1900

Régissa Shares have improved from 290 to 350.

A new course of applied electricity has been opened at the Liège school of mines, at the suggestion of the Minister of Public Works. The professor is M. Delarge, telegraph engineer. The concession for 50 years of rights to set up telephonic communication between Liège and its suburbs has been applied for by M. Bede. The wires would be above ground.

GERMANY.—The make of the district of Dortmund last year is calculated to have been as follows:—

	1879.	1878.
Pig-iron	660,000 tons.	632,000 tons.
Irons	459,000	452,000
Steel	489,000	480,000

Fresh furnaces are being put rapidly in blast. We may note, amongst newly-lit furnaces, one at Steele, belonging to the Dortmund Union Company, two at Hörde, which now has eight on blast, or four more than last summer, and four in Siegen, where there are twenty-three on blast and some ten preparing for work. In Alsace-Lorraine there will shortly be an addition of ten freshly-lit furnaces to the present productive power. The German revival and the belief in Germany in its durability are both very striking. The Gutehoffnungshütte, Oberhausen, quotes £10 as its standard price for manufactured iron in a recent price-list. The Hörde works have withdrawn all previous price-lists, and state that they are not bound by the terms of any current list unless for orders sent by return of post on receipt of such list. Rail contracts are let at rates above those of last autumn. On the 13th inst. the State let at Hanover, a tender for 800 tons of Bessemer rails to Oberhausen at £10. On the 12th instant tenders were received for rails at Münster, the Osnabrück Steelworks offering at £9 18s. 6d., Krupp at £10 2s., the Phoenix Works at £10 15s. The lowest offer got by the Main-Weser Railway recently for 1800 tons of rails was £11 15s.; the Mecklenburg Railway let tenders for 4800 tons at £12 8s. These two latter quotations were the rates at the works, and represent a rise on summer prices of about 100 per cent.

Krupp is reported to have taken out a patent for refining pig by means of iron oxide in a cupola lined with basic bricks in graphite. He gets out the greater part of the silicon, sulphur, and phosphorus without touching the carbon. The Steelworks, according to the *Intérêts matériels*, is making 50 tons a day of Thomas steel.

SPAIN.—The following is an extract from a letter from Bilbao to the editor of the journal just quoted:—"Some three months ago ironstone owners here thought themselves fortunate to get 6s. a ton for ore, demands were dull, mining sluggish, and the rumour of the dephosphorisation process caused a very depressing effect. Suddenly we heard of the United States taking heavy quantities of English pig. Bolckow-Vaughan buy 150,000 tons of ore at a stroke, the report spreads that the output of the Mokta mines is engaged for 1880, and that a contract has been entered into with American houses for 800,000 tons. This news being all confirmed, smelters' demands pour in from France, Germany, Belgium, England, and rates go up from 6s. to 8s., and so on, until they stop at 14s., to remain there some time. The total bulk of contracts in hand is about 200,000 tons for immediate delivery, while of this new business scarcely 100,000 tons can be won and sent away this year. There remains, therefore, some 100,000 tons as a sort of counterpoise in the market. Further, large French firms are desirous of contracts for 1881 and 1882."

RUSSIA.—Some 50,000 tons of old iron rails are said to be lying in the Baltic and Black Sea ports awaiting shipment to America.

THE PLATFORMS OF THE 100-TON GUNS.—On Tuesday four revolving platforms, upon which the 100-ton guns will be mounted at Malta and Gibraltar, were delivered at the Royal Arsenal, Woolwich. They are of iron, made in many parts, and each platform will cover, when fitted together in position, about 50 square feet. One similar apparatus is being put together experimentally in front of the proof butts in the Government marshes, adjoining the Royal Arsenal, Woolwich, and it will be tested with one of the great guns prior to their removal to their destination. The system of loading will resemble that adopted on board some of Her Majesty's ironclad ships, the muzzle of the gun being depressed and the charge rammed home by an hydraulic rammer from beneath. Captain Lee, Royal Engineers, has gone to the Mediterranean fortresses to make preparations for erecting the platforms.

WHY BURN GAS? ADOPT CHAPPUIS' REFLECTORS.—They supersede gas in daytime, and promote health, comfort, and economy. They are now in great use in private houses. For prospectus address two stamps to (J.) Chappuis, Patentee and Manufacturer, 69, Fleet Street, London.—[ADVT.]

NEW PATENTS.

ALL the Patents are placed Alphabetically, with the official numbers attached. The New Applications range from No. 238 to No. 346, being the entries from Jan. 20th, to January 26th, 1880.

NEW APPLICATIONS.

- Alcohol from Ligneous Materials.—A communication.—¹³⁵⁸
A. M. Clark, London.
Anhydrous Sulphuric Acid.—A communication.—¹³⁵⁹
W. L. Wise, London.
Aniline Black.—¹³⁶⁰
J. Schmidt, Hyde, Cheshire.
Apparatus to Protect Firemen.—¹³⁶¹
R. Jenkins, Devonport.
Azo Colouring Matters.—A communication.—¹³⁶²
J. A. Dixon, Glasgow.
Ball and Socket Apparatus.—¹³⁶³
G. D. Peters, London.
Baths.—¹³⁶⁴
G. Smith, Glasgow.
Bottle Holders.—¹³⁶⁵
H. Roper and T. R. Edwards, Birmingham.
Bottles and Stoppers.—A communication.—¹³⁶⁶
A. Specht, Hamburg.
Bookbinder's Cloth.—¹³⁶⁷
H. Thornton and F. E. Walmesley, London.
Breachloaders.—¹³⁶⁸
T. Southgate and E. Harrison, London.
Breaching Mechanism.—¹³⁶⁹
G. Quick, London.
Carding Engines.—¹³⁷⁰
S. H. Bickham, jun., and W. Houldsworth, Pendleton.
Cinder Sifting Apparatus.—¹³⁷¹
W. Hammond, Leam.
Colouring Fibrous Materials.—A communication.—¹³⁷²
J. H. Johnson, London.
Condensing Molten Metals.—¹³⁷³
A. Davis, London.
Cut-off Motion for Steam Engines.—¹³⁷⁴
J. Bentley and G. Bentley, Bury.
Daylight Reflectors.—¹³⁷⁵
P. E. Chappuis, London.
Discharging Vehicles.—A communication.—¹³⁷⁶
H. J. Madden, London.
Drawers for Desks, &c.—¹³⁷⁷
R. Kraus, London.
Dress Holders.—¹³⁷⁸
C. G. Gumbel, London.
Dyeing and Printing Colours.—A communication.—¹³⁷⁹
J. A. Dixon, Glasgow.
Elastic Garters.—¹³⁸⁰
M. Inner, Manchester.
Electric Lamps.—¹³⁸¹
J. W. Swan, Newcastle-on-Tyne.
Electric Telegraphs.—¹³⁸²
W. C. Barney, New York, U.S.A.
Electricity for Lighting, &c.—A communication.—¹³⁸³
W. R. Lake, London.
Endorsing Cheques.—¹³⁸⁴
W. W. Pearson, Manchester.
Extraction and Purification of Fat.—¹³⁸⁵
W. H. Allen, London.
Extracting Moisture from Whiting.—¹³⁸⁶
T. Marshall, Hongkong.
Felt Carpets.—¹³⁸⁷
W. Mitchell, Waterpool, Lancashire.
Fire-arms.—A communication.—¹³⁸⁸
W. R. Lake, London.
Fixing Horse Shoes.—¹³⁸⁹
J. M. B. Baker, London.
Flooring.—¹³⁹⁰
T. Wharum, Hyde, Cheshire.
Folding Chairs.—¹³⁹¹
W. H. Vaughan and S. G. Vaughan, London.
Frames for Glasses, &c.—¹³⁹²
T. H. Mann, London.
Gas Burners.—¹³⁹³
J. R. Fielding and B. Butterworth, Rochdale.
Gas Burners.—¹³⁹⁴
W. T. Sugg, London.
Gas Engines.—¹³⁹⁵
C. Linford, Leicester.
Gas Motor Engines.—A communication.—¹³⁹⁶
C. D. Abel, Chancery Lane, London.
Generation of Steam, &c.—¹³⁹⁷
C. Kingsford, London.
Glove Fasteners.—¹³⁹⁸
H. W. Southcomer, Ipswich.
Glove Fasteners.—¹³⁹⁹
H. Hambridge, Yeovil.
Grates, Chairs, &c.—¹⁴⁰⁰
J. G. Gray, Sudbury.
Hammerless Fire-arms.—¹⁴⁰¹
J. Dixon, Redinburn.
Hauling Clip.—¹⁴⁰²
J. Hanson, Kibbura, Horry, Derbyshire.
Heating Feed Water Boilers.—¹⁴⁰³
G. and J. Weir, Glasgow.
Horizontal Wind Wheels.—A communication.—¹⁴⁰⁴
P. H. Engel, Hamburg.
Hot-air Engines.—¹⁴⁰⁵
G. H. Lloyd, Birmingham, and J. E. Rogers, Smithwick.
Ice Manufacture.—A communication.—¹⁴⁰⁶
J. H. Johnson, London.
Improved Reel and Box.—¹⁴⁰⁷
A. Coates, London.
Kilns.—A communication.—¹⁴⁰⁸
M. Bauer, Paris.
Ladies' Dress Suspenders.—¹⁴⁰⁹
T. Brooks and T. Adams, Birmingham.
Lamps.—A communication.—¹⁴¹⁰
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Lighting and Extinguishing Gas.—A communication.—¹⁴¹¹
W. R. Lake, London.
Lixiviating Solid Substances.—¹⁴¹²
J. W. Chenhall, Morriston, Glamorganshire.
Machine for Drawing Corks.—¹⁴¹³
A. Nelson and J. S. Breckley, Margate.
Manufacture of Phosphates.—A communication.—¹⁴¹⁴
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Mannine Distributing Machines.—A communication.—¹⁴¹⁵
C. Kessler, Berlin.
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P. Meek, Dublin.
Propelling Wheeled Vehicles.—A communication.—¹⁴²³
W. R. Lake, London.
Protection of Exposed Surfaces from Wind.—A communication.—¹⁴²⁴
A. Machin, London.
Punching Machines.—¹⁴²⁵
J. Turner, London.
Railway and Tramway Construction.—¹⁴²⁶
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Railway Interlocking Apparatus.—¹⁴²⁷
W. P. Smith, Lostwithiel, Cornwall.
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A. M. Howarth, Rotherham.
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C. Bergeron, London.
Reaping Machines.—A communication.—¹⁴³⁰
A. M. Clark, London.
Revolving Furnaces.—¹⁴³¹
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J. Langley, Sheffield.
Rope Stoppers.—¹⁴³³
W. M. Bailly, London.
Screw Fastenings.—¹⁴³⁴
S. H. Tanser, Liddington.
Securing Lamps in Sockets.—¹⁴³⁵
H. Wallis, Brighton.
Separating Waxy, &c., Substances.—¹⁴³⁶
H. Lisagoray, London.
Showing Carpets.—¹⁴³⁷
W. Taylor, Achlam Road, and H. A. Ridsdale, Chiswick.
Slide Valves.—¹⁴³⁸
R. Robinson, Columbus, U.S.A.
Spinning Machinery.—¹⁴³⁹
E. Danby, J. Helliwell, W. Hillary, and W. Riley, Keighley.
Spinning Machinery.—¹⁴⁴⁰
H. Whitworth, Halifax.
Split Case Manufacture.—A communication.—¹⁴⁴¹
J. Nyland, London.
Steam-Boiler Gauge.—¹⁴⁴²
J. Reimann, Paris.
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T. Legge and J. Bartlett, London.
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Travelling Rollers.—¹⁴⁴⁹
P. A. Williams, London.
Utilising Wool-washing Residue.—A communication.—¹⁴⁵⁰
J. C. Newburn, London.
Vacuum Pumping Apparatus.—A communication.—¹⁴⁵¹
C. Kessler, Berlin.
Valve.—¹⁴⁵²
D. Thomas, Cardiff.
Valves.—¹⁴⁵³
W. C. Church, London.
Velocipedes.—¹⁴⁵⁴
H. T. Mortimer, London.
Vessels for Boiling Worts, &c.—¹⁴⁵⁵
C. A. Moss and T. Johnson, Stockport, and R. Wright, Manchester.
Wash Boiler.—¹⁴⁵⁶
J. F. Hayne, Kingstown, Dublin.
Waste Iron.—¹⁴⁵⁷
B. Biggs, London.
Waterclosets.—¹⁴⁵⁸
A. Gray, Edinburgh.
Water Feeding Apparatus.—¹⁴⁵⁹
E. Davies, Llandinam.
Water Waste Preventor.—¹⁴⁶⁰
R. Watkins, London.

Weighing Machines.—J. Chater, London. [113]
Woven Fabrics.—A. communication.—G. W. von Nuremberg, Berlin. [340]
Wool Spinning Machinery.—A. communication.—M. Bauer, Paris. [310]
Wringing Calico, &c.—E. Ainsworth, Salford, and C. A. Marriott, Manchester. [281]
Yarn and Thread Spinning Apparatus.—Partly a communication.—J. Boyd and T. A. Boyd, Shettleston, Lanark. [323]
Zinc Manufacture.—J. W. Chenhall, Morrison, Glamorgan-shire. [271]

COMMERCIAL.

NEW COMPANIES.

BLAINE FURNACES.—Under an agreement of 12th inst., this company proposes to obtain an assignment of a lease of the Blaine Blast Furnaces, situated in the parish of Aberystwith, in the county of Monmouth, and of premises and things connected therewith. It was registered 14th inst., with a capital of £50,000 in 500 shares of £100 each.

CARNARVON COPPER MINING.—This company was registered 16th inst., with a capital of £20,000 in £1 shares, to acquire and work a mining sett known as Talmignedd-issa, situated in the parish of Llanllyfni, county of Carnarvon.

CLARK AND CO.—This company proposes to manufacture and sell carbolic creosote soap, sheepdip, and other disinfectants, and of gas products, and also to work residual products from gas and other works, or any compound connected with sanitary works. It further proposes to carry into effect an agreement of 12th inst. for the purposes of acquiring from Mr. Thomas Viner Clark, of Trundley-lane, Deptford, certain debts, creosote, stock, materials, and letters patent. The company was registered 19th inst., with a capital of £5000, divided into £4500 A or ordinary shares, and 500 B shares of £1 each. For every eight ordinary shares allotted, Mr. Clarke is to receive one B share.

ECONOMIC COAL ASSOCIATION.—This company intends to carry on the business of colliery proprietors, coal merchants, and dealers, for which purpose it proposes to purchase the business carried on by Mr. John Dryden in London, under style of the Yorkshire Colliery Company. The purchase is regulated by an agreement of 15th ult. between the said Mr. J. Dryden and Mr. James Davidson Scott, the consideration being £1250, of which at least £500 is to be payable in shares. The stock-in-trade of the vendor is to be taken by the company at cost price. It was registered 17th inst., with a capital of £20,000 in £1 shares.

GARRETT SUBMARINE NAVIGATION AND PNEUMATOPHORE.—Upon terms of an agreement of 13th ult., this company proposes to acquire and work certain inventions consisting of a breathing apparatus, submarine torpedo boat, diving dress, and pneumatophore, and also letters patent No. 1839, granted to George William Garrett, for improvements in apparatus connected with submarine navigation. The company was registered 17th inst., with a capital of £10,000 in £1 shares. The purchase consideration is £5000 fully paid up shares, and a first mortgage of £1200 upon the said inventions and patents.

McMAHON'S TELEGRAPHIC NEWS.—The objects of this company are as follows:—To adopt and carry into an agreement of 16th inst., between Francis Edward McMahon and Alfred Collis for acquiring certain licences, agreements and property mentioned therein. To erect, maintain, and work telegraph wires and apparatus for transmitting Parliamentary, sporting, and general news to clubs, hotels, residences and other places. It was registered 20th inst., with a capital of £25,000 in £10 shares.

NEW FLORENCE MINING.—Upon terms of an agreement of 9th inst., this company proposes to take over the properties of the Florence Mining Company, Limited, in liquidation. It was registered 14th inst., with a capital of £15,000 in £1 shares, of which £5000 are preference shares. The purchase consideration is £2000 in cash or preference shares, and £10,000 in fully paid up ordinary shares.

ONGAR GAS, LIGHT, COAL AND COKE.—This company proposes to purchase the gas works and apparatus at Ongar, Essex, now in the possession of Mr. Henry Frost, of 7, Argyll Street, King's Cross. It was registered 17th inst., with a capital of £3000 in £5 shares.

STEAMSHIP "CRAIGMORE."—Registered 15th inst. with a capital of £25,000 in £10 shares, to carry on the ordinary business of a steamship company.

WATERHOUSE LEAD MINING.—With a capital of £15,000 in £2 shares, this company proposes to work the above mine which is situated in the Chapelry of Harydon, parish of Haydon, county of Northumberland. It was registered 20th inst.

PARTNERSHIPS DISSOLVED.

J. Aston and Co., Birmingham, button manufacturers.—Waines and Blake, Newton-le-Willows, Yorkshire, iron-founders.—Carr Brothers and Webster, Sheffield, stove manufacturers; as far as regards H. H. Carr.—R. Quarby, H. Crowther and B. Holroyd, Almonbury, Yorkshire, quarry owners.—E. Vernon and C. Adams, Smethwick, Staffordshire, engineers.—Wilson and Craiks, Berwick-upon-Tweed, ironfounders.—G. Atkinson and R. W. Vaughan, Coleford, Gloucestershire, civil engineers.—T. Ballie and Co., Wardour Street, Soho, enamellers.—Palmer and Son, Aston, Warwickshire, bicycle manufacturers.—Stansfield, Shipstone and Moore, Sheffield, joiners' tool manufacturers; as far as regards W. Moore.—H. Hargreaves and Co., Bury Lancashire, ventilating engineers.

JAMES H. WEAVER AND CO.'S METAL REPORT.

SINCE our last issue, the position of things in the metal market has again improved, and large transactions have taken place. In iron, a steady business is doing, and manufacturers are well booked. A good demand exists for hoops, both iron and steel, for South America.

Copper remains firm, with an upward tendency. Chili bars, £73 10s.; English, proportionally dearer, as quoted below.

Tin: We have had a rapid advance in this metal, but even now prices are only commensurate to the values and attitude of other metals.

Lead continues steady at list prices. There, perhaps, is not so much excitement.

Our prices of leading metals are, per ton, London:—

	£ s. d.	£ s. d.
Iron—Bars	8 10 0	9 10 0
Hoops	9 0 0	10 0 0
Sheets	11 0 0	12 0 0
Iron Wire	12 10 0	13 10 0
Copper—Sheets	82 0 0	84 0 0
Ingots	78 0 0	—
Wire	0 0 8½	0 0 9
Tin—Straits	99 10 0	100 0 0
English Ingots	105 0 0	—
Bars	106 0 0	—
Refined	108 0 0	109 0 0
Zinc—Sheets	25 0 0	—

Tinplate: Makers are now anxious to get off some of their present orders before entering. Cokes, 32s., 32s. 6d. per box; charcoal, 36s., 39s.

Quicksilver: £7 10s. per bottle.
26, Leadenhall Street, London, E.C.
20th January.

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.

PLACES OF SALE.	PROPERTY FOR SALE.
Wear Ironworks.	Ironworks.
Wirksworth.	Limestone Quarry.
Monges, Portugal.	Iron Mines.
Whitehaven.	Locomotive Tank Engines.
Middlesborough.	Colliery.
Easton Road.	Telegraph Plant.
Gloucestershire.	Freehold Estate.
Middlesborough.	Ironworks.
Auction Mart.	Factory Premises.

OPEN CONTRACTS.

Pacific Steam Navigation Company, Liverpool.	Steam Hammer, Crane, Furnace, &c.
Trinity Board.	Iron Bridge Sinkers.
India Office.	Lantern.
"	Railway Fittings.
"	Locomotive Engines.
"	Iron Bridge Works.

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

[FOR THE PRESENT AND PAST WEEK.]

(Metal Market, City, Thursday Afternoon, 4 P.M., January 29, 1880.)

METALS AND ORES.

	JANUARY 22.	JANUARY 20.
COPPER (per ton)—	£ s. d.	£ s. d.
Chili, for 99 per cent.	73 0/ 73 10/	73 10/ 73 15/
Wallaroo	81 0/ 82 0/	82 0/ —
Burra Burra	—	81 0/ —
English Tough	79 0/ 80 0/	78 0/ 80 0/
English Ingot, best	—	80 10/ 81 0/
Sheets sheathing and rod ..	—	82 0/ 84 0/
Bottoms	82 0/ 84 0/	86 0/ 88 0/
Ore per unit	0 14/6 14 0/	0 13/2 0 14/
PHOSPHOR BRONZE		
Special Bearing Metal (p n) ..	110 0/ —	110 0/ —
Other alloys (per ton)	115 0/ 130 0/	120 0/ 142 0/
TIN (per ton)—		
Straits (Cash)	98 0/ —	99 10/ 110 0/
Do. for arr	—	—
Billiton	—	—
Banco	—	—
English Ingots	103 0/ —	105 0/ —
Do. Bars	104 0/ —	106 0/ —
Do. Refined	100 0/ —	108 0/ 110 0/
Australian	98 0/ —	100 0/ —
TIN PLATES, per box, I.C.		
coke f.o.b. London	0 30/ 0 32/	0 30/ 0 32/
I.C. do.	0 35/ 0 40/	0 35/ 0 40/
I.C. charcoal	0 34/ 0 36/	0 34/ 0 36/
I.X.	0 40/ 0 44/	0 40/ 0 44/
LEAD (per ton)—		
Soft English pig	10 0/ —	10 0/ 10 10/
Do. W.B.	—	—
Spanish soft	18 13/ 18 15/	18 10/ 18 15/
Do. with silver	—	—
Sheet milled	19 10/ 19 15/	19 10/ 19 15/
Red lead	20 10/ —	20 10/ —
White	24 0/ —	24 0/ —
Patent shot	22 0/ 23 0/	22 0/ 23 0/
ZINC (per ton)—from No. 9 Gauge.		
Sheets, rolled	24 7/6 —	25 0/ —
Do., foreign	25 0/ —	25 0/ —
SPELTZ (per ton)—		
Rhenish, com	21 0/ —	21 0/ —
English	—	—
QUICKSILVER, bot	7 5/ 7 10/	7 5/ 7 10/
ANTIMONY (per ton)—		
Australian	11 10/ 14 10/	11 10/ 14 10/
Spanish	—	—
French Star	68 0/ 70 0/	68 0/ 70 0/
REGULUS—		
Crude (per cwt.)	1 14/ —	1 14/ —
NICKEL (per lb.)	0 3/ —	0 3/ —
BRASS (per lb.)—		
Sheets, 48 x 24	0 0/6 —	0 0/6 —
Tubes	0 0/8 0 0/9	0 0/8 0 0/9
Wire	0 0/2 —	0 0/2 —
Yellow metal	—	—
ASBESTOS (per lb.)—		
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/ —
Tea	1 4/ —	1 4/ —
Hartley	1 2/ —	1 2/ —
Heaton	1 4/ —	1 4/ —
Hawthorn	1 3/ —	1 3/ —
Tunstall	1 2/ —	1 2/ —

IRON.

	JANUARY 22.	JANUARY 20.
IRON, per ton (at works)*—	£ s. d.	£ s. d.
Bars, Welsh, common	6 5/ 6 7/	6 5/ 6 7/
Do. Best	7 0/ —	7 0/ —
Scotch, Common	8 10/ —	8 10/ —
Do. Best	8 0/ —	8 0/ —
South Stafford, common	8 10/ —	8 10/ —
Do. Best	8 10/ —	8 10/ —
Sheets, singles, Cleveland	9 0/ —	9 0/ —
Staffordshire	9 5/ 9 10/	9 5/ 9 10/
Do. doubles, Staffordshire	10 15/ 11 5/	10 15/ 11 5/
Scotch	10 5/ —	10 5/ —
Do. Lattens, Staffordshire	12 3/ 12 15/	12 3/ 12 15/
Plates, Ship, Stafford	10 0/ 10 5/	10 0/ 10 5/
Do. Scotch	8 5/ 8 15/	8 5/ 8 15/
Do. do. Stafford	12 0/ 12 10/	12 0/ 12 10/
Do. Boiler, Stafford	9 0/ 10 0/	9 0/ 10 0/
Hoops, Stafford	8 10/ 9 0/	8 10/ 9 0/
Nail Rods, Stafford	7 17/6 7 17/6	7 17/6 7 17/6
Swedish in Lond.	11 0/ 11 10/	11 0/ 11 10/
Angle Iron, Welsh	7 10/ 7 0/	7 10/ 7 0/
Do. Stafford	8 10/ 9 10/	8 10/ 9 10/
Pud. Bars, Welsh	6 0/ 6 10/	6 0/ 6 10/
Do. Stafford	6 0/ 6 10/	6 0/ 6 10/
Do. Scotch	—	—
Rails, Welsh	5 0/ 5 10/	5 0/ 5 10/
Do. Stafford	8 0/ 9 10/	8 0/ 9 10/
North England	5 5/ —	5 5/ —
Light Rails, Welsh	5 7/6 5 15/	5 7/6 5 15/
Do. Stafford	7 10/ 8 0/	7 10/ 8 0/
Pig Iron at Glasgow	3 12/ —	3 12/ —
Scotch warrants	3 13/ 4 5/	3 13/ 4 5/
Do. No. 1	2 1/ 2 0/	2 1/ 2 0/
Cleveland, Tyne or Tees	—	—
Indian Charcoal, London	—	—
Wrought Iron Girders	13 0/ 18 0/	13 0/ 18 0/
Rolls and Nuts	13 0/ 15 0/	13 0/ 15 0/
Fish Bolts	13 0/ 30 0/	13 0/ 30 0/
Washers	13 10/ 14 0/	13 10/ 14 0/
Kivets	10 0/ 13 0/	10 0/ 13 0/
Spikes	12 10/ 14 10/	12 10/ 14 10/
SWEDISH IRON—		
Do. b. Gotteburg, nett cash.		
Pig	11 0/ 11 10/	11 0/ 11 10/
Do. hammered	11 0/ 11 10/	11 0/ 11 10/
Billets	13 10/ —	13 10/ —
Horse Nail Rods	14 0/ 14 10/	14 0/ 14 10/
BELGIAN IRON—		
Do. b. Antwerp, less 2½ per cent.		
Bars and Silt Rods, common ..		
Best		
Best Best		
Hammered		
Puddled Steel		
Bessemer		
Hoops		
Rails		
Roller Girders		
STEEL—		
Best cast	40 0/ 42 0/	40 0/ 42 0/
Do. dbl. shear	45 0/ —	45 0/ —
Do. single do.	38 0/ 40 0/	38 0/ 40 0/
English spring med. quality ..	12 0/ 12 0/	12 0/ 12 0/
Blister	21 0/ 31 0/	21 0/ 31 0/
Swedish kog	10 0/ —	10 0/ —
Milan	25 0/ 28 0/	25 0/ 28 0/
Bessemer rails	6 5/ —	6 5/ —
Do. tires	11 0/ 15 0/	11 0/ 15 0/
Do. billets	7 10/ 10 0/	7 10/ 10 0/
Do. ingots	7 0/ 8 0/	7 0/ 8 0/
SPRUE IRON—		
Manganese, best	6 0/ 6 10/	6 0/ 6 10/
Common, and white, per ton ..	5 0/ 5 10/	5 0/ 5 10/
SCRAP (per ton)—		
Old rails for remanufacture ..	4 0/ —	4 0/ —
Do. H.	4 0/ —	4 0/ —
Ditto flange or bridge	4 0/ —	4 0/ —
Engineers' scrap	3 0/ 4 0/	3 0/ 4 0/
Light scrap	3 0/ —	3 0/ —
Scrap metal	2 0/ 3 0/	2 0/ 3 0/
Old steel scrap	3 15/ 4 10/	3 15/ 4 10/
WIRE—		
Best best drawn killed		
gal. tel., Nos. 6 to 6	17 0/ —	17 0/ —
Do. 7 & 8	18 0/ —	18 0/ —
Do. 9	18 15/ —	18 15/ —
Do. 10	19 10/ —	19 10/ —
Do. 11	20 0/ —	20 0/ —
Do. 12	21 0/ —	21 0/ —
Roller black fencing wire		
(per ton) 1 to 4	10 10/ —	10 10/ —
Do. 5	11 0/ —	11 0/ —
Do. 6	11 10/ —	11 10/ —
Do. 7	12 0/ —	12 0/ —
Bright Iron Wire (Charcoal		
wire, 45. 6d. per bundle		
extra per bundle	0 13/ —	0 13/ —
Do. 63 lb. 0 to 6	0 13/ 0 13/	0 13/ 0 13/
Do. 7 to 8	0 13/ 0 13/	0 13/ 0 13/
Galvanised, 80s. per ton extra.		
Best best annealed drawn		
fencing wire, per ton	12 5/ —	12 5/ —
Do. 7	12 15/ —	12 15/ —
Do. 8	13 0/ —	13 0/ —
CARRINGS (per ton) at works—		
Girders	6 10/ 7 10/	6 10/ 7 10/
Chairs	4 10/ 5 0/	4 10/ 5 0/
Floor plates	3 10/6 —	3 10/6 —
Pipes, 1½ to 2in.	0 12/6 7 0/	0 12/6 7 0/
Do. 3 to 4	0 12/6 0 3/	0 12/6 0 3/
Do. 5 to 8	0 1/6 6 4/	0 1/6 6 4/
Do. 10 110	6 0/ 6 2/6	6 0/ 6 2/6
Do. 18	5 17/6 0 0/	5 17/6 0 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/ 18 10/	17 10/ 18 10/
Rivets	14 10/ 21 0/	14 10/ 21 0/
Washers	19 10/ 21 10/	19 10/ 21 10/

* The entire ton consists of ten times 100 kilograms, or about 30 lb short of an English ton.

OILS, CHEMICALS, &c.

	JANUARY 22.		JANUARY 20.	
	£	s.	£	s.
Oils (per tun)--				
Olive, Malaga	—	—	—	—
Do. Gioja	—	—	—	—
Do. Levant	45	10/	45	0/
Do. Mogador	—	—	—	—
Do. Tunis	—	—	—	—
Do. Seville	47	10/	46	0/
Do. Sicily	43	0/	45	0/
Seal, pale	30	0/	30	0/
Seal, yellow	27	0/	27	0/
Seal, brown	25	0/	25	0/
Sperm head	69	0/	70	0/
Cod	27	0/	27	0/
Whale, pale	20	10/	20	10/
Do. yellow	25	10/	25	10/
Do. brown	20	0/	20	0/
E.I. Fish	—	—	—	—
Rapeseed, English, pale	31	10/	31	5/
Do. brown	29	12 6	29	5/
Foreign Pale	—	—	—	—
Ground nut and Gingelly	—	—	—	—
Madra	—	—	—	—

	JANUARY 22.		JANUARY 29.	
	£ s.	d.	£ s.	d.
Palm oil, fine.....	36 0/	—	35 15/	—
Palm nut oil.....	35 15/	36 0/	35 10/	—
Linseed oil.....	27 15/	—	27 0/	—
Cotton seed oil.....	29 0/	39 5/	29 0/	30 5/
Lard.....	44 0/	—	44 0/	—
Cocanut, Ceylon.....	30 0/	—	38 0/	—
Do. Ceylon.....	30 0/	—	38 0/	—
Do. Mauritius.....	37 10/	—	37 10/	—
C. Price & Co.'s patent engine oil (per gal.).....	0 3/6	—	0 3/6	—
Oil Cans (per ton).....	11 5/	—	11 5/	—
Linseed, Ldn.....	10 10/	—	10 10/	—
American lds.....	10 12 6/	—	11 12 6/	—
Do. bags.....	9 15/	—	9 15/	—
Marseilles.....	5 0/	—	5 0/	—
Rape, English.....	5 0/	—	5 0/	—
Do. Foreign.....	6 0/	—	6 0/	—
Green Cotton.....	6 0/	7 17/	6 0/	7 10/
TALLOW—PVC.....	41 0/	—	41 0/	—
S. American Beef.....	—	—	—	—
Do. Sheep.....	36 0/	—	36 0/	—
Australian Beef.....	40 10/	—	40 0/	—
Do. Sheep.....	34 0/	—	34 0/	—
Rough Town Fat.....	—	—	—	—
PETROLEUM.....	—	—	—	—
Fine (per gal.).....	0 0 7/	—	0 0 7/	—
Do. spirit.....	0 0 7/	—	0 0 7/	—
TURPENTINE—Split.....	—	—	—	—
French.....	—	—	—	—
American (casks).....	1 12 9/	—	1 12 3/	—
WHALE OIL (per ton).....	1100 0/	—	1100 0/	—
Davis' Straits.....	1000 0/	1000 0/	1000 0/	1000 0/
Arctic.....	500 0/	—	500 0/	—
Southern.....	—	—	—	—
BRIMSTONE (per ton).....	—	—	—	—
Rough, ad. ind.....	7 0/	—	7 0/	—
Do. lds, do.....	5 10 6/	—	5 10 6/	—
Kill.....	8 15/	—	8 15/	—
Sulphur, Flour.....	11 0/	—	11 0/	—
Acids (per lb.).....	—	—	—	—
Acetic, fine.....	0 0 4/	—	0 0 4/	—
Do. common.....	0 0 3/	—	0 0 3/	—
Citric.....	0 0 3/	0 2 1/	0 0 3/	0 2 1/
Muriatic fine (per cwt.).....	0 4/	0 6/	0 4/	0 6/
Do. common.....	0 4/	0 5/	0 4/	0 5/
Nitric.....	0 0 4/	—	0 0 4/	—
Oxalic (per lb.).....	0 0 5/	0 5 1/	0 0 5/	0 5 1/
Sulphuric, concentrated.....	0 0 4/	0 0 1/	0 0 4/	0 0 1/
Do. Brown.....	0 0 0/	—	0 0 0/	—
Tartaric Crystal.....	0 1 6/	0 4 7/	0 1 5/	—
Do. Poly.....	1 0 6/	0 1 7/	0 1 5/	—
AMMONIA.....	—	—	—	—
Carbonate, per lb.....	0 0 7/	—	0 0 7/	—
Sulphate, White & grey (per ton).....	20 0/	—	20 0/	—
ARSENIC—White Lump (per ton).....	23 10/	—	23 10/	—
Powdered, do.....	11 5/	—	11 5/	—
Bleaching powder.....	8 6/	—	8 6/	—
BORAX, Rld., do.....	1 10/	—	1 10/	—
COPPERAS (ton).....	2 5/	2 10/	2 5/	2 10/
BI-SULPHIDE CARBON (per ton).....	24 10/	26 0/	24 10/	26 0/
PORTLAND CEMENT.....	—	—	—	—
1st quality, in cks 400 lb. gross, inc. cks., l.o.b., Thames, per cwt.....	0 9/	—	0 9/	—
Do. in cks, 500 lb. net (per ton).....	2 0/	—	2 0/	—
Sacks extra, 1/6 each.....	—	—	—	—
Charlton White Paint (per cwt.).....	1 12/	—	1 12/	—
Calley's Tallow Paint, Brown Do. Red.....	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 0/	0 0/	0 0/	0 0/
Manganese.....	0 0/	0 0/	0 0/	0 0/
Soda.....	0 5/3	0 6/	0 5/3	0 6/
LEAD (per cwt.).....	—	—	—	—
Acetate, best.....	2 0/	—	2 0/	—
Nitrate.....	1 15/	—	1 15/	—
Red.....	1 1/	—	1 1/	—
White.....	1 3/	1 4/	1 3/	1 4/
LITHIUM (per cwt.).....	1 1/	1 2/	1 1/	1 2/
LIME (per ton).....	—	—	—	—
Acetate, Grey, 85%.....	0 10/	—	0 10/	—
Do. Brown, 70%.....	11 0/	—	11 0/	—
POTASH.....	—	—	—	—
Richmonte (lb.).....	0 0 6/	—	0 0 6/	—
Chlorate (pr. lb.).....	0 0 7/	—	0 0 7/	—
Muriate, 80% ton.....	0 15/	—	0 15/	—
Pruss. Red (lb.).....	0 1 8/	—	0 1 8/	—
Do. Yel. lb.....	0 0 11/	0 1/	0 0 11/	0 1/
Sulphate, 80% (per ton).....	14 0/	16 0/	14 0/	16 0/
SALTETRE (per cwt.).....	—	—	—	—
Rgl. refud. kgs.....	1 7 6/	—	1 7 6/	—
Do. barrels.....	1 6/	—	1 6/	—
Do. Bengal.....	0 10 6/	1 1 6/	0 10 6/	1 1 6/
SODA.....	—	—	—	—
Ash, deg.....	0 0 11 15-16	0 2/	0 0 11 15-16	0 2/
Bicarb. (per cwt.).....	0 10 0/	0 11/	0 10 0/	0 11/
Caustic, 60%.....	0 12/	—	0 12/	—
Do. 72%.....	0 13/	—	0 13/	—
Nitrate.....	0 19/	—	0 19/	—
Crystals (per ton).....	4 0/	—	4 0/	4 0/

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

PRICES CURRENT OF MANUFACTURED GOODS OF BIRMINGHAM AND DISTRICT.

This List being compiled exclusively for the pages of IRON, all rights of reproduction are reserved. The quotations given are 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.

January 28, 1880.

Last week we reported the following advances in hardware:—Screws by Messrs. Nettlefolds and other makers. Advances on other manufactures of Messrs. Nettlefolds; best round and paubed rivets; chains, cables, and anchors; patent wrought-iron hinges; smokestack and other heavy rivets; fryingpans; heavy nails and castings; box irons, sash pulleys, flat iron bar, and ring weights; hat-pins, hat and coat hooks; stair rods; kitchen fire-irons and fenders; brass and copper wire; tubes, sheets, and brass bells; copper and zinc sash chain; wire tacks and Paris points; Lancashire

locks, latches, and hinges. Following the lead of Messrs. Nettlefolds last week the manufacturers of cotter pins, wire gimp, and panel pins, and timmen's rivets have all reduced their discounts in proportion; and those patent hinge makers who had not received advices of alterations have now done so—the margin between the different makers of patent hinges not now being so great as was the case when iron was so very low in price, especially in hinge strip. This week Scotch and other shoe heels are advanced from 3d. to 6d. per gross. The makers of brass toddy kettles and brass candlesticks have reduced their discounts 2½ per cent. Brass lock-furniture makers have reduced their discounts again 2½ per cent. Makers of small chains have advanced their prices 10 per cent in the nett. Some of the tin and Japan ware manufacturers have reduced their discounts 2½ per cent. Brass wire sheets, and tubes, and copper-wire sheets and tubes, are again advanced ½d. per lb. in addition to the ½d. put on last week, and copper seems to be steadily going up again in prices. Thus it seems that the first series of advance brought about by the rise in iron is complete. Up to the present every article in the heavy departments of the hardware trade has been advanced in proportion to the cost of the raw material which is used in their production; and it is presumed that till iron again goes farther up the present lists will be maintained, but should any further advance, which is looked for by some, take place in the iron trade, we may look immediately for some increases being made on every article on which we have advised advances from time to time during the last three months. At present, except in some of the heavier branches, hardware is still in an unsatisfactory position. The present advances have, all along, checked buyers from operating, as they were not believed in, except in a few quarters, where the benefit will, no doubt, shortly be reaped, as there is no chance of any reduction being made in the price of iron, but the reverse is confidently expected. Lower prices, therefore, in hardware cannot be looked for, and before the quarter is out we shall probably see still higher values ruling. The price of marked bar iron is £9 at the works, and other brands are quoted £8 10s., being only a difference of 10s. per ton between the two, in place of 50s. four months ago.

THURSDAY EVENING.

The iron market to-day was less animated than last week, and quotations showed no further advances, but were steady at late rates in some instances. Lots under market rates were being offered by holders who had bought on speculation, but rates at makers' works were unchanged.

ABRIDGED LIST.

Axles, 15 to 25½; coach ironwork, 10 to 15½; coach and waggon springs, 15 to 20½; Augers, 10 to 20½. Axles.—Ship carpenters', 5½ to 6 per lb.; Kent and house carpenters', 5 to 6½; ditto, steel polished, 5½ to 7½; felling axes, 4½ to 5½; polished, 4½ to 6½; bright and blued solid steel, 7½ to 8½; American folding or wedge Axes, steel polished, 7½ to 8½ per lb.; common Axes, 8½ 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 7½ per doz.; deep Basins, galvanised, 12 inch, 10 to 12½ per doz.; Bastard Bellows, 4½ to 5½; Best extra nailed Bastard, 3½ to 4½; Best improved long Bristol, 3½ to 4½; casters' or moulders', best extra nailed, 12 inch, 30 per doz. net; common Smith's Bellows, 45 to 50; Best warranted, extra leather double nailed, 36 to 40; with movable pipe for shipment 2½ less discount. Bed screws, 6 and 7-16 and 1 inch, 10 to 11½ per gross for London black heads; London heads with bright turned collar, 6 and 7-16 and 1 inch, 12½ to 13½; Black welded heads, 9½ to 10½; common slit heads, 6 and 1 inch, 9½ to 10½; Bright turned notched heads, 6 and 7-16 and 1 inch, 13½ to 14½; black notched heads, 10½ to 11½ per gross; Brass head nails, 40 to 42½; star head, 35 to 40½; Brass plated countersunk head, 25 to 30; Blacksmiths' tongs, 20 to 28 per cwt.; real fine wrought Box irons, 20 to 25½; fine cast, 42½ to 60; middle cast, 42½ to 60; charcoal box irons—Victoria, 45 to 50; ordinary charcoal box irons, 55 to 70; Bolts—Straight tower; solid end tower, 65 to 75½; and Best solid tower, 60 to 65½; solid end barrel brass knob, 60 to 65½; Japanned Scotch tower bolts, 45 to 50; painters' brushes, 45 to 55; flat, 10 to 40; light galvanised Buckets, 12 inch, 1 lb. to the doz., 10/ per doz. net; Blind cord, 12 price net. Bed hooks and eyes, 50 to 55½ malleable, 60 to 65½; Brass chain Beading, 30 to 35½; Brass and plate coach heading, 30 to 35½; ashpan moulding, 20 to 10½; Bottle jacks—Linwood's, 15 to 20½; Salter's, 30 to 35½; Nicholas's, 15 to 20½; common painted Beams, 35½ to 65½; Bright round end beams, 40 to 55½; Bright box end beams, 40 to 55½; deep Copper scales, 45 to 65½; Steelyards, 40 to 60; pocket steelyards, best counter weighing machines, Avery or other best make, 25 to 30½; common, with round copper scale, 7 lb., 3 to 5½; 14 lb., 3½ to 5½; 28 lb., 5 to 8 each net; Bedsteads, cheap stump, 6 feet by 3 feet 6 inch, 7½ to 9½ each; cheap French, 6 feet by 3 feet 6 inch, 8½ to 10½ each, rising 7½ for every 6 inches. Brass—Rolled brass, 2 to 12 inches wide, to 30 W.G., 10½ to 10½ per lb.; Brass sheets, 24 by 48 inch, 8 lb. and upwards or 27 W.G., 10½ to 10½ per lb.; House bells, brass rough, 10 to 11 per lb.; turned edge, 11½ to 11½; turned, and lacquered on edge, 11½ to 11½ per lb.; cattle and sheep bells, with brass loops, 1½ to 1½ per lb.; clock bells, 1½ to 1½; ship and turret bells, 1½ to 1½; Battery kettles, 150 per cwt.; composition sheathing and Blasting nails, 10½ to 11½ per lb.; Brass Escutcheon pins, 1 by 16 inch, W.G., 10½ to 1½; Brass Jelly pans, with balls, 1½ to 1½; without balls, 1½ to 1½ per lb.; Maslin kettles, cast, 4 to 16 inch, 10½ to 1½ per lb.; Pinpoints, 1½ to 1½; Brass Rivets for boot, 12 to 15 W.G., 1½ to 1½; 1½ per lb.; Brass Shoe Bolts, 1½ to 1½ per lb.; Brass Scale pans, 2 to 2½; Brass Toddie kettles, 15 to 20½; Brass Tubes, plain rough, 1 inch and above, 10½ to 11½ per lb.; Locomotive and marine boiler tubes, seam less from 1½ to 4 inch outside diameter, to 14 W.G., 7½ to 10½.

Copper.—Copper boat nails, wrought 1½ by 12 inch, W.G., and upwards, 10½ to 1½ per lb.; Copper 1 boat Rovers, 1 inch and upwards 12½ to 1½ per lb.; Copper Brads and bills, same price as tacks. Light round Copper Kettles, bare rivets, 1½ to 2½ per lb.; Light round covered rivets, 1½ to 1½½; loaded, 1½ to 1½½; oval Copper kettles, bare rivets, 2½ to 2½ per lb.; oval bare rivets raised down, 2½ to 2½ per lb.; Copper Rivets and washers, 1½ to 1½ per lb.; Copper Blasting nails, cut, 1 to 1½ inch and upwards, 1½ to 1½ per lb.; Copper Scale pans, 1½ to 2½ per lb.; cut Copper Nails and tacks, 1 inch and upwards, 1½ to 1½ per lb.; wrought Copper nails and tacks, 1½ to 1½ per lb.; Copper Wire, 20 to 20 W.G., 10½ to 1½; Brass on-board turns, 45 to 52½; Chair webbing, No. 9, 4½; 10, 4½; Co. 4½; Cio. 4½ per gross of 66 yards; Carpet rings, 1 to 1½ per gross; Cornice poles, 2½ inch, brass best burnished, 4½ per foot, 25 to 35½; 3½ covered; brass poles, 1½ per foot, 25 to 35, imitation mahogany cornice poles with ends and rings, complete, 2½ inch, 1½ per foot; light birch ditto, 1½ to 1½ per foot; real mahogany, 2½ to 2½ per foot; cornice pole rings, brass, 2½ inch, light, 2½; middle, 2½; strong, 4½ per doz., 20 to 30½; wood cornice pole rings, 2½ inch, imitation mahogany, 15½ to 15½ per gross net; light birch, 17½ to 17½; real mahogany, 20½ to 25½ per gross net; machine made wire Chain, single link, iron, 50 to 55½; double link, iron, 45 to 50½; single link, brass, 45 to 50½; registered double link brass, 40 to 45½; close link brass Chain, 15 to 20½; brass oval lamp Chain, 30 to 35½; brass Clock Chain, 30 to 35½; Japanned pillar Chains, 1 yard, 10½ by 6, 6½ to 7½ per doz.; Japanned manger, 12 yard by 6, 8½ to 9½; Japanned rack, 1 yard, 18 by 6, 5½ to 6½; Japanned dog, 12 yards, 12 by 7, 6½ to 7½; 2 yards, 14 by 6, 11 to 12½; Cowlings, 2½ inch, or Derbyshire, 8½ to 10½; open ring, 8½ to 10½; close ring, 7½ to 8½ per doz.; Japanned watering chains, 14 by 6, 4½ to 5½; tinned watering chains, 14 by 6½; black chains, 1 inch hook at each end, 10½ to 20½ backhams, 10½ to 20½; short

link Chain, plain or twisted, 1 inch, 18½ to 20½; 1½ inch, 16½ to 18½; 1 inch, 14½ to 16½ per cwt.; Cart and plough traces, 21 to 23½ per cwt. Chesthandles, improved Japanned, 75 to 77½; broad plate, strong and extra strong, 15 to 55½, according to strength; railway Cotterpins, 55 to 60½; Brass Curtain rings, 37½ to 42½; Brass Chair nails, 40 to 45½; square box Coffee mills, 25 to 50½; Common post Coffee mills, 20 to 30½; best brass burnished mills, 40 to 45½; London mills, 35 to 40½; registered Coffin furniture, 50½; Common, 75½.

Door springs, X, 75 to 80½; XX, 70 to 75½; XXX, 65 to 70½; XXXX, 55 to 60½; brass circular and iron circular, 55 to 60½; brass reliance, 50 to 55½; climax, 5 to 10½; universal, 50 to 60½; paragon, 10 to 15½; smith's, 10 to 15½; O'Connor's patent lever hinge springs, 10 to 15½; 10 to 15½; O'Connor's vertical spring hinge door spring, 15 to 25½; Gerish's spring hinges, iron, 20 to 25½; brass, 10 to 15½; Japanned Door chains, 30 to 60½.

Fires, 25 to 50½; Frying pans, best, 50 to 55½ common, 55 to 60½; kitchen Fireirons, in sets, 7½ to 7½ per lb.; tongs only, 10½ to 11½; poker only, 10½ to 11½ per lb.; Fish hooks, 30 to 35½, best; common, 50 to 55½; light kitchen Fenders, 5 inch assorted, 2 feet 6 inches to 3 feet 6 inches, black fronts, 28 to 30 per doz.; bright fronts, 31½ to 34½; Manchester pattern kitchen Fenders, 5 feet 1 inch top, black front, 2 feet 9 inches to 3 feet 3 inches, 37½ to 41½ per doz.; 3 feet 3 inches to 3 feet 9 inches, 42½ to 46½; Cut wire Fencing staples, 2½ to 3½; 2½ to 3½ per cwt.

Gridirons, London pattern, fluted, 6½ to 6½; light ditto, 6½ to 6½; hanging round bar, 50½ to 55½; doublet, 17½ to 42½; round bar 1½ per bar, 57½ to 62½; best fluted bar, 54 to 62½; flat bar, 57½ to 62½; common flat bar, 57½ to 62½; common Gridirons, 1½, 1½ and 2 per bar, 65 to 70½; Goffering tongs, two prongs, 5½ to 6½ per doz.; Gimblets, 10 to 15½.

Ironfoundry, general.—Ash grates, 11 to 12½; air bricks, 2½ to 3½, half, single, 3½ to 4½; double, 6½ to 7½; Bars and bearers, 9½ to 10½ per cwt.; barrow wheels, 10½ to 11½; bake pans, 9½ to 10½; cart bushes, 11½ to 13½; camp ovens, 15 to 17½; cooking stoves, 12½ to 13½; coals for blocks, 17½ to 19½; cellar grating, 10½ to 11½; clock weights, 9 to 11½; Dutch stoves, 11½ to 13½; dumbbells, common, 9½ to 11½; best best Japanned, 20½ to 21½; frying pans, cast handles, 12½ to 14½; frying pans with wrought handles, 10½ to 18½; furnaces, up to fifty gallons, 1½ to 4½; galvanised furnaces up to fifty gallons, 9 to 1½ per gallon; furnace doors, 12½ to 14½; furnace grates, 9½ to 11½; forge backs, 12½ to 13½; heaters for box irons, 8½ to 10½; heaters for urns, 10½ to 11½; jack wheels, 18½ to 20½; oven doors and frames, 12½ to 14½; pots, three legged, Danish, plumbers', and Negro, 10½ to 12½; plumb bobs, 13½ to 15½; pudding pans, 13½ to 15½; pump spouts, 14½ to 16½; sash weights, 8½ to 9½; ditto, with pulleys, 11½ to 13½; shoe anvils, 11½ to 12½; slippers 12½ to 13½; Italian irons, 35 to 40½.

Knitting pins, iron, 14½ to 15½ per lb.; steel knitting pins, 15 to 16½ W.G., 1½ to 2½ per lb.; brass knitting pins, 14½ to 15½ per lb.; keys and banks, 10 to 55½; extra strong plate, 10 to 12½; extra strong Banbury, pin'd keys, 30 to 35½; brass shutter knobs, 54½ to 67½; brass cupboard turns, 52½ to 57½; brass drawer knobs, 52½ to 57½; brass ash pan knobs, 52½ to 57½; brass range knobs, 35 to 40½; kettle ears, 77½ to 80.

Lock furniture, brass, 60½ to 76½; buffalo, 25 to 30½; china lock furniture, 17½ to 42½; ebony lock furniture, 21-inch, Wilkes' spindles, 15 to 18½ per dozen sets; sham ditto, 8½ to 9½ per dozen sets; Norfolk latches, common, best, 55 to 65½ common Suffolk latches, 70 to 72½; best Suffolk latches, 45 to 55½; lined stick latches, 4-inch, 15½ to 16½; 4½-inch, 16½ to 17½; 5-inch, 21½ to 25½ per gross net.

Oddwork, tinned and black, 15 to 20½; Paris pointers, best English, 13½ to 14½; foreign, 15½ to 16½; planos, 25 to 30½; iron axle pulleys, 1½ inch, 12½ to 13½; brass face axle pulleys, 28 to 40 per gross; B. F. and wheel, 48½ to 60 per gross; brass escutcheon pins, 1 inch to 16 W.G., 1½ to 1½ per lb.; bright gimp pins, 1 to 19 W.G., 1½ to 8½ per lb.; black, 7½ to 10½; brass 1½ to 1½ per lb.; Japanned cut gimp pins, 1 inch, 7½ to 8½ per lb.; 1½ inch, 8½ to 10½ per lb.; cut cog or coffin pins, Japanned, 1½ inch, 15 to 16½; tinned, 7 to 8½; brass pin points, 1½ to 1½; plate locks, fine 40 to 50½; strong, 40 to 55½; Lancashire plate locks, 25 to 30½; pewter measures, 20 to 25½.

Ridgela, 35 to 40½. Rivets, iron boot rivets, 1½ to 4½ per lb.; patent machine-made Rivets, 30 to 35½; wrought timmen's Rivets, 30 to 35½; round or panhead boiler Rivets, 1 inch, 20 to 21½; 1½ inch, 16½ to 18½; 2 inch, 15½ to 16½; 2½ inch, 14½ to 15½; Delivered in London or Liverpool; machine-made wire Rivets, 1 inch, 15½ to 16½ per cwt.; Rakes, light garden Rakes 50 to 60½; light solid end Rakes, 47½ to 50½; bolstered teeth garden Rakes, 50½; solid end bolstered teeth garden Rakes, 40 to 45½.

Spades and Shovels, common, 55 to 57½; second, 45 to 40½; best 30 to 35½; best strong country Shovels, 25 to 30½; best hammered Spades and Shovels, 5 to 10½; Ship Scrapers, black steel blades, 45 to 50½; bright, 45½ to 47½; cast-steel blade, 45½ to 47½; bright, 45½ to 47½; cast-steel blade, 45½ to 47½; bright, 45½ to 47½; Wood Screws, 65½; brass wood Screws, 60 to 65½; copper, 35 to 45½; Stove Screws, 50 to 52½; dowel Screws, 60 to 65½; brass headlock Screws, 40 to 47½; gilt, silvered and plated head Screws, 40 to 45½; Jute Sash cord, 54½ to 57½; flax Sash cord, 45 to 50½; best flax, 5 to 10½; super flax, 7½ to 12½; extra super flax Sash cord, 5 to 10½; patent steel ribbon Sash-line, 25 to 35½; copper Sash-chain, 52½ to 57½; zinc Sash-chain, 47½ to 52½; iron prepared, 40 to 45½; copper Sash-chain, 35 to 40½; Best Irons, common, 9½ to 11½ per cwt.; best Japanned, 11½ to 15½; best best Japanned, 17½ to 19½ per cwt.; Shoe heels, York No. 1, 3½ to 3½; No. 2, 4 to 4½; No. 3, 8½ to 8½ per gross net; Dundee hot turned, 5½ to 6½; bright-edge imperial or solid Scotch, 9½ to 10½; bright York 6½ B, 8½ to 8½; bright solid, 6½ to 7½; 100 plates, 6½ to 10½ per gross. Stair rods, turned ends, 75 to 80½; solid fancy ends, 60 to 65½; cast tube, 30 to 35½; patent solid ornamental, 35 to 40½; Sola Springs, coppered, 8 by 6 inches, 25 to 27½ per gross; 9 by 7, 21½ to 23½; 7 by 7 inches, 17½ to 19½ per gross; galvanised Waterloo Scoops and hods, 16 inch, 15 to 16½; Japanned Scoops and hods, light, 16 inch, 15 to 16½ per doz.; Shutter bars, common spring, broad and double, 75 to 77½; Scotch iron drop, 77½ to 80½; brass drop, 70 to 72½; brass drop and catch, 67½ to 70½; registered brass spring box shutter bars, 52½ to 67½; double-headed brass spring box, 52½ to 67½; Saddlers' tools, 5 to 10½; Stocks and Dies

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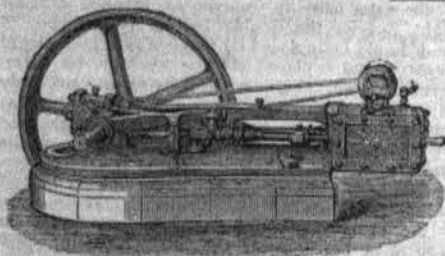
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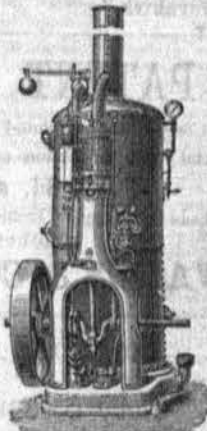
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3 x 3 = 10lbs.	5 x 3 = 13lbs.	7 x 2 = 14lbs.	9 1/2 x 3 1/2 = 24lbs.	12 x 5 = 41lbs.	
5 x 1 1/2 = 5 "	5 x 4 1/2 = 22 "	7 x 3 1/2 = 20 "	9 1/2 x 4 1/2 = 29 "	12 x 6 = 56 "	
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4 x 3 = 12 "	6 x 3 = 16 "	8 x 5 = 29 "	10 x 5 = 36 "	16 x 6 = 82 "	
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J. BERGER SPENCE AND CO.'S WEEKLY REPORT.

CHEMICALS.—The broad improvement which is being enjoyed by trade generally, is still being largely participated in by chemicals. The inquiry increases, and has, during the week, led manufacturers to further advance their quotations for many articles, particularly for those supplies of which are not too plentiful. These enhanced prices have not by any means checked demand, on the contrary, buyers rise to them with comparative ease, and the general disposition seems to be to cover requirements a fair period ahead even at prices now quoted rather than risk the future. This, of course, shows a return to confidence such as has been rather foreign to chemical business for some years past. The prospects at present seem bright enough, and are in strong contrast to those that ruled four months ago when there was not a glimpse of a favourable change visible. Rapid and tremendous as have been the advances, we cannot think that the zenith has yet been reached, for there is yet too much capital in the country waiting to be tempted into speculation, and, as far as chemicals are concerned, considerably more activity may be looked for as soon as the full resumption of shipping operations takes place. Sodas are dearer and in good demand. Bleaching powder and ash are also quoted at an advance—makers who are sellers are very firm. Sulphate of copper is the subject of considerable excitement in consequence of the advance in the metal. Acids are firm. Arsenic tends upwards. Acetate of lime is rather limited in supply, and somewhat better rates are obtainable.

MINERALS.—There is a steady progress to be noted in respect to Minerals, although in the case of a few articles this is slow enough. The great majority, however, continue to increase in demand and value, and the drawbacks of heavy stocks have almost entirely disappeared. Iron ore still increases in interest, and although large quantities of foreign ore are being brought forward, they are inadequate to the requirements, and rates become higher weekly. Brimstone steadily improves, and sellers are less disposed to quit their stocks at current rates, especially as the quantities aloft are more limited, and freights are yet increasing. Manganese is again in larger demand, principally for bleaching powder needs, though there is also more required for iron purposes. Ochres increase in activity, and somewhat higher rates are obtainable. China Clay also claims more attention, and the finer qualities move off with greater ease.

METALS.—Our experience of the week confirms our impression that pig-iron has still a period of higher prices before it, and this is further confirmed by the reports to hand. Business in Glasgow warrants has been active, and the efforts of sellers to force up values have been moderately successful. Notwithstanding the existence of stocks, which might be thought to preclude the possibility, quotations are about 73s. 6d. per ton, but they have since fallen to 69s. A large trade has been done in Middlesborough brands, though it has been characterised by the expected animation lately observable: prices have been maintained with moderate strictness, although the influences last week noticed by us have led a few parcels into the market from needy holders on slightly easier terms. These have been the exceptions, however, and their influence on the general tone has been almost nil. Makers are firm, and still averse to forward transactions of any magnitude. Hematites are in sustained demand, the want of adequate supplies being the only preventive to trade. The better classes of Bessemer are some 10s. per ton higher. Lancashire and Derbyshire iron becomes scarcer, and sales are made on more favourable terms to sellers only. Copper has been in a state of excitement all the week, and has achieved an advance of about £8 per ton. Tin has also advanced some £5 per ton. Lead is fairly steady and rather more doing.

GENERAL ITEMS.—The capital invested in gasworks in the United Kingdom is estimated at about £40,000,000, some £12,000,000 of which are owned by the London gas companies. At the end of 1878 there were upwards of 2500 miles of gas mains in the metropolis, and about 58,000 public street lamps.

Manchester, Jan. 24th, 1880.

THE COPPER TRADE.

(From RICHARDSON AND CO.'S Monthly Circular for January, 1880.)

It is estimated that the quantity of copper in Chili bars, ores, and regulus in stock at, and aloft for Liverpool and Swansea, and Havre, and of English and Foreign copper in London on the 1st of December, for the past four years, was:—1876, 32,287 tons; 1877, 35,674 tons; 1878, 46,539 tons; 1879, 51,299 tons.

Quotations of English tough, Chili bars (g.o.b.'s) ores, and regulus at the close of the past five years were as under:—

Tough, 1874, £92; 1875, £87; 1876, £82; 1877, £70; 1878, £62; 1879, £50. Bars, 1874, £87; 1875, £81; 1876, £76; 1877, £66; 1878, £58; 1879, £66. Ores and regulus, 1874, 16s. to 16s. 6d.; 1875, 16s. to 17s.; 1876, 15s. to 16s.; 1877, 12s. 6d. to 13s.; 1878, 11s. to 11s. 6d.; 1879, 13s. 6d. to 14s. 3d.

The course of the copper market for the past year may be summed up as follows:—

The first three months of the year had a continuous downward tendency; bars of g.o.b.'s commenced the year at £57 15s. and closed at £55 5s. Early in April the first excitement was caused but the news of war having broken out between Chili and Bolivia and Peru, which had the effect of sending bars up to 20s. per ton. Later on prices recovered the loss shown above, until the news came of the anticipated heavy charters in consequence of expected realisation and transfer to Europe of the late A. Edwards' stock—about 6000 tons—which tended to weaken prices, and bars fell again and fluctuated between £53 5s. and £55, until about the middle of September, when evident

signs of improvement set in, the result, no doubt, of it having become known that the whole of the above stock had been shipped. A sensible diminution in stocks also took place accompanied by a steadily increasing demand.

Prices kept improving until about the first week in October, when there was quite a rush to buy—g.o.b.'s had advanced £6 to £8 per ton, values standing in the middle of October at £66 10s.; this price has with sundry temporary fluctuations been fairly maintained to the present time.

A noteworthy feature of the past year has been the revival of our exports of copper to United States, which in 1872-3 amounted to about 6000 tons; since that time until the recent revival they have been sending us copper.

Mainly, no doubt, the improvement that has set in is the effect of our increased exports, which are, as will be seen, the heaviest on record. The imports have also increased, but not in the same ratio by at least 8 per cent.

We trust to see the present agreeable features continue; the result of which would be that our stocks would diminish and prices go up.

STEAM SHIPPING BUSINESS.

(From Messrs. H. E. MOSS AND CO.'S Circular.)

THE iron shipping tonnage built in 1879 was fully 12 per cent. less than was turned out in 1878, and the casualties and losses being fully up to an average, the relative position of shipowners was to that extent benefited. The totals for 1879 are 548,000 tons and 480 vessels, the whole of which were steamers, except about 20,000 of sailing ships, or 95 per cent. of the former of 4 per cent. of the latter. A marked feature in the tonnage returns for the past year is the great preponderance of steamers, ranging from 1400 to 1800 tons gross register. Few vessels exceptionally larger have been built, and much fewer small coasting steamers than is usual. This tendency still exists, and out of 98 iron steamers building on Tyne or Wear on the 1st of January, 1880, all except 14 are over 1200 tons register, the largest being one of 3378 tons; in fact, there is an absolute scarcity of 600 to 1000 tons ready or nearly-ready steamers, and we have many inquiries for this class of boat, but the holders of the few still unsold being very resolute in demanding extreme rates, business is not a certainty. We place the tonnage in construction on January 1st at 361,500 tons, and as a large proportion of it is intended for Atlantic, Black Sea, and Eastern trades, we are glad to notice the proportion of power to tonnage is decidedly better than previously, and we cannot but impress on owners to go further in the same direction. Time, economy, and safety are best served by a judicious increase in engine power, and owners may rely that charterers are more fully awake than ever to the advantages possessed by a full-powered over a small-powered boat, and they will find the best freights are secured by vessels that can be relied on to make nine to ten knots on a voyage. We are also justified in calling shipowners' attention to the discussions lately raised re "tanks" v. "double bottoms" for water ballast; and we are satisfied that for equal weight cargoes the double bottom is a source of danger, and should be replaced by tanks of sufficient height to receive cargo, and so placed as to be available for water, coals or general cargo. This question is being very anxiously discussed in nautical circles, and underwriters as well as owners are disposed to think that more than one of the late losses may be traced to unduly raising the weights in the vessels, and that thereby the stability of the vessel has been seriously injured. The subject is too important to be cast aside, and the best efforts of practical men should be given to solve the problem—"How to carry water-ballast in steamers, so as to best answer the interests of the shipowner, and at the same time to give such safety to the vessel that the minimum of risk may be gained." Prices, which until October, 1879, ruled as low as £10 per register ton for sailing vessels, and proportionately for steamers, have since gone on advancing, and we do not think any builder would, at the present time, accept a contract under £12 10s. to £13; the price of good ship-plates to-day on Clyde being £9 10s. against £5 12s. 6d. on the 30th of last September. Builders, as a rule, are full of orders, and it is difficult to place orders for delivery earlier than September; in fact, many orders already given are for December delivery. Steel, as a factor in construction, does not make rapid strides, and until prices are very much reduced it will only be used exceptionally.

MISTAKEN IDEAS ABOUT SHIPPING.

It is a common thing for some of the daily newspapers, in discussing the decadence of the American Merchant Marine, to refer to British shipping as being in a prosperous condition, and as an example of what ours might be were American citizens accorded the privilege of purchasing ships in the cheapest markets. Now, while Great Britain is by far the largest shipowner in the world, it is a notorious fact that the condition of her merchant marine is very far from being in a prosperous condition. In fact, British shipowners are even worse off than the American, for the reason that the losses on bad business of a large fleet are necessarily greater than those of a small one. A pamphlet recently issued by a London shipowner throws a flood of light on this subject. In it we are told that the tendency to substitute steamers for sailing vessels, which has been developed, more particularly since the Suez Canal was opened, has induced excessive building, and the over-building has produced all kinds of unhealthy attempts at obtaining credit on ships along with a most serious depreciation in their value; and this, too, in spite of prolonged depression of commerce. Shipbuilding on the Clyde and Tyne, it is added, went on upon speculation long after the rush of orders had closed. Yards were kept going on speculative work, always in the hope that trade would revive. This led to forced sales, and men of little or no means easily became shipowners by granting bills with three or even four years to run in payment. Vessels thus purchased entered recklessly into

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competition with those already afloat, freighting fell to an extremely low level, and losses have thus accumulated on all hands, till the strongest companies and private firms have in many cases had enough to do to maintain their position. Yet the building goes on. In 1877 no less than 653 vessels of 521,523 tons register were built; in 1878 the number was 649 vessels of 574,819 tons register; and in 1879 (the complete returns are not yet in) it is estimated that fully 450,000 tons will have been produced. A small amount of this enormous construction of tonnage has been for account of other countries, and some of it to meet the necessary requirements of the large steamship companies, as well as to take the place of lost or worn-out vessels; but making all allowance for these set-offs, the production of new shipping has been in late years enormously in excess of requirements. The pamphleteer closes with the assertion that there is no such increase in the commerce of the world, either present or prospective, as to warrant the continuance of such excessive shipbuilding, and it is asserted in very emphatic terms that unless it is checked it will inevitably be productive of serious losses, not only to those who own and control ships, but to the financial corporations by whom they are sustained.

In view of the enormous extent to which the ocean-carrying trade of the United States in foreign commerce is monopolized by vessels built and owned abroad, it is a matter of surprise that there should be so continuous and determined an effort to grant those vessels American registers. So far as foreign commerce is concerned, American registers would confer upon these foreign vessels no privileges that are not open to them now. They could run no more cheaply; they would not be likely to carry any more American officers or sailors; and it is doubtful if they could secure to the United States any more of the profits on the carrying trade. Still, the intense interest exhibited in this question, especially by British vessel owners and builders shows that some rich reward must be in view sufficient to warrant so persistent an effort to manufacture public sentiment to influence the action of Congress. What is evidently aimed at by the agitation of free trade in ships is the repeal of the Navigation Laws, thus throwing open our coastwise trade to foreign tonnage. While there is no evidence of any desire on the part of the Americans to purchase foreign built ships of any description, even were they at liberty to do so, it would probably do no harm to accord them that privilege, provisionally, or under proper restrictions; but our vast domestic traffic should be guarded with the same jealous care in the future as it has been in the past. For if the vast fleet of foreign vessels that annually reach our shores in ballast seeking had the privilege of engaging in the coasting trade, it must be evident that their chances of employment and profit would be greatly increased, while the chances of American vessels would be correspondingly diminished. Our Navigation Laws are antiquated, and are doubtless susceptible of improvement in many respects, but any change that may be contemplated should clearly not comprehend the throwing open of our coastwise trade to foreign competition.—*New York Shipping List.*

A RAILWAY ADVENTURE.—A former superintendent of the Providence and Worcester Railway says that one night when stationed at Providence in charge of the freight department a freight train was late, and there remained but twenty-five minutes to clear the track for a coming express train. This wasn't unusual, and, as the red light was burning for a signal no one felt alarmed. Hilton says: "I walked out to the very end of the depot platform, and there I suddenly heard in my ear these words, twice repeated and with impressive distinctness, 'Hilton, the light will go out! Hilton, the light will go out!'" The sound was so positive, and struck me with such strange power, that I instantly looked at my watch, saw that the Shore line express was due in three minutes, grabbed the red lantern on the last car of the freight train and ran up the track with all the

speed of which I was capable. Along I fairly flew, impelled by some strange intuition that there was danger, and never questioning for an instant, as I ran, why I was running, or what I was to do. Arrived at the first end of the curve, near the Corliss Engine Works, I stopped, and, for an instant, turned and looked back at the red light. It was burning, but in a second it fluttered a little and suddenly went out," and there came the express train. Hilton shouted and swung his lantern, and the engineer whistled down brakes and avoided collision. Then they examined the light and could see no possible reason why it should have gone out. It was full of oil, with a perfect wick, and there was no wind blowing, although if there had been, it should have remained burning, as it had before been through many a storm. There were ordinarily but two passenger cars on the express, and this night there were seven, all full. Hilton firmly believes the voice was supernatural.—*American Paper.*

QUICK TRAVELLING.—The train by which the Prince of Wales travelled back from Liverpool did not leave Lime Street station in that town till some time after the appointed hour, his Royal Highness having been delayed. The delay was made up for by extra speed, the train accomplishing the distance between Liverpool and London in the short space of four hours.

TO ENGINEERS.

This Corporation being desirous of receiving TENDERS for the Construction, Delivery and Erection of a FIRST ORDER LANTERN Complete for the Anvil Point Lighthouse, near Swanage, in the County of Dorset. Notice is hereby given that the Drawings may be inspected and Forms of Tender and Specifications 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 First Order Lantern for Anvil Point," must be addressed to the Secretary and delivered at this House on MONDAY, the 16th February next, and no Tender can be entertained that is not made on the form provided.

The Corporation does not pledge itself to accept the lowest or any Tender.
By Order,
ROBIN ALLEN, Secretary.

Trinity House, London, 29th January, 1880.

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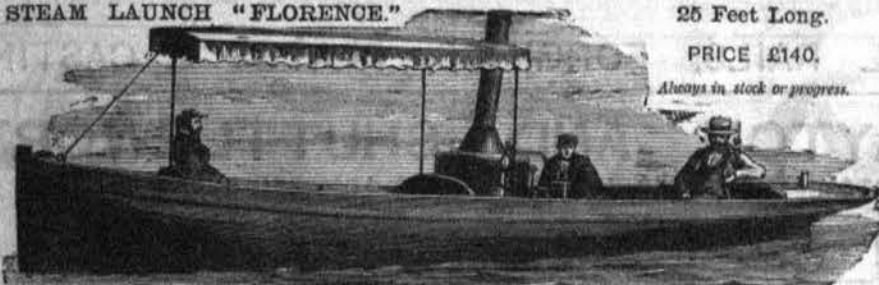
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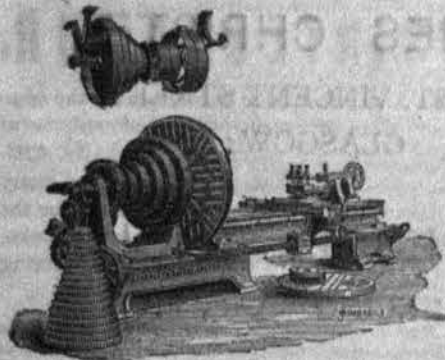
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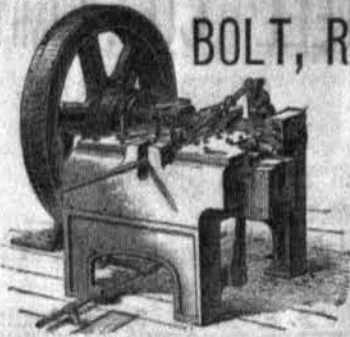
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ATLAS WORKS,

EARLS COLNE, ESSEX,

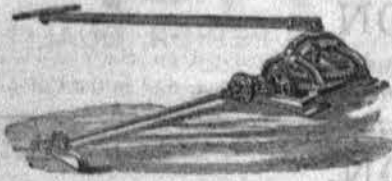
Manufacturers of

AGRICULTURAL IMPLEMENTS

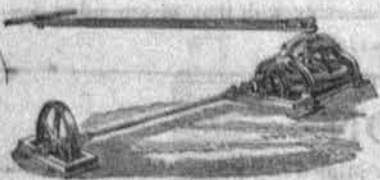
Including



Pony Gears for Churns and Elevators.



Horse Gears for Chain and Barrel Pumps.



Horse Gears for Saw Benches and Cotton Gins.



Horse Gears for Thrashing Machines Chaff Cutters, &c.,

And fitted for 1, 2, 3, or 4 horses.

Sole Manufacturers of BIDDELL'S PATENT FOOD PREPARING MACHINERY, recently manufactured by Messrs. Ransomes, of Ipswich.

Prices and terms to Shippers, with cost of packing, quoted on application.

THE STEEL COMPANY OF SCOTLAND, LIMITED,

(SIEMENS' PROCESS),

150, HOPE STREET, GLASGOW,

MANUFACTURERS OF

STEEL RAILS, FORGINGS, PLATES & CASTINGS.

CLAYTON AND SHUTTLEWORTH

STAMP END WORKS, LINCOLN, AND 78, LOMBARD STREET, LONDON.

TWO GOLD MEDALS & OTHER PRIZES

Have been awarded to Clayton and Shuttleworth for their
 STEAM ENGINES, GRINDING MILLS,
 THRASHING MACHINES, TRACTION ENGINES, &c.
 AT THE PARIS EXHIBITION, 1878
 CATALOGUE FREE ON APPLICATION.

The Royal Agricultural Society of England have awarded First Prizes to Clayton and Shuttleworth at every meeting at which they have competed since 1849.

COLMAN'S AUTOMATIC ENGINE-ROOM AND BRIDGE TELEGRAPH.

This is the only BRIDGE TELEGRAPH in which the Engine itself replies to the Captain's orders.

By Royal Letters Patent.

APPLY TO

JAMES CHRISTIE,

133, ST. VINCENT STREET,
 GLASGOW;

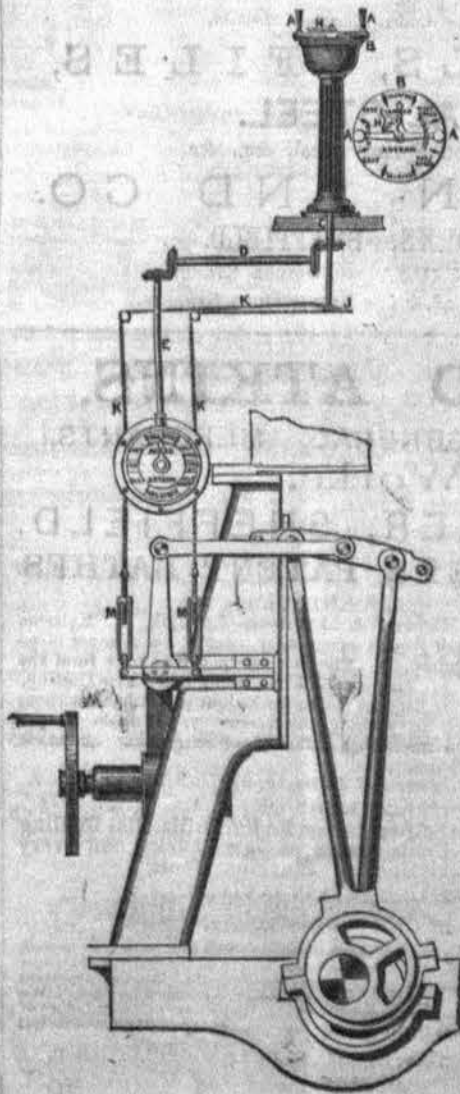
JAMES P. THOL,

18, MINCING LANE, E.C.;

OR TO

ARTHUR H. COLMAN,

NEWCASTLE-ON-TYNE,



JAN. 30, 1880

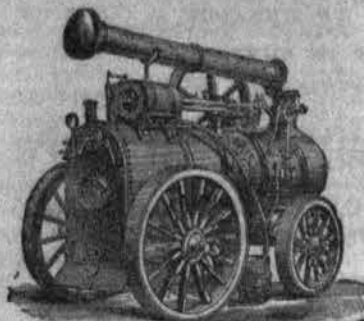
IRON.

XIII.

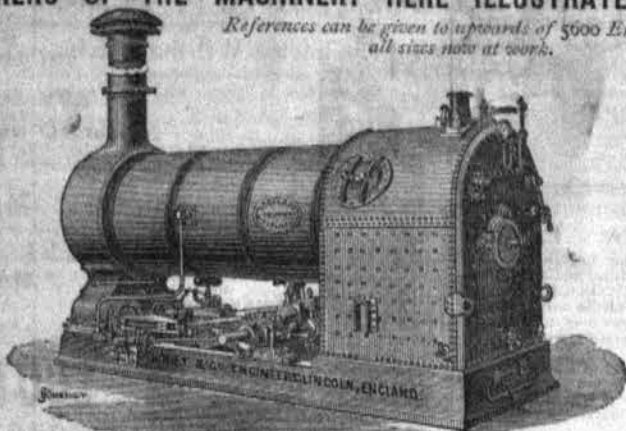
ROBEY AND CO., ENGINEERS, LINCOLN,

SOLE MANUFACTURERS OF THE MACHINERY HERE ILLUSTRATED.

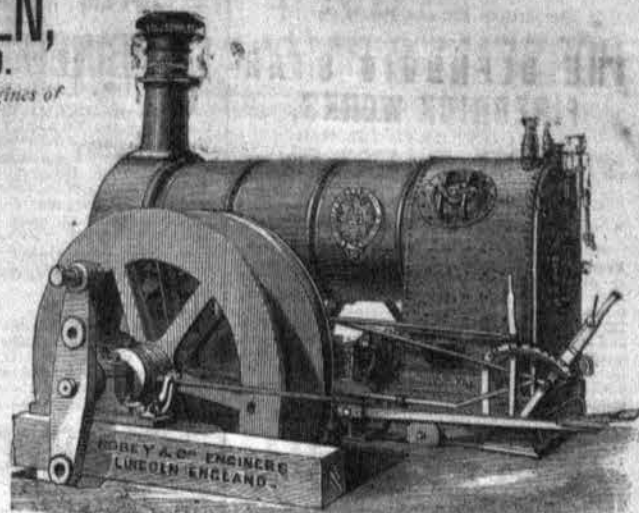
References can be given to upwards of 5000 Engines of all sizes now at work.



Superior Portable Engines, 4 to 50 h.p.



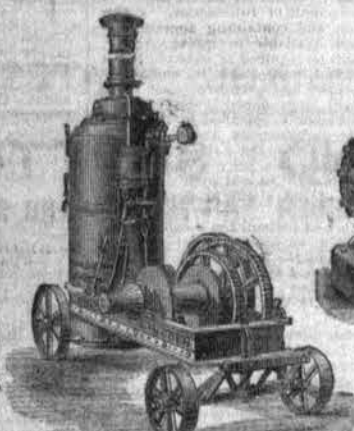
The Patent "Robey" Fixed Engine, 4 to 50 h.p.



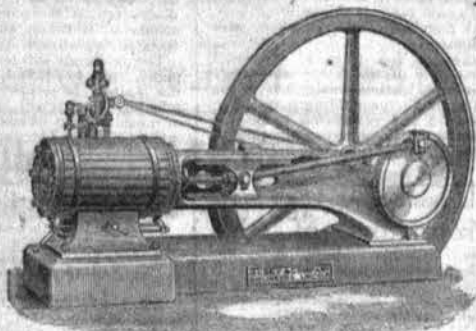
Patent "Robey" Mining Engine, 4 to 200 h.p.



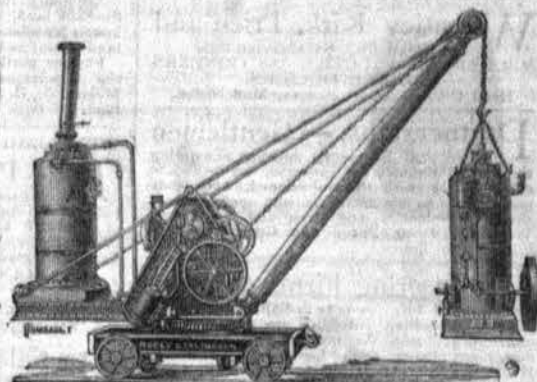
Vertical Engines, 1 1/2 to 12 h.p.



Improved Steam Travelling Crane

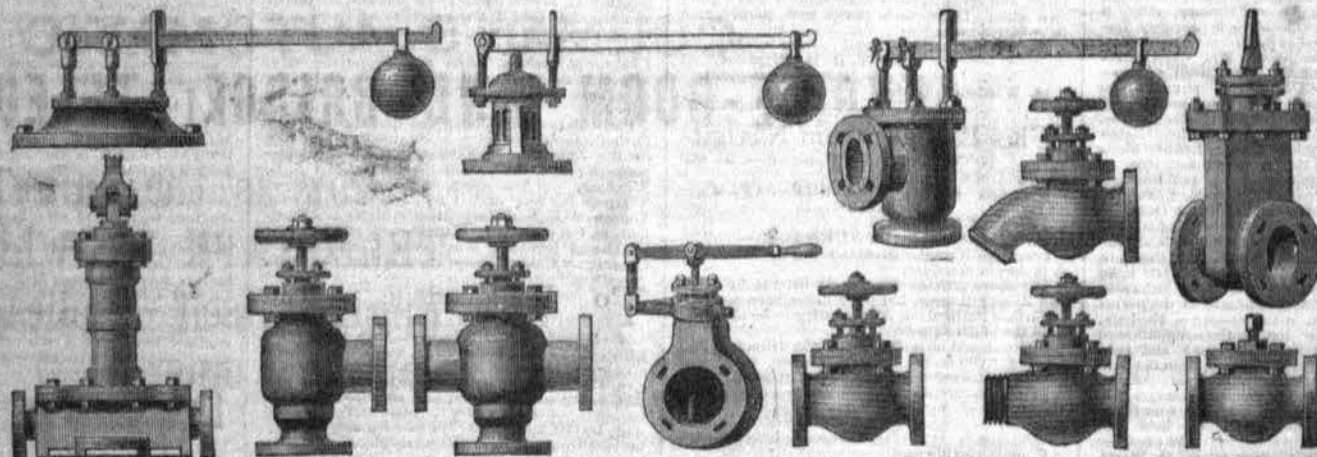


Horizontal Fixed Engines, 4 to 60 h.p.
ROBEY & CO.,
ENGINEERS,
LINCOLN, ENGLAND.



Improved Barrow Hoist.

ISAAC STOREY AND SONS.



MAKERS OF STEAM, WATER AND GAS VALVES, OF BEST FORM AND SUPERIOR QUALITY.
STEAM REDUCING VALVES, ENGINE FORCE PUMPS,
SLUICE VALVES, HYDRANTS, STAND PIPES, AIR VALVES,
Steam Boiler Mountings, Water Gauges, &c., of the most Approved Designs.

ILLUSTRATED PRICE LISTS ON APPLICATION.
Knott Mill Brass and Copper Works, Little Peter Street, MANCHESTER, and at Cathedral Yard,
London and Continental Agent:—T. W. BAINES, Billiter House, Billiter Street, London, E.C.

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.



COLLIERY BALANCE UP TO 1 TON



CONICAL SPRING



WIRE TESTER ANY PRESSURE UP TO 3 TONS



RASTRICK'S PATENT SCRAPER



KELLY'S DOOR SPRING

GOODS SUPPLIED THROUGH MERCHANTS AND FACTORS.