THE INSTITUTION OF MECHANICAL ENGINEERS.

Our last week's report of the proceedings of the Institution of Mechanical Engineers extended to the reading and discussion of Mr. F. C. Marshall's paper "On the Progress and Development of the Marine Engine," the discussion on which was postponed. The members and visitors then proceeded to the Assembly Rooms to lunch, and afterwards visited the Elswick works, which we have already fully described, and the Newburn Steel Works, of which the following is a description :—

The Newburn Steel Works.

From Elswick about 200 members of the Institute proceeded by train to the Newburn Steel Works, belonging to Messrs. John Spencer and Sons. The line runs for a portion of the way alongside the old Wylam wagon way, the first railway laid down with the smooth rail to be worked by locomotive power ; and in a siding of the works was shown the previous arrangement of rack rail and pinion by which this line was worked, these castings having been made from the original patterns which Messrs. Spencer possess. It was about the date of these early experiments with the locomotive, viz., in 1810, that Mr. John Spencer commenced these works, utilising the water of the burn at a large breast wheel 30ft. diameter, which is still used for file grinding, and also higher up the stream for a 10in. rolling mill, which has, however, now for some time been driven by steam. The steel processes now carried on are the cementation, crucible, and Siemens and Siemens-Martin. The Uchatius process of the manufacture of steel direct from pig iron by fine granulation in water was tried on a practical scale, and a fine quality of steel was obtained, but its irregularity precluded its adoption at the time. There are eight cones for the conversion of Swedish bar iron into blister steel by the cementation process, of a capacity of from 15 tons to 25 tons per heat. The blister steel is used for the production of the finer kinds of tool steel and Swedish spring steel. For tool steel the bars of blister steel are broken up into small pieces and carefully selected into various tempers, and then melted in small crucibles and cast into ingots, which are hammered or rolled for the various purposes required. The bulk of the product of these furnaces is, however, used for spring steel, the bars of blistered steel being rolled out into the various sizes required for springs. This Swedish spring steel has still a high reputation for durability amongst railway engineers, owing, probably, to the fibrous nature which steel made on this plan retains, which enables it to resist the rough shocks of railway work. The Siemens plant consists of three Siemens open-hearth furnaces of 7, 6, and 2 tons each respectively, and capable of turning out 180 tons per week. There are also two gas melting furnaces, each for twenty-four crucibles, and eight coke melting furnaces. The steel foundry proper is a fine shop fitted up with hydraulic swing cranes, and overhead travelling cranes capable of lifting up to 12 tons, with Buckley and Taylor's and Scott's wheel moulding machines ; also lathes and cold band saw for cutting off the runners of steel castings. The drying stoves heated by gas are arranged on either side of the moulding shop ; annexed is the dressing shop, along which are placed the annealing furnaces, also heated by gas. The variety of work being moulded, such as marine engine frame castings, wheels, pinions and rims of gear, propeller blades, dredger bucket backs and tumblers, hydraulic cylinders, horn blocks, tram and corve wheels, &c., shows the varied uses to which steel castings are now applied. It was intended to have run a casting of over 10 tons weight now in hand, but unfortunately the mould could not be got ready for the Engineers' meeting. There are twenty-four gas producers supplying all the Siemens melting and re-heating furnaces, drying and annealing stoves, &c. The forge contains one 8-ton, one 5-ton, and one 2-ton double-acting steam hammers, by Thwaites and Carbutt, the re-heating furnaces being Siemens gas furnaces, and cranes worked by hydraulic power. Steel forgings up to 10 tons weight are here dealt with, such as crank shafts and screw shafts for marine engines, crank and straight axles for locomotives and wagon and carriage axles. The 8-ton steel ingot the visitors saw cast will be forged here into a double-throw crank axle for a marine engine. The large forging under the 8-ton steam hammer was being forged into the tail end piece of screw shafting for a marine engine. In this shop is also a 3-high rolling mill 14in., and an 18in. train for cogging has just been completed, driven by a Corliss engine 230-horse power. Here the Siemens spring steel and rounds, &c., for machinery, shafting, &c., is rolled. Adjoining are also a 30 cwt., 12½ cwt., and 6 cwt. double-acting steam hammers for tilting and forging crucible cast steel.

The visitors then proceeded through the older portions of the works in which the manufacture of railway springs and buffers is carried on. The machine shops are well fitted up for drilling and turning up wrought iron buffers, of which large quantities of various types are in different stages of progress. In the old forge are six steam hammers up to 40 cwt., principally engaged in the various stamping operations for producing West's iron buffers, the cylindrical cases and plungers being coiled and welded by special machinery. In this shop considerable quantities of various steelwork for dredgers, such as dredger bolts, bushes, and dredger buckets fitted complete, are turned out. They are now fitting up dredger buckets and links entirely of steel, which, combining lightness with great strength and durability, reduces the total weight on the chain of buckets, and which is especially of importance to dredging companies abroad, where the cost of repairs is so much enhanced. Beyond this are the spring shops, capable of turning out 50 tons of bearing and buffing springs per week. The material used for springs is either Swedish spring steel, or Siemens steel, or occasionally crucible cast steel. The Siemens steel they use for their ordinary quality of springs is all new material specially selected for the purpose, the use of waste or crop ends, which can only result in an irregular spring, being specially discarded. Volute, conical, and spiral springs are also made, Messrs. Spencer being originally the sole manufacturers in England of the volute spring, and have recently brought out an improved volute which is lighter than the old form, and stands the same load, at the same time being a more regular and reliable spring. In the file shops the system of sharpening files by the sand-blast process was shown. A constant check on the steel turned out is made by chemical tests in the laboratory, and by mechanical tests with one of Mr. D. Adamson's testing machines. The works being built along the valley over various levels, are all connected by about a mile of railway with each other, and by the Scotswood, Newburn, and Wylam Railway with the North-Eastern system. A tank engine by R. and W. Hawthorn, and a very useful crane engine by Black, Hawthorn, and Co., make the transport of material comparatively easy. They have also the advantage of water freight up to within a mile of the steel works, the Tyne Hematite Iron-works, also belonging to Messrs. Spencer, being situated on the Tyne, one mile nearer Newcastle. Here are two of the earliest blast furnaces in the North of England, and an old beam engine by Boulton and Watt, dated 1802, formerly used for driving a mill and forge. The visitors were received by Mr. John W. Spencer in a spacious marquee, where light refreshments had been provided. Here a variety of tests of steel plates made by the Leeds Forge Company from their material, and showing remarkable ductility, were laid out for inspection. In the centre was a fine trophy of steel castings, the heaviest being a piston weighing three tons. A hydraulic cylinder and several other pieces were turned up and finished, showing the perfect absence of honeycombs in these forms. Messrs. Spencer are also the sole makers of Wasteney Smith's patent stockless anchors, the distinctive features of which are that it has no stock, and both arms are in the ground when holding instead of one arm as with other anchors. About 500 of these anchors have been made, and several of the large steamship companies, such as the Cunard Company, Union Company, &c., specify them for their new ships. Some large anchors have lately been made for her Majesty's Navy and the Cunard Company. They are made of best forged scrap iron, and are specially suited for vessels which require to anchor frequently, as they take hold quickly, are easily tripped, and require shorter cable than other anchors.

The discussion on Mr. Marshall's paper was resumed and concluded on Wednesday morning. An abstract of this appeared in our last impression. After the discussion closed, Mr. Cowper announced, amidst much applause, that Mr. Westmacott had been elected president for the ensuing year, Mr. Menelaus having declined the honour. A paper "On Printing Machinery," by Mr. Jameson was then read, and immediately afterwards the members and visitors proceeded to the *Newcastle Chronicle* office, where they saw the machinery described at work. Of Mr. Jameson's paper we shall give an abstract in another impression, with some notes on the *Chronicle* office.

Members and visitors then proceeded by special train to Jarrow, where luncheon had been provided for over 300 by Messrs. Palmer, in the drill hall. A good deal of time was expended in making and hearing speeches, after which a visit was paid to the gigantic works of the company.

Palmer's Shipbuilding and Ironworks.

These works, situated at Jarrow, about six miles below the Tyne Bridge, include within themselves the entire range of operations, from the smelting of the ironstone to the complete equipment of iron vessels. The ore itself is brought round by sea from the mines at Port Mulgrave, near Whitby, and is raised from the river wharf at the works up to the railway level, along an incline plane worked by a stationary engine. Coke and coal come from Marley Hill and other collieries in Durham and Northumberland, by the Pontop and Jarrow Railway ; the coke is discharged into a hopper capable of holding about 1500 tons, from the bottom of which the blast furnace barrows are filled through sliding doors, thus dispensing with manual labour. The three blast furnaces are 85ft. high, 24ft. diameter at the boshes, and 8½ft. in the hearth ; they are capable of producing together about 1400 tons of pig iron per week, over three-fourths of which is used in the works. The blast is heated to about 1100 deg. Fah. in fifteen cast iron pipe-stoves ; and there are a dozen kilns for calcining the Cleveland ironstone. The forges comprise eighty puddling furnaces, producing over 1000 tons of puddled bars weekly. There are two forge engines with 36in. cylinders, one of 4ft. and the other of 5ft. stroke, each driving a roll train and four pairs of 22in. rolls. There are two plate mills and ten mill furnaces, producing about 750 tons of finished boiler and ship plates weekly ; each mill has two pairs of 24in. rolls, reversed by clutch and crabs. A bar mill with two pairs of rolls driven by a 24in. cylinder, produces 120 tons per week. A fourth mill, with four pairs of rolls, driven by two 30in. cylinders with 4ft. stroke, produces about 300 tons of plates per week. There is also a large angle and bar mill, driven by a single engine having 36in. cylinder and 4ft. stroke, capable of rolling the very largest angles used in the trade ; and also a sheet mill. Attached to the rolling mills are shears, circular saws, punching and straightening presses, and other appliances for the construction of iron ships. The adjoining department is that of the engine works, which is capable of finishing annually from thirty to forty pairs of marine engines with their boilers. This department produces its own iron and brass castings, and its own forgings. In the boiler shop vertical rolls for rolling long boiler shell-plates were first used, and may be seen in operation. The shipbuilding department occupies the east end of the works. It contains the largest graving dock on the coast, and also a very fine repairing slip, just newly fitted with hydraulic hauling gear. The building slips are suitable for every kind of vessel, up to 500ft. in length, and are capable, with those in the Howdon branch of the works on the opposite side of the river, of launching 50,000 tons of shipping annually. There are nine building slips at Jarrow, and four at Howdon. The entire works cover nearly 100 acres, with a river frontage of about 3000ft., and employ about 7000 persons.

In the evening of the same day—Wednesday—the annual dinner of the Institution took place in the Assembly Rooms, about 300 being present.

On Thursday morning proceedings began with the reading of a paper by Mr. Norman C. Cookson, of Newcastle,

On some Recent Improvements in Lead Processes.

The author began by stating that probably in few trades have a smaller number of changes been made during recent years, in the processes employed, than in that of lead smelting and manufacturing. He then briefly noted what these changes are, and went on to describe the "steam desilverising process," as used in the works of the writer's firm, and in other works licensed by them, which process is the invention of Messrs. Luce Fils et Rozan, of Marseilles. It is one which should commend itself especially to engineers, as in it mechanical means are employed, instead of the large amount of hand-labour used in the Pattinson process. It consists in using two pots only, of which the lower is placed at such a height that the bottom of it is about 12in. to 15in. above the floor level, while the upper is placed at a sufficiently high level to enable the lead to be run out of it into the lower pot. The capacity of the lower pot, in those most recently erected, is thirty-six tons—double that of the upper one. Round each pot is placed a platform, on which the workmen—of which there are two only to each apparatus—stand when skimming, slicing, and charging the pots. The upper pot is open at the top, but the lower one has a cover, with hinged doors ; and from the top of the cover a funnel is carried to a set of condensers. At a convenient distance from the two pots is placed a steam or hydraulic crane, so arranged that it can plumb each pot, and also the large moulds which are placed at either side of the lower pot. The mode of working is as follows :—The silver lead is charged into the upper pot by means of the crane. When melted, the dross is removed, and the lead run into the lower, or working pot, among the crystals remaining from a previous operation. When the whole charge is thoroughly melted, it is again drossed ; and in order to keep the lead in a thoroughly uniform condition, and prevent it setting solid on the top and the outside, a jet of steam is introduced. To enable this steam to rise regularly in the working pot, a disc-plate is placed above the nozzle, which acts as a baffle-plate ; and uniform distribution of the steam is the result. To quicken the formation of crystals, and thus hasten the operation, small jets of water are allowed to play on the surface of the lead. This, it might be thought, would make the lead set hard on the surface ; but the violent action of the steam acts in the most effectual manner in causing the regular formation of crystals. Owing to the ebullition caused by this action of the steam, small quantities of lead are forced up, and set on the upper edges and cover of the pot. From time to time the valve controlling the thin streams of water playing on the top of the charge is closed, and the workman, opening the doors of the cover in rotation, breaks off this solidified lead, which falls among the rest of the charge, and instantly becomes uniformly mixed with it. Very little practice enables an ordinary workman to judge when two-thirds of the contents of the big pot are in crystals, and one-third liquid ; and when he sees this to be the case, instead of ladling out the crystals ladleful by ladleful, as in the old Pattinson process, he taps out the liquid lead by means of two pipes, controlled by valves, the crystals being retained in the pot by means of perforated plates The liquid lead is run into large cone-shaped moulds on either side of the pot ; and a wrought iron ring being cast into the blocks thus formed, they are readily lifted, when set, by the crane. To give some idea of the rapidity of the process, it may be mentioned that, from the time the lead is melted and fit to work in the big pot, to the time that it is crystallised and ready for tapping, is, in the case of a 36-ton pot, from thirty-five to forty-five minutes ; and the time required for tapping the liquid lead into the large moulds is about eight minutes. Before the lead begins to crystallise, the upper pot is charged with lead of half the richness of that in the lower pot. Thus, when the liquid lead has been tapped out of the lower pot, it is replaced by a similar amount of lead of the same richness as the remaining crystals, by simply tapping the upper or melting pot, and allowing the contents to run among the crystals. The same operation is repeated from time to time, until the crystals are so poor in silver that they are fit to be melted, and run into pigs for market. The large blocks of partially worked lead are placed by the crane in a semi-circle round it, and pass successively through the subsequent operations. The advantages of the steam process, as compared to the old 6-ton Pattinson pots formerly used by the writer's firm, are—(1) a saving of two-thirds amount of fuel used ; (2) the saving of cost of calcination of the lead to the extent of at least four-fifths of all that is used ; (3) above all, a saving in labour to the extent of two-thirds. The process has its disadvantages, and these are a larger original outlay for plant, and a constant expense in renewals and repairs. This is principally caused by the breakage of pots ; but with increased experience this item has been very much reduced during the last two or three years.

The "zinc process" of desilverising, which is largely used by Messrs. Locke, Blackett, and Co., and was patented in the form adopted by them about fourteen years since. The action of this process is dependent on the affinity of zinc for silver ; the following is a brief description of it :—A charge of silver lead, usually about fifteen tons, is heated to a point considerably above that which is used in either the Pattinson or the steam process. The quantity of zinc added is regulated by the amount of silver contained in the lead ; but for lead containing 50 oz. to the ton, the quantity of zinc used is in most cases about 1½ per cent. of the charge of lead. The lead being melted as described, a

portion of this zinc, usually about half of the total quantity required for the charge, is added to the melted lead, and thoroughly mixed with it by continued stirring. The lead is now allowed to cool, when the zinc is seen gradually to rise to the top, having incorporated with it a large proportion of the silver. The setting point of zinc being above that of lead, a zinc crust is gradually formed, and this is broken up and carefully lifted off into a small pot conveniently placed, care being taken to let as much lead drain off as possible. The fire is again applied strongly to the pot, and when the lead is sufficiently heated, a further quantity of zinc, about one-third of the whole quantity used, is added, when the same process of cooling and removing the zinc crust is repeated. This operation is gone through a third time with the remaining portion—$\frac{1}{2}$ per cent.—of zinc; and if each of these operations has been carefully carried out, the lead will be found to be completely desilverised, and will only show a very small trace of zinc. In some works this trace of zinc is allowed to remain in the market lead, but at Messrs. Locke, Blackett, and Co.'s works it is invariably removed by subjecting the lead to a high heat in a calcining furnace. The zinc crusts, rich in silver, are freed as far as possible from the lead by allowing this to sweat out in the small pot, after which the crusts are placed in a covered crucible, where the zinc is distilled off, and a portion of it recovered. The lead remaining, which is extremely rich in silver, is then taken to the refinery, and treated in the usual manner. The writer is given to understand that the quantity of zinc recovered is as high as from 50 to 60 per cent. of the total quantity used.

Although it was said that the rolling or milling of lead remains unchanged in its main features since the first mill was established, yet the writer's firm have introduced many important improvements. When lead is required for sheet making, instead of running out the market lead into the usual pigs of about one hundredweight each, it is run into large blocks of $3\frac{1}{2}$ tons. These $3\frac{1}{2}$-ton blocks are taken on a bogie to the mill-house, where the mill melting pot is charged with them by means of a double-powered hydraulic crane, lifting, however, with the single power only. Three such blocks fill the pot, and when melted are tapped on to a large casting plate, 8ft. 4in. by 7ft. 6in., and about 7in. thick. This block, weighing $10\frac{1}{2}$ tons, is lifted on to the mill table by the same crane as fills the pot, but using the double power; and is moved along to the rolls in the usual manner by means of a rope working on a surging head. The mill itself, as regards the roll, is much the same as those of other firms; but instead of an engine with a heavy fly-wheel, always working in one direction, and connected to the rolls by double clutch and gearing, the work is done by a pair of horizontal reversing engines, in connection with which there is a very simple, and at the same time extremely effectual, system of hydraulic reversing. On the usual method there is no necessity for full or delicate control of lead mill engines; but with this system it is essential, and the hydraulic reversing gear contributes largely to such control. This may be explained as follows:—In all other mills with which the writer is acquainted, when the lead sheet, or the original block, has passed through the rolls, and before it can be sent back in the opposite direction, a man on either side of the mill must work it into the grip of the rolls with crowbars. In the writer's system this labour is avoided, and the sheet or block is fed in automatically by means of subsidiary rolls, which are driven by power. When it is required to cut the block or sheet by the guillotine, or cross-cutting knife, instead of the block being moved to the desired point by hand-labour, the subsidiary driven rolls work it up to the knife; and such perfect control does the engine with its hydraulic reversing gear possess, that should the sheet over-shoot the knife $\frac{1}{8}$in., or even less, the engine would bring it back to this extent exactly. Another point, which the writer looks upon as one of the greatest improvements in this mill, is its being furnished with circular knives, which can be set to any desired width, and put in or out of gear at will; and which are used for dressing up the finished sheet in the longitudinal direction. This is a simple mechanical arrangement, but one which is found to be of immense benefit, and which, in the writer's opinion, is far superior to the usual practice of marking off the sheet with a chalk line, and then dressing off with hand knives. The last length of the mill table forms a weighbridge, and an hydraulic crane lifts the sheets from it either on to the warehouse floor or the tramway communicating with the shipping quay.

The discussion on this paper was very brief. Mr. Cowper stated that he had paid a visit that morning to Mr. Cookson's lead works, and he briefly described some of the peculiarities of the process which he had seen carried out. Mr. Rich referred to the extremely low specific heat of lead, about ·03, as exercising an important influence on lead processes, lead manufacturers caring nothing for the cooling of lead, since it could be remelted with a very small expenditure of fuel. The latent heat of liquefaction of lead was but one-fifth of the latent heat of liquefaction of ice. In reply, Mr. Cookson corroborated Mr. Rich's remarks, stating that one ton of coal sufficed to reduce 300 tons of hot lead crystals to the liquid state. Lead for making white lead must be very pure, and this the Pattison process could not produce. A vote of thanks having been passed to Mr. Cookson, a paper was read by Mr. George S. Strong, of Philadelphia, U.S.,

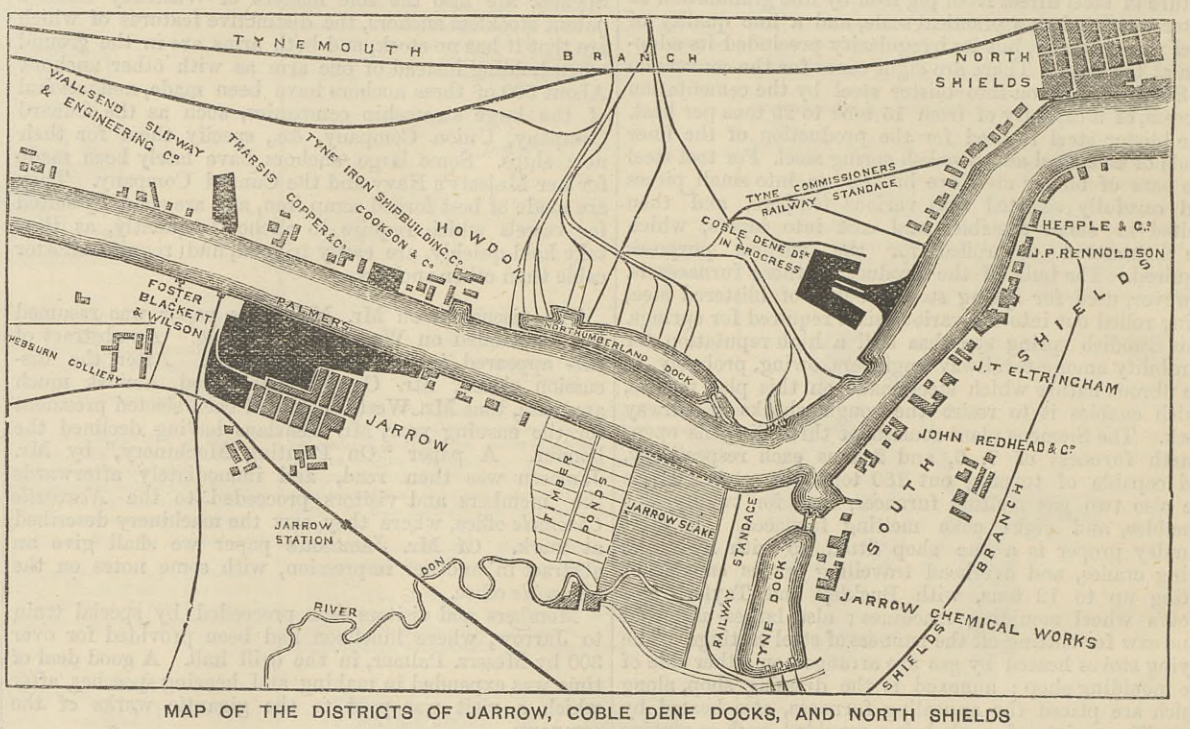
On a Feed-Water Heater and Filter for Stationary and Locomotive Engines.

The author first glanced at the construction of the heaters, then explained the trouble caused in Pittsburg by bad water, and went on to say that in designing the feed-water heater now to be described, he had paid special attention to the separation of all matters, soluble and insoluble; and he has succeeded in passing the water to the boilers perfectly pure and free from any substance which would cause scaling or coherent deposit. Taking the facts, well known to all chemists, as the basis of his operations, the writer perceived that all substances likely to give trouble by deposition would come down at a temperature of about 250 deg. Fah. His plan is therefore to make a feed-water heater in which the water can be raised to that temperature before entering the boiler. Now by using the heat from the exhaust steam, the water may be raised to between 208 deg. and 212 deg. Fah. It has yet to be raised to 250 deg. Fah.; and for this purpose the writer saw at once the advantage that would be attained by using a coil of live steam from the boiler. This device does not cause any loss of steam, except the small loss due to radiation, since the water in any case would have to be heated up to the temperature of the steam on entering the boiler. By adopting this method, the chemical precipitation, which would otherwise occur in the boiler, takes place in the heater; and it is only necessary now to provide a filter which shall prevent anything passing which can possibly cause scale. The heater, being subject only to a strictly determinate temperature, does not cause the precipitate to adhere to the tubes or metal, so that scale cannot be formed in it; since, to produce sufficient coherence to form a scale, it is necessary that the metal should be heated considerably above the temperature of the water, in fact that the flame of the fire should play on one side of it. Drawings were given showing a section and sectional plan of the heater. The cast iron base is divided into two parts by the diaphragm. The exhaust steam enters one side of diaphragm, passes up the tubes, which are fastened into the upper shell of the casting, returns by tubes, which are inside the others, and passes away by an exhaust passage. The malleable iron shell connecting the stand and the dome is made strong enough to withstand the full boiler pressure. An ordinary wood or other casing prevents loss by radiation of heat. The cold water from the pump passes into the heater through an injector arrangement, and coming in contact with the tubes is heated; it then rises to a coil, which is supplied with steam from the boiler, and thus becomes further heated, attaining there a temperature of from 250 deg. to 270 deg. Fah., according to the pressure in the boiler. This high temperature causes the separation of the dissolved salts; and on the way to the boiler the water passes through a filter, becoming thereby freed from all precipitated matter, before passing into the boiler. The purpose of the injector is to cause a continual passage of air or steam, either may be used, from the upper part of the dome to the lower part of the heater, so that any precipitate carried up in froth may be again returned to the under side of the filter, so as more effectually to separate it, before any chance occurs of its passing into the boiler. The filter consists of wood charcoal in the lower half, and bone black above, firmly held between perforated plates. After the heater has been in use for from three to ten hours, according to the nature of the water used, it is necessary to blow out the heater, in order to clear the filter from deposit. To do this a cock is opened, and the water is discharged by the pressure from the boiler. The steam is allowed to pass through the heater for some little time, in order to clear the filter completely. After this operation all is ready to commence work again. By this means the filter remains fit for use for months without change of the charcoal. The author then described the method of adapting his heater to locomotive boilers, and gave some particulars of the results obtained with it in America.

In the discussion which followed, Mr. Strong explained more in detail the working of his heater, and answered one or two questions. Filters in use at Pittsburgh lasted six months.

Mr. Richardson, of Oldham, referred to a paper read at the Nottingham meeting of the Institution of Mechanical Engineers on much the same subject, which members might consult with advantage, and explained that much the same system of filtering had been used at Oldham, as nothing but sewage water was to be had for feeding boilers. They used a mud filter with animal charcoal, and cleaned it by reversing the action and driving steam back through the filter. The thing had been done twenty years ago. The feed-water was heated to 210 deg. or thereabouts. Mr. Greig expressed in general terms his approval of Mr. Strong's apparatus, which appeared to him to be just what he wanted for his traction and ploughing engines, which had to use very bad water. Mr. Rich stated that if a heater was placed in line between a condenser and a cylinder, the water would not be much heated, as the temperature in the exhaust pipe of a condensing engine was so low that the hand could be placed on the pipe without injury. It did not exceed 130 deg. or so. It should not be forgotten that all boiler companies deprecated the use of hot well water for feeding boilers because of its acidity. Mr. Abbott was much pleased with the apparatus, but wanted to know how it could be opened up for cleaning and repairs. Mr. Head wished some competent chemist would corroborate the statements made in the paper as to the throwing down of deposit at high temperatures. The apparatus seemed to be well contrived and symmetrical. Mr. Cochrane stated that the water of condensation was too pure and valuable to be run to waste. He could cite cases where it had been used for twenty years without causing a sign of pitting in the boilers. A small quantity of caustic soda was added to the water, and effectually neutralised any acid due to the cylinder lubricants. Mr. Strong replied on the whole discussion. In reply to Mr. Rich, he stated that in practice he heated feed-water with condensing engine's waste steam from 60 deg. to 140 deg., which represented a saving of 5 per cent. in fuel. Water drawn from the hot well could in the same way be raised 40 deg. in temperature, which represented a saving of 3 per cent. In the States chemists did not quite agree about the process of deposition of carbonate and sulphate of lime. But he knew from practice that the sulphate is not deposited at 212 deg. (We may here remark that the whole question of the deposition of these salts at high temperatures may be found fully treated by Mallet, in the Proceedings of the Institution of Civil Engineers, Ireland.) He used brass tubes in his apparatus because the Pittsburg water would cut iron tubes right across at one point, as if done with a file, in eighteen months. The whole of the casing or outer shell was painted inside with three or four coats of red lead and boiled oil, which protected it. In very bad cases the whole apparatus was made of brass and copper. In reply to Mr. Abbott, he explained that a little gantry with a differential pulley block was fitted over the apparatus, and that the lid could be taken off and the filter cleaned or renewed in two hours, the apparatus supplying water for 600-horse power. The brass tubes were screwed into the cast iron bottom plate.

After a vote of thanks had been passed, a paper by Mr. John Price was read



MAP OF THE DISTRICTS OF JARROW, COBLE DENE DOCKS, AND NORTH SHIELDS

On Iron and Steel as Constructive Materials for Ships.

The object of the paper was to bring into greater prominence than has hitherto been done, the question as to whether it is more economical, for commercial purposes, to build vessels of steel rather than of iron. This paper was purely commercial, and the accuracy of the statements of price, relative cost, &c., was challenged by Mr. Denny and others. It was followed, indeed, by a very unpleasant personal discussion between Mr. Denny and Mr. Price, a discussion to be regretted in every way—one dealing with pounds, shillings, and pence, and supplying no technical information whatever; and while putting Mr. Denny's powers as a pungent debater very prominently forward, leaving but one impression on the minds of those who heard it impartially—namely, that the sooner the episode was forgotten the better. We believe we consult the interests of the Institution by saying nothing further here concerning either the paper or the discussion.

Mr. Price's paper was followed by one by Mr. W. Boyd, of Wallsend-on-Tyne, "On Slipways," which we shall give in our next impression.

No discussion followed, and the members and visitors were again entertained at the Assembly Rooms by the local committees. After luncheon the members and visitors proceeded to the quay, and embarking on board three special steamers, proceeded down the Tyne.

The first stoppage was made to afford the members an opportunity of examining the work being done by a double dredger at Bill Point, in deepening the bed of the river. The dredger was working not in mud but in sandstone rock, the ladders being fitted at intervals with heavy steel claws, which break up and abrade the rock, masses weighing as much as 1 cwt. being torn off. Now and then these hooks get firm hold, nothing will give way, and the engines are brought up all standing; but the struggle

is renewed, and ends in the defeat of the rock. The excursion was prolonged down to Tynemouth, and an opportunity was afforded the members of examining the whole of the works in progress, including the new Coble Dene Dock, which covers an area of twenty-four acres, with vast powers of extension. The excavation here is being made by three Ruston and Proctor's steam diggers, similar to those which have been already illustrated in The Engineer.

We cannot, within the space at our disposal, better describe the river Tyne improvements works than by reproducing here an account of them issued for the guidance of its members by the Institution of Mechanical Engineers, an abstract from a pamphlet by Mr. Messent, to which we add a small plan of the Coble Dean Dock and its environs.

Previous to 1850 improvements in the Tyne had been limited chiefly to dredging on a small scale, and to groynes and training walls thrown out into the river, behind which land was reclaimed. A bar extending about 800ft. from west to east, at the mouth of the river, gave at spring tides a depth of 21ft. and 6ft. at high and low water respectively, with 600ft. width of channel. An inner bar with stones occurred at five-eighths of a mile above the outer bar; and a little higher the channel was abruptly contracted to 400ft. width at the Narrows. Shields Harbour, extending about a mile and a-half up from this point, had a narrow, tortuous, deep-water channel, with large shoals dry at low water. Thence up to Newcastle were a series of shoals, with only a narrow serpentine channel between them, through which vessels drawing 15ft. could get up at high water spring tides, while at low water the depth was only 3ft. to 4ft. From Newcastle Bridge to Newburn small craft alone could get up the river, and these only at high water. In 1853 was commenced, under the late Mr. Plews, the construction of the Northumberland Dock on the north bank, about three miles above the bar, having nearly 55 acres of water space, with 24ft. and 20ft. depth over the cill at high water of spring and neap tides respectively. The dock was made by enclosing a portion of a bight in the river, where most of the coal from the Northumberland coalfield was shipped; it was completed in 1857, without the traffic having been stopped during its construction. In 1856 were commenced the Tyne piers, designed by the late Mr. Walker, at each side of the river mouth. On a base of rubble stone, deposited by barges, is erected a superstructure of concrete and built stonework. The length at present completed of the north pier is 2472ft., or 0·47 mile, with submerged base extending 350ft. further; and of the south pier 4495ft., or 0·85 mile, with 610ft. of submerged base beyond. In 1861 authority was obtained for carrying out Mr. J. F. Ure's comprehensive plan for improving the whole nineteen and a-quarter miles of the tidal portion of the river, namely, ten and a-half miles from the entrance bar up to Newcastle bridge, and eight and three-quarter miles above the bridge to the boundary stone at Hedwin Streams, midway between Newburn and Wylam. In accordance with this plan, and from the protection afforded by the Tyne piers, the entrance bar has been removed, the former depth of 6ft. at low water being now increased to more than 20ft., which is continued up into the harbour for a considerable width; and the obstructive Narrows have been widened from 400ft. to 670ft. In Shields Harbour the dangerous shoals have been removed, and for a length of one and a-half miles vessels can moor in more than 30ft. depth at low water spring tides. Thence up to Newcastle there is now more than 20ft. depth at low water spring tides; and for two and a-half miles further, about 18ft. This is now being continued upwards to Scotswood and Blaydon, where there is already 12ft. depth at low water. The dredging plant comprises six dredgers—three of over 50-horse power—ten steam hopper barges, forty four wooden hopper barges without steam power, and six steam tugs; the whole dredging plant and the repairing establishment have cost £300,000. The quantity dredged from the river bed since 1860 has been 60 million tons. The material dredged is carried two or three miles out to sea by hoppers, and deposited in a depth exceeding 20 fathoms at low water. Near Blaydon the dredged material is spread upon the land; and here the river has been widened from 150ft. to 400ft., while a new cut, 400ft. wide and nearly a-quarter mile long, has been made through Lemington Point, saving three-quarter mile distance between Newburn and Scotswood. At Newcastle the old stone bridge, which was a great obstruction both to tide and to navigation, has been replaced by a swing bridge, completed in 1876, having four openings corresponding with those of the High Level bridge immediately above. The two central openings, each of 104ft., are spanned by a double-leaf swing bridge, pivotted on the intermediate or centre pier. The piers and abutments are of stone and concrete, and rest on foundations of cast iron cylinders filled with concrete, which are sunk to the rock, 45ft. below low water. The superstructure is of wrought iron, and was constructed by Sir W. G. Armstrong and Co.; its width is 47½ft. over all. The length of the swing portion is 281ft., and its weight 1450 tons. The dangerous bend at Bill Point, on the north bank of the river about three miles below the bridge, has now been nearly removed by cutting back the cliff, rising 72ft. above high water, to a distance of about 400ft. Northumberland Dock has been deepened and enlarged, with the addition of a jetty and wharf; below it and outside has been constructed a riverside wharf, 1100ft. long. Above this are two self-acting coal-shipping staiths, each having three spouts; the loaded wagons, brought within about 540 yards by locomotives, run down inclines to the shipping spouts, and after discharging run off empty down other inclines; with the three spouts from 800 to 1000 tons of coal per hour may be loaded into a vessel at each staith. The staiths were completed in 1874. On the north side of the river, below the Northumberland Dock and at the upper end of Shields Harbour, is the new Coble Dene Dock, commenced in 1874, and now within less than two years of completion. It is intended chiefly for import traffic, and will inclose 24 acres of water space, with 3650ft. of deep-water quays; it will ultimately be extended to join the Northumberland Dock. The tidal entrance will be 80ft. wide, with a lock 60ft. wide and 350ft. long. The depth of high-water over the cill will be 30ft. at spring tides, and 26ft. at neaps. The excavation amounts to about five million tons, of which a large portion is removed by dredgers and steam navvies, and carried out to sea by hoppers, the rest being used to level up the standage ground and the wharves behind the quays. On the south side of the river, opposite the Northumberland Dock, are timber ponds, constructed in 1874, and inclosing 87 acres, for accommodating the timber trade of the port. The whole of the above works, since 1859, have been carried out for the River Tyne Commissioners, from the designs and under the superintendence, first, of Mr. Ure, and subsequently of Mr. P. J. Messent, M. Inst. C.E., the present engineer.

We have anticipated the progress of the steamers a little, and must return. After leaving the dredger, a visit was paid to the Lead Works of Messrs. Cookson and Co., where the process described in Mr. Cookson's paper is carried out. Much interest was taken by the visitors in the "boiling" of molten lead by steam. A very large plate of lead was being rolled into sheets. The engines employed have two cylinders 18in. diameter by 36in. stroke. They are fitted with link motion worked by water pressure, very simply, as described by Mr. Cookson. On a table were shown several specimens of silver, including some masses weighing 14,000 ounces, and a collection of specimens of lead ore, antimony, lead crystals, litharge, red-lead, &c. Mr. Cookson stated incidentally to his visitors that one sample of lead had been obtained which before concentration contained 4000 ounces of silver to the ton. The boats then proceeded to the works of the Wallsend Slipway and Engineering Company, which they carefully examined. There was no ship on the cradle, but the cradle was worked to show members its mode of operation. This is so fully described in Mr. Boyd's paper that we need not further refer to it. The company builds engines and boilers and turns out very good work The process of flanging boiler plates is effected by special machines, designed by Messrs. Tweddell and Boyd, which we shall illustrate in an early impression. A collection of photographs attracted a great deal of attention, illustrating as it did the injury done by collisions to ships which have been subsequently repaired by the company. We may mention in particular photographs of the steamships Elphinstone and Redwater, which totally wrecked each other's bows. The steamers then proceeded to Tynemouth, whence, after a glance at the pier works there in progress, the members and visitors returned to Newcastle by special train.

The day's proceedings were terminated by a *conversazione* given in the rooms of the Literary and Philosophical Society and of the North of England Institute of Mining Engineers. There were about 1000 persons present. The Museum of Natural History was thrown open, and there was a fine display of microscopes. The lecture-room and Wood Memorial Hall were lighted by Swan's lamps. In the course of the evening Mr. Swan delivered a brief lecture on the electric light. Sir William Armstrong made a brief speech, and so did Mr. Cowper. This terminated the business of the meeting as far as Newcastle was concerned. On Friday a visit was paid to Sunderland, our notice of which we must reserve for another impression.

ANALYSIS OF OILS, OR MIXTURES OF OILS, USED FOR LUBRICATING PURPOSES.

Oils, fats, waxes, and bodies somewhat similar in nature, may—according to the substance of a paper recently read before the Chemical Society, by Mr. A. H. Allen, of Sheffield, and Mr. Thomson, of Manchester—be divided into two great classes, viz., those which combine with soda, potash, or other alkalies to form soaps, and those which do not; and as those two classes of bodies differ materially in their actions on substances such as iron, copper, &c., with which they come in contact, it often becomes a question of great importance to the users of oils for lubricating purposes to know what proportions of these different substances are contained in any oil, or mixture of oils. The object of the authors was to give accurate methods for determining the percentages of these bodies contained in any sample. Hydrocarbon, or mineral oils, are now much used for lubricating the cylinders of engines, and especially of condensing engines, and that for two reasons—first, because they are neutral bodies, which have no action on metals; and, second, that they are not liable to deposit on the boilers, if they should happen to be introduced with the condensed water, so as to produce burning of the ironwork over the flues.

Animal or vegetable oils or fats are composed of fatty acids in combination with glycerine, and these, under the influence of high-pressure steam, are decomposed or dissociated, the fatty acids being liberated from the glycerine, leaving the former to act upon or corrode the iron of the cylinder. But here their objectionable influence does not end. They form with the iron hard, insoluble compounds, called iron soaps, which increase the friction between the cylinder and piston, and in some cases gradually collect into the form of hard balls inside the cylinder. When the water is used over and over again, a considerable proportion of the fatty acids of the oils used for lubricating the piston is carried over with the steam, and is found in the condensed water, which is introduced into the boiler along with the water. Here it commences action, which proves quite as injurious to the boiler as it does to the cylinder, but in a different way. It acts upon the iron of the boiler, and on some of the lime salts which constitute the incrustation, forming greasy iron and lime soaps, which prevent the water from coming into absolute contact with it. Thus the heat cannot be drawn away quickly enough by the water, and the plates thus coated above the flues are liable to become burned and weakened. This action has in many cases gone on to such an extent that the flues have collapsed under the pressure of the steam inside.

The authors give two different processes for the determination of animal or vegetable oils or fats and hydrocarbon or other neutral oils. They take a certain weight of the sample, and boil it with twice its weight of an 8 per cent. solution of caustic soda in alcohol. The soda combines with the fatty acids of the animal or vegetable oils, forming soaps; bicarbonate of soda is then added to neutralise the excess of caustic soda, and, lastly, sand, and the whole is evaporated to dryness at the temperature of boiling water. The dry mixture is then transferred to a large glass tube, having a small hole in the bottom plugged with glass wool to act as a filter, and light petroleum spirit—which boils at about 150 deg. to 180 deg. Fah.—is poured over it, till all the neutral or unsaponifiable oil is dissolved out. In the other process no sand is used, but the dry mixture is dissolved in water, and the soap solution, which holds the neutral oils in solution, is treated with ether, which dissolves out the neutral oil, and then floats to the surface of the liquid. The ether solution is then drawn off, and the ether in the one case, and petroleum spirit in the other, is separated from the dissolved oils by distillation, the last traces of these volatile liquids being separated by blowing a current of filtered air through the flask containing the neutral oil, which is then weighed, and its percentage on the original sample calculated.

All animal and vegetable oils yield a small quantity—about 1 per cent.—of unsaponifiable fatty matter, which must be deducted from the result obtained. Sperm oil, however, was found to be an exception, because, from its peculiar chemical constitution, it yields nearly half its weight of a greasy substance to the ether or to the petroleum spirit. The substance, however, dissolved from sperm oil after saponification has the appearance of jelly, when the ether or petroleum spirit solution is concentrated and allowed to cool; and the presence of sperm oil can thus be readily detected. Solid paraffin, heavy petroleum, or paraffin oils, and rosin oil—which is produced by the destructive distillation of rosin—are not saponifiable, and yield about the whole of the amount employed to the petroleum spirit or ether. Japan wax is almost entirely saponifiable, whilst beeswax and spermaceti yield about half their weights to the petroleum spirit or ether.

LARGE SHEET MILL MACHINERY.

Our Birmingham correspondent writes:—Mr. John Lysaght, who manufactures at the Swan Garden Ironworks, Wolverhampton, some 250 tons of black sheets weekly, which he uses up in his galvanising business in Bristol, is largely extending his Wolverhampton establishment by the laying down of two new double sheet mills, which, when they are in operation, will bring the number of mills turning at these works up to eleven, and he is also putting up a new forge train. For this additional production three new powerful engines will be required, which are being supplied by the Lilleshall Engineering Company, and nine new boilers have also been erected. The engines for driving the sheet mills will each have 36in. cylinders and 5ft. strokes. All the three fly-wheels have been cast at Mr. Lycett's Swan Garden Foundry, and one of those which are to drive the sheet mills has been cast during the past few days. The large wheels are alike, and their manufacture has been a feat which it is believed has never before been accomplished in, to say the least, the South Staffordshire district. Each wheel weighs forty tons in the rim, and has been cast in one piece. Their individual diameter is 26ft.; depth, 23in.; and measure across the face, 15in. Each rim will have eight arms affixed, which will weigh about 25 tons, making the total weight of each wheel 65 tons. Fly-wheels weighing 60 tons have been cast in this district before, and some of them with a diameter of 30ft., but it is believed that they have all been cast in either two or four segments, one great reason for this being that it would be impossible to convey such a ponderous piece of machinery *en masse* along a road. Casting them whole reduces the cost.

The operation of casting occupied seven minutes, the metal being supplied from three of Sheldon's patent furnaces situate about ten yards from the casting pit, two of which contain 16 tons 12 cwt., and the other somewhat over 11 tons. The molten iron made its way by three different channels into one moat which surrounded the casting pit, and from the moat it entered the mould by seven channels. The bottom and top of the mould was formed by iron plates lined with sand, and the sides by 9in. of brickwork. These heavy wheels are necessary, as the engines will drive the mills direct without the intervention of any intermediate gearing. The wheel which was first cast has already been moved upon oak rollers a distance of some 150 yards from the works and across an arm of the canal to the pit in which it will work, and the other wheels will be similarly dealt with. Each pit is 15ft. deep by 29ft. long.

PUMPING ENGINES—SALFORD SEWAGE WORKS.

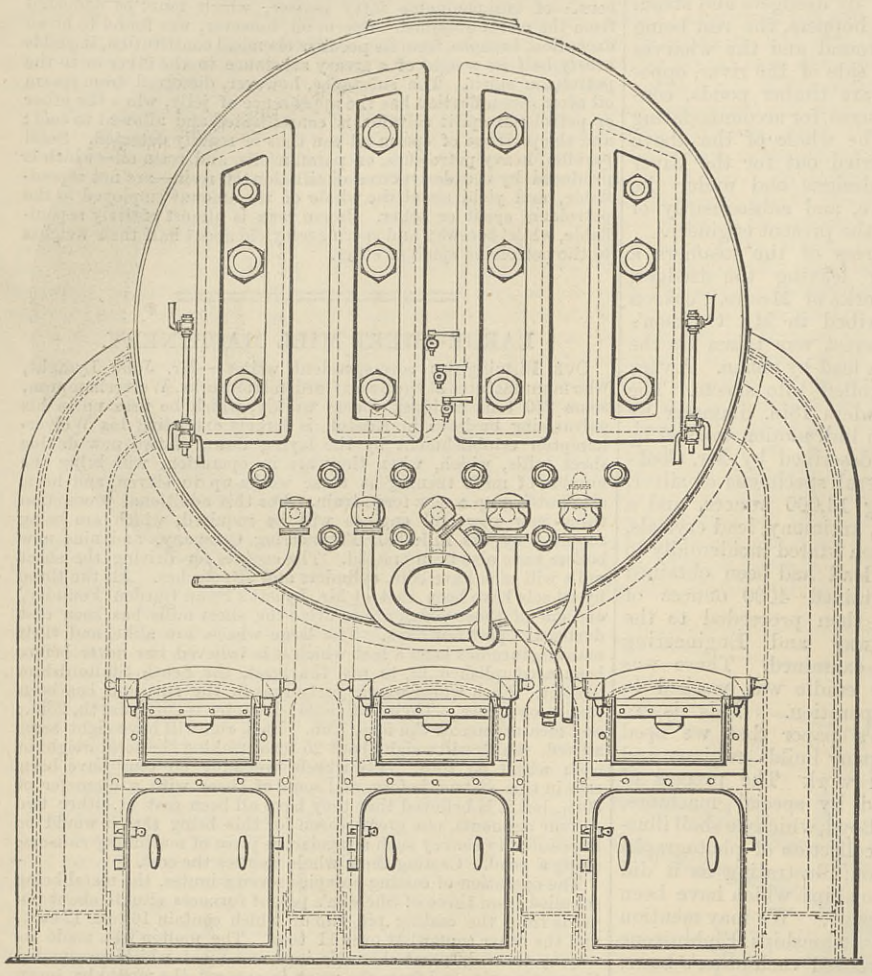
On page 116 we give the first of several illustrations of the pumping machinery at the Salford Sewage Outfall Works, near Mode Wheel, Salford. Mr. Arthur Jacob is the engineer for the works, and Messrs. James Watt and Co. have designed and constructed these pumping engines from his general specification. We shall give a full description of the works with the other illustrations in another impression.

Society of Engineers.—Arrangements have been made for a visit of the members and associates of this Society, on Wednesday, the 17th inst., to the new goods depôt of the Great Eastern Railway, at Bishopsgate, by permission of the company. Members and associates will assemble at the Engineer's-office, Bishopsgate Goods Station, at 2 p.m. Arrangements will be made for those members and associates who wish to do so to dine together at the Guildhall Tavern, Gresham-street, at 5.30 p.m. punctually.

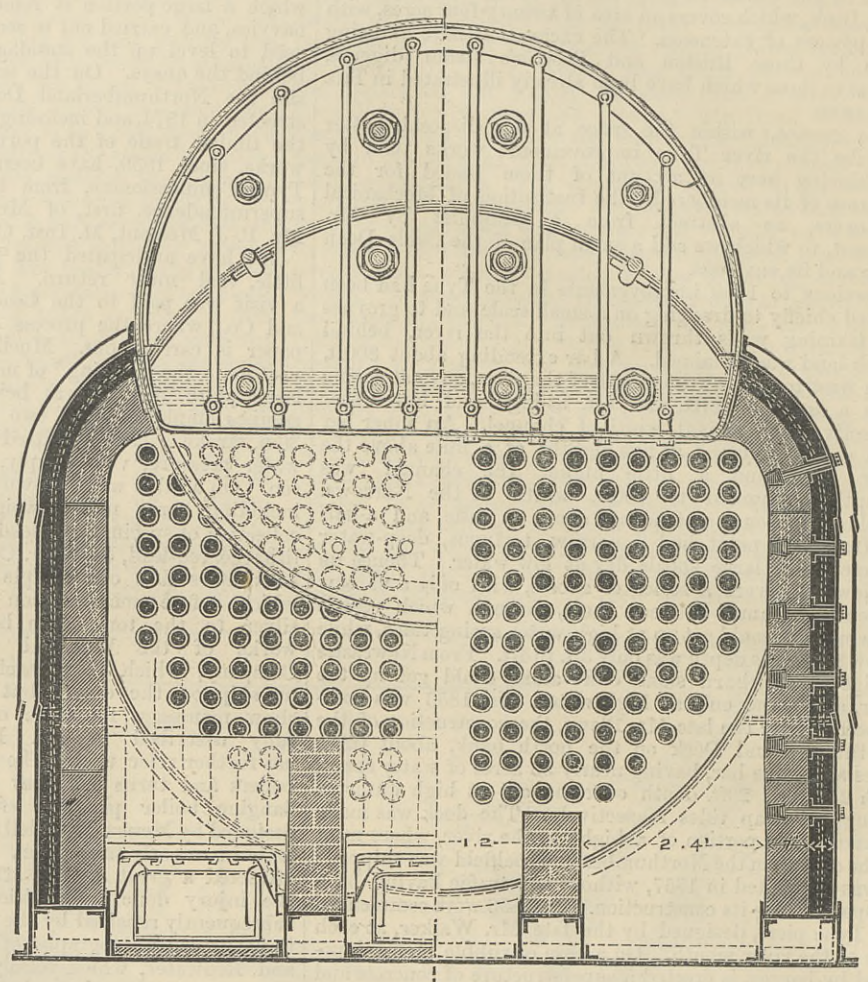
The New Docks and Municipal Buildings at Greenock.—The foundation-stones of the James Watt Dock and the new Municipal Buildings, Greenock, were laid on Saturday by Provost Campbell. In honour of the event the day was made a general holiday, and a procession, with representatives from almost every trade and society, to the number of several thousands, turned out to witness the ceremony. A banquet, for which 500 invitations were issued, was given in the Town-hall, followed by a display of fireworks. These docks, with other important extensions, constitute important engineering works, and of them we shall give illustrations and particulars in another impression.

Spanish Navy.—On the 28th ult. the Royal Spanish cruise Grarina was launched from the dockyard of the Thames Iron works and Shipbuilding Company in the presence of a large number of visitors, including many Spanish ladies and gentlemen. It is now sixteen years ago since there was turned out from the same shipbuilding yard, and for the same country, the armour-plated frigate Vitoria, which still ranks as the first vessel in the Spanish navy. The Government of Spain some time ago gave the above company an order for two very powerful naval corvettes, the first of which was launched yesterday week, while the sister vessel, the Velasco, will, it is expected, enter the water in about a month hence. The dimensions of the Grarina are as follows:—Length, 210ft.; breadth, 32ft.; depth, 16ft. 6in.; the burthen is 1038$\frac{3}{4}$ tons British measurement; armament, three 6in. 4-ton breech-loading new type Armstrong guns. The engines will be 1500-horse power, the constructors being Messrs. Humphreys, Tennant, and Co. Both vessels are built of iron, with full poop and forecastle, while as regards the three Armstrong guns, one will be in the bow under the forecastle, and one on each side amidship, firing *en barbette* on a projecting sponson, thus obtaining a range of fire of 180 deg. The two vessels are to have a speed of 14 knots, and will be barque-rigged. The invited guests were received by Mr. Rolt, chairman of the company, who was accompanied by Mrs. Rolt, Miss Rolt, Miss Greig, Mr. A. F. Hills (the director of the company), Mr. Hayward (the manager), and Mr. Mackrow (naval architect). Amongst those present were the Bishop of Avila, Senor Acana (president of the Spanish Commission in London for Shipbuilding), and Senora Acana, Senor Millas (Consul-General of Spain), Senor Pascual de Gayangos, Captain Comerma (Spanish Naval Attaché), Senor and Senora Carreras, Senor de Churruea, Senor Castilio (Spanish Naval Constructor), Captain Creasy and Captain Gialussi, of the Greek navy, and Captain Montajo, commander of the Grarina. The Bishop of Avila having, with the assistance of a Carmelite monk, gone through the religious ceremony customary at the launching of Spanish vessels, Senora Acana sent the vessel on her maritime career with the aid of a polished axe, amid loud cheers from the spectators, the launching being a perfect success. A luncheon followed in a spacious tent, under the presidency of Mr. Rolt.

BOILERS OF THE STEAM-TUG GAME-COCK.

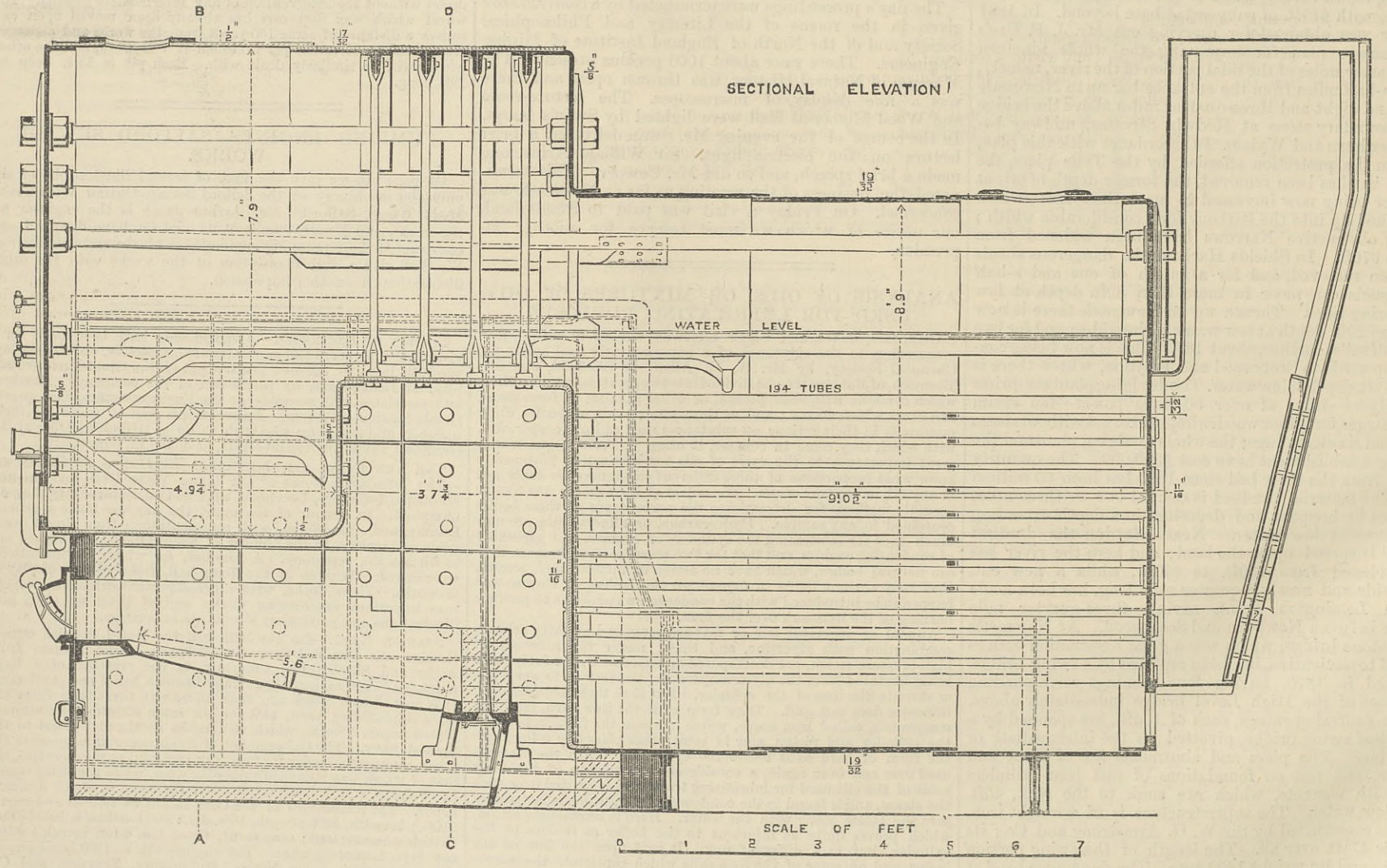


FRONT ELEVATION



TRANSVERSE SECTION ON LINE A B.

TRANSVERSE SECTION ON LINE C.D.

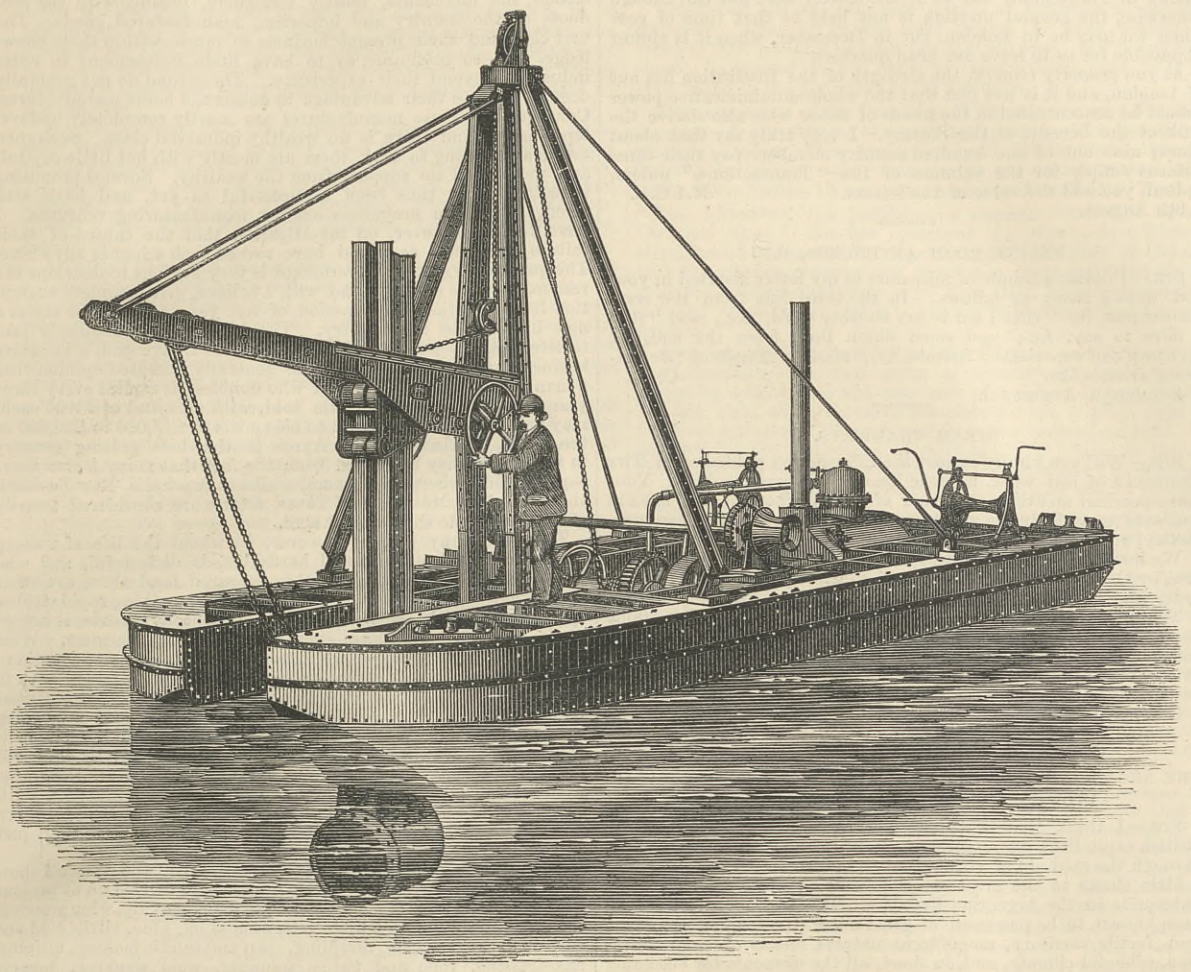


We illustrate above and on p. 120 the boilers of the Liverpool steam-tug Game-cock. The difference between these boilers and those of the Armathwaite, referred to in our impression for July 22nd, is in dimensions, only save that whereas the Armathwaite has two furnaces in each boiler, the Game-cock has three. The drawings explain themselves. It will be seen that the furnaces are of wrought iron plates lined with fire-clay blocks. The smoke-box doors being at the further end of the boiler, the stokers are spared the radiation from them, and the stokehole is remarkably cool. There is a saving in weight for a given power of quite 30 per cent.; and there is also a great saving in space occupied. As an example of the performance of the Game-cock's boilers, we may say that on July 9th, 1880, she took on board 145 tons of South Wales coals, which with what was in the bunkers, made about 210 tons; she got under weigh the same night to dock the s.s. Scandinavian. On the 10th she towed the steamer St. Patrick from the dock to the river, and attended upon her all day. Sunday 11th she took the St. Patrick to Holyhead, and came back for the ship Wandering Jew, and towed her to Holyhead on the 12th and came back on the 13th; she towed the ship Bay of Cadiz to Tuscar and then proceeded to Havre, arriving there at midnight on the 15th. On the 16th she left for Cardiff with the ship Duchess of Argyle arriving there at 9 p.m. on Sunday, the 18th. Monday, 19th, she docked the ship in Cardiff, on the 20th she towed the ship City of York to Lundy Island, and went back to Cardiff. On the 21st she towed the ship Eavesham Abbey to Lundy Island; the Game-cock then ran across the Channel to the Saltees. On the 22nd she spoke a number of vessels, and on the 23rd she took the ship Alexander Yates in tow for Liverpool and arrived at four Sunday morning, and docked the ship at noon the same day, 25th, and came up to the Canada Works. She had from forty-five to fifty tons of coal left in the bunkers. The average consumption of the ship is eight tons per day. The Game-cock has compound twin-screw engines. The high-pressure cylinders are 26in. and the low-pressure 45in. diameter by 2ft. 6in. stroke. The propellers are 8ft. 6in. diameter and 14ft. 9in. pitch. The average speed of the boat with 130 tons is twelve knots, the gross indicated power, 1164-horses, of which the circulating engine represents 35-horses. It will be seen that this performance is very good. In giving her consumption as eight tons per day, that is the average of her consumption from 23rd April to 21st December, during which time she was 233 days under steam, but, of course, not steaming the whole time. The boiler has now been so fully tried that no hesitation may be felt in pronouncing it thoroughly good.

Naval Engineer Appointments.—The following appointments have been made at the Admiralty:—Chief Engineer W. T. Pover, to the Sappho, when commissioned on the 16th inst.; Chief Engineer F. T. Pendleton, to the Asia, additional for Euphrates. Engineers Wm. H. Riley, to the Vernon, *vice* Gyles; David J. Gyles, to the Monarch, *vice* Renfry; Thomas Carter, to the Pembroke, additional for Elk; and George F. Greaves, to the Asia, additional for Euphrates. Acting Assistant Engineers John E. Jenkins, to the Assistance, *vice* Bolland; F. T. W. Curtis, to the Tamar, *vice* Cook; and Stephen Hockey, to the Tyne, *vice* McCarte.

SINGLE BUCKET DIPPER DREDGER.

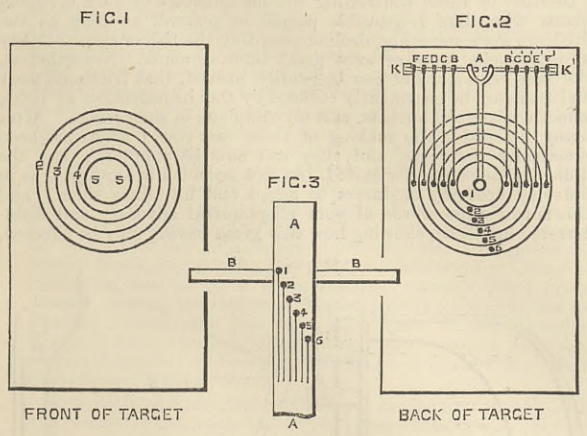
MESSRS. J. AND G. RENNIE, BLACKFRIARS, ENGINEERS.



We illustrate above a useful type of dredger made by Messrs. Rennie, of Blackfriars. The drawing almost explains itself. The machine consists of a double barge or pontoon, in which is erected a derrick. This derrick works a "spoon" dredge at the end of a lever. The spoon, as shown, is at its lowest position. It will make a forward stroke, through about one-sixth of a revolution, and will thus become filled with mud and be lifted above the surface of the water. The motion will be imparted to it by the chain and pulleys seen at outer end of the derrick jib. The jib will then be swung round over the bank on a hopper barge and its contents delivered. The requisite power is supplied by the steam engine at the end of the pontoon. Messrs. Rennie have made several of these little dredgers, which are found very useful and handy in shallow water.

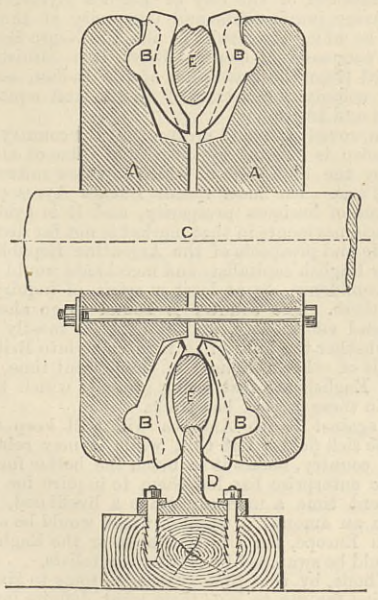
WILSON'S SELF-REGISTERING TARGET.

We give herewith a description which we have received of a design for a self-registering target. We think that suspension and pendulum action is a more hopeful plan than moving on rollers. The details, however, can only be tested by experiment. A short time since we published in The Engineer a description of an invention in some particulars similar to that now illustrated, but differing essentially in several important points, and to which points we made objection; one objection was that the spiral springs, which force back the struck portion of the disc, moving on rollers, might, under certain conditions, not always be effective in performing their function. The target now illustrated is the invention of Dr. Wilson, of Hawkhurst. It consists of a sufficiently thick plate of iron, out of which six circular discs, or concentric flat faced rings of necessary breadth, are made as seen at Fig. 1. The rings must be of such diameters that there shall be a clear opening all round between each of them of about $\frac{3}{16}$in. or $\frac{1}{4}$in., so that the disc rings—see Fig. 2 back of target—hang by hooks of sufficient length on the cross rod K K, and work on it, as an easy joint, may move backwards and forwards without touching each other. They support in pairs—with the exception of No. 5—one of the disc rings, which form the face of the target, F F support ring 2; D E, D^1 E^1, support rings marked 3; B C, B^1 C^1, rings marked 4; and A supports 5, the bullseye. When the bullet hits the face of one of the disc rings, it swings back, but, by the ring's own natural weight, it immediately rights itself, and falls back into its original position. The spots 1 2 3 4 5 6 are nipples or tongues. One is fixed in the back of each of the disc rings; and when the ring is suddenly forced back, its nipple plunges into a small hole—see Fig. 3—opposite, to correspond in the strong plank A A, faced with iron, behind the target, and to which the target is fixed. The holes in A A, Fig. 3, are also marked 1 to 6; into these the nipple plunges deep enough to touch the sensitive needle, and through this medium sets a signalling apparatus in motion. The sensitive needle must be sufficiently deep in each hole to be entirely protected against any accidental breaking and flying about of pieces of the bullet. The electric apparatus can be made safe behind the broad plank A A. On the inside of the crossbar B B, Fig. 3, a short distance behind the target disc, there are pads or buffers, to deafen the harsh sound of the iron disc in dashing against an iron surface, and also to prevent the disc ring being thrown back too far by the impact of the bullet. In Fig. 1, 5 represents the bullseye; then 4 and 3 are each divided into two rings. If the bullet strikes on the opening between 5 and the inner ring 4, forcing both back, it would not be a bullseye, but the best position on 4; if on the inner ring of 4 only, it would be a more valuable position than if it struck on the opening between the two rings marked 4, forcing both back, but this position of the shot again would be still more valuable than if the bullet hit the outer 4 ring only. These hits would point out a relative value, say equal to $4\frac{3}{4}$, $4\frac{1}{2}$, $4\frac{1}{4}$, 4, yet all equal to 4, but showing a difference, and they can be recorded with unfailing accuracy in the firing point at the moment the bullet hits the target. The rings marked 3 may be divided in the same manner. Thus eleven different values of hits may be recorded by this target. The hooks by which the disc rings hang require to be considerably bent outwards, all except F F, to allow the rings to swing sufficiently far back, and not touch any of the other's hooks.



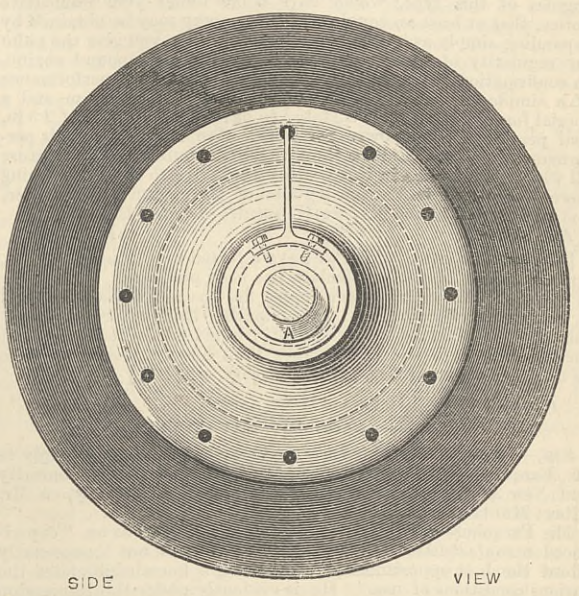
CENTRE GRIP WHEEL FOR HILL LOCOMOTION.

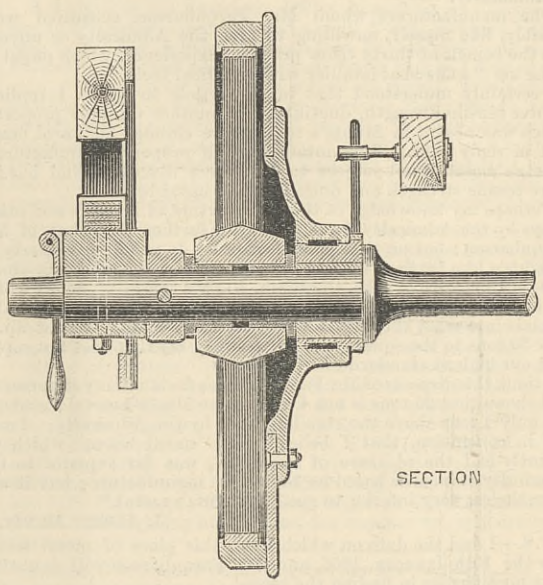
The arrangement of centre grip which is illustrated herewith we take from the *Wochenschrift des vereines Deutscher Ingenieure.* It is very simple, and is almost completely described by the illustration, in which *a* are two discs connected by bolts; *b*, movable checks; *c*, axle; *e*, loose tire; *d*, the rail of T-iron against which the tire is pressed with a force varying according to the weight, by the movable checks. The wheel is supposed to be keyed to a separate axle with two cranks, and the whole so arranged that the real locomotive or carriage wheels run upon ordinary rails or upon the ground, a part of the weight only being transferred to the axle *c*, whether by steam or spring pressure.



COMBINED ROAD AND RAIL TRUCK WHEELS.

In an article on Common Road Railways in our issue of July 8th, we mentioned the desirability of wagons being so constructed as to be able to run on common roads as well as upon rails. We now illustrate the wheels fitted to wagons made by Messrs. Ransomes and Rapier, Ipswich, to enable this object to be effected. This wheel, which is shown in detail, is the invention of Mr. E. Perrett, of Westminster, and the wagons or trucks to which they have been fitted are for use on the Dublin and Lucan steam tramway. As the line terminates some distance from the quays, the goods will be hauled by horses along the street to the terminus of the tramway, and then taken by steam to their destinations on the line, and *vice versâ*. The special apparatus consists of a wheel loose on the shaft and provided with a flange, which, however, is quite separate from it and carried on its own boss; in the flange boss are two excentrics, each of $\frac{5}{16}$in. throw, the inner one is fixed on to the shaft, and the outer one is prevented from turning by a stop. When running on the rail the two excentrics are placed so as to neutralise each other, and the wheel and flange rotate with equal angular motion, but by turning the shaft by means of a lever, and fixing it in that position, the flange is thrown up, and revolves at a higher level than the wheel, thus enabling the wheel to run on the road. The trucks are provided with a fore carriage and pole for use when running on the ordinary road.





THE PRODUCTION OF PIG IRON.

The following statement of the production of pig iron for the half-year ending June 30th, 1881, and of stocks in warrant stores, and in makers' hands in each district of the United Kingdom at that date was published yesterday by the secretary, Mr. J. S. Jeans, of the British Iron Trade Association:—

Stocks of Pig Iron.

	Production. Tons.	On June 30th 1881. Tons.	As against on 31st Dec. 1880. Tons.
Cleveland	1,359,849	431,326	331,124
Scotland	571,422*	567,155†	495,850†
West Cumberland	432,101	85,251	65,000
South Wales	470,502	63,696	61,000
North Wales	29,067	5,700	8,787
South Staffordshire	140,000	62,500	55,000
Lincolnshire	108,250	35,414	25,000
Lancashire	369,178	92,511	85,000
Northamptonshire	100,528	45,171	21,000
North Staffordshire	141,944	42,559	35,000
West and South Yorkshire	153,941	83,807	50,000
Derbyshire and Notts	197,539	53,471	30,000
Shropshire	42,500	34,000	30,000
Gloucester, Wiltshire	18,000	6,200	5,500
Total	4,134,821	1,608,761	1,298,261
Add makers' stocks in Scotland		Unknown	243,150
	Total		1,541,411

* Estimated. † Stocks in warrant stores only.

	Tons.
The stock of pig iron on January 1st, 1881, was	1,541,411
The production of pig iron during the first half of 1881, was	4,134,821
Total	5,676,232
Deduct stock * June 30th, 1881.	1,851,711
Consumption in first six months of 1881	3,824,521

* Makers' stocks in Scotland estimated at the same figure as on January 1st, 1881.

Of the quantity of production returned for the six months ending 30th June, 1881—3,445,399 tons are actual returns made to the Association, and 689,422 tons are estimated, including the whole make of Scotland; making a total of 4,134,821 tons.

Of the stocks of pig iron returned on the 30th June, 1881—1,563,761 tons are actual returns, and 45,000 tons are estimated, making a total of 1,608,761 tons.

The stock of pig iron in warrant stores and in makers' hands on the 30th June, 1881, is equal to 12½ weeks of the consumption of the first six months of 1881.

LETTERS TO THE EDITOR.

[*We do not hold ourselves responsible for the opinions of our correspondents.*]

COMPOUND PORTABLE ENGINES.

Sir,—From your leading article of July 29th, I gather that you deduce from actual comparative trials of simple *versus* compound engines of this type, which have come under your immediate notice, that at least an equal ratio of economy may be obtained by expanding simply as by compounding, although you give the palm for regularity of speed and durability to the compound engine. In confirmation of your argument you have quoted the performance of a simple expansive engine, which, with 120 lb. steam and a special form of valve gear, is stated to have given a result of 2·5 lb. coal per brake horse-power per hour. Are the data of this performance on record, and are they within the public reach? because all who are interested in this subject would like to know something more with regard to the construction of the engine and its boiler, and with regard to the evaporative results obtained therewith.

August 3rd. Enquirer.

[The experiments to which we have referred were made privately, and no record of the particulars has been published. The boiler of the engine in question has a copper fire-box and brass tubes, and is, no doubt, very efficient. In comparing this performance with that of the engines tested at Cardiff, it must not be forgotten that the pressure carried is 40 lb. higher than has yet been allowed to be used by the Royal Agricultural Society.—Ed. E.]

MUNTZ'S METAL AND NAVAL BRASS.

Sir,—I must ask you to allow me to write a few lines in reply to Mr. Farquharson in yours of the 22nd July, on the "Admiralty and New Alloys," or perhaps I might more correctly say, on Mr. Albert Muntz and Muntz's metal.

Mr. Farquharson is kind enough to put me down as an "experienced manufacturer," but he states, that does not "necessarily afford the best opportunities of acquiring a knowledge under the various conditions of use." He is evidently under the impression that the responsibility of a manufacturer ceases as soon as the material he manufactures leaves his premises. I have always understood that the "conditions of use" and the cause of failure under the various conditions of use, were one of the first lessons that every manufacturer had to study, for the very simple reason that his responsibility lasted long after the material left the manufactory, and this is especially the case in Muntz's metal, where the liability extends over several years, and makes the careful study of causes and effects "in use" very peculiarly interesting to the manufacturer.

The manufacturers whom Mr. Farquharson consulted were possibly, like myself, unwilling to give the Admiralty or anyone else the benefit of thirty years' practical experience, which ought to make me "somewhat familiar with practical facts."

I certainly understood that in the article to which I replied, greater tensile strength, ductility, and another valuable property, which was absent in Muntz's metal were claimed for naval brass, and in reply to this, I maintain that, if properly manufactured, Muntz's metal is not subject to the defect described, and has far more tensile strength and ductility than naval brass.

Perhaps my knowledge of the manufacture of Muntz's and other alloys by the Admiralty dates somewhat further than that of Mr. Farquharson; but on that point I regret I do not feel at liberty to enlighten him further than to say, that some sixteen years since, at the Admiralty Works, Chatham, I saw a piece of metal which we had supplied, but which had been converted by the Admiralty officials into what they considered "Muntz's metal" tested up to over 30 tons to the square inch; but I may say that does not represent our highest standard of strength.

I think this disposes of Mr. Farquharson's facts and my statements, and shows that 26 tons is not 4 tons above Muntz's metal standard, but only 4 tons above the standard fixed by the Admiralty. I may say in conclusion, that I believe the "naval brass," which we recently had the pleasure of supplying, was far superior to the Admiralty standards based on their own manufacture; but it was nevertheless very inferior to good "Muntz's metal."

J. Albert Muntz.

P.S.—I find the date on which I saw this piece of metal tested was the 15th January, 1866, and Mr. Farquharson will doubtless have no difficulty in finding the record.

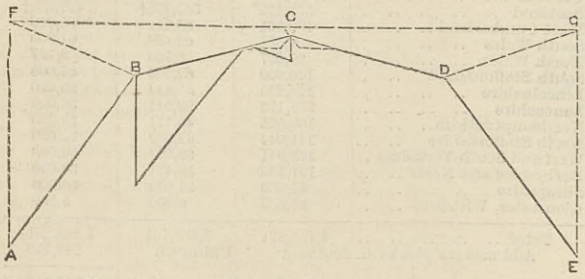
THE PROPOSED BRIDGE OVER THE DOURO.

Sir,—The main argument of "A Common Five-eight" being that the two cantilevers forming the bridge will fall at the centre, he will admit that the lines a-b, b-c, c-d, d-e are the representatives of the only members under strain if there is no weight or anchorage at f and g, therefore the strains might be calculated by the same method as that used for a polygonal framing, as under:—The weights of 750 tons acting 10ft. from b and d towards the centre are equivalent to the following weights at b, c, and d:—

$$\text{Weight at } b \text{ and } d = \frac{150}{160} \times 750 = 703{\cdot}1 \text{ tons.}$$

$$\text{Weight at } c = 2\left(\frac{10}{160} \times 750\right) = 93{\cdot}8 \text{ tons.}$$

Adding to weights at b and d, their proportions of the weight of the struts a-b and d-$e = \frac{80}{135} \times 100 = 59{\cdot}2$ tons, we have weights at b and $d = 762{\cdot}3$ tons. By determining the strains graphically from these weights, we find the strain in line c-b in the direction of $b = 172$ tons, which is much less than the strain of 747 tons in



the same line in the opposite direction, therefore the polygon will rise at the centre instead of falling, as supposed by "A Common Five-eight," and require the other members which are dotted in the diagram, and also the reaction of the abutments to balance the structure.

These strains are in excess of those computed by Mr. Reilly, because with the consideration of the other members the structure becomes a fixed framing, and the weight of 750 tons acts considerably above the polygonal framing, which, of course, cannot be the case when considering the lower members separately.

Upton, Aug. 9th. Henry A. Cutler, Stud. Inst. C.E.

OLIGARCHICAL GOVERNMENT OF TECHNICAL INSTITUTIONS.

Sir,—You have earned the thanks of all the country members of the Institution of Civil Engineers for your article on this subject. Your argument is, I think, perfectly sound—that the Council have interpreted the charter in a way that was never intended when it was framed, but as the Council think they must abide by the letter of the law, the remedy is clear—let us have the charter altered. As a sort of compliment to the provincials, the London men have of late years elected one or two country engineers, but so far as I can judge they have not been the men who would have received the honour were the elections not confined to a section of the institution.

Many of us whose business ties us to the country for the principal part of the year are up in town occasionally during the sitting of Parliament, but as if the matter were not bad enough otherwise, the general meeting is not held at that time of year when we may be in London, but in December, when it is almost impossible for us to leave our head quarters.

As you properly remark, the strength of the Institution lies out of London, and it is not just that the whole administrative power should be concentrated in the hands of those who also derive the bulk of the benefits of the Society. I may truly say that about ninety-nine out of one hundred country members pay their three guineas simply for the volumes of the "Transactions," unless, indeed, you add the value of the letters M.I.C.E.

9th August.

ENGINE ROOM ARTIFICERS, R.N.

Sir,—I notice a couple of misprints in my letter inserted in your last week's issue, as follows:—In the third line from the commencement, for "that I am to say another word," &c., read "that I *dare* to say, &c.;" and some dozen lines from the end, for "example of experienced friends, &c.," read "example of '*Experience's*' friends, &c." C. C.

Edinburgh, August 6th.

STEAM TRAMWAYS.

Sir,—Will you kindly correct the information published in The Engineer of last week, by your Lancashire correspondent. Your correspondent mentions the name of a firm whom he says have in course of manufacture a steam tramway engine for the Dewsbury, Batley, and Birstal Tramways Company.

We now wish to state that no engine has been ordered from any firm by the said tramways company, excepting the four engines on order from our firm, and which are now approaching completion.

The steam tramway engines working the whole of the traffic upon the Dewsbury, Batley, and Birstal Tramways were manufactured by us, and the other engines now in course of construction at our works have been ordered for the same tramway's recent extensions. Merryweather and Sons.

Greenwich-road, S.E., August 4th.

THE ARGENTINE REPUBLIC AS A FIELD FOR BRITISH CAPITAL, INDUSTRY, PRODUCTS, AND EMIGRATION.

Sir,—I think that it will be a good service rendered to the British capitalists, manufacturers, and agriculturists, if I succeed, through the medium of your columns, in directing their attention a little closer to the great scope now being opened up for their enterprise in the Argentine Republic. This vast country has long been known to be possessed of great natural resources, abundant and fertile territory, magnificent natural means of communication, splendid climate, and, in short, all the elements for becoming a great and wealthy nation. Hitherto its progress has been much retarded owing to the unsettled state of its government and other political evils arising directly from the errors of the Spanish colonial system. To those who have closely studied the history of South America it seems that the troubles of the early life of the Republics formed out of the colonies were inevitable, but that the causes which have led to them are now rapidly passing away. These political troubles have, however, been greatly exaggerated in the European mind, and their effects misunderstood. For all travellers from South America will bear me out in saying that even amongst educated people in Europe there exists an ignorance regarding South American affairs which is scarcely credible, and not at all creditable.

Thus many people confound all the countries of that Continent together, and half believe that these communities are still in a state of simi-civilisation and continual anarchy, and that life and property are utterly insecure. This partly arises from the fact that the European press rarely occupy themselves with South America, except when there is a revolution to chronicle, whilst in times of peace and prosperity it is forgotten. In the great cities of the Plate life and property are almost as secure as in London.

It is not my purpose to cumber your columns with information which may be found in treatises on geography and history by those who care to study them. But no treatise, however recent, can give an idea of the present state of the Argentine Republic, and of the vast strides of progress which have been made during the last twelve months. Despite the troubles which attended its rise, the progress made by this Republic is such as to strike with admiration all visitors to its shores. It cannot, therefore, be too widely known that with the advent of the present Government, under the presidency of General Roca, it may be said to have started upon a new era of its history, an epoch of progress. The reasons for this are too long to be detailed here, and they must, therefore, be accepted on the faith of the general public opinion of the country. This opinion is principally based on the strength, unity, and popularity of General Roca's government and its enlightened policy, which has rendered opposition unpopular. Also upon the effects of the federalisation of the city of Buenos Ayres, the rapidly increasing foreign immigration and prosperity of the emigrants. To this must be added the results of the Rio Negro Expedition of 1877, under command of General Roca, then Minister of War, which wrested from the possession of the Indian, and rendered available for colonisation, a tract of fertile land equal in area to Great Britain and Ireland.

That the improved state and prospects of the country are already becoming known is evident by the rise in value of all Argentine Stocks, and by the high price at which the new railway loan was taken up at Paris. The most recent Buenos Ayres papers teem with evidences of business prosperity, and it is evident that a return to specie payments in that market is not far distant. Such being the state and prospects of the Argentine Republic, it would be well if our English capitalists and merchants would now show a little more confidence, or at least a spirit of inquiry regarding possibilities there. The country is bound to go ahead and the trade to extend enormously, and it depends mostly upon their action now whether the bulk of it is to come into British or pass into the hands of other nations. At the present time, as far as I can see, the English are fast losing ground, which they can ill afford to do in these days of bad trade.

Prejudice against South America will still keep many from entering these rich fields; but this, while it may retard the progress of the country, makes it so much the better for those individuals whose enterprise has led them to inquire for themselves. At the present time a man can make a livelihood, and even a fortune, from an amount of capital which would be of very little use to him in Europe, the United States, or the English colonies, where he would be swamped by greater capitalists.

Having, I hope, by this time persuaded some to give me attention, it remains for me to give them what definite information I can as to how they should apply their energy and capital, for general remarks alone are of little practical value. Fortunately I am in a position to do so, for in view of my journey to Europe I collected many practical details and statistics regarding present and possible industries for the country, which I will be happy to place at the disposal of suitable parties who may think of emigrating to the Argentine Republic. Hard-working men of talent and energy alone are bound to succeed there, perhaps more easily than any other part of the world; but it is principally to capitalists, farmers, and manufacturers that I will direct my remarks, as it is those who are most wanted at present. Sheep and cattle farming are, and probably always will be, the staple industries of the Republic; but it is evident to anyone possessed of a technical education, and who has had an opportunity of studying the resources of the country, that very many sources of wealth are lying as yet untouched, waiting the arrival of men with the requisite knowledge, capital, and enterprise.

It seems, too, that such men must come from outside, for the capitalists of the River Plate may be said to consist of but two classes—first, the great landowners, sheep and cattle farmers, and second, the merchants, mostly foreigners, dealing with the products of the country and importing manufactured goods. The first class find their present business so much within their knowledge, and so profitable, as to have little inducement to enter industries beyond their experience. The second do not generally deem it to be to their advantage to encourage home manufactures. Consequently these manufactures are mostly completely undeveloped as yet, and there is no wealthy industrial class. Such men as are attempting to work them are mostly with but little capital, and meet with no support from the wealthy. Several promising industries have thus been unsuccessful as yet, and have still strengthened the prejudices against manufacturing ventures. I have found, however, on investigation that the causes of their failure were such as would have ruined such schemes anywhere. The present Argentine Government is very anxious to develope the resources of the country, and will, I believe, give complete exemption from taxation for a period of ten years to whoever starts a new industry in the country. The tariff is also distinctly protective. Sheep and cattle farming is, as I have said, a lucrative business, as may be judged by the generally accepted opinion that a man is only doing fairly well who doubles his capital every three years. Two young men, I am told, with a capital of £1000 each, may reasonably look forward to being worth £15,000 to £20,000 in ten years. That Buenos Ayres is the best grazing country in the world may be judged from the fact that many farms there support three sheep to the acre, whilst in Australia, New Zealand, the Cape, New Mexico, and Texas, estates are considered heavily stocked with one sheep to the acre.

There are many people, however, to whom the life of a sheep farmer, with its solitude and hardships, is distasteful, and who will be glad to learn that in this favoured land there are other occupations not less profitable. Agriculture is making rapid strides, and favoured with cheap land and a beneficent climate, it brings profits which would charm even North American farmers. Were the Argentine Republic as well known to the natives of Northern Europe as is North America, we would soon see a decided turn in the current of emigration towards its shores. Indeed, it is almost with a feeling of regret that we hear of so many good men going to waste their energies fighting with the elements on the inhospitable plains of Manitoba, or the moist climate and heavily timbered lands of Oregon. As yet most of our agriculturists are emigrants with little or no capital, so there is a great field for skilled agriculturists of means. The sugar industries of the northern provinces are also rapidly developing. Opportunities occur there just now such as can rarely be met with.

The following industries I have investigated, and they all show most favourable prospects—some of them are carried on at present with very good results. Rice cleaning, paper making, wine growing, the manufacture of vegetable oils, animal oil, glue, citric acid and various drugs, brewing, distilling, soap and candle making, tanning, flax-dressing, rope and twine spinning, wool weaving, tobacco curing, dairy farming, flour milling, and a variety of others. There are also an immense variety of products, such as paper stock, vegetable fibres, cotton, &c., which might successfully be taken up. In short, we may say we have here an immense field for enterprise where nothing has been done.

Before concluding let me again call the attention of our British manufacturers to the fact that they are neglecting the trade of a country which will be ere long one of the best markets in the world. In the warehouses of Buenos Ayres are to be seen the manufactures of every country in Europe, and also of North America, and it would perhaps surprise the untravelled Briton to see what formidable rivalry he is meeting from foreigners.

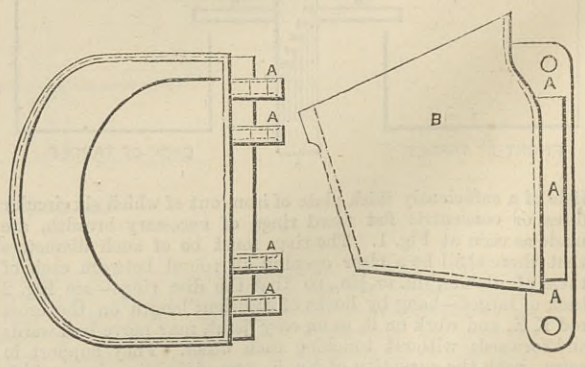
General mechanical engineering is very prosperous just now, yet I do not know of an engineer's shop in the Argentine Republic in the hands of Englishmen. Much of the class of work we are accustomed to consider as peculiarly English, machinery, dry goods, hardware, rails, &c., is coming from the Continent; and the great bulk of Argentine products have left the English for continental markets.

In civil engineering there is much in prospect at present. Besides the great port and city improvement works now about to be completed, and the Government railways to Bolivia and the Andes, now going rapidly ahead, there are numerous projects for light country railways, gas and waterworks. Several of these have subsidies and guarantees. John Samson, C.E.

Buenos Ayres, July 12th

DREDGING PLANT.

Sir,—Your useful article of last Friday on Dredging Plant induces me to communicate with you regarding the lessening of the enormous friction therein referred to; and which friction was apparent to observing members of the Institute of Mechanical Engineers who, like myself, visited the Tyne last week. Experience proves there is still greater friction to overcome in the shape of the "inertia" of those controlling the manufacture of such dredging plant, who, like responsible people in general, so long as the dredgers work smoothly, decline accepting the risk or responsibility of introducing new, or even great improvements. Nevertheless, the fact remains, and can be readily proved, that frictional wear and tear can be enormously reduced by the introduction of light, smooth, cast steel buckets, cast all complete in themselves. After many difficulties, the making of these cast steel buckets has been practically overcome, and they can now be supplied; but the difficulty, as previously stated, lies not so much in supplying as in inducing dredging engineers to adopt and introduce them; and this is why a few words of your all-powerful advocacy and disinterested influence, showing how this great saving may be effected,



may possibly lead to the 60 per cent. waste of engine power being enormously reduced. In advocating the use of steel buckets, it may be said the writer is introducing them with the object of profiting thereby. Assuming their introduction may benefit infinitesimally, the enormous public saving accruing from using light steel buckets in lieu of the "present heavy, cumbersome, wrought iron, built-up, friction-creating buckets," far counterbalances anything which may be gained personally; and therefore, in the public interest, it is desirable that a novelty in the form of a steel bucket, cast as a whole in one piece of light cast steel, and similar to the buckets described in the blue-book inclosed, should be made known to the world. I trust the same may be considered of sufficient utility and general interest to find a place in your columns, and solicit your notice thereof. Robert Hadfield.

Sheffield, August 9th.

RAILWAY MATTERS.

Tenders were opened on June 14th for a section of the Queensland Central Railway. That of Messrs. O'Rourke and McShany was accepted, at £3053 a mile. For the next section of the Northern, Messrs. Bashford were the successful tenderers at £3087.

On the 2nd inst. the first of eight new carriages and cars, to be put on the Vale of Clyde Tramway Company's line between the Paisley-road Toll and Govan, was tried with success. The cars are of a very substantial build, and are constructed to carry thirty passengers inside and thirty outside, twenty more than carried by the old cars.

We are informed that the directors of the Lancashire and Yorkshire Railway Company have awarded the premiums for designs for the proposed new Exchange Station, Liverpool, as under, viz.: 1st, £750, Mr. John West, 4, South Parade, Manchester; 2nd, £500, Mr. F. J. Percival, Old Parsonage, Newchurch, near Manchester; 3rd, £250, Mr. Thos. Mitchell, 17, St. Ann's-square, Manchester.

A recent Canadian Government advertisement announces that a homestead of 160 acres will be given free to every settler in Manitoba and the North-West, and that the Canada Pacific Railway will be pushed westward at the rate of 300 miles annually, until 150 million acres of the best wheat land in the world are opened up for settlement, besides 50 millions of the best grazing ground, available all the year through.

The report of the directors of the Cornwall Railway shows that to the end of June last the total mileage was 65¼ owned and ¼ mile rented. On this the company's trains, goods and passenger and shunting, made a total of 303,177 miles, as against 311,322 miles last year. The total number of passengers was also less in the proportion of 350,933 in 1881, to 367,594 in the same half of 1880. The locomotive power cost £9142 to June, 1880, against £8723 in 1881, the cost per train mile being 7¾d. in each case.

On Monday a number of the members of the International Medical Congress visited, by special invitation, the works of Messrs. Merryweather and Sons, at Greenwich. Metropolitan Brigade steam fire engines, manual engines, and other appliances for extinguishing fires were displayed at Messrs. Merryweather's jetty on the river, adjoining their works; and upon their private line a street tramway engine was kept running backwards and forwards whilst the visitors were present. Many engines of similar construction were shown in course of manufacture for English and foreign tramways, five of the engines well advanced towards completion being for the Stockton-upon-Tees Tramways.

Railway extension is progressing rapidly in South America, and important new lines are proposed. The Buenos Ayres *Standard* says:—"The Andine Railway from Mercedes is rapidly nearing San Luis, under the efforts of 2500 navvies. The extension of the Tucuman Railway northwards to Jujuy was commenced a week ago, and work will begin on the branch to Santiago in about a month. Then there is the Chaco Railway, about which Dr. Lucas Gonzalez and Mr. Hume, C.E., left for London in the last steamer; a projected extension of the Western Railway from Pergamino to Rosario; and a mooted line by an English 'empressa' from Bahia Blanca to San Luis. It will be seen that land and railways are the great topics of the day with the producers of the country."

Major Marindin concludes his report on the accident which occurred on the 23rd of June, near Wainfleet, on the Great Northern Railway, when as an excursion train, returning from Skegness to Nottingham, was approaching Wainfleet station, the whole of the train, with the exception of the engine and tender, left the rails, and ran for 157 yards before coming to a stand, as follows:—"I believe that this accident was due to the bursting of a weak and badly fastened road, by an engine running at a greater rate of speed than is consistent with safety upon a 15-chain curve with a permanent way of this description, with the chairs secured by trenails only without any spikes; and I would strongly recommend the company to lose no time for providing this branch line, upon which they now run heavy excursion traffic, with a better class of permanent way."

Mr. H. Morris has published a pamphlet on communication between passengers and guard on railways, and gives in it a list of recent cases to show the necessity for such communication, a list which is certainly much longer than one would think it could have been made. It is, however, noticeable that in many cases, as of violent assault, it is very unlikely that any of the systems which require a cord or ring to be pulled at a certain point of the compartment, the one assaulted would be prevented from reaching it. Mr. Morris describes his system of communication, which attracts attention by detonation and the presentation of signal discs at the end of the carriage in which signal is made, as described in our impression for 16th May, 1879. Each carriage is complete, no coupling has to be made, and the signal handle or ring hangs in the centre of the compartment.

The St. Gothard Railway is now so rapidly approaching completion that a table of the fares to be charged on it is, the *St. James's Gazette* notices, printed in the last edition of Meyer's Guide-book to Switzerland, in anticipation of the line being very shortly, in part at all events, open for traffic. Starting from Rotkreuz, eleven miles from Lucerne, the St. Gothard line runs along the western shore of Lake Zug, round the base of the Righi and by Lake Lowerz, striking the Lake of Lucerne at Brunnen. From Fluelen the line begins to ascend the valley of the Reuss, attaining an altitude of 1558ft above the level of the sea at the village of Erstfeld, five miles from Fluelen. Up to this point the gradient of the line nowhere exceeds 10 in 1000; but from Erstfeld to the next station, Amsteg, it rises 26ft. in every 1000. From Amsteg the line runs through a number of short tunnels and over a number of bridges to Gurtnellen, eight miles from Fluelen, where it attains an altitude of 2427ft. From Gurtnellen the line ascends the mountain side in a series of bold spirals, crossing the Reuss several times, and passing through the Pfaffensprung Tunnel, 1487 metres in length. And then, running through the Wattengen Tunnel, reaches the station of Wasen, 3008ft. above the sea level. Leaving Wasen, the line runs back again in the direction of Fluelen; then, turning, passes through the Naxberg Tunnel, 1570 metres in length; and reaches, the station of Göschenen. Here the St. Gothard Tunnel begins.

The Railway Rates Committee have sat for four months, but all the necessary evidence has not yet been taken, and they do not feel prepared to make a full report. There are, however, a few points connected with the matters submitted to them upon which they have felt themselves in a position to arrive at definite conclusions, and they accordingly report them to the House:—(1) It is necessary permanently to maintain some special tribunal to which shall be referred questions arising as to the rights and duties of railway companies in their relations to the trade and traffic of the country; and security should be taken that the procedure of such tribunal shall be simple, cheap, and expeditious. (2) The Railway Commission should have jurisdiction to enforce provisions of the special Acts of the several railway companies, and to give redress in any cases of illegal charges. (3) A *locus standi* before it should be given to Chambers of Commerce and similar associations of traders or agriculturists. (4) A revised classification of goods and merchandise ought from time to time to be adopted by the railway companies, as between themselves and the public, such as, under the name of the Clearing-house Classification, is already in use as between themselves. This classification ought to be on sale at a small price for any person to buy who wishes to obtain it. . . . . (6) In the rate book in use at each railway station, the fixed terminal charge, if any, which the railway company claims a right to demand, as well as any other terminal charges for services rendered, should be distinguished from the mileage, or mere conveyance charges. (7) Railway companies should be bound to make no increase in any rate or rates without giving at least one month's public notice in the locality.

NOTES AND MEMORANDA.

A very large deposit of specular iron ore has recently been discovered dear Acworth, Galveston. The vein is a large one—5ft. at the surface, and approaches the surface in the form of a wedge.

Paris has 100,000,000 cubic metres of sewerage to dispose of annually. Allowing 50,000 cubic metres to each hectare, she requires 2000 hectares of land for this purpose. 600 hectares will shortly be secured in the plain of Gennevilliers, and 1400 have been found in the peninsula of St. Germain.

The population of the Dominion of Canada is now 4,350,933, an increase of 680,498 in the past ten years. The provinces of Ontario, Quebec, New Brunswick, and Novia Scotia, increased 547,882, or 16 per cent.; Ontario, 18 per cent.; Quebec, 14 per cent.; Nova Scotia, 13 per cent.; and New Brunswick, 12 per cent.

Dr. Lassaulx has published a memoir "On the So-called Cosmical Dust." He has examined the *cryoconite* collected in Greenland, and named by Nordenskjold "the dust of Catania," and the residue obtained by melting a large quantity of snow collected in the neighbourhood of Kiel. Dr. Lassaulx's conclusion is that "atmospheric dust is in general to be regarded as terrestrial detritus."

As a formula for a liquid glue, the *Chemist and Druggist* gives the following:—Mix four parts of treacle with twelve parts of water, by weight, and add one part of quicklime; heat to about 150 deg. Fah., and afterwards macerate for two or three days with frequent agitation. Then decant from the undissolved lime. The solution has the consistence of mucilage. By adding to this solution about one-fourth its weight of glue with about 2 or 3 per cent. of glycerine, a strong and convenient liquid glue will be formed.

With reference to a paragraph in this column in our last impression on paper production of this country, which was estimated to exceed 300,000,000 lb. in weight, a correspondent writes:—"With some knowledge of the trade, I think I may venture to question this assessment, which, speaking moderately, should at the very least be doubled. We have no reliable statistics of the quantity of paper made in the United Kingdom, the last statistics being the amount of duty paid in the year ending 1861, when the duty was paid on 110,000 tons. During the last twenty years, considering the increased consumption of paper due to cheap newspapers and serial literature, the penny post, telegrams, and the extension of education generally, I believe I am within the mark in estimating the total output at 300,000 tons, or say, for comparison, 672,000,000 lb."

Herr O. Löw has described experiments with fluorspar from Wölsendorf—*Berliner Berichte*—which seem to show that the liquid contained in the cavities of this mineral consists of free fluorine. When the mineral is broken up, a strong chlorine-like odour is perceptible; when heated with sulphur, an odour resembling that of sulphur chloride is evolved; the liquid in the mineral decomposes sodium chloride and iodide, with formation of chlorine and iodine respectively. On addition of dilute potash it yields a solution which instantly decolorises indigo solution. When the mineral is moistened with ammonia water, powdered, the liquid filtered off, neutralised with sodium carbonate and evaporated, a residue is obtained which, on addition of sulphuric acid, evolves hydrofluoric acid. Herr Löw thinks that the fluorine is produced by dissociation of cerium fluoride in the mineral.

MM. Cailletet and Hautefeuille have determined the densities of liquid oxygen, nitrogen, and hydrogen—*Compt. rend.*—by liquefying these gases mixed with carbonic anhydride and with nitrous oxide, and basing their calculations on the assumption that the mixed liquids are without action on one another. The density of liquid oxygen at — 23 deg. (pressure = 300 atmos.) was found to be 0·89 from experiments with carbonic anhydride, and 0·94 from experiments with nitrous oxide; at 0 deg. the numbers obtained were 0·58 and 0·65 respectively. Liquid nitrogen at — 23 deg. gave numbers corresponding with the density 0·44, while at 0 deg. the density was 0·37. The density of liquid hydrogen was 0·033 at — 23 deg., and 0·025 at 0 deg. Dividing the atomic weights of the three elements by the densities at — 23 deg., the atomic volume of oxygen is found to be 17, of nitrogen 31·8, and of hydrogen 30·3.

The population of all Scotland, including the seamen belonging to the Mercantile Shipping in Scottish ports or on Scottish waters, amounted last April to 3,734,441 persons, of whom 1,797,592 were males, and 1,936,849 females. Comparison with the census numbers of 1871 shows an increase of 194,449 males, and 179,974 females, or a total increase of 374,423 persons in ten years, *i.e.*, an increase of 11·1 per cent. The population of Scotland has grown more in the last ten years than in any decennial period since 1821-31. Glasgow has increased from 491,846 in 1871 to 511,532 in 1881, or 4 per cent.; Edinburgh from 197,593 to 228,190, or 15·48 per cent.; Dundee from 120,724 to 142,454, or 18 per cent.; Aberdeen from 88,181 to 105,054, or 19·13 per cent.; Greenock from 59,794 to 68,897, or 15·22 per cent.; Leith from 46,434 to 61,168, or 31·73 per cent.; and Paisley from 48,257 to 55,642, or 15·3 per cent.

Experiments have been recently carried out by Major Lauer, of the Austrian Engineers, at Krems, on the Danube, to show the value of his new method of blasting rocks under water. The chief feature of Lauer's system is to employ a hollow cylinder, like a gas-pipe, and to place the dynamite cartridge, not as hitherto in a hole bored into the rock to be blasted, but in the cylinder in question. The cartridge only touches the surface of the rock which it is desired to shatter. The explosion of the dynamite is effected by means of electricity, and the effect is said to be greater than with the usual cartridge in a hole bored in the rock. The rock is shattered into fragments so small that a fair stream is able to wash them away without help, whereas in the case of gunpowder the rock is only split up into blocks more or less large and troublesome to remove. The Lauer system is calculated to effect a saving of fully 40 per cent. as compared with the old system.

An interesting field of inquiry is opened up by some experiments lately made by Professor Ira Remsen, of the Johns Hopkins University in Baltimore. He desired to know whether the chemical behaviour of a metal is in any way influenced by magnetic action; and with this view placed a shallow vessel of thin iron, containing a solution of copper sulphate, over the poles of a strong permanent magnet. The copper was deposited in a fairly uniform way on the entire surface, except at the lines marking the outlines of the poles. These lines were strongly marked as depressions in the deposit. The action was still more striking when an electromagnet was used, instead of the permanent magnet. In a narrow space marking the outlines of the pole there was no deposit. Within this outline the deposit was fairly uniform, but outside of it the copper was deposited in irregular ridges running at right angles to the lines of force, and apparently coincident with the lines marking the equi-potential surfaces. The nature of the phenomenon is not yet well understood.

The cost of some of the most recent buildings of the present day is given as follows by the *Builder*:—The New Grand Opera at Paris cost 40,000,000f.; the new Hotel de Ville, 40,000,000f.; the new Paris Post-office, 30,000,000f.; extension of the Conservatoire of Music, 8,000,000f.; the new Museum of Victoria, Australia, £100,000; the Maison du Roi, in the Brussels Market-place, 2,000,000f.; the new Provincial Government Buildings at Bruges, 2,000,000f.; the Brussels Cavalry Barracks, 4,000,000f.; the new Brussels Mint, 4,000,000f.; the Palais des Beaux-Arts at Brussels, 3,000,000f.; the new Museum at Antwerp, 2,000,000f.; the Palais de Justice at Brussels, 40,000,000f.; and the Department of Justice Buildings at the Hague, 1,700,000f. We may compare with the above the cost of the following buildings in the United Kingdom: The Houses of Parliament at Westminster cost £3,500,000; or 87,500,000f.; the new Foreign Office, Whitehall, £550,000; the Record Office, £120,000; and the Law Courts are estimated, exclusive of special fittings, at nearly £900,000.

MISCELLANEA.

In our last impression we referred in this column to a large wheel-cutting machine recently erected in Huddersfield, at the works of Mr. David Brown. We are requested to add that this machine was made by Messrs. F. and J. Butterfield and Co., of the Midland Works, Keighley.

The Oldham evening *Express* now daily publishes several columns of reports transmitted from Manchester by telephone. This is the longest telephone wire communication supplying newspaper intelligence yet in use. Messrs. David Moseley and Sons supplied and erected the apparatus, and though some difficulty was at first experienced at the Oldham end, the line is now in thoroughly practical working order.

The second annual meeting of the shareholders of Thomas Green and Son, Limited, was held at Leeds, on the 2nd inst. The accounts were taken as read, and showed a profit out of which a dividend at the rate of 8 per cent. was declared. The chairman remarked that the lawn mower branch of the business had kept pace with the results of former years, and the Royal Horticultural Society had given them the highest award at the exhibition which took place in June last at South Kensington.

The American *Trade Review* announces that Mr. Brush has been a long time experimenting on the means of electric storage, and that he will probably startle the public with a new form of condenser in which metal is used instead of lead and peroxide of lead, and which will store double the quantity that Faure's battery can contain in the same space. It is also stated by the *Trade Review*, that "Mr. Brush would appear to have anticipated Faure, though the latter is the first to make public proof of his system."

For several months Messrs. Bolckow, Vaughan, and Co., have been working two 15-ton Bessemer converters on the basic process, and in the course of a few days two others be will put into operation. The make of steel from the native ore will then exceed 2000 tons per week, and it has been authoritatively announced that the saving as compared with hematite, is from 10s. to 15s. per ton, whilst the steel, after having been subjected to the usual tests, has been proved to be of the highest quality accepted for large rail contracts.

The University authorities of Oxford have taken upon themselves some of the duties of the sanitary authorities, and have issued orders to lodging-house keepers, whose houses they have had inspected by Mr. Griffith, calling upon them to conform to certain sanitary requirements, and those who use well water to have it analysed by the University analyst. These things may be very necessary, but the Local Board has written to the University authorities that any alterations in sanitary arrangements must be entrusted to that Board.

A writer in the American *Miller*, in seeking an explanation of the oft-repeated assertion that a mill "runs stronger" at night than in the day, satisfies himself that he has got it somewhat as follows:—"Sounds are transmitted faster at night than at day"—ergo, "atmospheric resistance is least at night. This decrease of resistance may be due to greater purity or less pressure, or both, though the barometer may not indicate it; but anyhow, water becomes relatively heavier." Ergo, "moving parts in a mill receive less atmospheric resistance at night, and same quantity of water does more work." At the commencement of this article the author records his contempt for the mere pretenders to scientific knowledge.

The steamship Great Britain, which was one of the wonders of the period in which she was built, and which now lies in the West Float, Birkenhead, has recently been offered for sale at the rooms of Messrs. Kellock and Co., Liverpool. The Great Britain is of 3270 tons gross, and 1795 tons net register. She was for many years in the Australian trade, in which she made some rapid passages, and she has also done good service as a troopship. In the "bill of particulars" it is stated that her construction is of great strength. She is admirably adapted for the cattle trade across the Atlantic, her high 'tween-decks and side ports affording grand ventilation. She can carry live stock on three decks. Her beautiful lines peculiarly adapt her for a sailing ship, and with her machinery taken out she would, it is calculated, carry upwards of 4000 tons dead weight. She is 325ft. long, with 50ft. 6in. breadth, and 31ft. 5in. deep. The biddings began at £2000 and went up to £6500. There being no advance, the steamer was withdrawn from the sale.

At the Clerkenwell County-court on the 5th inst., an action, under the Employers' Liability Act, Robins *v.* Cubitt and Co., was tried before a jury. The plaintiff, a plasterer's labourer, sought to recover from the defendants, builders, of Gray's-inn-road, damages for injuries sustained, under the Employers' Liability Act of 1881. On the 30th of April the plaintiff was in the employ of defendants, and engaged on work at the Panorama, Leicester-square, and while carrying a pail of water under the scaffolding on his shoulder a pail of waste mortar, which was being lowered from above, fell on him and injured him so severely that he was taken to the Charing-cross Hospital, where he was an in-patient for six weeks, and since that time, fourteen weeks, an out-patient. Mr. Whitehead, house surgeon at the Charing-cross Hospital, said he believed the plaintiff would suffer permanently. The jury returned a verdict that the injuries were caused by the pail through the negligence of two men in the employ of defendants, and they gave a verdict for plaintiff, damages £50.

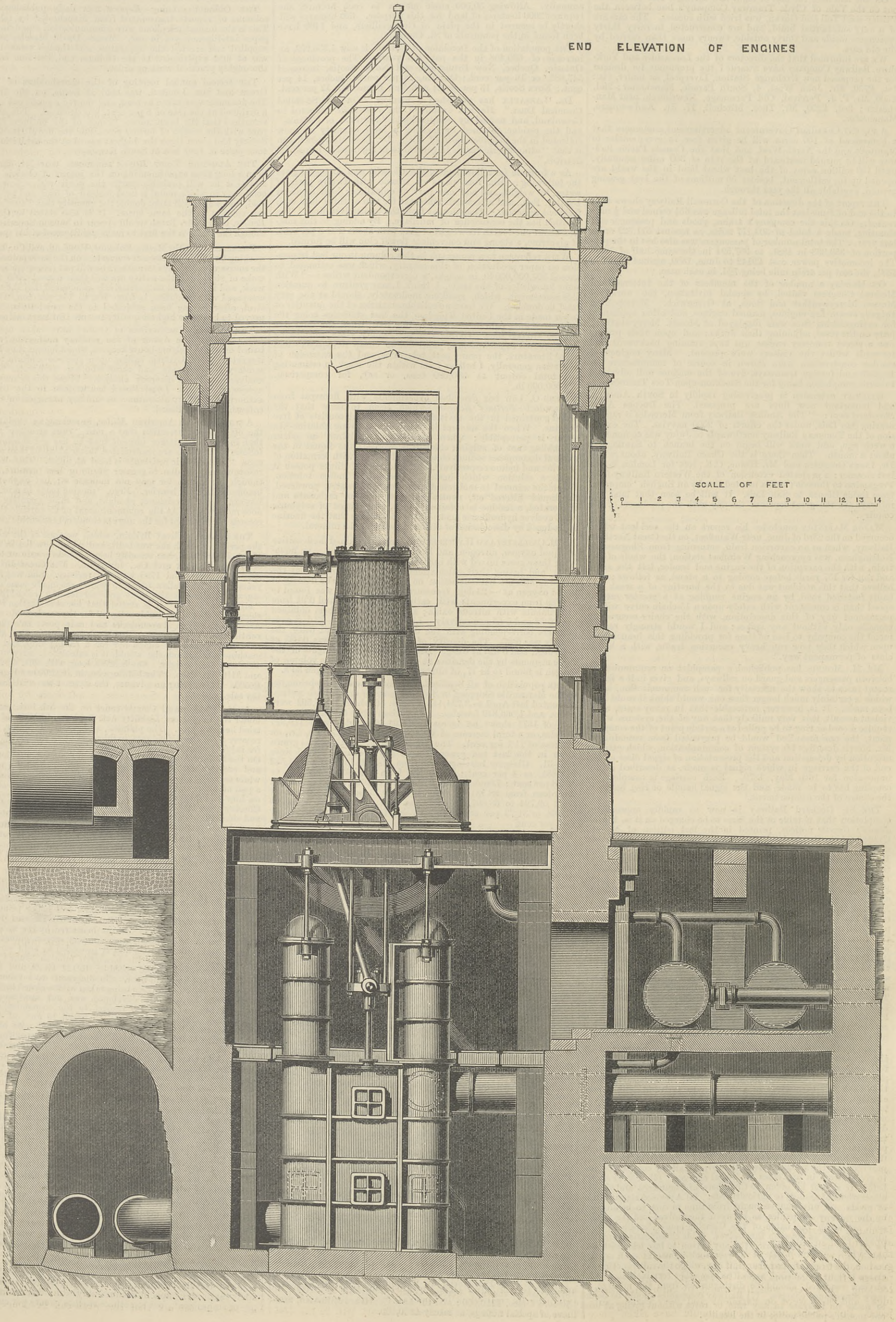
An exhaustive series of comparative trials, extending over three days, has just been made by the steam departments at Portsmouth Dockyard with a Herreshoff and a White's 48ft. pinnace. The Herreshoff is worked on the inventor's coil boiler principle, and has both the engine-room and the stokehold inclosed, forced air being used at a pressure of 2in. as measured by the water gauge. White's, on the other hand, is an ordinary service pinnace, having only the stokehold inclosed, and is propelled by twin screws. As the result of six runs on the measured mile in Stoke's Bay, the Herreshoff realised a mean speed of 15·124 knots, and White's a speed of 12·604 knots an hour. No diagrams were taken, as Mr. Herreshoff objected to their being taken with a closed engine-room, so that the horse-power developed was not ascertained. The vessels were also tested with respect to the economical consumption of fuel. Each pinnace took on board 10 cwt. of coal, and, having proceeded to the westernmost measured mile buoy, were kept running at full power until the engines stopped for want of steam on the consumption of the coal. The Herreshoff went twenty-eight times round the buoys before its fuel was exhausted, while Mr. White's boat, after going twenty-nine times round the buoys, proceeded into harbour, having, according to the *Times*, 258 lb. of coal unconsumed at the end of the trial.

Great improvements have been made in the methods of threshing and cleaning rice by the introduction of machinery. When the grain is cut it is stacked in the field to sweat, to facilitate the threshing, after which the rice is sent to special mills for hulling and polishing. We learn from the *American Miller* that there are seven mills of this sort that have been built in New Orleans during the past decade. Each mill employs from twenty to forty hands, and all are busy. The rough rice is received in large bins, from which it is taken by elevators to the upper floor, where it is winnowed and sifted to remove sticks and rubbish. To remove the beard the rice is passed through a revolving "hoodlum," from which it is carried to the stones, which crack off the hulls. Then the dark-coloured grains are polished for market. The polisher consists of sheepskin, tanned, stretched over wool or revolving cylinders, the space between the sheepskins and wire gauze being just sufficient to allow the rice grains to find their way by degrees to the bottom. The grains are highly polished by the friction against the skins, which rubs off the bran, and leaves the grain clean and white. The bran amounts to eight barrels for every hundred barrels of clean rice. It is sometimes used for the adulteration of spices. The waste in the hulling averages about five or six per cent., but sometimes reaches twenty per cent.

PUMPING ENGINES, SALFORD SEWAGE WORKS.

MESSRS. JAMES WATT AND CO., SOHO, BIRMINGHAM, ENGINEERS.

(*For description see page* 111.)



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TO CORRESPONDENTS.

*** *In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a* 1d. *postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions.*

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Apprentice.—*The same balance weight would be necessary for any speed.*

F. W. D.—*With the same pressure the friction will be the same. In the steam steering gear to which you refer, some objection may be made to the use of the rack and pinion arrangement if the pinion is small. Judging from the wood-cut, however, there is no objection to be made on this head.*

T. T.—*The necessary area of the chimney will depend upon the height you intend to build it, and to some extent upon the length of the flues from the furnace to chimney base. If you send these we can answer your question, or you may answer it for yourself by getting Wilson's book "On Chimneys," published by Lockwood and Co., and to be obtained through any bookseller.*

F. Platt.—*The best section will in any case be that which has the top and bottom flanges in the proportion of* 1 *to* 3 *or* 3½, *but the best form of the girder will depend upon whether the* 12 *tons is concentrated at the centre and the* 4 *tons distributed, or whether the* 12 *tons is distributed through a considerable part of the middle of the girder. It will again depend upon the nature of the load, as, for instance, whether consisting of intermovable parts, or of a solid, as a brick wall built upon it. As you ask for the best form, we cannot answer your question without more definite information.*

MACHINERY FOR MAKING STEEL NAILS.

(*To the Editor of The Engineer*)

Sir,—If any of your readers know the names of the manufacturers in America who make machines for making steel nails from taper-rolled steel, they will greatly favour me by sending the address of the parties, through you, marked W. S.

Shieldmuir, Wishaw, August 4th.

RETAINING WALLS.

(*To the Editor of The Engineer.*)

Sir,—Will some of the readers of your valuable journal kindly give me the best formulæ for working out the strength of retaining walls for reservoirs, &c., and at the same time would they kindly tell me the best books on retaining walls, and their strengths and modes of calculating them? A great deal has been written on this subject in the past and again lately, but I should like to know where to find that which is the most practically useful to A Student.

Canonbury Park North, August 6th.

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*** *Letters relating to Advertisements and the Publishing Department of the paper are to be addressed to the Publisher, Mr. George Leopold Riche; all other letters to be addressed to the Editor of* The Engineer, 163, *Strand.*

THE ENGINEER.

AUGUST 12, 1881.

THE INSTITUTION OF MECHANICAL ENGINEERS.

The Newcastle meeting of the Institution of Mechanical Engineers was a success in certain respects, and only in these. It left something to be desired. The members and visitors were entertained by the engineers and shipbuilders of the Newcastle district with princely hospitality, and nothing was left undone by the hosts to make the guests enjoy themselves. The weather was all that could be desired; and the excursions were well planned, and the works visited among the most important and interesting of their kind in the world; yet with all this something was lacking, and the impression carried away by those who looked a little below the surface was not quite pleasing. It is not difficult to see in what the defect of the meeting lay; and it is well that it should be brought somewhat prominently forward, that it may, if possible, be avoided in future. The meeting was deficient in the performance of serious work; and in no place was this more apparent than in the lecture hall; at no time more than when serious business was being transacted. A very good collection of papers had been got ready. These papers left little or nothing to be desired. They were not too long; they were well illustrated by admirable drawings; and they were on excellent and very various subjects. But the discussions which should have taken place either did not take place at all, or were quite unworthy of the papers and of the reputation of the Institution. All the talking was done by half a dozen men, who spoke on every paper, and of course failed as a rule to say much that was either useful, interesting, or of value. We may cite as an example Mr. Marshall's eminently suggestive and valuable paper. The discussion which followed it taught nothing, and was only not dull when it was enlivened by some speaker like Mr. Adamson with his four-cylinder engine, or Mr. Crampton with his coal-dust fuel, cantering his hobby across the arena. Neither Mr. Adamson nor Mr. Crampton attempted to show how the system which they advocated could be used in practice by shipowners. Dust fuel is an admirable thing, and four-cylinder engines may possess all the advantages claimed for them by Mr. Adamson, and by no other living engineer, but a proposal to utilise the Falls of Niagara in driving ships across the Atlantic would have possessed just as much interest for shipowners. The most interesting parts for discussion again were ingeniously left out. Not one word, for example, was said concerning the relative cost of maintenance of the various types of engine referred to by Mr. Marshall, although this is a question of the utmost importance. Not a word as to first cost, save the general statement that light engines cost more than heavy engines. Not a syllable as to the best proportions to be employed. Not a word about the heating of feed-water, a means of securing economy hitherto almost totally overlooked in the marine engine, instead of the wide generalities talked by men, clever engineers in their own way, but possessing no practical knowledge of the construction or working of the marine engine.

The discussion on Mr. Price's paper is best forgotten. It afforded Mr. Denny an opportunity of displaying the great powers of debating which he possesses, and which in this case he exercised with a bitter energy out of place and uncalled for, and in bad taste. Mr. Price had the sympathies of his audience when he said that Mr. Denny, and Mr. Denny's friends, had hardly acted fairly by him in refraining from asking him for an explanation of what they considered a numerical error in his calculations, during the three days which, with the printed copy of his paper in their hands, they had met and conversed with him. Mr. Adamson's attack on Mr. Philips' report on the corrosion of iron and steel was in worse taste than Mr. Denny's attack on Mr. Price, in that Mr. Philips was not present to defend himself and Mr. Price was. Several papers were suffered to pass wholly undiscussed. For example, Mr. Bell's paper "On the Development of the Tyne District," and the papers by Mr. Jameson and Mr. Boyd. It cannot have failed to escape the notice of many persons that the Institution of Mechanical Engineers appears to be falling off in debating power, and the members who attend meetings, the President, and the Council, will do well to take this fact to heart. We may cite the Manchester meeting last autumn, the meeting since held in London, and now the Newcastle meeting, as examples quite to the point of a defect in the working of the Institution very much to be deplored.

The excursions of the Institution in Newcastle and its neighbourhood were or were not successful according to the point of view from which they are regarded. As pleasure trips they left nothing to be desired; but as means of instruction they have been distinctly and positively failures. Too much was attempted. We may cite, for example, the visit to Messrs. Palmer's works at Jarrow. The members and visitors arrived there late in the afternoon, and proceeded to the Drill Hall, where they sat down to a splendid meal. Much time was expended in eating and drinking, and afterwards Mr. Palmer delivered a long, able, semi-political speech, not one word of which was heard by half the company at the lower end of the hall. At last an adjournment was made to the works. If our readers will bear in mind that these works include blast furnaces, rolling mills, shipbuilding yards, repairing docks, engine and boiler works, foundries, &c., and employ over 7000 hands, it will, we think, be conceded that little or nothing was to be learned during an hour's visit. The visitors were divided into parties, and an attempt was made to take them systematically over the place, but the attempt was a failure, because it was impossible to hurry them through the works as quickly as was necessary to keep pace with the programme. The visitors got a good luncheon, and a hasty glance at small portions of one of the most gigantic manufacturing establishments in the world, but they learned nothing of the system of working employed, and very little concerning the class of work turned out.

We have spoken thus freely, because everything is to be gained in such cases by free criticism. No precedent can be said to be established as yet, and in working changes for the future no rules will be broken through. Either it should be clearly understood that the annual country meeting of the Institution of Mechanical Engineers is intended to be one of pure pleasure, or arrangements should be made to render it profitable as well. There can be no question as to which is the proper course to adopt. It ought to be clearly understood that too much will not be attempted, and that whatever is done will be well done. Thus, for example, a visit to Jarrow might very well have occupied the entire day. The visitors might have reached it at 11 a.m., gone over portion of the works; lunched from 1 p.m. till half-past two and then spent the remainder of the afternoon in fresh explorations. Again, it ought to be in the power of the Council to do something to get papers discussed. There is no more lamentable sight than that presented by a president compelled to ask one man after another to get up and say something, unless it be that supplied by the man who, taking pity on the president, gets up to talk against time on a subject about which he knows next to nothing. There ought to be a remedy found for all this kind of thing. There must be a great deal of debating power latent in the Institution; can it not be brought out? It must be remembered that the Institution is to a certain extent on its trial when it appears in the provinces, and those who have its best interests at heart will be the first to agree with us that just now it does not appear to the best advantage. At Newcastle, at all events, there was too much play and too little work.

THE LIEGE CONTRACTORS' CONGRESS.

The congress of contractors which recently took place at Liege under the auspices of the Chambre Syndicale des Entrepreneurs of Liege has not received much attention in this country, but some of the business of the Congress indicated the direction in which contractors feel that a greater amount of unanimity of action is desirable between contractors and contractees and those who act for them. The method of procedure by the Congress consisted in the division of the several subjects to be dealt with into sections represented by well-known leading members or presidents of contractors' associations of Belgium, who presented reports on the subjects and sub-subjects of their sections. These reports were read, discussions were taken upon them, and resolutions proposed and adopted. The first section got through the most work, principally because it came first, and a great deal too much work was proposed for the length of time at disposal. This section dealt largely with the several systems of contracting, and with the changes which are considered most desirable in these, and in the form in which specifications, quantities, and drawings are generally prepared and published. The systems of open contract, of which the relative advantages were discussed, may be resolved into three, namely, contract by lump sum, contract by schedule of prices, and contract by lump sum, but with predetermined arrangements for altering the extent of the works to be carried out by deducting from or adding to the contract sum in accordance with the ordinary schedule of prices.

The first of these is the system most preferred by those who took part in the Congress, and it was urged that this system could be much more generally adopted than it is, simply by the more complete preparation of all necessary drawings, special importance being attached to sectional and detail drawings, and by the preparation of full and definite specifications. The system, it was considered, was not only better for the contractor, because it gave him opportunity and incentive to perform his work in the best possible manner, and because it gave the engineer little other work than of superintendence once the contract was commenced; but because it gave the engineer opportunity to show his ability to prepare perfect plans, and the contractor his ability to carry out such plans with credit to himself and within a specified time, the latter being impossible when imperfect plans made it necessary to adopt the third system, which is known as the relative price system. It was admitted that alterations in plans sometimes become necessary after work has commenced, but it was urged that this would much less often be the case if a thorough study of the geological questions involved, was made before plans were settled upon, and if drawings and specifications received the care which should be bestowed upon them before tenders were invited. The objections made to the schedule system were, that the contractor becomes a mere go-between for sub-contractors and those who let the contracts; that the actual cost of any undertaking cannot be so equitably estimated when the estimate has to be made for one of a multiplicity of single parts, more or less similar or dissimilar, as when a contractor is left scope for enterprise and the use of his experience. It was, nevertheless, admitted that in many instances work could be best carried out under this system. The relative system, it was argued, was calculated to strengthen the tendency to make alterations as the work proceeded, to encourage starting upon work with insufficiently matured plans, and to make it possible so to alter the work during its course that the contractor's profits might be reduced to nothing.

From all this it will be seen that the contractor's point of view was most strongly represented in the reports; but it must be admitted, as we have often urged, that contractors have frequently real ground for complaint in the insufficiency of the plans for some kinds of work, and the incompleteness and unfairness of many specifications. In the remark made as to scope for the exercise of the experience and enterprise of the contractor, only the desire to have everything his own way may be at first obvious; but this is far from being altogether the case. The contractor, for instance, who would make the remark, can probably see that he could make a fair profit from, say, a piece of excavation work if he took it for a certain lump sum, but at the same time he could not with safety fill up a schedule of prices in which the charge per yard would be that lump sum divided by the number of yards to be excavated. His schedule price must be one that will cover the cost of doing a small quantity of excavation work which may be required as an extra, and this might be considerably higher than that at which he could see his way to perform a large quantity of excavating work, though there may be much diversity in the quantity of work to be done, or labour to be expended on a cubic yard in one place and in another. The speculative element which is strongly developed in some contractors may not be wisely encouraged, but at the same time it is indisputable that some contractors have ability which enables them to get work more quickly and economically executed than others; but who would, nevertheless, be unable to take a contract entirely on the schedule principle at any less a sum than those who have not that ability. A much stronger grievance on the part of the contractors, however, is that relating to incomplete specifications, the imperfections in which are covered by clauses which so bind the contractors who accept them that they have everything to lose and nothing to gain when it is found that the specification has not plainly conveyed an exact meaning of the nature of the work, its extent, or the way in which it is to be done. Of course it may be said that contractors should not tender under such specifications, but this advice the contractor cannot very well follow, for he knows that many others will tender upon the hope that the specification may be overridden, or that the chances are that the work can be done in such

a way as to escape the possible effects of a badly-worded specification. Another grievance relates to quantities which are provided, and upon which contractors are supposed to tender, but which the specification specially stipulates shall not be held binding upon the contractee. Of course, these quantities may err on the side of the contractor, but generally it is said they err on the other side, and that a contractor who undertakes any piece of work for a certain sum on the supposition that these quantities are correct, has no remedy, and may lose very considerably upon the work. The Congress expresses itself in favour of the suppression of these supplied quantities, for the contractor is usually charged for them, and yet if he exercises proper care is unable to rely upon them, and those who make them out will not be responsible for their accuracy. The contractor would thus be better off without them, he would use the specification and plans more freely, as these would have to be more complete and definite, and would be able to tender upon an estimate made with a more thorough consideration of all the points and questions of each case. There is no doubt that contractors, and those for whom they work, often lose by the defects of badly drawn specifications and incomplete drawings, and yet, as it was urged at Liege, adjudications are often made on tenders based upon incomplete plans, the insufficiencies in which are supplied by a schedule of quantities for which no one is responsible. Opinions were very strongly expressed against the system of limited tenders, as leading to favouritism and fraud. The system of inviting tenders from a few firms, as adopted by some Government departments and municipal and other authorities, may be sometimes defended on the ground that it is useless to receive tenders from contractors whom it is thought would not be able to carry a contract through satisfactorily, but it is undoubtedly one that has been abused, and that prevents that fair competition which the contract system is supposed to secure.

These are only a very few of the questions debated by the Congress. A reference to all, or anything like all, cannot be made here, but many of them were of the greatest importance both to contractors and those who employ them. The second and third sections were devoted to the many questions which form part of the varied conditions of contract, and the fourth section dealt with the progress in the art and method of construction. The latter section seems to have done but little work, though the many mechanical and civil engineering questions placed upon the list of subjects under this head indicate an intention to encourage very useful discussions. The work of the Congress, and the programme of work—not carried out as completely as was intended—showed that a very useful part might be played by a society of contractors in this country. There are already several in Belgium, and with the growth of the number of technical societies in this country it is somewhat surprising that contractors have no representative institute. A good many contractors belong to our engineering societies; but the questions in which they are directly interested are seldom discussed, and for some reason contractors are looked upon as non-technical members, although some of our most able constructive engineers are contractors. Some contractors might consider that little benefit would result from discussion of technical subjects by members of such a society; but this would not be generally admitted, for although many contractors are successful owing to early severe practical experience, and to shrewdness and intuitive constructive ability, there are many who are successful owing to better education and to acquired administrative ability, but who know that an exchange of ideas in discussions upon methods of operation would be beneficial to all, even to the most shrewd and experienced. Experience is not the only acquirement necessary for success, and the most profitable work; for we have very recently seen a very experienced contractor performing certain work in a rude costly way, which showed that on some sorts of work he might very profitably have gained useful ideas from some engineering contractors instructed in the use of more modern machinery. To the Belgians we owe the first Congress of Contractors, but we may certainly say that English contractors might with advantage follow the Belgian example.

RAILWAY COLLISION AT BLACKBURN.

A few days ago the Blackburn station of the Lancashire and Yorkshire Railway Company was the scene of a collision which has resulted in more or less serious injury to forty persons, and up to the present in the loss of five lives. In view of the official enquiry, which has already been opened by Col. Yolland, and in which Capt. Galton will act on behalf of the railway company in investigating all the facts which can be obtained, it would be premature to put forward any conclusions as to the cause of the disaster, but the circumstances, as far as at present ascertained, under which the collision took place, may be briefly described. It may be remembered that some time ago a direct route from Manchester to the North was opened by the construction of a short line from Chatburn to Hellifield, joining the Lancashire and Yorkshire Railway with the Midland Company at the last-named place. Express trains were at once introduced to run between Manchester and Hellifield, stopping only at Over Darwen, Blackburn, and Clitheroe, and through carriages for both Glasgow and Edinburgh were put on by both companies. Two or more of these carriages have been sent regularly on the Manchester train, which have not been uncoupled until they reached Hellifield, but one or two have been sent from Liverpool, and these have had to be uncoupled at Blackburn, as well as at Hellifield. One of the Liverpool and Yorkshire express trains is due in at Blackburn at 3.6 p.m., and out again at 3.9 p.m., whilst one of the Manchester and Hellifield express trains is due in at 3.14 and out at 3.19 p.m. The last carriage of the Liverpool train is generally the "through" one, and this being taken off by an engine in readiness at Blackburn is afterwards attached to the front of the Hellifield train and sent on with the other "through" carriages which invariably come next the engine. It was between these two trains that the collision occurred. The train from Liverpool happened to be late, and was standing between the platforms in the Blackburn station when the Manchester train came up in the rear. Usually the Manchester train runs through the station and pulls up at what is termed the tunnel platform, which is at the further end, but on this occasion it ought, as is sometimes the case, to have stopped before getting half way through the station, and to have set down its passengers for Blackburn there. At the time of the accident, an engine which is used for working a local loop line and for shunting was standing behind the Liverpool train, having been coupled to a "through" carriage, for the purpose of taking it off and removing it to a siding until the Manchester train should come up. A minute or two later the Liverpool train, already five minutes behind its time, would have gone on to Accrington and Yorkshire, and the shunting engine would have followed it into the tunnel, thus leaving the main line clear. But before this could be done the Manchester train came into the station, running almost at full speed, and before it could be pulled up was in collision with engine and train along the platform. The engines struck one another with such force that they became interlocked whilst the nearest carriages on both trains were piled up one upon the other, smashed or telescoped, and but for the fact that the shunting engine received the first shock of the collision there is little doubt the disaster would have been of a much more serious character even than it has been. As to the actual cause of the catastrophe, widely different opinions are at present expressed, but there are two facts which are not in dispute. Shunting was going on in the station when the Manchester express was due in, and the Manchester train came in at a speed variously estimated, but generally stated to have been at least thirty-five miles per hour. It is not an unusual circumstance for the Manchester train to come into the station whilst shunting has been going on, but the driver of the express has a full view into the station for upwards of 300 yards before he enters, and under ordinary circumstances, with proper control over his train, ought to be able to pull up long before reaching any obstruction which he would be able to see in his way. In this case the Manchester train which consisted of a heavy bogie express engine, two Scotch carriages, and a van, a first, second, and two third-class carriages had pulled up at Darwen station, which is four miles distant from Blackburn, and between the two stations there is a gradient of 1 in 100 until within 26 chains of the Blackburn station, where the line is on the level, and at which point there is a signal-box, after which there is a perfectly straight run with nothing to obstruct the view of the driver into the station. In leaving Darwen station the only steam required is just what is requisite to start the engine, the incline afterwards being sufficient to carry it on to Blackburn, and as the train in question passed the signal-box steam was observed to be shut off. The train was provided with a new Westinghouse automatic brake with all the most recent improvements, and although the driver was running this particular journey for the first time he had previously been in charge of express trains on the same line, and was well acquainted with the working of the Westinghouse brake. In the official account published by the railway company it is stated that "the driver had not sufficient control of the train, but from what cause has not been ascertained," but both the driver and the guard assert that the brake was put on, but would not act. So far as the accident is concerned the questions at issue would seem to be whether, in the first place, the driver of the express train should have been allowed to pass the signal box whilst another train was shunting in the station; then, when the driver had passed the signal box, and being in full view of the train standing in the station, he took proper measures for pulling up, for which he had more than ample distance, and, lastly, whether the brake, supposing it to have been applied, failed in its operation. These, of course, are questions which can only be decided by the official inquiry, as, prior to this, the railway authorities, on the one hand, have naturally been very reticent in expressing any opinion, whilst, with regard to the brake, any investigation has been impossible, as the whole of the wrecked engines and trains were taken charge of by the police.

THE BARRANQUILLA WATER SUPPLY.

The South American republic known as the United States of Colombia, formerly called New Granada, is probably not much known to the generality of English people, though the two important ports of Panama and Colon *alias* Aspinwall are comprised within its limits. Considerable improvements have been effected throughout the country generally within the past ten years, and amongst those of some interest is the Barranquilla Water Supply Works. Barranquilla is a town of about 16,000 inhabitants, situated on a small loop or "turn-out" of the river Magdalena, from the mouth of which it is situated about six miles. The actual port, Salgar, is about fifteen miles from Barranquilla by railway, and here the steamers of the Royal Mail, West India and Pacific, Hamburg-American, Atlas, and Transatlantique companies, call monthly, the passengers when landed being immediately despatched to Barranquilla, which is thus virtually made the import town of the country. Until the year 1878, the supply of drinking water for the town was derived from the above-mentioned loop of the Magdalena—locally termed Caño—and in this same stream were washed all the clothes of the town, to say nothing of innumerable human beings, horses, donkeys, pigs, and dogs. This state of things became so bad that a local company was formed for the purpose of constructing a waterworks which should supply the town with pure water from the river Magdalena, and after the usual preliminaries the appointment of consulting engineer was assigned to Mr. Heber Duckham. With a staff of skilled workmen whom he took with him from England his plans were soon carried into effect, and in March, 1880, the water of the Magdalena was first delivered to the town. The desired end having been attained, the work of the consulting engineer was completed, and the works handed over to the resident engineer, Mr. C. Simmons Church, in whose charge they remain. Already upwards of 180 services have been laid. The water is drawn from the Magdalena by two of Tangye Bros'. 10in. Special pumps, placed on board of a barge moored about 20ft. from the shore, and on the upper deck of which are five filters made by the Silicate Carbon Filtering Company. From these the water passes through a 10in. main, one mile and a quarter in length, to the pumping station in the town. Here there are a pair of 14in. cylinder high-pressure horizontal engines, with four 7in. plunger pumps fixed on the bed-plate, and pumping into an accumulator with 20in. ram, weighted to 35 lb. per square inch. The boilers, two in number, are of the locomotive type, and are provided with two furnaces each suitable for burning wood, the whole of this work being manufactured by the East Ferry-road Engineering Works, Millwall. The street mains are 6in. diameter in the principal streets with 4in. and 3in. mains in the side streets. The service pipes are principally of lead, $\frac{1}{2}$in. and $\frac{3}{4}$in. diameter, and the supply of water is from 6 a.m. to 4 p.m. Within twelve months the works will probably be earning a good dividend. The Barranquilla Waterworks are on a small scale, but the description of them is useful as showing how simply and cheaply a small town may be provided with a good water supply.

MANAGEMENT OF COLLIERY BOILERS.

The South Staffordshire and East Worcestershire Institute of Mining Engineers have done what, in view of the Employers' Liability Act, and of contemplated further legislation of the same class, is a prudent thing. They have drawn up a number of "suggestions to proprietors and users of steam boilers," and have compiled a series of "rules for the working and management" of such machinery. If the "suggestions" should bear the fruit desired, we shall in the future hear less of the buying of old and well-worn boilers at a worked out colliery, and setting them up at newly-opened mines, and the recent sentence to a year's imprisonment of the owner of a boiler not used for colliery working is conclusive that they are not pit proprietors alone who might ponder these "suggestions" with advantage. The Institute do not claim originality for the views which they formulate when they lay it down that "boilers of first-class construction, on sound principles, are best and most economical in every respect, and good quality should be the main consideration." Self-evident though such salutary truths are, they need to be again and again dinned into the ears of men who imagine that economy consists in lowness of first cost. Nor are the engineers less prudent in advising that unless proprietors and users are competent to judge upon the suitability of boilers for various requirements, and the various conditions under which they have to work, "the duty of deciding such matters should be placed in the hands of a person qualified to advise, and on whom would rest the responsibility in case of mishap."

LITERATURE.

Resources of South-West Virginia. By C. R. Boyd. 8vo. New York: John Wiley and Sons. 1881.

The portion of the Apalachian range between the north eastern corner of Tennesee and the Valley of New River, to which this volume refers, is one of extreme interest, whether it be regarded from the economic sense or geological point of view. The structure of this country will be familiar to many of our readers from the classic works of Sir Charles Lyell, the surveys of Pennsylvania, by the late Professor Rogers, and other geologists upon the same chain further north, but we have not hitherto had so detailed a notice of the mineral deposits of the better known portions of the region as that contained in the present volume. Speaking generally, the country consists of a series of parallel folds, following a generally N.E.-S.W. course, about thirty miles broad, between the plateau of the Ohio coal basin on the west, and the blue mountains of Virginia, North Carolina, on the east. Within this distance are found the whole series of formations from the lowest silurian to the coal measures, each with its characteristic group of mineral deposits. The most important of these are the iron ores, which appear in the lowest silurian, or Polidam sandstone series, as beds of manganiferous hydrates of great thickness, and also in the Dyestone ore series of the upper silurian period, and those of the carboniferous limestone. These generally form great cavernous deposits, following the flexures of the rocks, or as a miner of the region adjoining this to the north described it to us, "in rainbow arches," often holding enormous quantities of ore in comparatively small space, in which respect they may be compared to the great churns of the Furness district. In fact we may say with the author—"It is difficult to know where to begin the description of the brown hematite ore, there is so much of it." In the centre of the district there are considerable deposits of lead and zinc ores, and in the older formations to the south-east, although not literally within the same area, being in the State of North Carolina, are the Ore Knob mines, where about 1000 tons of copper are extracted yearly from a low class of pyrites ore by the Hunt and Douglas process. These and many other deposits of actual or prospective value are described by the author in considerable detail; but as the description is arranged by counties, and there is no index, finding the notice of any particular place is rather hard work. The district is evidently in a poor and backward condition, and from the forcible language used in reference to the prevalent "Demagoguery," a new verbal coinage of the author, we believe, it would appear that the race of carpet baggers is not yet extinct in Virginia. The author has, among other subjects, some peculiar notions on agricultural chemistry. A theory on the fertilising action of gypsum, founded on the belief that the constituents of that substance retain the full properties of sulphuric acid and caustic lime unaltered, is set forth at considerable length. The author considers that if this belief were to be properly disseminated among the farmers it might counteract the pernicious activity of the agents of Yankee fertilisers, and so keep money at home. How far the crops might benefit by the change is not stated.

British Association Meeting at Swansea. Scientific Papers and Full Report of the Meeting. Swansea: C. Sweney and Co. 1880. People's edition.

The approach of the meeting of the British Association at York reminds us that we have not yet noticed this book, which presents in a cheap and handy form the addresses and scientific papers read at the Swansea meeting, together with a notice of the places of interest which were visited during the meeting. Many papers of real value and interest read at the British Association meeting are never fully reported in such a way as to be accessible at a moderate cost to the ever growing science reading public. They are published in the Association reports, but these cannot be said to be at the command of large numbers who would be glad of them. The publishers propose to continue the publication of these reports, and it may be hoped that they will receive that support which will enable them to do so. Not the least interesting parts of the volume are those which describe the geology and the industrial resources of the district of Swansea, and although the addresses of the presidents of the sections are more fully given than the other business of the meeting, the attempt to collect and publish a succinct account of these meetings should be favourably received. The report of the Swansea meeting is the first published, and has the fault that some papers are too briefly referred to, though the volume contains sixty-eight closely printed pages, and that it has no index or table of contents, but these may be remedied in the report of the York meeting if the publishers should determine to follow up their project.

TRIALS OF STRING SHEAF BINDERS AT DERBY.

No. I.

After a week's postponement, rendered necessary by the unripe condition of the crops on the 1st of the month, the trials of sheaf-binding machines, using any other binding material than wire, instituted by the Royal Agricultural Society of England, began on Monday morning, the 8th inst. By nine o'clock, the time appointed for beginning operations, there was a very large number of gentlemen interested in these trials already collected on the farm of Mr. Hall, at Thulston, and the distances that many of them had come testified to the importance of the interests involved. The morning was perfect for reaping, though ominous clouds in the south-west led many to hazard conjectures, which unfortunately turned out too well founded, that the Royal Agricultural Society would not on this occasion escape the fate which had visited them so often. The corn stood ripe and upright in the various plots into which the fields had been divided, and the ground was level and dry. The published list of the competitors contained twenty entries, not by as many firms, however, for many names appeared more than once; but the rules of the society, which objects to different machines being used for different kinds of corn in these trials, together with non-attendance for unknown reasons, have reduced the actual list of competing machines to seven. These are as follows:—Mr. W. A. Wood, the McCormick Harvesting Machine Company, the Johnston Harvester Company, Messrs. Samuelson and Company, Messrs. J. and F. Howard, Messrs. Aultman and Company, and Mr. H. J. H. King. All these machines were to be seen at the show, except the second named, which was delayed by the stranding of the steamship Britannic, and has only lately arrived in rather a weather-beaten condition. The trials are to be made upon oats, barley, and wheat, and the plots for the preliminary trials are about half an acre in extent. Shortly after half-past nine o'clock, the judges and engineers of the society having arrived upon the ground, a start was made upon the oats by the three machines belonging to Mr. Wood, Messrs. Samuelson and Co., and the Johnston Harvester Company. It should, perhaps, be mentioned that the strength of this crop of oats varied a good deal in different parts of the field. These three machines all belong to the class which has the automatic trip—that is, the binding gear is thrown into action by the pressure of the straw accumulated arriving at a certain value, independently of any special action on the part of the driver. The sheaves from Messrs. Samuelson's machines were extremely neat and well separated from each other, a point to which farmers attach great importance.

It would appear that it is impossible to secure the binding of every single sheaf. Here and there, even with the best binders, an occasional miss will occur, in which the corn is thrown out unbound. However, with Messrs. Samuelson's machine this was extremely rare, and the neatness of the sheaves produced was remarkable. No doubt the shortness of the crop in the portion allotted to this machine may have had something to do with this, as a longer straw is more likely than a shorter one to connect two sheaves and produce that hanging together which in other machines is so often observed to precede a miss in the binding. Mr. Wood's machine had a stronger crop and longer straw to deal with, and the hanging together of the sheaves occurred far too frequently, and was almost always followed by a loose sheaf. The Johnston harvester went through a very fair performance; there was no hanging except at turning the corners, and the piece of work was finished in a shorter time than with the other machines. Notwithstanding the automatic character of the gear for binding, we believe it will be found that the sheaves produced in these machines vary very much in weight.

At about 10.20 the next lot of machines started. They were those of the McCormick Harvesting Machine Company, Messrs. Howard, and Messrs. Aultman and Co. Of these, the first-named only has the automatic trip. We believe it made no miss in binding during this trial, and the sheaves were neat, though, perhaps, rather too tightly bound. There was no hanging together or check in this run. The machine of Messrs. Aultman and Co. was not so successful in separating the sheaves, though this was not so often followed by an unbound sheaf as in some other machines. Sometimes as many as three sheaves, clinging closely together, were ejected at one time. To avoid this a man walked by the machine, and assisted the delivery of the sheaf. The tension of the string which binds the sheaves varies a good deal in this machine, some of the sheaves being rather too loosely held together, while at other times the fault is in the other direction. In Messrs. Howard's machine there is a tendency in the sheaves to cling together, but this is not accompanied to any extent with missing the binding. Mr. King attempted a run after the three last had finished their plots; but his machinery had not been fully adjusted, and after one course the trial stopped. As far as one could judge from this short performance, the chief fault in the sheaf produced was the uncertain position of the string upon it. Sometimes this was near the bottom of the straw, and sometimes among the corn. Unfortunately at 11.25 the rain began, and experiments were stopped till the afternoon. It was no light shower which could give a check to the ardour of the judges and other officers of the society, but a heavy downpour of some hours' duration, which soaked the crop through and through. Indeed, we think it a pity that the experiments should have been continued at all under circumstances in which practical harvesting would have been out of the question. However, after a short lull in the rain, the machines of Mr. Wood, Messrs. Samuelson, and the McCormick Harvesting Company, went into the wet barley. The machine of Mr. Wood worked most rapidly, but the clinging of the sheaves and the failure to bind were again very apparent. The stubble left by this machine was the shortest and most even of the three. The machines of Messrs. Samuelson and the McCormick Company left a very ragged, long, and uneven stubble in this trial, though the delivery and binding of the sheaves seemed to be as good as in the oats trial. The binding in the former was rather too tight.

The remaining machines, with the exception of that of Mr. King, then attempted a trial; but Messrs. Howard's machine having too smooth a face to the driving wheel, was unable to drive all the gear in the wet condition of the ground. The damp weather had no doubt tightened up the canvas carriers, and thereby added to the work to be done, but this was the only machine that was found incapacitated through the action of the rain. Unfortunately the plots assigned to this machine and to the Johnston harvester were in juxtaposition, so that the latter machine was blocked by the former, and could not proceed, and that of Messrs. Aultman alone went through with its work. There was no improvement in the separation of the sheaves, and the misses were rather more frequent than in the trials among the oats. The sheaves too that issued singly were somewhat wanting in neatness. The whole of these barley trials must be looked upon as unsatisfactory, on account of the condition of the crop, and it is to be hoped that before the investigations are brought to a conclusion all these machines may have a more favourable opportunity of demonstrating the advantages which are claimed for them. It may be here said that throughout these trials there has been as yet no wind at all, which, as the investigations are in other respects to be so thoroughly carried out, is a matter of regret. Probably Messrs. Howard's machine was as well protected from the wind as any other of the seven competitors.

We shall have more to say on these trials, and of the machines, in another impression, but the following are the awards of the judges, which were made known on Wednesday evening:—Gold medal: Messrs. McCormick and Co. Silver medals: Messrs. Samuelson, Messrs. Johnston and Co. Highly commended: Mr. H. J. King, for principle of tying and separating sheaves. The only gleaning binding machine which entered the field was that of Mr. J. G. Walker, made by the Notts Fork Company, but no official trials of this were made.

PATENT LAW REFORM.

The accompanying draft of a Bill for the Amendment of the Patent Laws has been prepared by a committee of the Society of Arts, and is published by the Council of that Society for consideration. It is proposed to summon a public meeting in the autumn for the discussion of the Bill, after which measures will be taken to obtain its introduction into Parliament in the session of 1882. The following is a list of the committee by whom the Bill has been prepared:—Sir Frederick J. Bramwell, F.R.S., chairman; F. A. Abel, C.B., F.R.S.; Alfred Carpmael; Sir Henry Cole, K.C.B.; Captain Douglas Galton, C.B., F.R.S.; W. H. Perkin, F.R.S.; C. W. Siemens, LL.D., F.R.S.; H. Trueman Wood, secretary:—

A BILL

To Consolidate with Amendments the Law concerning Letters Patent for Inventions, and for other purposes.

The Bill commences with the usual preamble, which is followed by—

PART I.

Preliminary.

1.—(1) This Act may be cited as the Patents for Inventions Act, 188 .

(2) This Act extends to the Channel Islands and to the Isle of Man.

(3) This Act comes into operation (except where it is otherwise expressed) on the first day of January, 188 , which time is herein referred to as the commencement of this Act.

2.—The Acts described in the first schedule to this Act are hereby repealed as from the commencement of this Act to the extent in that schedule mentioned.

All rules and regulations made under any of the enactments repealed by this Act are also hereby repealed as from the commencement of this Act.

3.—In this Act—[Here follows the usual interpretation of terms.]

I.—Exception from Statute of Monopolies.

4.—All patents duly granted under this Act are hereby excepted from the operation of the Statute of Monopolies, and shall not be invalidated or affected by anything therein contained.

II.—Subject Matter of Patents.

5.—A patent may be granted under this Act for—

(*a*) Any manufacture or any product not being a natural product;

(*b*) Any machine, or any means of producing any manufacture, product, or result;

(*c*) Any process or method of producing any manufacture, product, or result;

(*d*) Any part of a machine, means, process, or method of producing any manufacture, product, or result.

6.—(1) A patent may be granted to any person, whether a British or foreign subject, declaring himself to be the inventor of an invention within the meaning of this Act, or to his executors, administrators, or assigns, or to his or their attorney or agent, subject to the provision made by this Act for inventions patented abroad.

(2) Where two or more persons declare themselves to be joint inventors of an invention within the meaning of this Act, a patent may be granted to them in their joint names, subject to the like provisions as in the case of a single patentee.

7.—(1) Where a grant of privilege has been made by letters patent or otherwise for the monopoly or exclusive use or exercise abroad of an invention, a patent for that invention can only be granted to the foreign or colonial grantee, or his legal personal representative (by himself, his attorney, or agent); and can only be granted to him on his written application within twelve months from the date of the foreign or colonial grant, or of the earliest of them if more than one, or where the same is or are existing at the commencement of this Act, then within twelve months after the commencement.

(2) The patent, if granted, shall not be affected by the publication of the invention in the United Kingdom, the Channel Islands, or the Isle of Man, by means only of the circulation or republication therein within those twelve months of copies of any foreign or colonial grant in respect of the invention or of any specification or other document connected with that grant.

(3) The patent, if granted, shall not be affected as to duration or otherwise by the expiration or determination in any other manner of the foreign or colonial grant.

III.—Commissioners of Patents and Examiners.

8.—(1) There shall be a Board of Commissioners of Patents for Inventions, in this Act referred to as the Commissioners:

(2) At any time after the passing of this Act her Majesty may, by warrant under the Sign Manual, appoint three persons to be Commissioners, of whom one shall be experienced in engineering, one shall be experienced in chemistry, and one shall be experienced in the law:

(3) On the occurrence of any vacancy her Majesty may from time to time in like manner appoint a person of qualifications similar to those of the vacating Commissioner to fill the vacancy:

(4) The Commissioners shall have an official seal, and impressions thereof shall be judicially noticed and admitted in evidence.

9.—(1) The Commissioners may from time to time after the passing of this Act, subject to the approval of the Treasury, appoint such persons qualified by knowledge of manufactures or science or arts, as they see fit, to be Examiners of Patents.

(2) The instrument of appointment shall in each case state the opinion of the Commissioners that the person appointed is so qualified.

IV.—Application for Patent.

10.—(1) An applicant for a patent must lodge at the Patent-office an application and declaration in the prescribed form, accompanied by a specification describing the nature of the invention (in this Act termed the Provisional Specification).

(2) Notice of the application, but not of the contents of the provisional specification, shall be published by the Commissioners.

(3) On the grant or refusal of a patent, or on failure to prefer a request for sealing within the time allowed, the provisional specification shall be destroyed in the Patent-office; and until it is so destroyed its contents shall be kept secret.

11.—The publication or public use of the invention after the application and within a period of nine months from the date of the application shall not prejudice the grant of a patent for the invention—which protection from the consequences of publication or public use is in this Act referred to as provisional protection.

12.—(1) The application and its accompanying documents shall be referred by the Commissioners to an Examiner, who shall report to them his opinion—

(*a*) Whether the invention is subject matter for a patent;

(*b*) Whether the title of the invention sufficiently indicates its nature, and whether the provisional specification is in accordance with the title.

(2) A copy of the report shall be furnished to the applicant, and he may within the prescribed time appeal to the Commissioners against it.

(3) If the Examiner reports against the title and the provisional specification or either of them, and his report is not appealed against, or is affirmed on appeal, the application shall not be further proceeded with, unless the applicant within the prescribed time amends the title or provisional specification, as the case may be, to the satisfaction of the Commissioners.

(4) If the Examiner reports that the invention is not subject matter for a patent, the application may, notwithstanding that his report is affirmed on appeal, be proceeded with; but in that event every copy of the patent if granted and every office copy of the specification shall bear on it a short statement of the report of the Examiner.

13.—(1) At any time during, and not less than three months before the expiration of, the period of provisional protection, the applicant may lodge at the Patent-office a further specification, particularly describing and ascertaining the nature of the invention and in what manner it is to be performed—in this Act termed the Complete Specification or the specification—together with a written request for the sealing of the patent.

(2) If he fails to do so, the provisional protection shall cease and the application shall not be proceeded with, save by special leave of the Commissioners, on proof to their satisfaction of reasonable excuse for the failure.

14.—(1) The applicant may, if he thinks fit, instead of lodging a provisional specification lodge a complete specification and request for sealing, with his application and declaration in the first instance.

(2) In that event the provisions of this Act relating to the provisional specification and to provisional protection shall not apply.

15.—(1) On the lodging of the complete specification the Commissioners shall again refer the case to an Examiner.

(2) The Examiner shall report to the Commissioners his opinion—

(*a*) Whether the complete specification is in accordance with the title and with the provisional specification (if any); provided that the applicant shall be allowed, at any time before the Examiner reports, to modify his complete specification by omitting therefrom any matter contained in the provisional specification.

(*b*) Whether the claim of the applicant is defined with sufficient clearness.

(3) A copy of the report shall be furnished to the applicant, and he may within the prescribed time appeal to the Commissioners against it.

(4) If the report of the Examiner on any question submitted to him is adverse to the applicant, and is not appealed against or is affirmed on appeal, the application may nevertheless be proceeded with; but in that event every copy of the patent if granted and every office copy of the specification shall bear on it a short statement of the report of the Examiner.

16.—The Commissioners shall publish the complete specification as soon as may be after it is finally settled, and thereupon for the residue of the period of provisional protection, or—where no provisional specification has been lodged—for nine months after lodging the complete specification, the applicant shall have the like privileges and rights as might have been conferred by a patent for the invention sealed as of the date of the application.

17.—(1) The Commissioners shall publish notice of the time appointed by them for considering the grant of a patent.

(2) Any person may, within the prescribed time, give notice to the Commissioners of his intention to oppose the grant, on the ground of the applicant having obtained the invention from him, but on no other ground.

(3) The Commissioners shall hear such person, if in their opinion entitled to be heard, as well as the applicant, before the expiration of the period of provisional protection, or (where no provisional specification has been lodged) of the nine months after lodging the complete specification.

18.—If the decision of the Commissioners is in favour of the grant, the Commissioners shall cause to be made out and sealed with their seal a patent in the form in the second schedule to this Act, or in such other form as may be prescribed.

19.—(1) Every patent shall be dated the day of application for it [save that, where the Commissioners so direct, a patent may be dated the day of the sealing, or any day between the day of the application and the day of sealing.]

(2) Every patent shall be sealed as of the day of its date.

(3) But it shall not be competent for the patentee to take any proceeding in respect of an infringement of the patent committed before the publication of the complete specification.

20.—The term limited in every patent for the duration thereof shall be seventeen years from its date.

21.—Every patent when sealed shall have effect throughout the United Kingdom, the Channel Islands, and the Isle of Man.

22.—(1) Every patent shall notwithstanding anything therein or in this Act, cease at the end of the fourth or the eighth year of its term, unless in the fourth and in the eighth year respectively of its term the patentee takes out at the Patent-office a certificate of renewal which shall be granted on his request in writing.

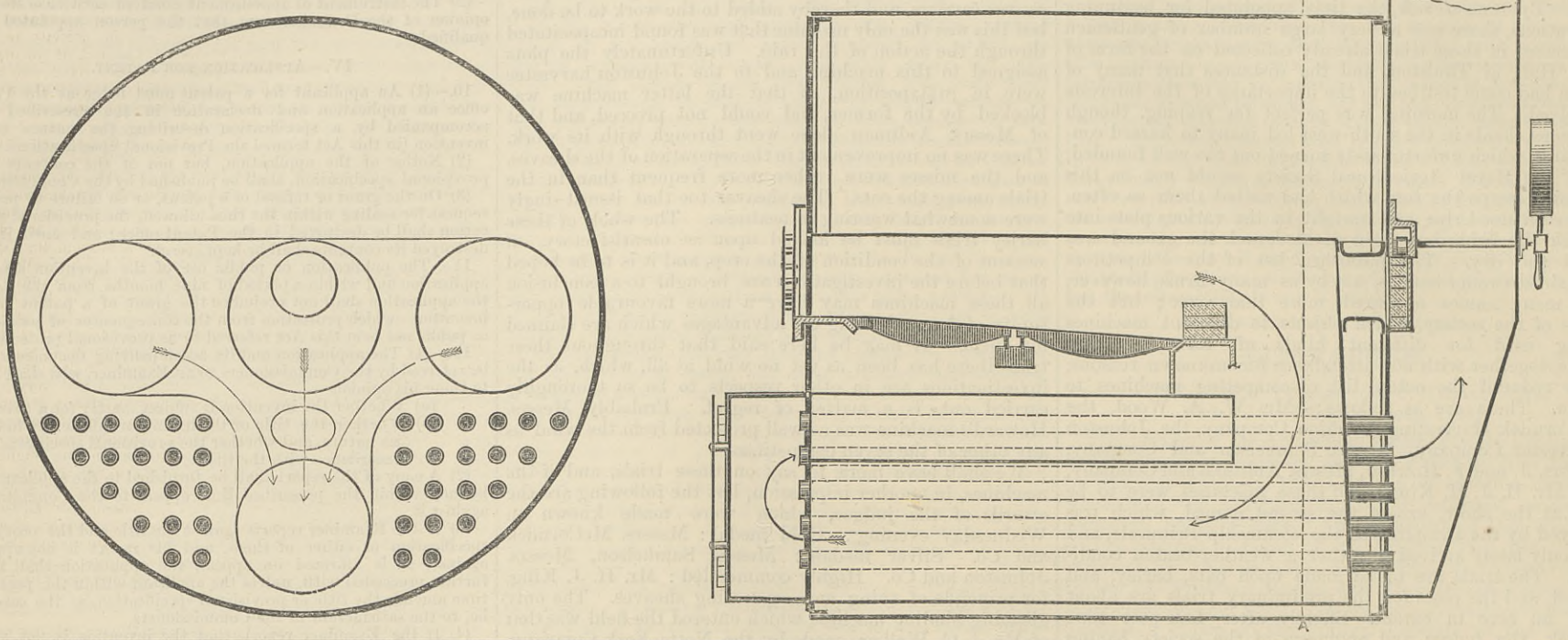
(2) If, nevertheless, in any case, by accident, mistake or inadvertence, the patentee fails so to take out a certificate of renewal, he may prefer a request to the Commissioners for an enlargement of the time for taking it out.

(3) Thereupon the Commissioners may if they think fit enlarge the time accordingly, but not in any case so as to extend beyond six months from the end of the fourth or the eighth year aforesaid (as the case may be).

(4) No proceeding shall be taken in respect of an infringement committed within the enlarged time, save by special leave of the Commissioners.

(*To be continued.*

BOILERS OF THE STEAM-TUG GAME-COCK.



ALMOND'S SHAFTING COUPLING.

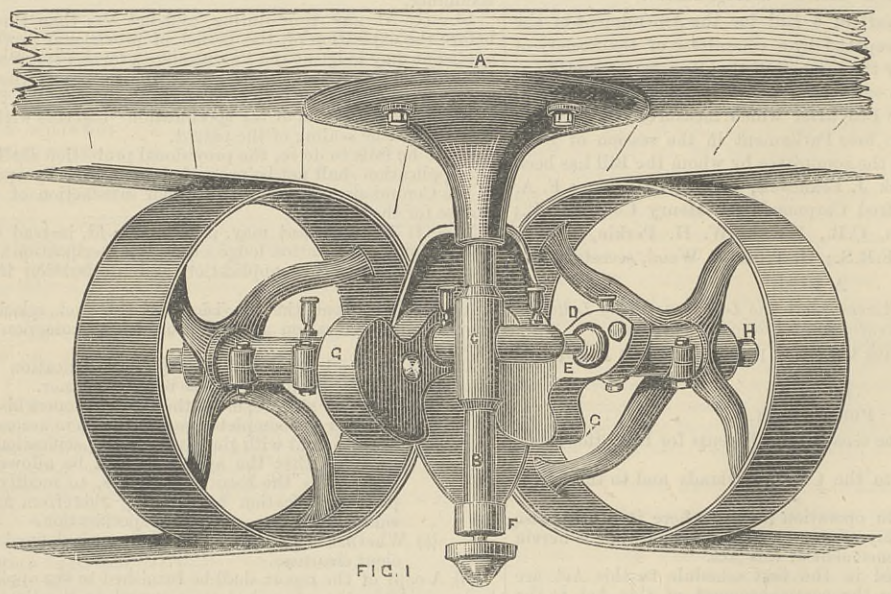


FIG. 1

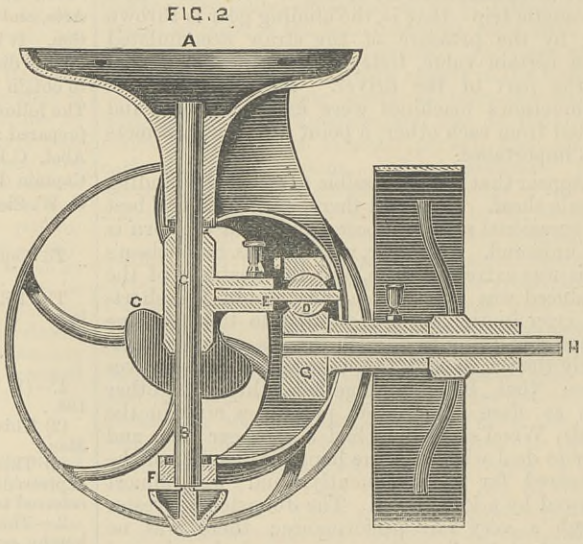


FIG. 2

The annexed woodcuts illustrate a coupling for communicating motion from one piece of shafting to another, at any angle within a given range. It is a very ingenious thing, but whether it is suitable for any but comparatively light shafting needs experience to enable one to say. It is the invention of Mr. T. R. Almond, of Pearl-street, Brooklyn, and seems to be made by the Putnam Machine Company, Liberty-street, New York. The arrangement may be very useful in some situations, and its construction will easily be gathered from the illustrations which we reproduce from the *American Machinist*.

Fig. 1 shows the device arranged as a hanger, to be placed upon the ceiling in the same manner as any ordinary hanger. The two pulleys stand in a vertical position, and at right angles to each other. A belt from the main line will, by virtue of the reciprocating and rotative motion of slide C, drive both pulleys. The crank head, Fig. 2, contains a ball D, through which a hardened steel pin E passes. This steel pin is firmly secured to the slide C, but moves freely in the ball, so that when the shaft H is made to turn, the slide C will move up and down and partly around the post B, causing, as it does so, a regular circular motion to be given to the opposite crank G. Both cranks are fitted up precisely alike, and connected with the slide C, as shown by the cross-section in Fig. 2. The centre lines of the cranks H intersect at a point corresponding with the centre line of the vertical post B. The pulleys are made to overhang the bearings as much as possible, for the purpose of equalising the strain upon them. The balls D and their seats are lubricated by means of a passage through the pin E, to the oil cups on the slide C. The slide C lubricates itself by its lower end coming in contact with oil, contained in the recess F.

THE IRON, COAL, AND GENERAL TRADES OF BIRMINGHAM, WOLVERHAMPTON, AND OTHER DISTRICTS.

(*From our own Correspondent.*)

Upon 'Change in Birmingham this—Thursday—afternoon, and also in Wolverhampton yesterday, sheet makers were besieged with offers to buy, and the galvanisers and merchants doing an export business were anxious to place orders for early execution. The latter desired deliveries in London, Liverpool, and Hull for shipment to Australia, Russia, and India in particular. Makers, however, would not accept all the work offered them; indeed, they could not, in the present satisfactory state of their order-books. For common shipping qualities, they demanded as works' prices:—Singles, £7 5s.; doubles, £8 5s.; and lattens, £9 5s. Galvanising qualities were an addition to these prices of 10s. upon singles, 5s. upon doubles, and between 10s. and 15s. upon lattens.

American buyers of hoops would seem to have made up their minds that English prices are likely to continue to rise. Some makers announce this week that they are in receipt of communications from U.S. consumers offering to take the whole of their next year's output. But such offers meet with no acceptance. Although it is left with makers to name a reasonable price, they refuse to entertain the idea; for they are already sold as far forward as for the present they care to be. Prices remain at about £6 10s. to £6 15s. at the works for ordinary sorts, though common sorts can be had at as low as £6, the marked iron firms, however, demanding £8.

The long-continued depression in the marked bar trade is without any conspicuous relief. Masters are only working from hand-to-mouth, and even then the plant is but partially employed. Most of the orders are coming through London for consumption in the colonies and other foreign markets where Staffordshire marked iron maintains the high reputation for quality which it has long enjoyed. Current bar rates are £7 12s. 6d. for Earl Dudley's, £7 10s. for New British Iron Company and Messrs. John Bradley and Co., and £7 for the remainder of the leading houses. Sheets and plates, rolled by the same makers, are £1 10s. per ton above the bar prices.

The thin sheet houses, whose products are used for stamping and best working-up purposes, reported to-day an active sale on home and foreign account. Prices to actual consumers—not merchants—of such firms as Messrs. E. P. and W. Baldwin and Co. were:—£11 Severn singles; £12 B.B. quality; and £13 B.B.B. quality. There were American inquiries on the market for stamping sheets of splendid quality, for which makers' quotations were about £25 per ton.

Pig iron makers announced in numerous instances that they were now selling pretty much all their make. They prefer to maintain this amount of custom at present prices rather than advance rates with the risk of uncertain employment. It is, therefore, only upon former minimum rates that higher prices are at date being secured. Quotations for pigs in general remain unchanged upon those given in my last report. Lately Messrs. Bagnall, of West Bromwich, have blown out one furnace, and a furnace at the Level, Brierley Hill, is likely soon to follow suit.

The directors of John Bagnall and Sons, Limited, of the Golds Hill Ironworks, West Bromwich, propose to raise a further £20,000 by the creation of 10,000 new pre-preference shares of £3 each, £1 of which is to be accredited as paid up on account of losses in trade.

This week I have had an opportunity of comparing a set of hand pumps made by a well-known English pump firm, with a set made by a well-known American pump firm. The English firm was Joseph Evans and Sons, Wolverhampton, and the Transatlantic firm was W. and B. Douglas, Middletown, Connecticut, U.S.A. The set included the sizes ranging from No. 0 to No. 6. A few comparative figures will be of interest alike to makers, to buyers, and to users of such pumps. As large numbers of these manufactures are exported the weight is a matter of importance. The English pumps were, in six out of the seven samples weighed, lighter than the American. The exception was the smallest, No. 0 size. This size of the Douglas weighed 14 lb. against the Evans 14½ lb. The Douglas No. 1, which on the makers' list is designated "cistern pump," weighed 18 lb. 2 oz., and the Evans No. 1, 17 lb. 4 oz. As the sizes increased, the difference was increasingly marked, until at No. 6, with brackets, the American weighed 53¼ lb., and the English 47¼ lb.

The difference in the external appearance of the pumps was not sufficient to account for the difference in weights. I took the rod and bucket out of a Douglas No. 4, and it weighed down 3¾ lb., the same parts of an Evans No. 4 weighed 2 lb. 10 oz. The metal of the case and spout of the English pumps was evidently run out thinner in some parts than that of the American. Yet at the parts where most wear would take place there was an evidence of strength. In the Evans pump there is a brass seat to the valve, and one thickness of strong properly cupped leather on the bucket, and in the Douglas an iron valve seat and two thin ill-fitting pieces of leather. I observed that the English pump could be moved from its base for internal repair by the unscrewing of two small nuts and the simple lifting of the pump. The American pump is screwed into its base, and removal would be a very difficult matter when corrosion had set in.

As to hardwares, it is satisfactory that the gradual improvement which has of late been going on in the colonial business should now be slowly extending to the home trade. The change is not at present conspicuous, still it none the less exists. Factors who almost wholly confine themselves to home trading are, certain of them, beginning to send out travellers again, after a departure from this course of getting custom extending over some considerable time. Some manufacturers announce this week that the recent calls from the factors as well as from the merchants have been of so encouraging a sort that formerly heavy stocks have now been reduced to quite a normal level.

A number of the workmen and manufacturers of Birmingham, lately called together by the National Trades Defence League, to consider the bearing of the French Treaty negotiations upon their interests, have forwarded to the President of the Board of Trade a resolution in which they "protest against the conclusion of a treaty which does not materially reduce the high French duties on British manufactures, and also does not provide for a twelvemonth's notice of withdrawal." They ask the president to use his influence in their behalf. Mr. Chamberlain, in reply, does not believe that a disregard of the principles mentioned in the resolution would be held by the majority of those interested to be sufficient to prevent the conclusion of a treaty; and as to the duration, he points out that if the arrangement were a bad one, twelve months would be too long a time, and if it were advantageous to this country, its regulations should remain in force for a fixed period.

The Birmingham Trades Council have secured the election to a trusteeship of the Mason Orphanage of one of its two workmen nominees, and at its last gathering it passed a vote of thanks to the Town Council for that corporation's recognition of the principle of labour representation as exemplified in the election.

NOTES FROM LANCASHIRE

(*From our own Correspondent.*)

Manchester.—So far as pig iron is concerned the market here has been very quiet during the past week, and with the make throughout the country still so much in excess of the present requirements of consumers there is naturally no anxiety on the part of buyers to place out orders. Inquiries even for forward delivery, which were being pretty freely made, have been checked by the unfavourable reports during the week from the principal iron-making centres, and to effect any sales of importance just now there i little doubt makers would have to give way upon late rates

Lancashire makers of pig iron who are tolerably well sold for the next few months are not pressing sales, and although little or no new business of importance is at present coming in, their quotations for delivery into the Manchester district remain very firm at 44s. for No. 4 forge, and 45s. for No. 3 foundry, less 2½ per cent.

The Wigan Coal and Iron Company have just blown in an additional furnace, which has been put upon spiegeleisen, but this will still leave four of their furnaces out of blast.

With regard to outside brands of pig iron coming into this market, there is not much to report. Most of the makers being well sold for the present are holding for late rates, but here and there where they are not very well placed for orders there is a slight giving way to secure new business.

Throughout the manufactured iron trade generally a decided improvement is being maintained. The new business recently coming in, it is true, has chiefly been on account of orders for shipment, but there has also been lately a very fair demand for common bars and sheets for home consumption. The result has been that most of the makers in this district have secured orders which will keep them fully going for the next three months, and for any further business they are holding out firmly for a substantial advance upon late rates. In many cases an advance of fully 7s. 6d. per ton is being asked, and generally it may be stated that an advance of quite 5s. per ton has been obtained. For ordinary bars, delivered into the Manchester district, the minimum price is now £6 per ton; hoops average about £6 10s. to £6 12s. 6d.; and for sheets, from £7 15s. up to £8 per ton has been obtained.

Amongst engineers there is a rapidly growing feeling of confidence that a revival in trade has commenced. Although the prices which have to be taken cannot yet be said to be remunerative, orders are coming in more freely, and inquiries are thickening, which, it is hoped, will lead to business of a more profitable character than of late.

The foreign trade, especially, is improving. One of the largest engineering firms in the Manchester district is at present busily engaged on lathes, planing machines, and other heavy tools for the French marine yards, and there are also a number of American inquiries at present afloat in this district for general engineering tools.

Some fair locomotive orders for abroad have also been received, and amongst these I may mention that the Vulcan Engine Company, at Newton-le-Willows, have in hand the construction of locomotives for the Bombay and Baroda Railway Company.

Messrs. W. and J. Galloway and Sons, of Manchester, have just completed their large new foundry, to which I referred a short time back in my "Notes." This foundry is probably one of the largest and most complete of its kind in the kingdom, and the firm are now able to turn out readily castings of from 40 to 50 tons in weight.

So far as merchants are concerned the home trade continues only dull, but I hear that orders for exceptionally heavy mill machinery for France have just been placed in this district.

An improvement of the Lehman hot air engine, which practically doubles its working power, has just been completed by Messrs. W. H. Bailey and Co., Salford. As is well known, the essential feature of the Lehman engine is in the difference of temperature produced at the opposite ends of the cylinder, an increase of cold at one end being quite as economical as an increase of heat at the other. In Messrs. Bailey's improved engine, by an ingenious alteration of the water spaces at the cold end a more rapid condensation of the air has been effected, whilst a greater heating surface has been secured at the retort end. These engines, I understand, are meeting with such an increased demand that Messrs. Bailey are laying down additional plant for turning out this class of work.

Recently I have pointed out the advantage which tool-makers in this district in some cases, and which they might very readily to a much larger extent secure to themselves by manufacturing numbers of small tools which are being sent over by continental and American makers, and upon which large profits are realised. If makers here would only adapt themselves to the production of these articles, which they would have no difficulty in doing, they could readily secure a very remunerative trade, and in addition to one or two small tools now being made here, to which I have already referred, I may mention that last week I had brought under my notice a small drilling machine for pin holes on an American pattern, but more substantial in make, at 10s. 6d., whereas the American drill has been selling at 15s.

In the coal trade there is not much to report since last week. The reductions in price which have been made by the colliery firms in the Manchester district have to some extent enabled them to keep their customers together against the competition of outside districts; but they have not led to any material increase of actual business, and stocks are still accumulating at the pits. Outside the Manchester district there has not been any general reduction of list rates, but round coals are being offered at extremely low figures even for forward delivery. The better classes of round coal are very bad to sell, and although there is more doing amongst finished iron makers, supplies of common round coal are still so much is excess of requirements that these continue a drug in the market. For engine classes of fuel there is a steady demand; but there is not the pressure on the part of consumers which was the case a short time back, and although stocks are not accumulating, supplies appear to be quite sufficient to meet present requirements. The average prices at which orders for anything like quantities could be placed at the pit mouth are about as under:—Best coals, 8s. to 8s. 3d.; good seconds coals, 6s. to 7s.; common round coals, for iron making and steam purposes, 4s. 6d. to 5s. 3d.; burgy, 4s. to 4s. 3d.; good slack, 3s. 9d. to 4s.; and inferior sorts, 3s. to 3s. 6d.

The shipping trade has been only dull, and steam coal delivered at Liverpool and Garston averages about 6s. 6d. to 7s. per ton.

Barrow.—The hematite pig iron trade in this district occupies a position of steadiness, and the business doing displays a regularity of transactions which is calculated to maintain this steadiness. On foreign account there is a strong inquiry, and buyers are speculating with a spirit which shows that confidence in the immediate future of the trade is generally experienced. The demand from colonial and continental consumers is fairly maintained, and on home account no reduction can be noted in the consumption of either Bessemer or forge qualities of pig iron. The value of iron is undisturbed, 54s. being the price at which all-round parcels of Bessemer are changing hands at 52s. 6d., the value of No. 3 forge at works. Stocks of iron have not been lessened during the past fortnight, as the delivery of foreign consignments has been reduced. Very large deliveries have, however, to be made before the close of the season to America, the colonies, and the Continent, and several large steamers have already been chartered. Shipbuilders and engineers have an extensive programme of work in hand, and in the marine department of the latter systematic overtime has to be worked. Finished iron is in fair request, but local makers of this material are handicapped severely with competition from other districts. Railway rolling stock works are very well furnished with orders, but the iron ore trade is quiet, owing to the importation of foreign ores on the one hand, and the lessened consumption of manufacturers of iron on the other, consequent on the reduction in the output of the furnaces throughout the district.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

During the past week the iron market has remained firm on the prices as given last week. There has been a heavy clearance of stocks, these clearances being for shipment to the Northern ports. It will have been noticed that some of the local houses took advantage of the reduction of ironworkers' wages as proposed under the sliding scale, by the North of England Board of Arbitration. Many hundreds of the workmen in the Sheffield iron mills are, however, ruled by Staffordshire prices, and where these rules apply, the men have not made any concessions, nor have they been asked to do so.

Boiler and ship plates are selling freely, and in the former line especially manufacturers have more orders on hand than they can complete for a year to come. This is well known in the trade, and consequently prices of best best Yorkshire makes are strengthened. Boiler plates of superior makes are realising as high as £14 5s. per ton, but common can be obtained as low as £12 per ton. The former are, however, selling best. In ship plates there is also a fair business doing, but the competition of Lancashire houses, who are nearer to Scotch shipbuilding yards, is severely felt. Low prices and the difference in railway rates are against local makers. Notwithstanding the representations to the railway companies on the part of South Yorkshire manufacturers, no abatement in rates of transit have been made.

Though the coal market is exceedingly depressed at present, some of the merchants in this line have already issued notices to the effect that on and after the 1st of September next, prices for household descriptions will be 1s. per ton above the quotations of to-day. Rates, as now ruling out wharves, are as follows:—Best branch, 14s. per ton; best Silkstone, 12s. 6d.; ordinary, 10s.; nuts, 8s. 6d.; and slack, 3s. 6d. and upwards per ton. Many hundreds of colliers in this district are on short time, and notwithstanding the amalgamation of the South and West Yorkshire Miners' Association, there is little likelihood of the position of the men improving until there is a genuine revival in many trades. Should that take place—and there are already indications of it—the united union of men will have a stronger voice than for some years has been the case, and a stronger power also, as is already recognised by the employers.

That the Bessemer trade is fairly busy may be gathered from the fact that holders of stocks refuse to make any concessions in order to induce business. Billets are fetching £6 15s. per ton at works, and some marked brands as high as £9 2s. 6d. With extra admixtures of foreign irons even £10 is bid. The latter are used for special purposes. An important innovation is the introduction of foreign Bessemer for tool purposes. This will further affect for the worse the trade in cast steels. Whilst the Bessemer trade is advancing the old cast steel trade is receding, and this is daily becoming more noticeable. Converters of best cast steel are doing a really good business with the United States, orders being principally for tool steels ranging in value from £22 per ton to £40. Only the old-established houses are getting these lines.

Cutlery manufacturers are finding a slightly improved market, principally on shipments for the colonies, the home trade being depressed. Advices which are coming in, however, show that Spanish and Australian merchants are doing best, and consignments in these directions are daily becoming heavier. It cannot, however, be denied that Spanish buyers are prejudiced at present against English goods, and French makers are gaining a headway in this market which it will be difficult to check. The feeling in Spain against English goods is due to the extreme duties which have to be paid by Spanish producers before their consignments—principally wines—are admitted into the English market. Files and saw manufacturers are short of work, but the old staple trades of the town are improving.

The Tinsley Rolling Mills Company, Limited, pay 10s. per share—£10 shares, £6 called up. The British Wagon Company, Limited, declare 6 per cent. per annum.

Dr. Webster, the United States consul here, informs me that the exports of Sheffield goods to the States during the month of July amounted to £95,303 0s. 2d., as compared with £105,866 2s. 7d. for the corresponding month of 1880. The value of steel was £26,012 5s. 7d.; of cutlery, £27,868 14s. 5d. In July of last year the figures were: Steel, £27,233 17s. 1d.; cutlery, £27,416 19s. 5d. The total for the previous month of 1881 was £121,763 13s. 11½d. There is thus a large falling off in July, but July and August are known as "the hot months," and decreased business with the States is looked for during that period.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

A slack attendance and still further weakness were the characteristics of the Cleveland iron market held at Middlesbrough on Tuesday. The increase of stocks which took place during July to the extent of about 5000 tons, notwithstanding the strike at Coatham, Lackenby, and Eston, had a depressing effect, from which there has as yet been no recovery. The shipments so far this month have been up to the average, but the local consumption has been less, owing to minor disturbances among the workmen at the rolling mills. Next week several manufactured iron firms will close their works, owing to Stockton races, and about 5000 tons of pig iron will thereby be thrown upon the market, All these circumstances, together with the weakness at Glasgow, have tended to lower the price: No. 3 g.m.b. will not now fetch more than 36s. 9d. f.o.b.; warrants are 37s. 9d.; and forge iron, 35s. 9d. per ton. The stock in Connal's Middlesbrough store now amounts to 85,073 tons, being an increase of 563 tons over the previous week. Ironfounders are complaining bitterly of the slackness of their branch of the trade, and are quoting lower than last month. The finished iron trade remains steady. The ironworkers generally have accepted the reduction of 2½ per cent., awarded under the sliding scale. It is thought, however, that but for the timely resolution passed by the Leeds Conference in favour of carrying out the award honourably, and but for the near approach of Stockton races, when money will be required, there would have been some resistance to the unpalatable award. Ship plates are to-day quoted at £6; angles at £5 10s., and bars at £5 12s. 6d., all free in trucks, Middlesbrough less 2½ per cent. discount for cash. Puddle bars are in some demand.

The creditors of Messrs. Simpson and Backhouse, iron merchants, of Middlesbrough, and Cannon-street, London, have had a meeting, resulting in the acceptance by them of five shillings in the pound, to be paid half in prompt cash and half in three months.

Nine assistant shearmen were brought before the Middlesbrough stipendiary on Monday, charged with breach of contract. They were, till recently, employed at the Newport Rolling Mills, and were all Irishmen. They had repeatedly left the works without notice, thereby causing the mills to stand, and throwing large numbers of other workmen idle. When it was attempted to supply their places with other workmen, they intimidated them, and, in fact, like the dog in the manger, would neither work themselves nor allow any one else to do so. The stipendiary ordered the three ringleaders to pay £2 11s. 2d., and the remainder £1 11s. 2d. each, including costs. The men were also discharged from their situations.

The strike of platers' helpers has now ended as far as the Tyne, Tees, and the Hartlepools are concerned. At Sunderland, however, it still continues, and the members of the Institution of Mechanical Engineers when passing down the Wear on Friday last saw all the yards idle. For three weeks the strike has lasted, and few know what it is about. Attempts are now being made to supply the place of the helpers with other men, and if successful, the usual activity may soon again prevail.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The Glasgow pig iron market has lacked animation during the past week, and very little business has been done in warrants, which have not, however, varied much in price. The exports of pigs are considerably larger than they were in the preceding week, but the current demand is still much below what might be expected. The trade with the United States is sluggish, being hampered by increased freights, and by the very low prices at which the American ironmasters are disposing of the produce of their furnaces. One or two lots have been booked for Canada within the past few days, but there are still considerable stocks in hand there, which will prevent material purchases on this side for a time, although a better inquiry is eventually anticipated. The continental demand is fair, being larger than at this time last year, but yet below the expectations of merchants. At home the consumption is good, but there is proportionately a better inquiry for Cleveland than Scotch pigs for use in the manufacturing works. Since last report an additional furnace has been put in blast at the Eglinton Ironworks, making 120 now in operation, as compared with 117 at the same date in 1880. Seven furnaces are producing hematite, to which increasing attention is being called by the activity in the steel trade, and it is highly probable that this branch of the manufacture will be more largely developed. Stocks have not been increasing so rapidly in the past week, there being only a few hundred tons added to the reserve in Messrs. Connal and Co.'s stores, which aggregate about 574,000 tons.

Business was done in the warrant market on Friday morning at from 46s. 6½d. to 46s. 4½d. cash, and 46s. 8d. to 46s. 6d. one month, the afternoon's quotations being 46d. 4½d. to 46s. 5d. cash, and 46s. 6d. to 46s. 6½d. one month. On Monday the market was flat, with a further decline to 46s. 2½d. cash, and 46s. 6d. one month, from which, however, a slight recovery took place before the close. The market was steady on Tuesday, with business from 46s. 5d. to 46s. 3d. cash, and 46s. 6d. to 46s. 5d. one month. The feeling was sluggish on Wednesday, with business from 46s. 3d. to 46s. 1½d. The market was again quiet to-day—Thursday—at 46s. 1d. to 46s. 2d. cash.

In nearly every branch of the manufactured iron trade there is a healthy activity, and the exports of manufactures of this class have done much to swell the increase disclosed in the Board of Trade returns for the past month. Prices have varied very little, and this circumstance has tended greatly to the steady growth of trade. The marine and general engineers and ironfounders are busy, and so also are the steel workers. A new iron and steel works called the Waverley has just been started in the neighbourhood of Airdrie. The past week's shipments of iron manufactures from the Clyde embraced £10,000 worth of machinery, including £7018 locomotives for Calcutta, £1300 for Boston, and £1020 for the Mediterranean; £21,000 other manufactured articles, of which £7500 were despatched to Calcutta, £5530 to Rangoon, £2800 to Bombay, £2620 to Shanghai, £1010 to Boston, and £1000 to the Mediterranean; 1782 tons of steel rails, valued at £10,250 for Baltimore.

Messrs. William Dixon, Limited, are reported to be about to stop the manufacture of plates and bars at their Govan ironworks, which are probably the oldest of the kind in the country. Their site is to be let for building purposes. They will still, of course, carry on the blast furnaces and foundry, and their malleable business will, it is stated, be transferred to their works at Coats.

There is a gratifying continuance of activity in the coal trade, both the home and export departments showing an increasing demand. In Fifeshire, the coalmasters have increased their prices about 6d. per ton, and in the west values are firmer, although no formal advances have as yet been announced.

Mr. Macdonald, M.P., in the course of an address to the Hamilton miners, has assured them that they may, if they act prudently, obtain an advance of wages in the course of the next month. He does not advise a strike, but counsels a union such as will impress the masters with the necessity of meeting the demands of the men.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

I have been in the anthracite districts of Wales lately, and am sorry to admit that the hopefulness which prevailed last year respecting the possibility of getting a good London market has not been realised. For malting there is still a moderate enquiry, and that is the most that can be said. The qualities of coal new in special demand are the Rhondda coals, and the best four feet of the upper part of Glamorganshire. Inferior varieties, though rated, of course, at 1s. and even less per ton than the best, are beginning to flag, and this was especially noticeable at Cardiff last week. Seconds, as they are called, were very little in request, and it was difficult to maintain the quotations of the preceding week. There was no change however, in price, coalowners being assured that it was only a temporary lull, and that business would in a few days recover itself. The steady export of over 100,000 tons from Cardiff which has characterised the trade nearly the whole of the year, faltered last week for the first time, and the total quantity sent away was only 92,000 tons, or nearly 20,000 tons less than that of the preceding week. Newport, on the contrary, showed an improvement, and instead of its previous total of 16,000 tons sent off 19,000. Swansea too exhibited an improvement, though here prices are not so high or so firm as at the other seaports. This is simply due to quality.

I do not hear of any movement on the part of Swansea to get the Rhondda railway, and until this done they must be contented with the third position in the coal trade. Energetic movement is to be seen at the new dock, and it is gratifying to state, on the authority of Mr. Dillwyn and Mr. Abernethy, that the great speed now shown in bringing the dock to completion is marked by thoroughness of work and complete stability of performance. This must be as gratifying to the public to learn as it is for Mr. Walker to know, as every one can see that things are being carried on at high pressure. October is the date named for completion, and the prospects are that everything will be sufficiently ready for the ceremonial.

I have been informed on good authority that the whole of the business of the Old Newport Dock Company has been leased by Sir Geo. Elliot.

It may interest our local readers to know that two representatives of the old ironmasters of Glamorgan and Monmouth are still living—Miss Fothergill, now nearly ninety years of age, at Hensol, and Mr. Charles Harford, at Cheltenham.

The promised movement at Cyfarthfa is in abeyance, but I have noted the last day or two repairs going on at the coke ovens in immediate juxtaposition to the Pandy mill—the site of the new steel works—and this sign, slight as it is, may be taken as hopeful.

There is little to chronicle in connection with the iron trade from a survey lately of Rhymney, Tredegar, Dowlais, Treforest, and Swansea. My impression is confirmed that business is satisfactory, though prices are scarcely such as to meet with the views of makers, or warrant any launching out into expensive and extensive improvements. Alterations are progressing at Treforest and Tredegar.

Nothing satisfactory can be stated of the tin-plate trade. Some makers, to my knowledge, have been in Liverpool within the last day or two; but the result has not been to improve the present long-continued depression.

The College Works, near Llandaff, which have for some time been in a flagging condition, have stopped, and will remain so until things improve. One of the proprietors informed me that the chief cause of stoppage is the want of confidence in buyers. Orders come in freely enough, but not of a character to justify the acceptance, except at cash prices.

The South Wales Wagon Company have declared a dividend of 10 per cent., and the accountant's statements show a prosperous condition.

The quantity of foreign ore received at Cardiff and Newport, principally from Bilbao, last week, was close upon 24,000 tons. One of the leading subjects of conversation at Cardiff at present is the "ring" which is being attempted in Bilbao to improve the price of their ores. I do not think that this will be successful. Stocks in hand at many of the works are such as to enable holders to carry on business for twelve months independently of further supply.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

*** *It has come to our notice that some applicants of the Patent-office Sales Department, for Patent Specifications, have caused much unnecessary trouble and annoyance both to themselves and to the Patent-office officials by giving the number of the page of* THE ENGINEER *at which the Specification they require is referred to, instead of giving the proper number of the Specification. The mistake has been made by looking at* THE ENGINEER *Index and giving the numbers there found, which only refer to pages, in place of turning to those pages and finding the numbers of the Specification.*

Applications for Letters Patent.

*** When patents have been "communicated" the name and address of the communicating party are printed in italics.

2nd August, 1881.

3330. Gas, &c., Engines, E. A. Brydges.—(*M. V. Schiltz, Cologne, Germany.*)
3331. Pads, J. Hobbs, Brighton.
3332. Road-making Engines, A. Lamberton, Lanark.
3333. Making Ice, W. Thompson.—(*F. McMillan, U.S.*)
3334. Wire Fencing, W. J. Smith, Inverness, N.B.
3335. Cranes, A. Barclay, Kilmarnock, Ayr, N.B.
3336. Metallic Alloys, W. L. Wise.—(*L. Guétat and T. Chavanne, Paris.*)
3337. Fish-plates, &c., T. Swift and H. Swift, Ince.
3338. Rolling Scythes, &c., C. D. Abel.—(*L. Werndl, Steyr, Austria.*)
3339. Locks and Bolts, L. Bensel, Germany.
3340. Felting Hats, &c., H. A. Bonneville.—(*W. A. Baglin and J. Gray, Brooklyn, U.S.*)
3341. Adjusting Door Handles, W. Neilson, Lanark.
3342. Railway Sleepers, H. H. Lake.—(*J. C. Rupp, J. H. Ray, and J. Hassinger, Newark, Delaware, U.S.*)
3343. Velocipedes, J. M. Tyrer, Crosby, Lancaster.
3344. Grinding Corn, &c., H. H. Lake.—(*J. T. Noye, R. K. Noye, and E. H. Noye, Buffalo, U.S.*)
3345. Shawls, R. Millar, Renfrew, N.B.
3346. Electrical Signalling, J. Mackenzie, U.S.
3347. Steam-boilers, H. W. Blake, London, and J. Shepherd, Manchester.
3348. Textile Fabrics, L. Smethurst, Halifax.
3349. Electric Lamps, A. Reddie.—(*D. Chertemps, Paris.*)
3350. Preserving Meat, C. Reina and G. Betti, Milan.
3351. Hanging Window Sashes, E. J. Hill, London.
3352. Extracting Metals, W. W. Hughes, London.

3rd August, 1881.

3353. Crushing Machinery, A. Lamberton, Lanark.
3354. Sash Fastenings, A. B. Carpenter, London.
3355. Working Gates, T. Wright & W, Stubbs, Stafford.
3356. Alarm Signals, W. Petty, London.
3357. Preparing Clay, &c., C. Walton, Bournemouth.
3358. Metallic Palate-plates, H. J. Haddan.—(*R. Telschow, Prussia.*)
3359. Gasaliers, T. Kennedy.—(*G. Poirier and A. Chatouillot, Paris.*)
3360. Applying Water-ballast Tanks, C. J. D. Christie, Newcastle-upon-Tyne.
3361. Opening Bottles, A. Lofthouse, Fartown, and R. King, Linthwaite.
3362. Electric Lamps, J. Hopkinson, London.
3363. Reaping Machines, R. Attenborough, Reading.
3364. Elliptic Springs, P. Justice.—(*W. Davison, U.S.*)
3365. Capping Cans, B. Mills.—(*H. and F. Thurber, U.S.*)
3366. Registering Passengers, J. Rogers, Oldham.
3367. Engines, M. P. W. Boulton, Tew Park, Oxford.
3368. Folding Bedstead, H. H. Lake.—(*R. White, U.S.*)
3369. Electric Lighting, K. W. Hedge, London.
3370. Brake, W. Walton, Harrytown Hall, Chester.
3371. Velocipedes, F. Wirth.—(*P. Praechter. Germany.*)
3372. Ships' Sleeping Berths, W. R. Lake.—(*J. H. Laskey, Massachusetts. U.S.*)

4th August, 1881.

3373. Preventing Displacement of Wedges, J. Bland, Harley-street, London.
3374. Winding Machines, H. Crawford & J. Lee, Belfast.
3375. Traps for Water-closets, C. Parker, Amberley.
3376. Artificial Ivory, &c., F. W. Cottrell, London.
3377. Fire-engines, H. J. Haddan.—(*S. Babcock, U.S.*)
3378. Artificial Manure, H. d'Esplaviz, Twickenham.
3379. Drying, &c., Wood Shavings, &c., E. G. Brewer.—(*F. Stormer, Christiania, Norway.*)
3380. Detecting Electric Current, W. P. Thompson.—(*J. A. Pel, Liége, Belgium.*)
3381. Moving Forgings, A. Mure, Glasgow.
3382. Frames for Bottles, &c., G. Green, Birmingham.
3383. Baths, J. Shanks, Barhead, Renfrew.
3384. Indicators, J. Mewburn.—(*C. Pond, New York.*)
3385. Siphon, H. Descours, Paris.
3386. Electric Organ, W. Schmoele & A. Mols, Antwerp.
3387. Skates, W. G. Rawbone.—(*J. Rawbone, Toronto.*)
3388. Underground Pipes, C. Detrick, Philadelphia.
3389. Wire Hair Brushes, W. Lake.—(*J. Horton, U.S.*)
3390. Permanent Way, P. J. Neat, Belsize Park.

5th August, 1881.

3391. Capsuling Bottles, J. Madocks, Dartmouth.
3392. Asbestos Packing, C. J. Allport, London, and A. Hollings, Manchester.
3393. Supplying Air, D., M., and A. Sowden, Bradford.
3394. Generating Electric Currents, G. Fox, London.
3395. Surgical Apparatus, J. C. Mewburn.—(*E. Bonnefoy, Paris.*)
3396. Car Couplings, A. J. Boult.—(*J. H. Hunt and F. W. Jones, Spartanburg, U.S.*)
3397. Knitted Fabrics, W. and T. Wild, Ayr.
3398. Slubbing, &c., Frames, G. P. Leigh, Manchester.
3399. Intermittent Siphons, A. T. Bean, London.
3400. Electric Machines, J. H. Johnson.—(*J. B. J. Mignon and S. H. Rouart, Paris.*)
3401. Propelling Aerostats, J. H. Johnson.—(*G. Tissandier, Paris.*)
3402. Electric Lamps, J. H. Johnson.—(*J. B. J. Mignon and S. H. Rouart, Paris.*)
3403. Sugar, J. Duncan, Mincing-lane, London.
3404. Lighting Electric Candles, E. G. Brewer.—(*A. G. Desquins, Paris.*)

6th August, 1881.

3405. Telephonic Apparatus, T. A. Connolly, London.
3406. Foot Skates, J. F. Walters, Bayswater.
3407. Churns, N. Stewart.—(*A. Stewart, Canada.*)
3408. Bicycles, G. Strickland. Malta.
3409. Regulating Electricity, G. Westinghouse, jun., King's Cross, London.
3410. Fire-proof Documents, J. R. Meihé.—(*L. Frobeen, Berlin.*)
3411. Beverages, G. W. Kincaid, Chelsea, London.
3412. Fluid, T. Coad, Finsbury, London.
3413. Lids for Oil-cans, J. Nickholds, Wolverhampton.
3414. Throttle Valves, R. D. Napier, Glasgow.
3415. Utilising Gaseous Products, P. M. Justice.—(*F. Osann, Düsseldorf, Germany.*)
3416. Sawing Stones, J. Vanlohe.—(*P. Gray, Paris.*)
3417. Frames for Bottles, J. Middleton, Birmingham.

8th August, 1881.

3418. Indicating Depth of Water, J. Dillon, Dublin.
3419 Feeding Bottles, H. G. Wells, Liverpool.
3420. Fastening Apparel, A. Adams, Southampton.
3421. Making Cigarettes, W. R. Lake.—(*J. Cowman and G. H. Frost, New York, U.S.*)
3422. Pianoforte Actions, F. L. Mitchell, Halifax.
3423. Musical Boxes, J. G. Dudley, Carmarthen.
3424. Gearing, G. Cruikshank.—(*A. Houston Bombay.*)
3425. Clocks, H. J. Haddan.—(*A. Dardenne, Belgium.*)
3426. Locks, F. Glaser.—(*F. Hasdenteufel, Germany.*)
3427. Permanent Way, F. Glaser.—(*A. Haarmann, Germany.*)
3428. Roof Principals, F. H. Beattie, Birmingham.
3429. Cases, E. G. Brewer.—(*F. R. Grumel, Paris.*)
3430. Pumping Apparatus, A. Stierlin —(*Schläpfer and Sonderegger, Lausanne, Switzerland.*)
3431. Mounting of Ordnance, A. Longsdon. —(*A. Krupp, Germany.*)
3432. Securing India-rubber Tires, W. Foster and T. J. Williams, Bermondsey.
3433. Supplying Lubricants, A. Hugot, London.
3434. Working Brakes, G. Westinghouse, London.
3435. Electric Lamp, F. Wright, London.
3435. Valve for Brakes, G. Westinghouse. London.
3437. Electric Lamp, F. Wright, London.
3438. Self-levelling Berths, B. J. B. Mills.—(*J. C. Thompson, Brooklyn, U.S.*)

Inventions Protected for Six Months on deposit of Complete Specifications.

3326. Valves, H. H. Lake, Southampton-buildings.—A communication from F. B. Rice, New York, and S. A. Murphy, Detroit, U. S.—*30th July*, 1881.
3340. Felting Hats, &c., H. A. Bonneville, London.—A communication from W. A. Baglin and J. Gray, Brooklyn, U.S.—*2nd August*, 1881.
3342. Railway Sleepers, H. H. Lake, London.—A communication from J. C. Rupp, J. H. Ray, and J. Hassinger, Newark, U.S.—*2nd August*, 1881.
3388. Underground Pipes, C. Detrick, Philadelphia, U.S.—*4th August*, 1881.
3396. Car Couplings, A. J. Boult, High Holborn, London.—A communication from J. H. Hunt and F. W. Jones, Spartanburg, U.S.—*5th August*, 1881.

Patents on which the Stamp Duty of £50 has been paid.

3097. Setting Black Diamonds, H. Conradi, London.—*6th August*, 1878.
3070. Boiler Furnaces, E. Bennis, Bolton.—*3rd August*, 1878.
3102. Converting Grain into Food, C. Kesseler, Berlin.—*6th August*, 1878.
3243. Producing Printing Surfaces, H. Goodwin, Bloomsbury, London.—*16th August*, 1878.
3109. Evaporating Saline Solutions, S. Pitt, Sutton, Surrey.—*6th August*, 1878.
3195. Carding Machines, E. A. Leigh, Manchester.—*13th August*, 1878.
3213. Combing Wool, R. Scott and J. Hanson, Halifax.—*14th August*, 1878.
3094. Locks and Latches, J. A. Lea, Shrewsbury.—*5th August*, 1878.
3131. Velocipedes, J. Turner and S. Martin, Coventry, and J. Adams, jun., Newcastle.—*8th August*, 1878.
3145. Treating Hop Stalks, J. W. Tasker, Halifax.—*8th August*, 1878.
3177. Transmitting Motive Power, N. Macbeth, Bolton.—*12th August*, 1878.
3114. Washout Water-closets, &c., J. Dodd, Liverpool.—*7th August*, 1878.
3124. Corsets &c., W. R. Lake, Southampton-buildings, London —*7th August*, 1878.
3135. Roasting Coffee, &c., T. Neal, London.—*8th August*, 1878.
3289. Slide Valves and Valve Facings, F. W. Webb, Crewe.—*21st August*, 1878.
3538. Matches, T. H. Bryant, Glencairn, Surbiton-hill, Surrey.—*6th September*, 1878.

Patents on which the Stamp Duty of £100 has been paid.

2760. Rock Drills, R. Hosking and W. Brakewell, Dalton-in-Furness, Lancaster.—*10th August*, 1874.
2740. Busks for Stays, &c., H. A. Lyman, Cheapside, London, and R. Stokes, Bow.—*7th August*, 1874.
2783. Tempering Glass, F. B. A. R. de la Bastie, Paris.—*12th August*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 26*th August*, 1881.

1430. Railway Brakes, E. W. Furrell, London.—*1st April*, 1881.
1452. Tills, &c., T. E. Boyce, Westbourne Park, London.—*2nd April*, 1881.
1456. Automatic Fire-Extinguisher, W. H. Beck, London.—A communication from L. C. Blon and J. Kratzenstein.—*2nd April*, 1881.
1491. Dyeing Fabrics, C. T. Smith, S. M. Milne, and J. H. Binns, Bradford. —*5th April*, 1881.
1513. Vessels to Carry Grain, J. Taylor, Gracechurch-street, London.—*6th April*, 1881.
1538. Paper for Photographic Purposes, H. J. Haddan, London.—A communication from J. J. D. Hutinet and P. E. Lamy.—*8th April*, 1881.
1576. Indicating Apparatus, W. E. Gedge, London.—A com. from J. François.—*11th April*, 1881.
1608. Sifting Flour, R. W. Dobing, Providence-row, Durham.—*13th April*, 1881.
1628. Ventilating House Drains, G. E. Mineard, Kensington, and T. Crapper, Chelsea.—*13th April*, 1881.
1637. Obtaining Colouring Matters, T. Holliday, Huddersfield.—*14th April*, 1881
1638. Producing Azo Colours, T. Holliday, Huddersfield.—*14th April*, 1881.
1688. Boot Protectors, W. Beverley, Aberdeen.—*19th April*, 1881.
1711. Wearing Apparel, J. Ramsay, Glasgow.—*20th April*, 1881.
1712. Odometer, E. S. Ritchie, Massachusetts, U.S.—*20th April*, 1881.
2036. Ticket Delivering, J. J. Mielecki, George-street, London.—*10th May*, 1881.
2133. Rotary Engines, W. R. Lake, London.—A com. from W. H. and A. J. Jacobs.—*16th May*, 1881.
2249. Heating Dwelling-houses, &c., C. L. Friedländer, Jönköping, Sweden.—*24th May*, 1881.
2439. Moss Peat, F. Versmann, New Charlton.—A communication from E. Meyer.—*2nd June*, 1881.
2670. Obtaining Motive-power, B. J. B. Mills, London.—A com. from J. Lunant.—*18th June*, 1881.
2714. Clay, E. J. T. Digby, Hammersmith.—*21st June*, 1881.
2988. Telephones, G. L. Anders, Lombard-street, London.—*7th July*, 1881.
3012. Compounds for Castings, J. J. Sachs, Sunbury, Middlesex.—*8th July*, 1881.

Last day for filing opposition, 31*st August*, 1881.

1463. Raising Sunken Vessels, R. Hodgson, London.—*4th April*, 1881.
1470. Sugar, A. M. Clark, Chancery-lane, London.—A com. from J. B. M. P. Closson.—*4th April*, 1881.
1471. Filling, &c., Chaff in Sacks, &c., G. Gilders, Stratford-by-Bow.—*5th April*, 1881.
1473. Pipes and Syphon Boxes, G. B. Jerram Walthamstow.—*5th April*, 1881.
1475. Window Blinds, W. H. Dandy, Great Driffield, York.—*5th April*, 1881
1489. Flour, A. Crabtree and J. Jackson, Bolton.—*5th April*, 1881.
1490. Fibrous Material, W. R. Lake, Southampton-buildings, London.—A communication from Messrs. Corral, Tejado, et Corbera.—*6th April*, 1881.
1500. Rails, E. Frere, Antwerp, Belgium.—*6th April*, 1881.
1509. Water Heaters, H. Schofield, Stannington, York.—*6th April*, 1881.
1540. Railway Points, H. Whitehead, Bucknall, Stafford, and T. Dodd, Cheshire. —*8th April*, 1881.
1544. Drying Coffee, J. Walter, London.—A com. from F. C. da Cahunda and Co.—*8th April*, 1881.
1546. Menstrual Apparatus. F. A. C. Groebert, Peckham.—*8th April*, 1881.
1551. Speed Indicators, W. Stroudley, Brighton.—*9th April*, 1881
1555. Treating Bituminous Substances, J. G. Tongue, London.—A communication from H. Randhahn.—*9th April*, 1881.
1559. Supports, A. Pumphrey, Birmingham. —*9th April*, 1881.
1560. Distributing Liquid, W. Wells, Earlswood, Surrey.—*9th April*, 1881.
1575. Railway Brakes, G. W. von Nawrocki, Germany.—A com. from G. Lippmann.—*11th April*, 1881.
1577. Electric Telegraphs, J. Hopkinson and A. Muirhead, London.—*11th April*, 1881.
1587. Mineral Oil, &c., W. Young, Lasswade, Midlothian.—*12th April*, 1881.
1593. Injectors, A. Budenberg, Manchester.—A com. from C. Budenbergand B. Schaeffer.—*12th April*, 1881.
1598. Horse-shoes, G. W. von Nawrocki, Germany.—A communication from A. Finze.—*12th April*, 1881.
1647. Pencil Holders, P. Lawrence, London.—A com. from J. Reckendorfer.—*14th April*, 1881.
1685. Electric Lamps, A. M. Clark, London.—A com. from J. Gerard-Lescuyer.—*18th April*, 1881.
1725. Preparing Colouring Agents, J. Young, jun., Kelly, Renfrew.—*20th April*, 1881.
1732. Rotary Engines, P. Jensen, London.—A communication from A. J. Atterberg.—*21st April*, 1881.
1842. Extracting Soluble Matter, E. B. Hart, Belfast.—*28th April*, 1881.
2092. Harvesting Machines, J. Miller, Edinburgh.—*13th May*, 1881.
2105. Ornamental Fabrics, F. C. Jeune, Queen Victoria-street, London.—*13th May*, 1881.
2128. Steering Apparatus, A. B. Brown and W. F. King, Edinburgh.—*16th May*, 1881.
2165. Lubricators, F. Wolff, Denmark.—A communication from C. Mollerup.—*18th May*, 1881.
2316. Collecting Leaves, A. Smith, Goudhurst, Kent.—*26th May*, 1881.
2427. Wagons and Trucks, J. C. Martin, Bengal.—*2nd June*, 1881.
2449. Measuring Mechanical Power, C. V. Boys, Wing, Rutland.—*3rd June*, 1881
2574. Kneading Dough, B. J. B. Mills, London.—A com. from E. R. von Skoda.—*14th June*, 1881.
2638. Lamps, F. Siemens, Dresden.—*17th June*, 1881.
2647. Locomotive Engine, L. A. Groth, London.—A communication from C. Raub.—*17th June*, 1881.
2716. Filtering Water, P. M. Justice, London.—A communication from J. Hyatt.—*21st June*, 1881.
2740. Reerigerating Apparatus, A. S. Haslam, Derby.—*22nd June*, 1881.
2799. Steam-boilers, R. Thompson and J. Watson, Liverpool—*27th June*, 1881.
2919. Exploding Gases, W. Watson, Leeds.—*4th July*, 1881.
2990. Gas Engines, C. Linford and C. T. Linford, Leicester.—*7th July*, 1881.
3049. Electric Lamps, F. W. Haddan, London.—A com. from L. G. Woolley.—*12th July*, 1881.
3062. Treating Wood, C. D. Ekman, Old Broad-street, London.—*13th July*, 1881.
3074. Turbines, F. W. Haddan, London.—A communication from J. J. Delori.—*14th July*, 1881.
3082. Food for Horses, J. Long, Reading.—*14th July*, 1881.
3083. Food for Horses, J. Long, Reading.—*14th July*, 1881.
3141. Tooth-brushes, G. Gillies, London.—*19th July*, 1881.
3171. Illuminating Gas, W. Thompson, Liverpool.—A communication from H. T. Smith and H. U. Alcock. *21st July*, 1881.
3203. Piston Springs, W. Buckley, Sheffield.—*22nd July*, 1881.
3256. Pumps, H. H. Lake, London.—A communication from P. E. Jay.—*26th July*, 1881.
3269. Circular Knitting Machines, J. Bradley, Lowell, U.S.—*26th July*, 1881.
3326. Operating Valves, H. H. Lake, London.—A com. from F. Rice and S. Murphy.—*30th July*, 1881.
3388. Continuous Underground Pipes, C. Detrick, Philadelphia, U.S.—*4th August*, 1881.
3396. Car Couplings, A. J. Boult, London.—A com. from J. Hunt and F. Jones.—*5th August*, 1881.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 5th August*, 1881.)

378. Shoeing Horses, J. Offord, Wells-street, London.—*28th January*, 1881.
510. Steam-boilers, H. H. Lake, Southampton-buildings, London.—*7th February*, 1881.
511. Fastener for Gloves, E. Horsepool, Wood-street, London.—*7th February*, 1881.
527. Water-closets, A. Clark, New Cross, Kent.—*7th February*, 1881.
534. Dressing and Preparing Fabrics, &c., W. E. Gaine, Glendale, Rivercourt, Hammersmith.—*8th February*, 1881.
541. Withdrawing Corks from Bottles, &c., F. W. Russell, Upper Thames-street, London.—*8th February*, 1881.
546. Manufacturing Dinitro-benzole, J. A. Kendall, Dalston, Middlesex.—*9th February*, 1881.
548. Connecting and Disconnecting Link, J. Walker, Derby.—*9th February*, 1881.
558. Penholders, E. Fischer, Halle-upon-Saale, Germany.—*9th February*, 1881.
561. Roofing-tile, C. D. Phillips, Gaer Fach Farm, Newport, Mon.—*9th February*, 1881.
568. Fire-bars, A. Murfet, Nottingham.—*10th February*, 1881.
588. Soup Compound, S. Pitt, Sutton, Surrey.—*10th February*, 1881.
589. Mangling and Wringing Machines, N. Tupholme, Sheffield.—*10th February*, 1881.
587. Rolling Mills, P. Kirk, Workington, Cumberland.—*15th February*, 1881.
660. Sizing Machines, E. Tweedale and S. Tweedale, Accrington, Lancaster.—*16th February*, 1881.
674. Pit-sinking, W. R. Beith, Crumlin, Monmouth.—*16th February*, 1881.
716. Fire-arms, J. J. Atkinson, Middle Temple, London, and J. Needham, Hammersmith-terrace, Middlesex.—*19th February*, 1881.
738. Manufacturing Steel, P. Aube, Paris, France.—*21st February*, 1881.
750. Colouring Matters, C. D. Abel, Southampton-buidings, London.—*22nd February*, 1881.
772. Railway Buffers, J. W. Howard, Fenchurch-street, London.—*23rd February*, 1881.
831. Stockings, &c., R. P. Robertson, Leytonstone, Essex.—*26th February*, 1881.
1256. Colouring Matters, G. W. von Nawrocki, Berlin.—*22nd March*, 1881.
1332. Preserving Organic Substances, F. S. Barff, Kilburn, Middlesex.—*25th March*, 1881.
1350. Regulating Fanlights, W. Leggott, Bradford.—*26th March*, 1881.
1482. Subaqueous Boring, T. English, Hawley, Dartford.—*5th April*, 1881.
1511. Receptacles for Packing Bottles, J. Heaps, Manchester.—*6th April*, 1881.
1552. Scraping Ships' Bottoms, J. Westberg, Roodlane, London.—*9th April*, 1881.
1581. Thrashing Machines, R. Creed, Cloyne, Cork, Ireland.—*11th April*, 1881.
1591. Laminated Springs, J. W. Spencer, Newburn, Northumberland.—*12th April*, 1881.
1606. Traction Engines, A. M. Clark, Chancery-lane, London.—*12th April*, 1881.
1676. Electric or Galvanic Batteries, J. H. Johnson, London.—*16th April*, 1881
1778. Bleaching Cotton Fibres, W. Mather, Manchester.—*25th April*, 1881.
2024. Boots, M. Nicolson, Parliament-street, London.—*9th May*, 1881.
2196. Figured Cloth, T. Taylor and J. Warburton, Bolton.—*19th May*, 1881.
2198. Electric Lamps, C. D. Abel, Southampton-buildings, London.—*19th May*, 1881.

(*List of Letters Patent which passed the Great Seal on the 9th August*, 1881.)

586. Steering Vessels, G. D. Davis, Stepney, London.—*10th February*, 1881.
595. Folding Easy Chairs, A. Lloyd, Charlotte-street, London.—*11th February*, 1881.
598. Slide Valves, E. Pilkington, Pendleton, Lancaster.—*11th February*, 1881.
612. Harrows, H. G. Grant, Manchester.—*12th February*, 1881.
617. Portable Drilling Machines, T. and R. Lees, Park Foundry, Manchester.—*14th February*, 1881.
624. Retaining Heat, E. A. Brydges, Upton, Middlesex.—*14th February*, 1881.
629. Feed Apparatus for Thrashing Machines, A. M. Clark, Chancery-lane, London.—*14th February*, 1881.
630. Drawing off Beer, T. Slade, York-street, London.—*14th February*, 1881.
633. Looms for Weaving, S. Smith, Houley, York.—*14th February*, 1881.
635. Securing Tubes, W. Tully, Kennington Park, Surrey.—*15th February*, 1881.
636. Desiccating Potato Foods, &c., G. L. Laird, Douglas, Isle of Man.—*15th February*, 1881.
671. Velocipedes, A. Kirby, Harpur-place, Bedford.—*16th February*, 1881.
672. Looms, E. Jackson, Bradford, York.—*16th February*, 1881.
675. Supporting Automatic Brakes, &c., W. S. Paterson, London.—*16th February*, 1881.
684. Fancy Yarns, G. A. J. Schott, Bradford.—*17th February*, 1881.
712. Thrashing Machines, A. M. Clark, Chancery-lane, London.—*18th February*, 1881.
730. Treating Textile Fabrics, J. Patterson, Belfast, and D. Stewart, Glasgow.—*21st February*, 1881.
749. Colouring Matters, C. D. Abel, Chancery-lane, London. —*22nd February*, 1881.
755. Boxes of Carriage Axles, J. Grice, Birmingham.—*22nd February*, 1881.
758. Tentering Fabrics, C. Heap, Rochdale.—*23rd February*, 1881.
781. Extracting Oxygen, H. J. Haddan, Strand, London.—*24th February*, 1881.
800. Blasting Compound, B. J. B. Mills, London.—*24th February*, 1881.
818. Substitute for Coffee, S. T. Francis, Southwark-street, Surrey.—*25th February*, 1881.
874. Agglomerating Fuel, H. J. Haddan, London.—*1st March*, 1881
964. Chlorine, W. Weldon, Burstow.—*7th March*, 1881.
965. Chlorine, W. Weldon, Burstow.—*7th March*, 1881.
966. Chlorine, W. Weldon, Burstow.—*7th March*, 1881.
967. Hydrochloric Acid, W. Weldon, Burstow, Surrey.—*7th March*, 1881.
968. Chlorine, W. Weldon, Burstow.—*7th March*, 1881.
1091. Tiling for Roofs, &c., A. M. Clark, Chancery-lane, London.—*14th March*, 1881.
1134. Lamps, J. Fyfe, Glasgow.—*16th March*, 1881.
1349. Rabbit Trap, T. Douglas, Wire Bridge, Peebles, —*26th March*, 1881.
1601. Railway Brakes, C. Fairholme, London.—*12th April*, 1881.
1675. Treatment of Maize, A. W. Elliott, Bruges, Belgium.—*16th April*, 1881.
1775. Miners' Safety Lamps, J. Fyfe, Glasgow.—*25th April*, 1881.
2030. Colouring Matters, J. A. Dixon, Glasgow.—*May*, 1881.
2112. Flannel Farbics, W. Schofield, Rochdale.—*14th May*, 1881.
2136. Artificial Alizarin, J. A. Dixon, Glasgow.—*17th May*, 1881.
2274. Dye Colours, W. G. and R. A. A. White, Crayford, Kent.—*24th May*, 1881.
2293. Piston Valve Musical Instruments, B. J. B. Mills, London.—*25th May*, 1881.
2362. Paper-cutting Machines, R. M. Greig, Edinburgh.—*30th May*, 1881.
2375. Magneto-electric Machines, H. E. Newton, London.—*31st May*, 1881.
2390. Pianofortes W. R Lake, Southampton-buildings, London. —*31st May*, 1881.
2593. Electric Clocks, A. M. Clark, Chancery-lane, London.—*14th June*, 1881.

List of Specifications published during the week ending August 6th, 1881.

3698, 2d.; 4588, 6d.; 4680, 10d.; 4726, 6d.; 5146, 4d.; 5254, 6d.; 5338, 8d.; 5374, 4d.; 5446, 8d.; 5493, 6d.; 5500, 6d.; 5503, 6d.; 5507, 6d.; 5514, 6d.; 3, 6d. 13, 4d.; 18, 6d.; 25, 6d.; 28, 2d.; 30, 6d.; 31, 6d.; 33, 2d.; 34, 6d.; 37, 2d.; 40, 6d.; 41, 1s. 6d.; 42, 8d.; 43, 6d.; 44, 2d.; 45, 6d.; 46, 1s. 8d.; 47, 6d.; 48, 6d.; 49, 8d.; 50, 2d.; 51, 6d.; 53, 4d.; 54, 6d.; 55, 2d.. 56, 6d.; 57, 6d.; 58, 2d.; 60, 10d.; 61, 6d.; 62, 4d.. 63, 4d.; 64, 4d.; 66, 6d.; 67, 6d.; 68, 7d.; 69, 6d.; 70, 6d.; 72, 2d.; 73, 2d.; 76, 2d.; 77, 2d.; 80, 2d.; 81, 2d.; 83, 8d.; 84, 8d.; 35, 4d.; 86, 4d.; 89, 2d.; 90, 2d.; 91, 6d.; 93, 6d.; 94, 2d.; 96, 6d.; 100, 6d.; 101, 6d.; 102, 6d.; 104, 2d.; 105, 4d.; 106, 4d.; 107, 4d.; 108, 2d.; 111, 6d.; 112, 2d.; 114, 2d.; 115, 4d.; 126, 4d.; 129, 6d.; 140, 4d.; 142, 4d.; 157, 4d.; 177, 6d.; 184, 4d.; 201, 6d.: 242, 6d.; 267, 4d.; 318, 6d.; 455, 6d.; 667, 6d.; 1100, 6d.; 1913, 4d.; 1955, 6d.; 1995, 6d.; 2011, 4d.; 2045, 6d.

*** Specifications will be forwarded by post from the Patent-office on receipt of the amount of price and postage. Sums exceeding 1s. must be remitted by Post-office order, made payable at the Post-office, 5, High Holborn, to Mr. H. Reader Lack, her Majesty's Patent-office, Southampton-buildings, Chancery-lane, London.

ABSTRACTS OF SPECIFICATIONS.

Prepared by ourselves expressly for THE ENGINEER *at the office of Her Majesty's Commissioners of Patents.*

3698. Converting Skins into Leather, *R. Brown.*—11*th September*, 1880.—(*Not proceeded with.*) 2*d.*

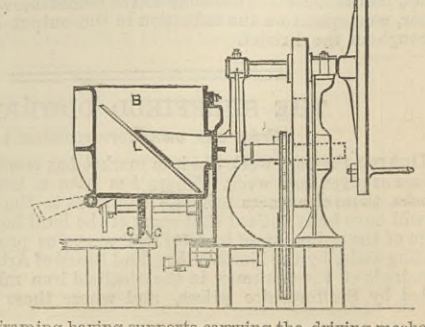
This consists principally in forming the substance of the skins of an insoluble chromate of lead or other suitable metal.

4588. Compositions for Decorating Articles of Furniture, &c., *M. Hartmann.*—*9th November*, 1880. 6*d.*

This relates to the decoration of wood, marble, or other material with a combination of colours, and it consists of a composition consisting of 60 parts finely pulverised chalk, 34 parts distilled water, and 6 parts nudellume, which composition is applied with a brush and when dry is polished with pumicestone, and then varnished with a varnish consisting of 21b. gum arabic to 4 pints of spirits. The necessary colours are then applied to the surface, and when dry covered with a varnish consisting of 80 parts spirits, 15 parts shellac, 2½ parts calipot, 1 part mastic, and 1½ parts sandrak. A polish consisting of benzine, white shellac, and alcohol is applied when the varnish is dry.

4726. Pugging Mills, *R. R. Gubbins.*—16*th November*, 1880. 6*d.*

The carriage of the pugging box B is supported on a



framing having supports carrying the driving mechanism. The carriage can slide to and fro on a rail C,

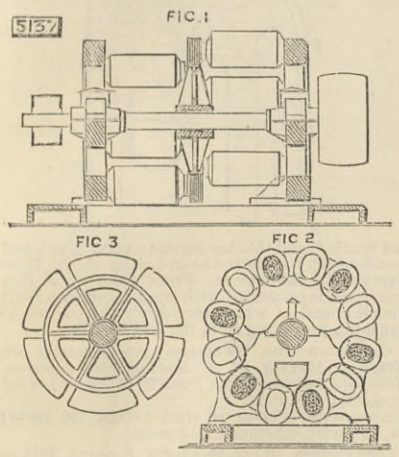
motion being imparted to it by a link. The shaft of the pugging blades L passes through a slot in the side of the box B.

4680. Measuring Cream, Milk, &c., *J. Wilson.*—*13th November*, 1880. 10*d.*

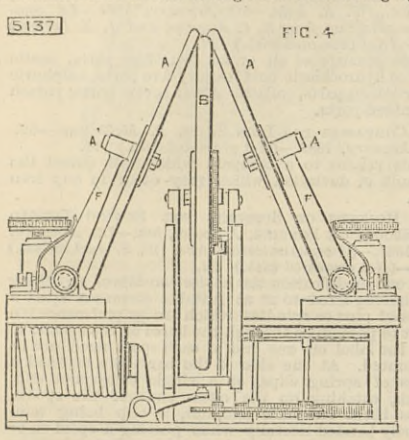
One or more troughs of a depth corresponding to the height of the measuring vessel is divided into compartments each connected with a tank containing the liquid to be measured, the connections being so arranged as to shut off, by means of floats, the supply into each compartment at such a height as will ensure the required quantity of liquid being run off into the measuring vessel.

5137. Electric Machinery and Apparatus for the Production of Light and Heat, *G. W. T. Henley.*—*9th December*, 1880. 2*s.* 8*d.*

This patent includes several distinct items, First, a dynamo machine partially shown by Figs. 1, 2, 3, its peculiarity being more especially in the armature wheel, which is fitted with a number of soft iron pieces on its circumference, and revolves between two sets of electro-magnets, the poles of which are not opposite but intermediate to each other, or there may be a com-



bination of such wheels, or various modifications. Another peculiarity is the combination of an exterior circular series of magnets held in stationary ring frames, and an interior double star shaped armature revolving in close proximity to the poles of these magnets. The inventor also claims the system of winding, of certain applications of electro-magnets, a commutator of rods each having a short and a long leg



dipping into mercury cups, &c. Secondly, an arc lamp, one modification of which is shown in Fig. 4. A A are carbon (or other suitable material) discs, mounted on spindles A1, fitted in jointed lever F. The spindles incline to one another. The material B is of such a kind as to burn or melt away equally with the carbons.

5146. Obtaining useful Products from Residue of Manufacture of Sulphuric Acid by Means of Cupreous Pyrites, *W. Weldon.*—*9th December*, 1880. 4*d.*

This consists, First, in separating sulphate of soda from copper liquor and residual liquor by subjecting them to artificial refrigeration; Secondly, in combining with such separation the method of dehydrating and purifying the crystals by mixing them with solid chloride of sodium, heating the mixture, and then subjecting to filtration the resulting mixture of anhydrous sulphate of soda with solution of chloride of sodium or of chloride of sodium and other salts; Thirdly, in the utilisation of the solution of chloride of sodium, from which anhydrous sulphate of soda has been separated by evaporating it, and mixing the solid chloride of sodium with pyrites cinders; and Fourthly, in adding to the mother liquor left after copper and sulphate of soda have been separated, either chloride of calcium, or chloride of barium.

5254. Foundations of Submerged Structures, *F. W. Reeves.*—*15th December*, 1880. 6*d.*

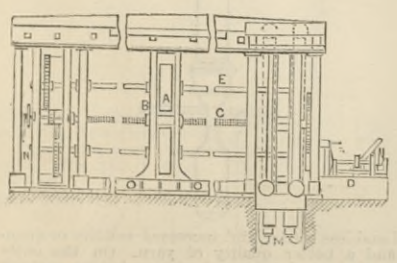
Square or other shaped tubes perforated at the bottom are sunk into the soil by hydraulic action, water being forced into them at the top, and passing out through the perforations, clears away the soil from beneath the tube.

5338. Bundling and Tying Bundles of Chips, &c., *M. Glover.*—*20th December*, 1880. 8*d.*

The chips are conveyed from the chopping machine down a spout, in which is a set of rollers which alternately reverse the position of the chips, so as to cause them to be more closely packed. The chips are then carried forward by rollers with roughed peripheries, which revolve so as to shake out the splinters, the chips passing on to an endless band which delivers them to a cylinder or box, fitted with an agitator to shake the chips during the filling operation. On each box is a plunger which forces the chips into a compressor, where they are held during the tying operation.

5446. Ordnance, &c., *Sir W. G. Armstrong.*—*28th December*, 1880. 8*d.*

This relates to ordnance in which wire under tension is coiled upon a tube or cylinder, and it con-



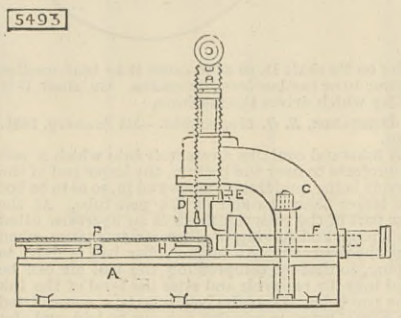
sists in the apparatus for effecting the coiling. A are the paying-off drums, carried in frame B which is traversed in either direction by screw C, operated by hydraulic engine D. Each drum slides on a square shaft E, which revolves with the drum and carries a fricton wheel at one end, the band of which is tightened by means of a weighted lever so as to adjust the tension, the levers being connected by means of chains. M are cataract cylinders for steadying the motion of the levers. N is a winch to allow wire to be wound on one drum while the other is being wound off.

5374. Treatment of Mineral Phosphates Containing Alumina and Oxide of Iron, *J. J. Knight.*—*22nd December*, 1880. 6*d.*

This relates to treating such mineral phosphates with an excess of sulphuric acid or oil of vitriol of a specific gravity of 145 deg. Twaddle and upwards, so as to render the sulphates of alumina and iron produced insoluble in the sulphuric acid, whilst the phosphoric acid is converted into the soluble state, and mixes with the excess of sulphuric acid, from which it may be separated by distillation and the sulphuric acid used again.

5493. Flanging Boiler Plates, &c., *R. H. Tweddell, J. Platt, J. Fielding and W. Boyd.*—*30th December*, 1880. 6*d.*

On bed A is fixed a turntable B to receive the plate P. At the end of the bed is a frame C, on which are mounted three hydraulic cylinders D, E, and F, on the ends of the plungers of which are suitable tools. To



bend a flange round the edge of a circular plate, the plunger of D is caused to hold the plate while E descends and turns over the portion of the metal, when the plunger of F advances and bends it over anvil H. The plate is then shifted and the operation repeated.

5500. Preventing Shifting of Ships' Cargoes, *J. Goudie.*—*31st December*, 1880. 6*d.*

A moving or shifting deck is used to cover the entire cargo, and is connected to the upper deck by screw stanchions passing through it, so that the moving deck can be screwed up or down.

5503. Stretchers for Umbrellas, &c., *C. A. Smith.*—*31st December*, 1880. 6*d.*

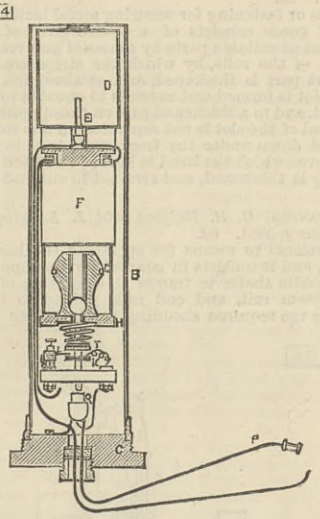
This relates to umbrellas with trough-shaped ribs, and consists in forming the stretchers from wire of T section. The vertical branch of the stretchers when the umbrella is closed enters the hollow of the rib, and the head rests against it so as to form a kind of cover thereto.

5507. Manufacture of Mould Candles, *W. E. Nutt.*—*31st December*, 1880. 6*d.*

This relates to the moulds for forming the tapering ends, and consists in forming them in two halves, which can be opened out to allow the candles to be withdrawn.

5514. Torpedoes, *C. A. McEvoy.*—*31st December*, 1880. 6*d.*

This relates to floating torpedoes to be fired when struck by a passing vessel, and it consists of a case B, enclosing the firing mechanism which is placed in the outer case of the torpedo. The end of case B is closed by a plug C, screw-threaded to screw into the torpedo case. D is the igniting charge, E an electrical fuse, F



a battery in a close case resting on the top of a fixed outer casing surrounding a rocking weight G or circuit closer. This weight rests on the top of a plate H, and is held down by the head of rod I, acted on by a spring. When the weight is thrown over it lifts rod I and brings a ring K into contact with a spring finger L, the ring being connected with one pole of the battery and the fixer with the other pole. By sending a strong current through wire P, a fine wire Q is fused so that the circuit of the battery F cannot then be completed, and the igniting charge cannot possibly be fired.

3. Floor Springs or Apparatus for Closing Doors, *E. Bull.*—*1st January*, 1881. 6*d.*

A short lever is connected to the bottom of the door by a pivot and screw, and on its under side is a socket to fit over a stationary ball, which allows the lever to swing backward and forward as the door is opened or closed. To the lever one end of a chain is fixed, the other end being attached to a collar by a link, the chain being kept in a state of tension by a spiral spring acting upon the collar. The chain passes between two friction rollers, against one or other of which it bears on the door being opened.

28. Moulding Plastic Substances for Confectionery, &c., *C. G. Goddard.*—*4th January*, 1881.—(*Not proceeded with.*) 2*d.*

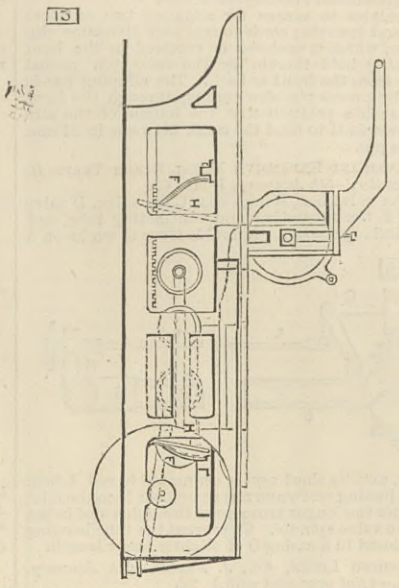
A plunger is fitted to move in a box or mould, with an aperture of the shape to be given to the article, such piston being driven forward by a spring. The plastic substance is placed in the mould, the piston having been previously drawn back, and when released the spring drives the piston forward and forces out the plastic substance.

30. Revolving Seats, Chairs, &c., *W. H. Blain.*—*4th January*, 1881. 6*d.*

This consists in causing the seat as it rotates or swivels to move to one side, so as to facilitate leaving the same.

13. Lithographic Machines, *G. Newsum.*—*3rd January*, 1881. 4*d.*

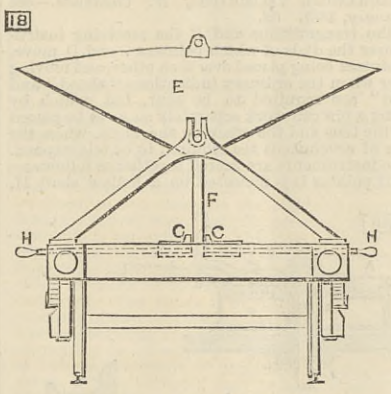
This relates to means for enabling machines to be worked at increased speed, and it consists in placing springs or buffers F at each end of the machine so as to cushion the table or carriage at the extremity of its forward movement, and at the same time to assist in the return movement thereof. Stops on the table



come in contact with the levers H on which the springs act.

18. Tip Wagons, Trucks or Earth Trollies, *G. Allix.*—*3rd January*, 1881. 6*d.*

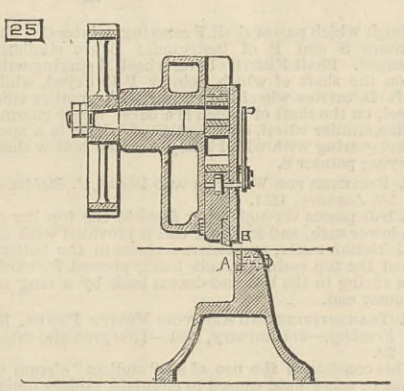
The body is capable of turning over to either side, and when empty returns to the loading position. The



body E is of Y shape, and its tail F is weighted and held in position by catches G, which are actuated by levers H.

25. Shearing Machines or Apparatus for Cutting Sheet Metal, *J. H. Johnson.*—*3rd January*, 1881.—(*A communication from C. Donnay.*) 6*d.*

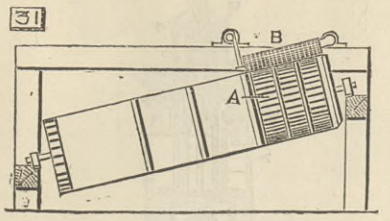
This relates to a machine capable of cutting sheet metal at any distance from the edge irrespective of the length or width of the sheets. The shearing mechanism is mounted on a frame in two parts, the lower one



carrying a stationary horizontal cutter A, and the upper portion carrying a movable cutter B. The lower portion of the frame is shaped so as to allow one part of the metal sheet to travel onwards in a straight line, while the other travels down an incline on one side of cutter A.

31. Cleansing Metallic Screens or Reels for Screening Grain, &c., *P. Van Gelder and T. Apsimon.*—*4th January*, 1881. 6*d.*

A is the perforated part of the reel, and on it rests a roller B composed of a number of discs of india-



rubber, and capable of rising and falling as it meets irregularities on the surface A. The roller B exerts sufficient pressure to force any portions caught in the perforation of A back into the reel.

33. Gas Burners, *H. H. Doty.*—*4th January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in causing the gas to issue through slits formed in the sides of the burner in a horizontal direction.

37. Paring the Curls of Felt Hat Brims, *R. Grimshaw.*—*4th January*, 1881.—(*Not proceeded with.*) 2*d.*

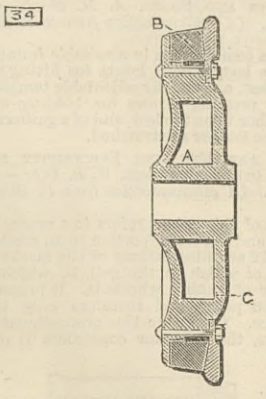
This consists of a peculiar foot and fixed knife for holding and cutting the curl, and also of an arm and slide to carry the combined foot and fixed knife.

41. Knitting Machinery, *J. and H. Kiddier.*—*4th January*, 1881. 1*s.* 4*d.*

In the production of broad rib fabric the "machine" needles are arranged to operate in sets placed on their bar at intervals across the machine, depending on the breadth of the respective "ribs," whilst the "frame" needles are arranged continuous or complete for each breadth. An extra presser bar is used, the operating parts being at distances apart to act only on the beards of the "frame" needles opposite the "machine" needles. In the production of narrowings for broad rib fabric extra instruments are used to transfer the loops from the "machine" to the "frame" needles, whilst the "frame" needles are operated upon by the ordinary narrowing instruments, the extra instruments being bent or curved forward at their points, and having covering recesses formed in the backs of their stems. To prevent one side of the fabric being longer than the other in work done by "cotton" machine, the "jack" comb leads are supported on a separate bar fixed to a tie bar, and adjustable by screws, so that the comb leads with their bar may be readily adjusted for the "jacks" to produce shorter or longer loops.

34. Wheels for Railway Vehicles, *J. Rigby.*—*4th January*, 1881. 6*d.*

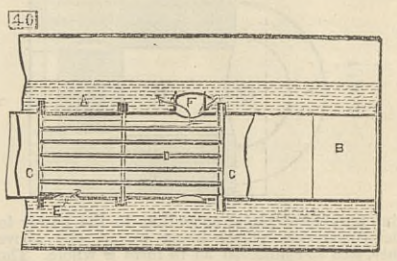
The body consists of a hub A with an inner and an outer plate, and intermediate radial arms terminating in a peripheral ring, all cast in one piece. Enlargements are formed at the junction of the arms with the



ring, and through them bolts pass to secure the flange C in position. Semi-cylindrical recesses are formed in the periphery, of the ring, and also in the inner face of the tire B, and into the recess formed pins or studs on the flange C project. The inner face of flange C is shaped so as to lock the tire in position.

40. Steam Boilers, *G. Petrie.*—*4th January*, 1881. 6*d.*

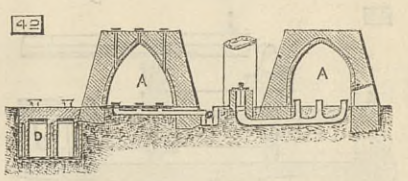
This relates to Lancashire boilers, and consists in forming chambers within the flues by means of cross plates connected by means of tubes, through which the heated products of combustion pass. Through the



upper and lower parts of the flue containing the tubes openings are formed so as to enable the water in the boiler to circulate round the tubes; B is the flue in which the chamber A is formed by cross plates C connected by tubes D, and E are the openings in the flue to allow the circulation of the water.

42. Drying and Burning Bricks, &c., *J. Craven and H. Chamberlain.*—*4th January*, 1881. 8*d.*

This relates to the system in which the burning is effected by gas, and it consists of the use of air heated by means of the gas generator in drying the articles, also to the mode of drawing off the vapour from the drying articles, and further in the general arrangement of the kilns or ovens. As applied to a kiln consisting of the series of chambers A, the gas main is



arranged between them, and at each side of the generator D is a chamber into which air is admitted, and which has pipes surrounding the main and communicating with each chamber. Openings are formed in the roof of the chambers for the egress of the vapour from the drying articles.

43. Compound for Washing and Cleansing, *A. Watt.*—*4th January*, 1881. 6*d.*

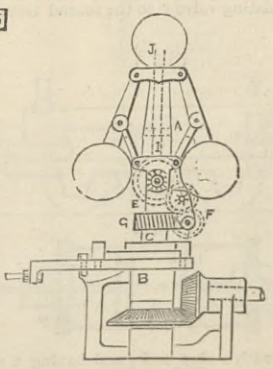
Oil and fat are placed in a boiler or vat, together with a quantity of soap-maker's leys, and the soap produced is mixed with potash, soda ash, soda, or other alkali, and then treated in a granulating machine.

44. Artificial Leather, *T. E. Hardy.*—*4th January*, 1881. 2*d.*

Leather scraps (either alone or mixed with vegetable fibres boiled under a pressure with caustic soda in the proportion of 10 lb. to 100 lb. of fibre) are reduced to powder by mechanical means, using water, boiled linseed oil, or a mixture of both. The pulp obtained is formed with sheets in a machine similar to a paper machine, and then dried.

45. Expansion Gear for Steam Engines, *J. Bodington.*—*4th January*, 1881. 6*d.*

This relates to means for effecting the expansion of steam in the cylinder, whereby the steam is cut off automatically. The governor spindle A has mounted on its lower end two cams B and C, one B fixed thereon and controlling the admission and exhaust, and the other C loose and capable of being turned



round, so as to control the cut off. The spindle A has a slot in which a rack E can slide, and with it gears the first and smallest of a series of five toothed wheels, the fifth of which engages a screw F gearing with a wheel G keyed on the loose cam. A small spindle I passes through the governor spindle and its lower end bears on the top of the rack, while to its upper end a hollow sphere J is fixed and can be weighted to balance the governor balls.

46. Steam and Hot Water Apparatus for Supplying Heat to and Utilising, Measuring, and Regulating the same in Dwelling Houses, &c., *E. F. Osborne.—4th January*, 1881. 1s. 8d.

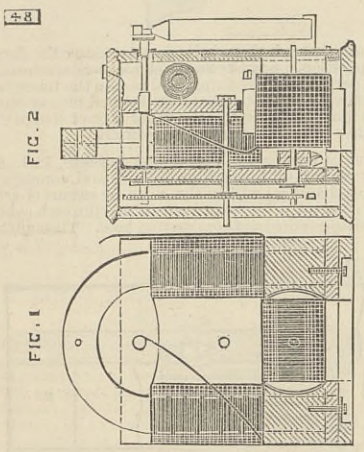
Two mains are used connecting with each other at one end through a steam generator, and at the other through service connections. One main is a steam supply main, and the other the water return main. In the building to be heated is another closed circuit interlacing the main circuit, but separate therefrom, suitable means being provided for transmitting heat from the main to the local circuit. The transmitter may be in the form of a tubular boiler. An automatic pump forces water from the return main into the boiler, so as to maintain a circulation through the main circuit. Special apparatus is employed for measuring and regulating the supply of heat.

47. Lasting Boots and Shoes, *A. M. Clark.—4th January*, 1881. —(*A communication from S. B. Ellithorp.*) 6d.

This consists of a combination in a suitable frame of a seat for holding a last, flanged levers for fitting the leather about the last, a vertically adjustable template with clamps and pressing screws for holding and stretching the leather upon the last, and of a gathering cord for holding the leather so stretched.

48. Generating and Utilising Electricity for Lighting and other Purposes, *W. R. Lake.—4th January*, 1881.—(*A communication from F. Etève.*) 6d.

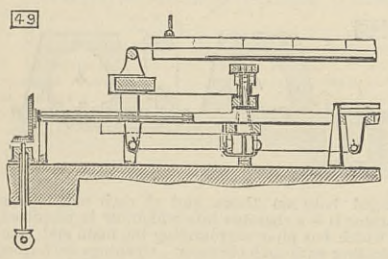
The first portion of this patent refers to a magneto-electric machine, and the latter portion to an electric lamp. Figs. 1 and 2 are illustrations of the machine, the chief feature of which is the coil B, which is actuated by a pair of toothed wheels D. It presents only two induction poles, and therefore only two points of resistance. To render this proportionately small coil effective, the inventor constructs it of a



varying number of plates according to the power to be developed, the plates being placed one above another, and so connected as to form a whole. The current developed is sent into two friction brushes by means of a small commutator. The wires are so arranged that the current returns into the coils of the magnet in the field of which the coil rotates. The current which is produced is collected in two terminals, which serve for attaching the wires of apparatus such as lamps, medical coils, &c. The figure shows an arrangement for lighting spirit lamps, &c.

49. Cloth-stretching or Tentering Machine, *W. R. Lake.—4th January*, 1881.—(*A communication from Messrs. Goudiat, Frères.*) 8d.

The fabric is impregnated with some suitable finish, and whilst still damp is stretched upon a frame, first in the direction of its length and then of its width, after which the fabric is caused to take a slanting direction alternately in opposite directions, so as to



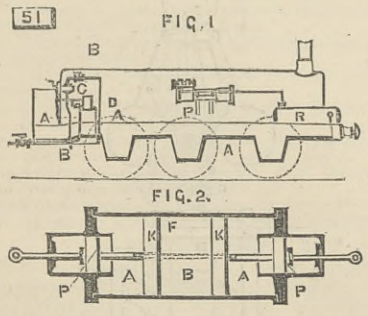
render the weft threads straight and parallel. For this purpose the frame is hinged so that the lateral clamps are moved on the lines of a parallelogram in one direction or the other. To preserve the elongation of the weft threads as it is produced, a widening mechanism and automatic controlling device are employed, the latter acting so as to shift the lateral clamps for a distance equal to the elongation.

50. Giving Motion to Spinning Tops, *T. Wrigley.—4th January*, 1881.—(*A communication from G. Fisher.*)—(*Not proceeded with.*) 2d.

A quick pitched multiplex screw provided with a nut has a portion of its spindle above the screw fitted with a loose handle, and its lower end terminates in a tube in which a slow pitch spiral groove is formed. The spindle of the top fits into the tube, and has a pin to engage with the spiral groove.

51. Working Railway Brakes by Fluid Pressure, *J. Imray.—5th January*, 1881.—(*A communication from A. Wenger.*) 6d.

As arranged for working by compressed air the apparatus consists of a pump P worked by the engine, and compressing air in reservoir R, which communicates by pipe A with a reducing valve D, and thence by a branch furnished with a stop-cock with the high-pressure pipe A extending along the train. A branch from A after passing the reducing valve D leads through a regulating valve C to the second train pipe



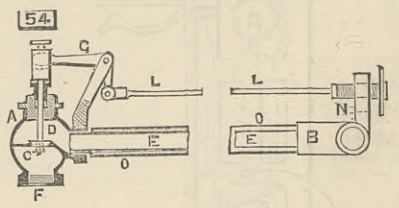
B, also fitted with a stop cock, and having a second cock to be used when the locomotive is separated from the train. The pipes A and B are crossed so that each presents itself at the same hand at each end of the vehicle. The brake cylinder F has two pistons K and side ports for admitting air to put on the brakes, and a port for pressure to take them off. The small pistons P prevent leakage when the pistons are at the end of their strokes. The regulator C, if pipe A breaks, will cause the pipe B to discharge and the brakes to be applied, while if B breaks the pressure in A will put on the brakes.

53. Venetian Blind Actions and their Head Laths, *H. Tylor.—5th January*, 1881. 4d.

This relates to means for allowing two or more raising and lowering cords to run over the same clip or action, which is enclosed or recessed in the head lath, being held therein by the cross pin passed through from the front or back. The clipping bar is formed by a cross pin also passing through the head lath, in such a position that the tongue of the clip bears towards it to bind the cords between itself and the cross pin.

54. Lever and Expansive Metal Steam Traps, *H. Lancaster.—5th January*, 1881. 6d.

A is the valve box, B inlet box, C the valve, D valve spindle, E the expanding and contracting tube, and F the discharge outlet. A double lever G works on a



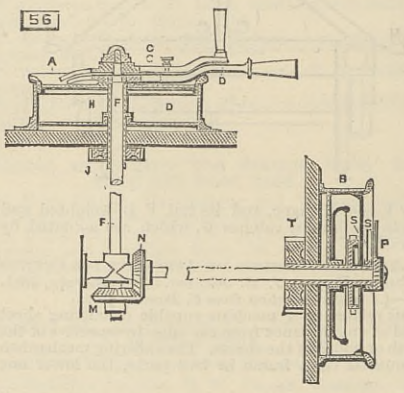
fulcrum, and its short arm is connected to rod L held by an adjusting screw and nut in bracket N on the inlet box, while the longer arm passes through a slot in the top of the valve spindle. To prevent the tube bending it is enclosed in a casing O of slightly lesser length.

55. Washing Linen, &c., *J. Hughes.—5th January*, 1881.—(*Not proceeded with.*) 2d.

This relates to an apparatus to be placed in a copper so as to cause a continuous circulation of the water, and it consists of a hollow boot with portion cut away at the base, from the centre of which rises a vertical pipe turned off at right angles at top, or formed with opening round it.

56. Mechanical Telegraphs, *W. Chadburn.—5th January*, 1881. 6d.

A is the transmitting and B the receiving instrument, over the dials of which pointers C and D move, such pointers being placed over each other, and moving together when the ordinary indications "ahead" and "astern" are required to be sent, but which by removing a pin can work separately so as to be placed one on the tens and the other on the units, when the number of revolutions are required to be telegraphed. The two instruments are geared together as follows:—The unit pointer D is mounted on a hollow shaft H,



through which passes shaft F carrying pointer C. The pointers S and P of instrument B are similarly arranged. Shaft F carries bevel wheel M gearing with N, on the shaft of which pointer P is keyed, while shaft H carries wheel J gearing with another spur wheel, on the shaft of which is a bevel wheel gearing with a similar wheel, on the shaft of which is a spur wheel gearing with wheel T keyed to the hollow shaft carrying pointer S.

57. Fastener for Windows and Doors, *J. Stables.—5th January*, 1881. 6d.

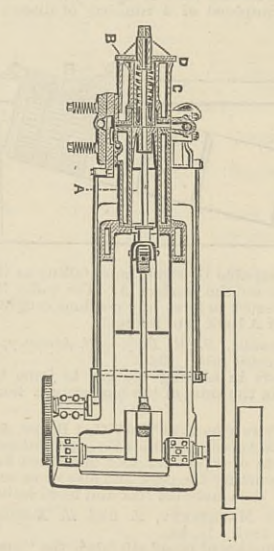
A bolt passes through a box fixed to the top bar of the lower sash, and its inner end is provided with an anti-friction roller, and enters a recess in the bottom bar of the top sash, the bolt being pressed forwards by a spring in the box and drawn back by a ring on its outer end.

58. Transmitting and Applying Motive Power, *W. Freakley.—5th January*, 1881.—(*Not proceeded with.*) 2d.

This consists in the use of an "endless" stream of water or other fluid caused to circulate rapidly under pressure through an endless pipe, and in utilising the stream to drive machinery. The water is forced through the pipe by a pump, and passes successively to any suitable form of motor attached to the different machines to be driven, returning from the last motor to the suction branch of the pipe.

60. Gas Motor Engines, *C. D. Abel.—5th January*, 1881.—(*A communication from N. A. Otto.*) 10d.

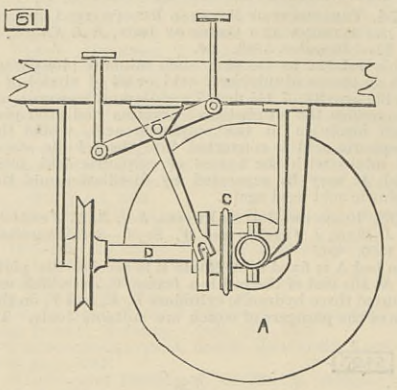
This relates to means for removing the products of combustion from the space left in the cylinder beyond



the piston when at the end of its in-stroke, as described in patent No. 2081, A.D. 1876, and serving to enable the combustible charge to be ignited while the piston is still at the dead centre, before commencing the working stroke. For this purpose the cylinder has an extension C, in which is an auxiliary piston B, whose rod passes through a guide on the open cover D, and which is pressed forward by a spring. This piston, under the pressure between it and the main piston A, is forced outwards, and when the charge is ignited it is forced inwards by the spring, thus expelling the products of combustion. Several arrangements for effecting the desired object are described.

61. Actuating Sewing Machines, &c., *J. Holden.—5th January*, 1881. 6d.

This relates to means for varying the speed, and consists in the use of two discs A and C placed at right angles to each other, and the latter capable of



sliding on its shaft D, so as to cause it to bear on disc A nearer to or further from its centre. On shaft D is a pulley which drives the machine.

62. Inkstands, *R. G. Clupperfield.—5th January*, 1881. 4d.

The inkstand contains a reservoir into which a pen tube projects to near the bottom, the lower end of the reservoir being, preferably, narrowed in, so as to be but little larger than the end of the pen tube. At the upper part of the reservoir there is an aperture fitted with a plug, and serving to allow air to escape when filling the reservoir. An india-rubber ball is fixed to the plug, so that by compressing the ball air can be forced into the reservoir and rsise the level of the ink in the pen tube. Over the pen tube is a cover fitted with horns, between which a pen can be laid, and also serving to open the lid.

63. Inflammable Composition for Lighting Fires, &c., *W. R. Lake.—5th January*, 1881.—(*A communication from C. D. Bradley.*) 4d.

This consists essentially in impregnating sawdust or other absorbent material with a volatile inflammable fluid, such as coal-oil or any of the products of petroleum, and then mixing or coating the same with resin, pitch, grease, wax, or similar solid combustibles, in such a manner as to form an impervious covering about the absorbent material.

64. Knitting Machines, *T. Coltman.—6th January*, 1881.—(*Not proceeded with.*) 2d.

This relates to improvements on patent No. 1555, A.D. 1880, and consists of an improved arrangement of cams, consisting of three drawing cams for lowering the needles and two cams for raising them both on the back and front of the machine. This arrangement enables two courses to be made in traversing from left to right, and two when traversing from right to left, when making the cuff of a sleeve or a one-and-one stitch.

66. Blind Rollers, *J. E. Ditchfield and K. Hothersall.—6th January*, 1881. 6d.

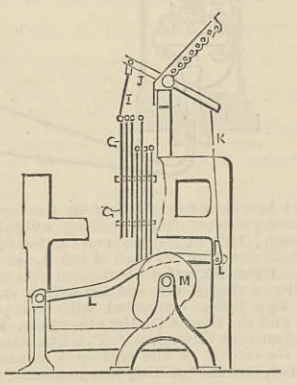
This consists principally in a novel method of attaching the blind web to the rollers, and consists in forming along the rollers an undercut groove open at one end to receive the edge of the blind, which is folded over a tongue or bar. To prevent the cord riding over the edges of the grooved pulley, an eyelet or guide is arranged at the centre of the pulley and beneath its axis, and through it the cord passes, such eyelet being freely suspended from the roller axis.

67. Bale-ties or Hoop Locks, *E. Hale.—6th January*, 1881. 6d.

The tie or fastening for securing metal bands round bales of goods consists of a square strip of metal thickened at suitable parts by means of grooves in the surfaces of the rolls, by which the strips are made. The front part is thickened, and at about 1in. therefrom a slot is formed and extends to one side to admit the band, and to a thickened part on the opposite side. The metal of the slot is not separated on one side, but is turned down under the front part, so as to form a flange, over which the band is bent. The back end of the strip is thickened, and rivetted to one end of the band.

68. Weaving, *G. H. Hodgson and J. Broadley.—6th January*, 1881. 6d.

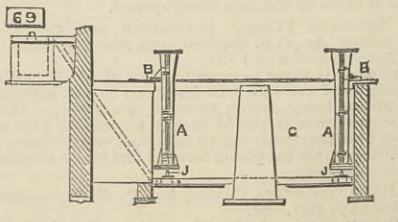
This relates to means for operating the healds or heddles, and it consists in connecting the upper and lower heddle shafts to frames G, consisting of a top and bottom rail, and end rails guided so that in effecting the required shedding motion these frames



are controlled to move positively in the vertical or other desired direction. The motion is given to the frames by connecting them by links I to arms J mounted on a rocking shaft, carrying other arms connected by rods K to levers L, provided with bowls M operated by cams or tappets.

69. Casting Metal Pipes or Tubes, *C. B. Palmer, R. E. B. Crompton, and J. Chambers.—6th January*, 1881. 6d.

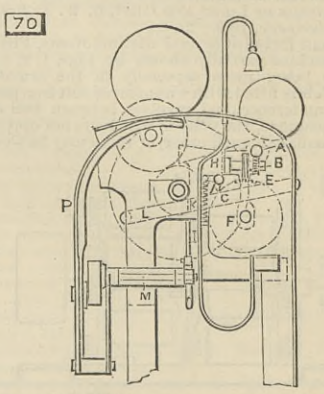
A series of moulds A are supported in a frame B, and by the sides of the pit C. The sides of the mould



boxes are formed in parts divided longitudinally and hinged together and secured by catches, and one part of each box is fixed to the frame B and to the sides of the pit, while the other part is movable. The moulds having been dried by gas jets J beneath them, are then brought into use in succession for receiving the molten metal.

70. Stop Motion for Spreading and Drawing Frames, *A. T. Lawson and S. Dear.—6th January*, 1881. 6d.

This relates to an automatic stop motion to throw the driving belt on to a loose pulley when the required length of sliver has been delivered. On the delivery roller A is a worm B gearing with a wheel C mounted on a short shaft, to which is keyed a worm D driving wheel E mounted loosely on a stud. This wheel E carries a crank pin F, which at each rotation strikes a bell-crank lever G keyed to a shaft parallel with roller A. To the shaft is keyed a second crank lever H, to one arm of which is pivotted a finger, its other arm being attached to a spring secured to the frame. A bar I has an extension sliding in guides in



a fixed bracket, and this bar carries a plate K notched out horizontally to receive the end of an elastic lever L pivotted to the frame. From lever L a link depends, and is connected with an arm on rock shaft M, the other end of which carries an arm slotted to receive a pin projecting from the belt fork P.

72. Compound for Swelling and Welding or Uniting Metals, *H. J. Haddan.—6th January*, 1881.—(*A communication from H. G. Julien.*)—(*Not proceeded with.*) 2d.

This consists of iron or steel filings, 100 parts; borax, 50 parts; sal-ammonia, 3 parts.

73. Tube Cutter, *P. Skeldon.—6th January*, 1881.—(*Not proceeded with.*) 2d.

This consists essentially of a strong hollow cylinder, a screwed spindle working with the said hollow cylinder, a series of cutting rollers carried by the hollow cylinder, and a tubular guard external to and capable of being fixed to and removed from the hollow cylinder.

76. Preparation of Aniline Solutions for Dyeing, &c., *W. R. Lake.—6th January*, 1881.—(*A communication from N. C. Armand and J. E. Berton.*)—(*Not proceeded with.*) 2d.

This consists of oil or fat forty-five parts, acetic acid or hydrochloric acid twenty-five parts, sulphuric ether seven parts, volatile alkali seven parts, potash seventeen parts.

77. Compasses for Iron Ships, *D. McCallum.—6th January*, 1880.—(*Not proceeded with.*) 2d.

This relates to a compass which will detect the amount of deviation which may occur in any iron ship.

80. Holders or Supports for Sewing Thread Spools or Bobbins, *J. Coates, jun.—7th January*, 1881.—(*A communication from W. S. Auchincloss.*)—(*Not proceeded with.*) 2d.

In one modification the holder consists of an oblong box having fixed to it at suitable distances apart a series of pins or spindles, which are by preference too short to pass quite through the bores of the spools, so that the label on one end of each spool need not be perforated. At one side of the bar there is fixed a series of spring clips, or a single compound clip, which, catching on the outer ends of the spools, keeps them on their spindles, a clip being temporarily bended laterally when putting a spool on or off a spindle. Springs of metal, rubber, plush or other suitable material are fixed so as to be under the spools, and so as to press the spools in a gentle manner against the holding lips of the clips, and these springs impart a resistance or tension when a thread is being drawn off its spools, which prevents the spool over-running.

81. Apparatus for Obtaining Motive Power, *F. R. Shaw.—7th January*, 1881.—(*Not proceeded with.*) 2d.

The apparatus consists mainly of a series of weights connected together by links in such a way as to form an endless chain. This chain of weights hangs in a perpendicular direction, and passes round two grooved pulleys, one above and one below.

84. Oil and Gas Burners, *J. N. Douglass.—7th January*, 1881. 8d.

This consists in an arrangement of an outer deflector surrounding the burner and lower part of the flames, one or more of which it covers, and in connection with this deflector is a deflecting glass chimney, both deflector and chimney being so formed as to force the outer flames on to the inner flame or flames, and thus to condense all the flames, and deflect on to the internal and external surfaces of each of the flames the whole of the ascending currents of air, and in such a manner as to invigorate the combustion of the flames, and augment the intensity of their light.

85. Manufacture or Treatment of Paper, Leather, &c., *W. B. Fitch and H. A. Barton.—7th January*, 1881. 4d.

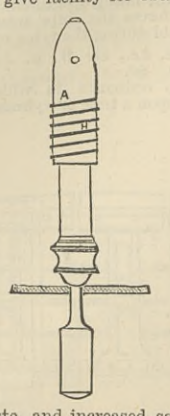
The materials or substances are treated with a solution of either acetate of potash or acetate of soda.

90. Machine for Wrapping up or Making Packets of Tobacco, &c., *W. Rose.—8th January*, 1881.—(*Not proceeded with.*) 2d.

The machine has a series of rollers and an endless band or apron, between which the tobacco and the paper in which it is to be wrapped are placed, the said rollers and band with other mechanism then operating to roll up and secure the paper around the tobacco.

91. Cap Spinning or Twisting Apparatus, *R. and W. H. Dawson.—8th January*, 1881. 6d.

The object is to give facility for obtaining greater



speed and less waste, and increased solidity or quantity and a better quality of yarn. On the outer surface the cap A is formed with projecting surfaces obtained by coiling wire B round in a spiral.

86. RACK FOR MECHANICAL PURPOSES, *W. Prowett.*—*7th January*, 1881. 4*d.*

This consists in constructing racks with loose teeth, that is with teeth pivotted or otherwise jointed to the rack.

89. VELOCIPEDES, *R. C. Fletcher.*—*8th January*, 1881. —(*Not proceeded with.*) 2*d.*

This relates, First, to a new arrangement of the wheels and a mode of steering; and Secondly, to a device for transmitting the motion of the treadles to the driving wheels.

93. TELEPHONIC APPARATUS, *J. Imray.*—*8th January*, 1881.—(*A communication from Dr. C. Herz.*) 6*d.*

The object of this invention is to obtain clear articulation and freedom from the effects of earth currents. To accomplish this, the receiver is made microphonic by the use of discs of conducting ores, each of the discs being separately connected to pairs of voltaic elements, all being pressed together with adjustable pressure, and subjected to the sound vibrations of a diaphragm. The sounds are thus magnified, and to render them distinct, condensers are introduced in the line. To avoid earth currents the line wire, instead of going straight to earth from the receiver, is terminated in a number of fine points extended over a large area, and another set of such points close to the former set communicate by a wire to earth. One method of arranging the instruments is shown in Fig. 1. M is a microphonic transmitter, one convenient form of which is shown in section, Fig. 2, and in plan with front cover removed, Fig. 3. On the vibrating diaphragm X are fixed a number of plates P of iron pyrites.

93 FIG 1

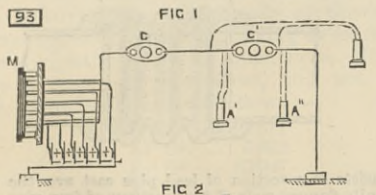


FIG 2

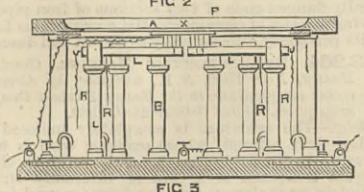
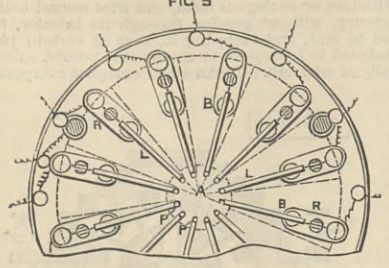


FIG 3



Against each of these is pressed a piece of carbon A on a lever L, the pressure of which is regulated by spring R. Each alternate contact piece is connected to the positive pole of a battery cell, the other alternate contact pieces being connected to one terminal plate of a large surface condenser C, the other terminal plate of which is in connection with the line wire. The negative poles of the battery are connected to earth. At the receiving station a bell telephone may be employed alone, but it is better to use a second condenser C^1, having one of its terminal plates connected to line and the other to earth. The receiving telephone may then be placed in either side of the condenser as indicated at A^1 or A^{11}. Various other arrangements are shown, including the arrangement of the diffuser for the prevention of earth currents.

94. MANUFACTURE OF COLOURING MATTER, *F. Wirth.*—*8th January*, 1881.—(*A communication from O. Fischer.*)—(*Not proceeded with.*) 2*d.*

This consists in using paranitrobenzaldehyde instead of benzaldehyde for the preparation of new derivatives of triphenylmethan by the action of the same on secondary and tertiary aromatic amines in the presence of dehydrating agents, and the conversion of the Leuco bases by oxidation into colouring matters.

96. METAL FENCING, *R. R. Main and J. Dick.*—*8th January*, 1881. 6*d.*

The standard is made with the usual two-pronged foot, but the foot is made out of a bar of about double the width of that employed for the stem. This broad bar is divided for a suitable distance from the lower end along the middle, and the parts are separated and bent to form the prongs, whilst the stem is welded to the upper end.

100. MILL GEARING, *N. Macbeth.*—*8th January*, 1881. 6*d.*

Fig. 1 shows a section of the rim of a belt pulley, A being the wrought iron rim, B the strengthening rib rolled with it, and C the extremity of an arm of the pulley of cast metal. Fig. 2 shows a section of two hollow shafts coupled together. Each tube E has a plug piece F, which enters the coupling G. Fig. 3

100 FIG. 1.

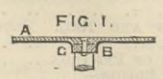


FIG. 2.

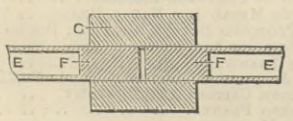
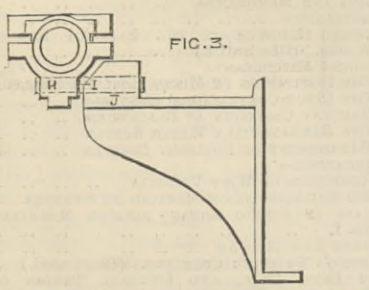


FIG. 3.



shows an adjustable shaft bearing, H being the pedestal, through the lower part of which passes pin I, which also enters a hole in bracket J. Set screws secure the pin I when the pedestal is adjusted thereon.

101. FURNACES OR FIREPLACES FOR STEAM BOILERS, &c., *J. Lart.*—*8th January*, 1881. —(*A communication from C. W. Doten.*) 6*d.*

The chief feature of the invention consists in the employment of a series of wheels C, and segments F placed on parallel shafts, and provided with perforations or openings for the passage of air. These wheels and segments support the fuel, the former being

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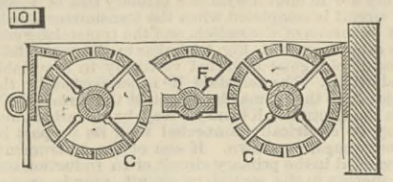

caused to revolve while the latter are mounted loose on their shafts.

102. METALLIC WAGONS, *R. Hudson.*—*8th January*, 1881. 6*d.*

This relates to improvements on patents No. 2677, A.D. 1875, and No. 50, A.D. 1877, and consists in forming both the body and under frame of the wagon entirely of metal. The under part A is made of a broad metal sheet, and carries the bearings for axles of wheels. Plates E are attached to A, and shaped

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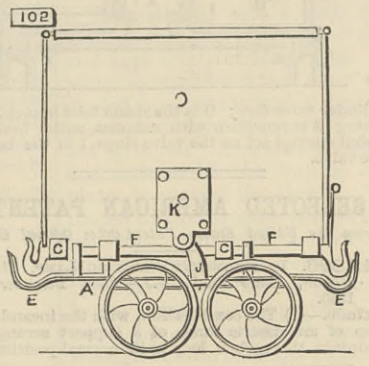

so as to form spring buffers, an opening being left in them to allow a coupling link to pass over hooks of the drawbar F, which is carried in bearings beneath the body. The body O has a socket piece K on each side to take over and revolve on the trunnion piece J.

104. COMBINED HYDROSTATIC STEAM GOVERNOR FOR MARINE ENGINES, *J. G. Galley and T. Smith.*—*8th January*, 1881.—(*Not proceeded with.*) 2*d.*

A pipe is connected with the stern of screw ships, and amidships with ships propelled by paddles, and directly communicating with an elongating and contracting cylinder placed in the engine-room. This cylinder is constructed of some pliable material on the same principle as a bellows, to give motion to the slide valve of the steam cylinder, the action of the valve being obtained from the bellows, which rise and fall according to the water level surrounding the screw or paddle, and adjustable by means of a spring.

105. MOP WRINGER, *J. Whittingham.*—*8th January*, 1881. 4*d.*

This consists of a mop wringer constructed mainly of two perforated plates of iron, wood, or any suitable material, preferably square, arranged to work on hinges or other suitable contrivance on the bottom sides of the plates, with a treadle and lever to press them together.

106. PENHOLDERS, *R. Spear.*—*8th January*, 1881. 4*d.*

This relates to means for ejecting or removing a pen from its holder.

107. MANUFACTURE OF WEAVER'S MAILS, &c., *J. C. Ramsden.*—*8th January*, 1881.—(*Not proceeded with.*) 2*d.*

The mails are stamped out of sheet steel instead of iron; they are then finished off in the usual manner and passed through a furnace.

108. CONVERTING HEAT INTO ELECTRICITY, *J. C. Ramsden.*—*8th January*, 1881. —(*Not proceeded with.*) 2*d.*

The object of the invention is carried out by placing spliced iron rods in a furnace, the external portion of the rods being enclosed by a porcelain cylinder. To the outer end of the rods are attached metal conducting bars, to which bars are attached wires, each pair of wires being continued and the circuit closed in the ordinary way. The furnace has each end contracted, and at the mouth of each is arranged two tubes with fine orifices, one being in communication with refined petroleum, and the other with a supply of steam. When steam is discharged over the mouth of the petroleum tube it exhausts and discharges the hydrocarbon in the form of spray. On being fired an intense heat is generated, and being free from impurities no deposit on the bars takes place.

111. APPARATUS TO PREVENT SHIPS FROM SINKING, *R. G. Sayers.*—*10th January*, 1881. 6*d.*

This consists in attaching to each side of a vessel a sufficient number of flexible bags filled with air and covered with netting to support the vessel and keep it from sinking, when said vessel has sprung a leak or is otherwise disabled.

112. CONSUMING SMOKE FROM FIRES, *J. Teer.*—*10th January*, 1881.—(*Not proceeded with.*) 2*d.*

The bottom of the fire-grate is made of a series of bars of an I shape, so that when placed together they will have apertures between them for the admission and passage of a continuous current of air, which rushes through these apertures to and through a perforated lump or lining of metal or fire clay at the back of the grate, raised to about the height of the top of the fire, whence the air is withdrawn in a rarified state through the said perforations, and there coming in contact with the smoke converts it into flame.

114. APPARATUS FOR STEERING VESSELS, &c., *W. Legge.*—*10th January*, 1881.—(*Not proceeded with.*) 2*d.*

A pair of cylinders are provided, between which is fitted a sliding piece carrying two grooved pulleys. Each cylinder is provided with a piston and piston rod, to which the sliding piece is attached. The cylinders are connected in such a manner that the steam admitted thereto causes the pistons to work simultaneously, and being connected with the sliding piece carry the grooved pulleys backwards and forwards therewith. Round these pulleys is passed the steering chain, which is also conveyed round a pitch chain pulley, such pitch chain pulley being a fixture when the steam power is used. By imparting a backward or forward motion to the grooved pulleys, the chain thereon draws or moves the rudder in any required direction.

115. BEARINGS OR SUPPORTS FOR SHAFTS, AXLES, &c., *L. A. Groth.*—*10th January*, 1881.—(*A communication from A. Gravelin.*) 4*d.*

A substance such as, for example, woollen stuff or felt, is interposed between the bearing and its shaft or axle, or between the moving part and its support. The body of the bearing or support may be composed of glass or crystal toughened or not as may be preferred, porcelain, basalt, lava, slag, scoria, fusible or infusible silicious or aluminous stones, the fusible borates, and silicates or other similar substances.

117. BRUSHES, *G. W. von Nawrocki.*—*10th January*, 1881.—(*A communication from C. E. Flemming, sen.*) 6*d.*

This relates to brushes with wire pins secured to a caoutchouc foundation, and it consists in fastening such foundation to the back by means of tufts of bristles or wires, passed through holes pierced in the edge of the foundation and into holes in the back, where they are secured by wiring or cementing.

118. BRUSHES, *G. W. von Nawrocki.*—*10th January*, 1881.—(*A communication from C. E. Flemming, sen.*) 6*d.*

This relates to brushes with wires pins secured to a caoutchouc foundation, and it consists in securing the wires sufficiently far part to allow tufts of bristles or wires being introduced between them, passing through the foundation, and into the back of the brush, where they are secured by wiring or cement.

129. GALVANIC POLARISATION BATTERIES OR MAGAZINES OF ELECTRICITY, &c., *J. H. Johnson.*—*11th January*, 1881.—(*A communication from C. Faure.*) 6*d.*

This relates to batteries which, though incapable of themselves producing electricity, will, when charged from some other source, retain and furnish when required the charge of electricity. In carrying the invention out, leaden plates are mechanically covered with a coating of metallic salts, mixed with inert substances, as, for instance, a coating of lead mixed with pulverised coke, which mixture may be moistened with a small quantity of gelatine. When two elements prepared in this way and coupled together as in a battery in dilute sulphuric acid are

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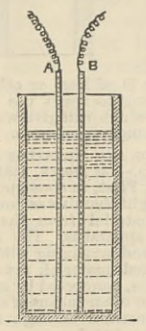

connected with some electrical source, it is found that the sulphate of lead will be reduced on one of the plates and form an adhesive porous coating. After this has been done for one of the plates, the current is reversed so as to reduce the other element; but by so doing the first element becomes re-oxidised, and lead oxidised under such conditions becomes per-oxidised, so two elements are obtained covered with lead in a porous state, and the covering of one of the elements is per-oxidised. This pair of elements thus becomes a magazine of electro-chemical energy, and is capable of acting as a galvanic battery. Various other methods of effecting the same object may be employed. The figure is an illustration of a pair of elements of two thin lead plates A and B covered with a porous covering and placed in a rectangular vessel containing dilute sulphuric acid. Other illustrations of different methods of preparing the elements are given. These batteries may be used to work various kinds of machines, to drive boats, &c.

126. EYELET TAPE OR BINDING, *W. Pretty, jun.*—*11th January*, 1881. 4*d.*

For one half of the width the taper is woven thick, and into this part the eyelets are set. For the other half of its width the tape is divided in the weaving and formed as two complete fabrics, connected together only where they meet in the middle of the tape. The fabric is introduced between the two flaps of the divided tape, and is then fastened in the usual way.

140. PRESERVATION OF ALIMENTARY SUBSTANCES, &c., *F. F. Wilkins.*—*12th January*, 1881. 4*d.*

This consists in the process of preserving alimentary substances by first treating them with an antiseptic or antiseptics, and afterwards coating them with uncrystallised hydrocarbon.

142. MANUFACTURE OF USEFUL PRODUCTS FROM SEAWEEDS, *E. C. C. Stanford.*—*12th January*, 1881. 4*d.*

This relates to the treatment of seaweeds, whereby algin, algic acid and a separated paper making material are obtained.

143. PICKS, AXES, ADZES, HAMMERS, &c., *T. Brown.*—*12th January*, 1881. 6*d.*

The blade of the pick is made in two halves, which are secured in the loop of the shaft by the same wedge or key.

157. COLOURING FIBROUS MATERIALS, *J. Young, jun.*—*12th January*, 1881. 4*d.*

This consists in subjecting the infusorial earth or other colour bearing vehicle to a preparatory bleaching by any suitable bleaching process, then charging the infusorial earth or colour bearing vehicle with the desired colour or oil, and afterwards applying the same in a comparatively dry state to the cotton, wool, or other fibrous material.

177. OBTAINING MOTIVE POWER FROM FLUID CURRENTS, *J. Imray.*—*14th January*, 1881. 6*d.*

When a current of water is very rapid a series of successive turbines have been used, the water passing from one to the other through the series. According to this invention a series of successive blades or channels of one wheel are employed to receive and utilise a succession of impulses from a fluid current

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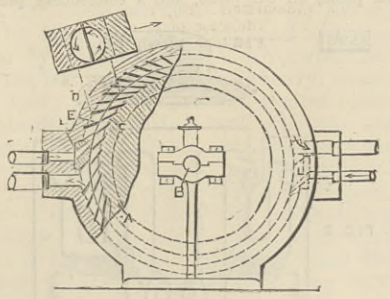

acting upon them. The wheel A revolves with shaft B in the casing D, and on both semi-elliptical grooves are formed to receive sets of blades C and E. The casing is divided by pieces L into two cells, through which the water passes as shown by the arrows.

184. CARBONATE OF POTASSIUM, *E. P. Alexander.*—*14th January*, 1881. —(*A communication from C. R. Engel.*) 4*d.*

This consists in obtaining a double carbonate of magnesium and potassium by treating by carbonic acid gas a mixture of carbonate of magnesium or free magnesia with an aqueous solution of a salt of potassium.

196. FLUE TUBES FOR STEAM BOILERS, *J. A. and J. Hopkinson.*—*14th January*, 1881. 6*d.*

This relates to improvements on patent No. 3258, A.D. 1880, and consists in providing means for securing transverse water circulating pipes in corrugated flat tubes, without forming them with a plain portion. For this purpose the flue tube is formed corrugated all along, and at the place where the water circulating pipes are to be inserted holes are formed with the metal raised round them so as to form a rim or collar, to which the ends of the circulating pipes are rivetted or welded.

201. GRINDING MILLS, *H. J. Haddan.*—*15th January*, 1881.—(*A communication from B. Tonya.*) 6*d.*

Two horizontal discs A and B are provided with vertical pins arranged so that one row of the upper discs projects and passes between two rows of the

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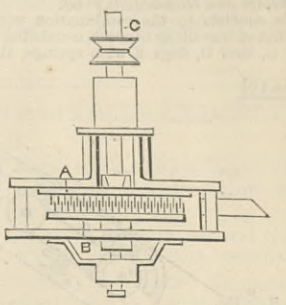

lower disc and *vice versa*, the upper disc being fixed to and revolving with the vertical shaft C, while the other is stationary. The material to be ground passes between the discs.

206. FURNACES FOR ROASTING, CALCINING, OR BURNING ORES, &c., *E. A. Barry.*—*15th January*, 1881. 6*d.*

This relates to the mechanical forward delivery of

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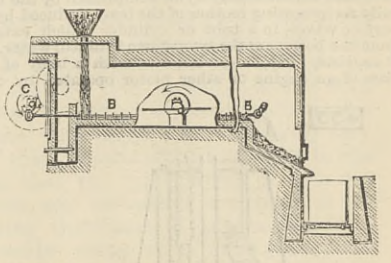

ore along the bed of a roasting furnace, by means of the scrapers B attached to a shaft actuated by cranks C.

242. PURIFYING AND HEATING FEED-WATER FOR STEAM GENERATORS, &c., *J. H. Dane.*—*20th January*, 1881. 6*d.*

The chamber A is funnel-shaped at its lower end, and near its centre is a grating C to support a depth of cobble stones D, through the interstices in which the exhaust steam can ascend freely. The steam is

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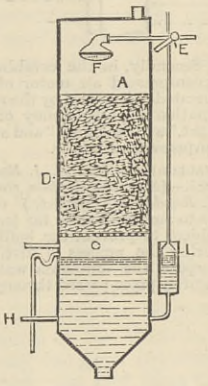

met by a stream of water supplied by a spray F. A pipe H leads to the feed pumps. The supply of water is regulated by a float L which opens or closes the cock in supply pipe F, as the level of the water in the bottom of chamber A varies.

267. MANUFACTURE OF TUBING, *J. C. Mewburn.*—*21st January*, 1881.—(*A communication from La Société J. L. Martiny et Cie.*) 4*d.*

This consists in the manufacture of tubing made of india-rubber covered with endless fabric.

318. REVERSIBLE AND ADJUSTABLE TOASTING FORK, *E. Brookes.*—*24th January*, 1881. 6*d.*

This consists of making the fork proper capable of being reversed by moving it through a semi-rotation and making it capable of being set or adjusted either parallel or at any inclination to the handle of the toasting fork.

320. GAS ENGINES, *C. M. Sombart.*—*25th January*, 1881. 6*d.*

This relates to improvements on the Bisschop engines, and consists, First, in the separation of the slide valve casing from the working cylinder; Secondly, in removing the slide valve excentric to the

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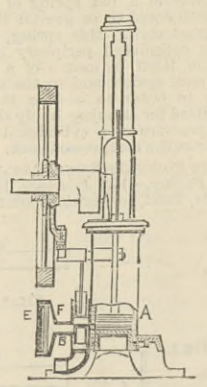

rear end of the crank shaft bearing; Thirdly, in the application of a sieve-like perforated disc in the air valve chamber: and also to the use of self-acting regulating apparatus for these or other gas engines of similar type. The drawing is a section of the engine with the improvements. A is the working cylinder, B the slide valve casing, the slide valve being actuated by excentric C. E is the air valve chamber containing the perforated disc F.

388. ROLLERS FOR CALENDERING, &c., *W. R. Schürmann.*—*28th January*, 1881. 6*d.*

This relates to constructing rollers so as to prevent deflection when subject to a considerable strain, and

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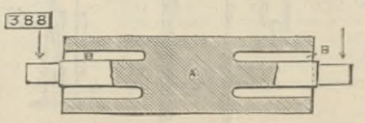

it consists in forming a deep annular groove B at each end of roller A, extending inwards for about one-third of the entire length of the body of the roller.

419. Continuous Roving, Slubbing, and Spinning Frames, *G. W. von Nawrocki.*—1*st February*, 1881. —(*A communication from R. Sehrke and Messrs. Buldge and Hildebrandt.*) 6*d.*

This consists in the combination with a spinning machine of travelling nippers, consisting of an endless band C, bars D, dogs E with springs, sliding bars H

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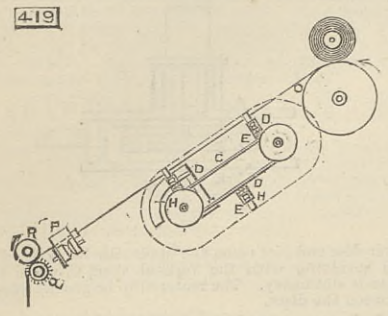

with studs, and which successively nip the sliver yarns, carry them onwards towards the twisting apparatus P and drawing rollers Q and R, and release them.

455. Signal Buoys, *F. Barr.*—3*rd February*, 1881.—(*Complete.*) 6*d.*

This relates to signal buoys in which the signals are produced automatically by air compressed by the vertically reciprocating motion of the buoy, induced by the surface waves, in a tube or cylinder which extends from the bottom of the buoy down into still water, and it consists, First, in combination with a buoy of this class of an engine or other motor operated by com-

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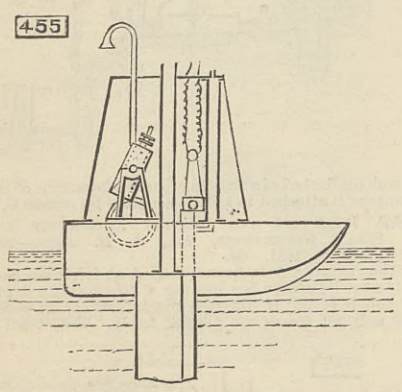

pressed air; Secondly, in the combination with the buoy and its compressed air motor of an electric or other light operated or supplied by the motor; Thirdly, in the combination in a single buoy of a "day mark," a "beacon light," a "fog signal" and an automatically operating compressed air motor.

471. Manufacture of Ice, *H. J. Haddan.*—4*th February*, 1881.—(*A communication from T. L. Rankine and C. A. Randall.*)—(*Complete.*) 6*d.*

This relates to ammonia stills for ice machines, and has for its object to prevent the boiling over of the ammonia during the process of distilling the same. For this purpose the ammonia water is caused to traverse separately pipes passed through a boiler shell,

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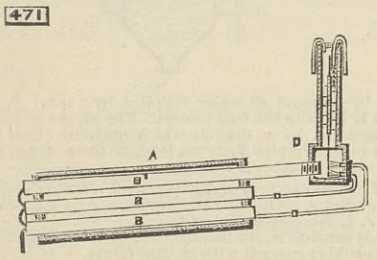

and blowing off the water and steam from the lower and hotter still pipes through a chamber which receives the incoming ammonia water into the upper still pipes which lead from said chamber. A is the boiler shell, into which steam is admitted to heat the still pipes arranged to form a lower series of pipes B, and an upper series B' extending beyond the rear end of the boiler, and connected to a chambre D.

545. Corking Bottles Containing Champagne, &c., *W. H. Beck.*—9*th February*, 1881.—(*A communication from E. Guichard.*)—(*Complete.*) 6*d.*

This consists in compressing the cork at all points of its height uniformly, simultaneously, and concentrically by means of a flat spring of one or several blades of a width equal to or greater than the height of the compressed cork. This spring, which exactly surrounds the cylindrical periphery of the cork, is tightened upon itself by means of a lever so as to compress the cork against and in the cavity *ad hoc* of a fixed piece in order to reduce the cork to the diameter required for entering freely the neck of the bottle by the pressure of a cylindrical spindle of the same diameter as the compressed cork.

667. Railway Point and Signal Apparatus, *J. Saxby and J. S. Farmer.*—16*th February*, 1881. 6*d.*

This consists, First, in working point indicators by

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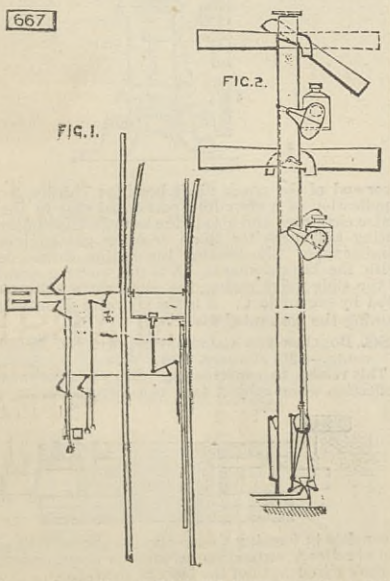

the concurrent action of the point levers and the point locking levers, so as to show how the points are set and whether they are locked or unlocked; Secondly, in the combination of the semaphore arms and signal lanterns and the rods for working them with the levers, for working and locking the points at a railway junction, so that the arms and lanterns operate as indicators showing how the points are set and whether they are locked or unlocked. Fig. 1 is a plan showing the junction of a set of main line rails with a branch. Fig. 2 is an elevation of the indicator post.

735. Preventing Explosion of Kitchen Boilers, &c., *J. Tattersall.*—21*st February*, 1881. 6*d.*

In the top of the boiler is screwed a short pipe A, to the top end of which is screwed a cap B, bored at C to correspond with the bore of pipe A. Between A

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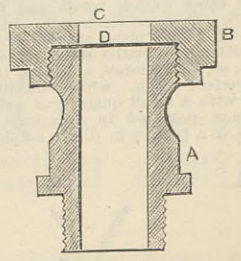

and B is a disc D of lead or other suitable material sufficiently strong to resist the ordinary pressure in the boiler, but which will give way when the pressure increases to a dangerous degree.

858. Handling and Treating Dredged Material, *F. A. Bishop.*—1*st March*, 1881.—(*Complete.*) 6*d.*

This consists, First, in constructing within a boat or scow a water-tight chamber or compartment to receive the dredged material from the scoops, buckets, or other dredging apparatus. The Second part consists in applying to and arranging within the chamber for receiving dredged material, a number or system of hydraulic nozzles, connected by suitable pipes with a pump, engine, or other means of supplying and forcing water under pressure through them, and into the space within the chamber.

938. Colouring Matters, *C. D. Abel.*—4*th March*, 1881.—(*A communication from Messrs. Bindschelder and Busch.*) 2*d.*

This relates to the production of green colouring matter by conversion of the homologues of tetramethyldiamidotriphenylmethan, or the substitution products thereof, into a sulpho-acid, and the treatment of this sulpho-acid with oxidising bodies.

939. Colouring Matters, *C. D. Abel.*—4*th March*, 1880.—(*A communication from Messrs. Bindschelder and Busch.*) 4*d.*

This consists in the production of colouring matters by the action of the halogenes upon the azo-derivatives of resorcine.

1100. Giving Motion to Carriages, Vessels, &c., *L. A. Groth.*—14*th March*, 1881.—(*A communication from G. Liedman and C. Beger.*) 6*d.*

The body of the carriage carries a rocking seat, the swinging movement of which is facilitated by a hand lever. The rocking seat is connected with the axle of the carriage by means of a system of springs and pawls.

1175. Breaking Pig Iron, *W. R. Lake.*—17*th March*, 1881.—(*A communication from T. A. Blake.*—(*Complete.*) 6*d.*

This consists essentially in the combination of a bed having a single rib or breaking point, over which the pig iron is placed, and a reciprocating slide provided with two ribs or breaking points to bear upon the

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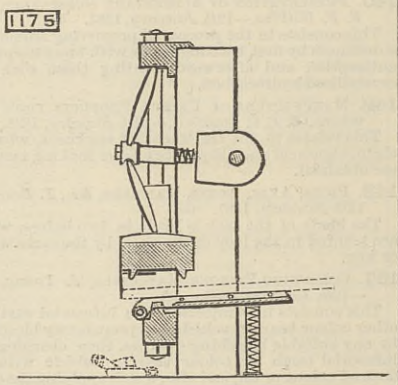

pig iron, one in front, and the other in the rear of the rib or breaking point below, with a feeding bench constructed to yield against the breaking pressure, and either with or without a stop to govern the length of the piece to be broken.

1395. Electrical Apparatus for the Transmission of Sound, *W. R Lake.*—29*th March*, 1881.—(*A communication from A. E. Dolbear.*) 6*d.*

Prof. Dolbear claims improved telephonic receivers and transmitters. Fig. 1 is a central section of the receiver. The case of receiver is in three pieces, a back piece, an ear piece, and a connecting piece;

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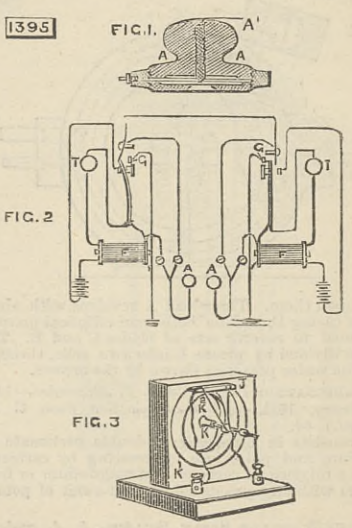
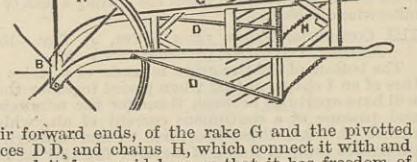


their elastic plates, preferably, of iron, forming terminals of the secondary coil of an induction coil. These places are very near each other, only separated by a thin ring, and a screw serves to adjust. It is not necessary to use both terminals of the secondary, and several modifications are described. The advantages claimed are that ordinary induced currents do not appreciably affect the work; it has no magnet to deteriorate, the adjustment is simple, is not affected by barometric and hygrometric variations, is efficient on very long lines, &c. Fig. 2 shows the arrangement of the apparatus for work; A A are the receivers, F the induction coils, G the switches, T the transmitter. The transmitter T and battery are in circuit with the primary coil of F, and this circuit is completed when the transmitter is to be used by means of the switch, and the transmitter consists of a diagram K, Fig. 3 (similar to the usual telephone diaphragms) mounted vertically in a suitable standard K^1. The terminal K^3 is supported by the hanger J, so that it may bear against the terminal K^2. Both the electrodes K^2 and K^3 may be of carbon, and J may be electrically connected with its support by mercury cups, as shown. If one of the instruments is arranged in the primary circuit of an induction coil and another in the secondary circuit, sounds spoken at the diaphragm of the first will be reproduced by the second instrument.

1315. Valves and Ports, &c., *J. Snelling.*—24*th March*, 1881.—(*Complete.*) 6*d.*

The balanced valve A works in casing B, and has reciprocating motion imparted to it by the rod C, worked by a cam lever or other rod. F is the induction port of the valve A; E are the steam ports of the

1315



cylinder valve face; D is the steam inlet branch. The casing B is provided with exhaust outlet branches. Spiral springs act on the valve rings I in the back of the valve.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

242,896. Incandescent Electric Lamp, *Thos. A. Edison, Menlo Park, N.J.*—*Filed December* 15*th*, 1880.

Claim.—(1) The combination, with the incandescing loop of an electric lamp of a support arranged to maintain the carbon loop in its normal position. (2)

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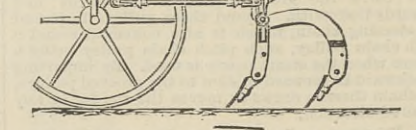

The supporting neck in which the wires leading to the loop are sealed, provided with an arm for maintaining the loop in its normal position, substantially as set forth.

242,897. Incandescent Electric Lamp, *Thos. A. Edison, Menlo Park, N.J.*—*Filed December* 15*th*, 1880.

Claim.—(1) The combination, with the incandescing conductor of an electric lamp and the key for controlling the circuit thereof, of an adjustable resistance located within the base of the lamp and cut in or out of the circuit in any desired proportion by the key, so that the lamp may be used at any desired power less

242,897.

than its normal capacity, substantially as set forth. (2) A carbon resistance made substantially as described, and provided with a series of metallic contacts, in combination with a key having an arm for completing circuit at any desired contact, substantially as set forth.

243,081. Hay Rake, *George H. Preston, Ottawa, Ontario, Canada.*—*Filed September* 24*th*, 1880.

Claim.—In a hay rake, the combination, with the bars or handles C C and the wheel A, for supporting

243.081

their forward ends, of the rake G and the pivotted braces D D, and chains H, which connect it with and suspend it from said bars, so that it has freedom of movement within certain limits, as shown and described.

243,090. Two-horse Cultivator *Daniel Unthank, Spiceland, Ind.*—*Filed January* 22*nd*, 1881.

Brief.—Clamp connection at front of parallel rods for

243.090

vertical and lateral adjustment. Devices at rear for securing and adjusting the shovels.

243,186. Weighing Scale, *Aaron Williams, Ingleside, Pa.*—*Filed February* 24*th*, 1881.

Claim.—In weighing scales for ascertaining the net weights of articles, the combination, with the weigh ing beam C, provided with scales numbered from th platform outward, of the adjustable beam F, having the scale numbered from the outer end corresponding with the scale on the weighing beam, and arranged to

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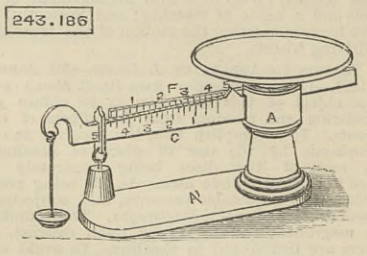

slide in a slot in the standard A, substantially as described.

243,192. Pliable Coupling for Pipes, *Robert W. Baylor, Jersey City, assignor to Samuel T. Williams, Red Bank, N.J.*—*Filed October* 20*th*, 1880.

Claim.—The extensible pipe herein described, which

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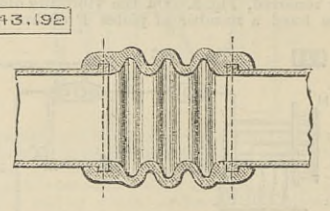

consists of a section of lead pipe cast over the outwardly-flanged ends of two sections of iron pipe, and having a series of circumferential corrugations formed in its periphery, substantially as shown and described.

243,264. Dynamo-electric Machine, *Charles A. Hussey, New York, N.Y., assignor, by direct and mesne assignments, to the Hussey Electric Company, same place.*—*Filed October* 23*rd*, 1880.

Brief.—The armature is completely inclosed in a hollow field magnet, whose exciting wire is wholly external to the field magnet. *Claim.*—(1) An electro-magnet composed of a core of internally circular, cylindric, or analogous form, and wire wound over its exterior, without passing through its interior, from end to end, and inclosing it, save at certain places designed to form poles or consequent points, substantially as set forth. (2) An electro-magnet composed of

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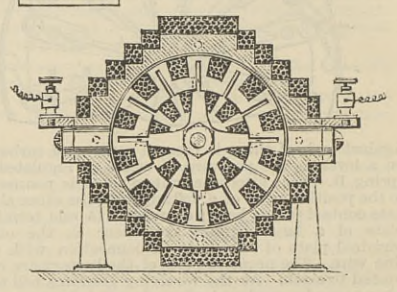

a core of internally circular, cylindric, or analogous form, provided, save at certain places designed to form consequent points, with external ridges and wire wound over the exterior of the core on said ridges, but not through the interior of the core, substantially as set forth. (3) An electro-magnet composed of a core of internally circular, cylindric, or analogous form, provided, save at certain places designed to form consequent points, with external ridges disposed spirally or angularly, and wire wound over the exterior of the core on said ridges, but not through the interior of the core, substantially as set forth.

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The Engineer, August 12th, 1881.