THE INSTITUTION OF MECHANICAL ENGINEERS.

The proceedings of the thirty-fourth annual summer meeting of the Institution of Mechanical Engineers began on Tuesday morning at Newcastle-on-Tyne, the meetings for the reading and discussion of papers taking place in the lecture hall of the Literary and Philosophical Society, a convenient apartment enough, the benches being raised in semicircular form, rising tier above tier from the centre, where the table for the president, Mr. E. A. Cowper, and the Council is placed, a little in front of and high over the table being a number of Swan's electric lamps, which, however, were not used.

The proceedings commenced on Tuesday, August the 2nd, with a reception of the members by the Mayor of Newcastle, Alderman Angus, who, a little after ten a.m., accompanied by several local dignitaries, entered the hall, and welcomed the members of the Institution in a few well-chosen words. He was suitably thanked by the President. The secretary, Mr. Walter R. Browne, then read the minutes of the last meeting, and announced the names of candidates who had been elected as members. Some further purely formal business having been transacted, the President proceeded to deliver his inaugural address, which we have very slightly condensed.

He began by stating that as members of the Institution of Mechanical Engineers, on revisiting their brother members and friends here in Newcastle, after an interval of twelve years, they came as it were to one of their natural homes; certainly to the home of one of the greatest engineers that England has ever produced, and the birthplace of the locomotive, which has done more than any other improvement of our age to lessen the cost of materials to the men who have to use them, and therefore to cheapen and extend production in the most wonderful manner. He then went on to say that it seems but a few years ago since George Stevenson, at a meeting in 1847, proposed the resolution that the Institution of Mechanical Engineers be formed. He was strongly supported by a large number of the mechanical engineers of the country, and the speaker had the honour of seconding the resolution that he be first president. The intention was that engineers from all parts of the country should join to form a compact body capable of discussing and judging of all mechanical subjects and appliances. In this the Institution had been eminently successful, and it numbered among its members, mechanical engineers in every large town in the country, and has increased in strength and importance. The last twelve years have been marked by many very important changes, whilst low prices have generally ruled. Amongst other causes of fluctuations in demand and supply (and consequently in values), must be mentioned the occurrence and the threatening of foreign wars, which disturbed the course of commerce greatly for some years. Such causes must be considered as extraneous to the sphere of influence possessed by good or bad manufacturing or engineering. Mr. Cowper does not look upon the very great expense of improved war material and implements as an unmixed evil for this country; for it so happens that we can better meet such outlay than any other nation, and thus our wealth gives rise to greater power and security than our neighbours possess; while, seeing that we are not an aggressive nation, such power tends materially at once to the progress of this country, and to the peace of the world. Having referred briefly to one cause of disturbance to the progress of mechanical engineering, he named another, which at the present moment is occupying thoughtful men to a considerable extent, namely, the arbitrary imposition of duties and bounties for the professed object of protecting manufactures, whilst in fact they constitute taxes on a nation for the benefit of a few individuals. In some countries excessive duties have been imposed, as against our manufactures, and it is even proposed to increase them; whilst in other cases bounties are actually paid out of the public purse to men engaged in a particular manufacture, on their exporting to this country certain of their wares, as, for instance, beet-root sugar. One extremely significant lesson, resulting from high duties—which it may be hoped will not be thrown away upon the American public—is, that whereas our cousins on the other side of the water used to build almost all the American "liners" of wood, they now find that, with their excessive duties against the importation of iron and steel from England, they cannot compete with English iron and steel shipbuilders and marine engineers. This is one of those damaging effects naturally produced by excessive protective duties; which, whilst they enable American ironmasters quickly to realise enormous fortunes, drive the American merchants to purchase English ships, or entrust their merchandise in English bottoms, as it is impossible to maintain protective duties at sea.

Whatever fluctuations have occurred, it is now pretty clear that several foreign nations have settled down to cultivate and extend their manufactures, and we are brought face to face with the fact—which has now been for some years growing to its present importance—that many articles which in years gone by we thought it to be our especial province to supply, are now produced in the very countries requiring them. Even Spain is awakening to the advantage of producing hematite iron from her own excellent ores, with English and Welsh coke carried out in the same ships that bring Spanish ores to this country. Now with regard to the possibility of any foreign nation eclipsing us in our manufactures, he would say at once that any such successful rivalry on their part is far worse than the effect of any duties, even if they be prohibitive; for it means rivalry in the markets of the world, and possibly in our own markets here at home. Therefore it behoves us to put our house in order, and see in what way we may be enabled to manufacture better, and with greater economy. Mechanical engineering is of such extreme importance in advancing civilisation, that it is most essential that its progress should be rapid and unimpeded. Perhaps the very large increase in steam shipping, and the change from sailing ships and paddle steamers to screw steamers, has been one of the greatest improvements of recent times, and it is none the less real or important from having been gradual, while the result to this neighbourhood has been most beneficial. This change has been due in great measure to the introduction of very economical marine engines, chiefly of the compound type, together with better boilers carrying a higher pressure. The speed and regularity of ocean steamers has also greatly improved, and one small scientific improvement has added much to the safety of traversing such seas as the Atlantic at a high speed—namely, the careful and continual use of a good thermometer, to ascertain constantly the temperature of the sea water at the surface. For if an iceberg is floating within a quarter of a mile—or even half a mile, if the sea is pretty smooth—the surface water will be several degrees colder than the rest of the sea; since the very cold fresh water, resulting from the melting iceberg, floats on the top of the sea water for some distance. No doubt the use of iron, and now of steel, has contributed most largely to the increase of shipbuilding in this country. Good arrangements of water ballast have also proved very useful; and steam cranes and arrangements for loading and discharging cargo have greatly promoted the use of steam colliers, enabling them to make more voyages in the year. Closely connected with marine engineering is the great improvement in the economy of stationary engines, which has become more fully developed during recent years, both in reference to waterworks engines and factory engines. In aid of stationary engines, "surface evaporator condensers" have been found very useful, particularly where the supply of water is very limited; and at waterworks it is now very common to pass the whole water pumped through a surface condenser, thus giving a good vacuum without the expenditure of any water, and with the result of only raising the temperature of the water a very few degrees, on account of its large volume. Locomotives have shared to some extent in the general improvement in machinery. The boilers are better made, and are safer at the higher pressures now carried than they were formerly with a low pressure. Several new valve gears of great promise have been brought forward, both for locomotives and marine engines. Amongst them Joy's motion should be again noticed. Mr. Webb says:—"The engine shown at Barrow has been at continuous work ever since the Barrow meeting, and has run 30,273 miles; we had it in for examination on the 18th inst., and found the motion practically as good as the day it went out of the shop, more especially the slides, about which so many of the people who spoke at the meeting seemed to have doubts. I do not think you could get a visiting card between the slides and the blocks; in fact, the engine has been sent out to work again, having had nothing whatever done to it. The first thing, of course, that will require doing will be the tires; as far as I can see nothing else will want doing for some time."

A very fine engineering work has now been accomplished in America in reference to navigation, namely, the deepening of the channel at the mouth of the Mississippi through the training of the river by jetties and banks. In consequence, ships of large size may now go up the river—there being plenty of deep water above the mouth—and bring down grain cargoes, without the expense and inconvenience of trans-shipment, thus reducing the freight of corn to this country. This great improvement is the work of Captain Eads. A somewhat similar improvement was the blowing up of about 50,000 tons of rock from the bed of the river, at the narrow pass of Hell's Gate, near New York. It is to be hoped that these good examples may spur on our friends on the Continent to improve their harbours, so that large channel boats may cross with comfort to the passengers, thus avoiding the excessive expense that a tunnel would involve. Great improvements have been made in the illumination of lighthouses by oil lamps; a light equal to 1300 candles has been produced by Mr. Douglass, of the Trinity House, and now two such lights will be placed one above the other, where required. The electric light has made such numerous and rapid strides that it is impossible even to notice its various applications; but on the one hand the lighting by Dr. Siemens of four miles of dock frontage at the Albert Dock of the London and St. Katherine Dock Company, together with the railway behind the warehouses, and the warehouses and ships themselves, and, on the other hand, the elegant and steady domestic light of Mr. Swan, are excellent examples of the two extremes in this department. I believe we shall have the pleasure of closely observing the Swan light during our visit here. The lighthouse electric light is also a noble application of the great power of a single electric light on the arc principle. The most powerful electric light in the world is situated near here on the coast, between the Tyne and the Wear. It is possible, and even probable, that one of the great uses to which electric force will be applied eventually, will be the simple conveyance of power by means of large wires; and as a higher percentage of power is gradually being realised, this method will become more economical. I may mention that 60 per cent. has already been obtained. The invention of Messrs. Thomas and Gilchrist, by which a very large field of ironstone is now, for the first time, made available for the purposes of making good steel by the Bessemer process, bids fair to make very considerable alterations in the steel-making trade, and in the hands of Mr. E. Windsor Richards it has been made a great success, whilst in Germany there are several works also using the process largely. Mild steel is now being used to a great extent for the construction of steam boilers as well as of ships, and in steel castings for a variety of purposes, such as spur wheels, frames of portable engines, manhole doorframes, &c. &c. Amongst the uses to which steel may be put is the manufacture of steel sleepers in place of wood. It is a very encouraging fact that there are now, or rather there were already, at Dusseldorf, in 1880, 70,000 tons of iron or steel railway sleepers in use in Germany. Mr. Webb, of Crewe, has exhibited a very promising arrangement of sleepers and fastenings, to be made either of iron or steel. Steel sleepers should also be used for tramways. If, now, some clever ironmaster could only accomplish the task of making a good "street pavement" of cast iron, the increased demand for pig metal would be enormous. It has nearly been accomplished already, by several different modes of construction; and there are very many streets where the luxury of wood pavement, which wears very rapidly, cannot be afforded, and where macadamising will not stand the wear and tear of the heavy traffic. The use of ingot steel, or very mild steel, for making tin-plates is now an established thing, and manufacturers are now taking this metal for making large tinned sheets up to 7ft. by 3ft. The making of casks by machinery, cheaper and better than those made by hand, is now an accomplished fact by Mr. Ransome's machines. There are twelve factories already established abroad, some turning out 2000 or 3000 casks a week. This is a good case of English invention taking the lead in a manufacture. Amongst good mechanical appliances that have been proved to be highly valuable to the civil engineer may be mentioned the excavating machine, which answers well for certain soils and situations, though not for all; and the dredger of Messrs. Bruce and Batho, for excavating from the inside of piers in water. In manufacturing chemistry, which, with its numerous mechanical appliances, is much indebted to mechanical science and engineering, great advances have been made during the last dozen or twenty years. Aluminium has been brought into practical use to a large extent, it being at once a very light metal and a very cleanly one. "Anthracine," obtained from coal tar, has been manufactured largely for the purpose of producing the various brilliant dyes now so common. New materials for making candles have been manufactured, in some cases by purely mechanical means, such as boiling together for some hours, at a pressure of several hundred pounds per square inch, neutral grease and water, when the water takes up the base, viz., glycerine, and leaves the grease as an acid grease. This same effect has been noticed in some steam boilers, where the same water, without admixture of fresh, has been used over and over again with surface condensers. Then, again, large rotating chemical furnaces have been introduced; and improved glass furnaces—particularly tank glass furnaces, in which the batch is put in at one end, and the working holes are towards the other end—have cheapened the actual production of glass, and are being worked largely on the Continent, and to some extent in this neighbourhood. Toughened glass has made some progress for certain purposes. Besides the improved and extended use of glass in lighthouse illumination, it has again been pressed into our service for other purposes, through our greatly extended knowledge of the laws of optics. Spectrum analysis has become of practical use, and photographs of the various Frauenhofer lines in the spectrum have been taken, as permanent records of each experiment. The such extended knowledge should have been developed by that one little instrument, the lens, is but natural; for the lens is at once the means by which we discover the extreme magnitude of some portion of the infinite works of the Almighty, in the architecture of the heavens, and by which we appreciate to some extent the extremely minute markings of a diatom, that one cannot see with the naked eye. At the same time we feel sure that there are other markings still smaller, as every increase in the power of the microscope has always rendered visible some markings still smaller than the last; and in like manner has every increase in the power of the telescope developed more worlds and suns far away from our system, and beyond our "milky way." An approach to the infinite in minuteness, and to the infinite in magnitude and distance is thus furnished to us by one instrument alone. There was but one further observation that he would venture to make, and it is this. When one looks back upon the goodly list of clever men and benefactors of the human race, who have lived, say during the last 100 years, one is sometimes tempted to wish that more of those scientific men, who have had the most brilliant ideas, and been our greatest discoverers, should have striven to carry out their discoveries into practice. For instance, take Faraday's beautiful discoveries in electricity. It was, in a manner, left to Sir Francis Ronalds, Professor Daniell, Professor Wheatstone, Fothergill Cooke, Dr. Siemens, and others, to develope from those discoveries the "intelligence wires," and "bands," that now encircle the earth, and unite nations, and do so much to prevent misunderstandings.

It is gratifying to know that the engineering profession has not been forgotten when honours have been conferred on distinguished men; and amongst others may be named Sir William Fairbairn, Sir John Rennie, Sir Peter Fairbairn, Sir Charles Fox, Sir William Armstrong, Sir Joseph Whitworth, Sir John Hawkshaw, Sir John Coode, Sir William Thomson, Sir Joseph Bazalgette, Sir Charles Hartley, Sir Charles Bright, Sir James Ramsden, Sir John Anderson, Sir George Elliot, Sir Daniel Gooch, Sir Henry Tyler, Sir Samuel Canning, Sir Edward Reed, and Sir Frederick Bramwell With many noble examples before us, and with signs of an improvement in many branches of commerce, he trusted that the latter part of the present century will, with somewhat greater exertion of thought and enterprise on our parts, be marked, not only by numerous small improvements, but by many substantial inventions for the good of mankind.

A vote of thanks was proposed by Mr. Abernethy, president of the Institution of Civil Engineers, seconded by Sir Frederick Bramwell, and carried unanimously. A paper was then read by Mr. Lowthian Bell,

On the Tyne as Connected with the History of Engineering.

This paper rapidly skimmed over the life of Newcastle-on-Tyne. As a technical paper it possessed little interest, but it was fluently written, and well read by the author himself. Being in itself almost an abstract of the eventful history of the locality, it does not abmit of being abstracted with advantage, and we must content ourselves with saying that it left few subjects connected with the trade and manufactures of the town, their rise and progress, untouched.

No discussion followed the paper; indeed, it was not calculated to provoke discussion in any way.

Mr. F. C. Marshall then read his paper

On the Progress and Development of the Marine Engine.

The author began by referring to a paper read at the Liverpool meeting in 1872, by Mr. F. J. Bramwell, F.R.S., on "The Progress Effected in Economy of Fuel in Steam Navigation, Considered in Relation to Compound Cylinder Engines, and High-pressure Steam;" then proceeded to continue the subject from the date of that meeting, to trace out whether any, and if so what, progress had been made; further, to consider whether or no we have reached the finality so strongly deprecated by Sir Frederick Bramwell in the discussion referred to, and if not, then in what direction we are to look for further development.

From a table it would seem that the steam pressures are now much higher, the boilers have less heating surface, and the cylinders are much smaller for the indicated horse-power developed, than in 1872; and at the same time the average consumption of fuel is reduced from 2·11 lb. to 1·828 lb., or by 13·38 per cent. The author then briefly described the modern marine engine and boiler. The three great types of compound engines may be placed as follows in the order of their general acceptance by the shipowning community: (1) The two-cylinder intermediate-receiver compound engine, having cranks at right angles. (2) The Woolf engine in the tandem form, having generally the high-pressure and low-pressure cylinders in line with each other, but occasionally alongside, and always communicating their power to one crank. Such a pair of engines is used sometimes singly, oftener two pairs together, working side by side to cranks at right angles; recently three pairs together, working to cranks placed 120 deg. apart. The system affords the opportunity of adding yet more engines to the same propeller to an indefinite extent. (3) The three-cylinder intermediate-receiver compound engine, with one high and two low-pressure cylinders, the steam passing from the high-pressure cylinder into the receiver, and thence into the two low-pressure cylinders respectively. The cranks are placed at equal angles apart round the crank shaft, so as to balance the forces exerted upon the shaft. These three types may be said to embrace all the engines now being manufactured in this country for the propulsion of steam vessels by the screw propeller. In their leading principles they also embrace nearly all paddle engines now being built, whether the cylinders be oscillating, fixed vertically, or inclined to the shaft. The compound engine in fact, in one of these three forms, may now be said to be universally adopted in this country; and the question of the relative value of simple expansion in one cylinder, and of compound expansion in two or more cylinders, which agitated the minds of some of our leading engineers ten years ago, is now practically solved in favour of the latter. The marine boiler of to-day is in all its main features the same as it was ten years ago. The single-ended boiler, made with two, three, and sometimes four furnaces, is the simplest form, and for all powers under 500-indicated horse-power is the most generally adopted. The double-ended form is largely used. It has been found more economically efficient than the single-ended form, by as much as 10 per cent. in the writer's own experience. It is generally adopted for engines of large power, but for small power is inconvenient, owing to its occupying more room lengthwise in the vessel, and also involving two stokeholds and therefore more supervision. At one time great difficulty was found in keeping the bottoms of boilers of this kind tight. Owing to their length, the unequal expansion due to different temperatures at the top and bottom caused severe racking strains on the bottom seams and rivetting—so severe in some cases as to rend the plating for a large part of the bottom circumference of the shell. This difficulty has now been to a large extent got over, in consequence of the greater attention given to the form and direction of the water spaces in the boiler itself, so as to induce circulation of water; the introduction of the feed-water at the top instead of near the bottom; the more careful management now usual on the part of engineers; and lastly, the use of larger plates, welded horizontal seams, drilled rivet holes, and more perfect workmanship throughout. A modification of double-ended boiler is that introduced by Mr. Alfred Holt. It has many decided advantages, but is costly to make. The formation of the two ends into separate fire-boxes leaves the bottom of the boiler free to adapt itself to the variations of temperature to which it is exposed. The separation of the furnaces from the combustion chamber, excepting through the opening afforded by a connecting tube, is an advantage in the same direction, and avoids almost entirely the racking strains due to irregular furnace action. The weight of water carried is less, and that of the boiler may also be made less; while the elliptical form of the two ends gives greater steam space. A type of boiler largely used in her Majesty's Navy, somewhat like a locomotive boiler, is highly efficient in regard to weight and power developed. Many examples have yielded one indicated horse-power in the cylinders for every 3 square feet of heating surface, under natural draught and with a very moderate height of funnel; and this with a consumption of fuel not exceeding 2½ lb. per indicated horse-power per hour under a working pressure of 60 lb. With the aid of a steam jet in the funnel, the heating surface per indicated horse-power has fallen below 2½ square feet. The large water surface afforded for escape of steam secures almost entire freedom from priming, without the incumbrance of steam domes; and the large combustion chamber allows of the thorough combustion of the gases before their passage through the tubes. The locomotive type of boiler has lately occupied the writer's attention, with a view to its more definite introduction into marine work. The difficulties however, which lie in the way of applying it to steamers going long voyages, are very great. The principal difficulty lies in the necessity of burning a large quantity of fuel in a very limited space and time. This can only be done either by direct pressure or exhaust action applied at the furnace. In other words we must either exhaust the funnel, which will absorb a large amount of power, but would be comparatively easy of application; or our stokers, as is the case with our miners, must work under a pressure of air. The writer stated that his experience in the manufacture and working of steel boilers was satisfactory. Many steel boilers of sizes varying from 6ft. diameter to 14ft. 6in. diameter have left the works at St. Peter's since 1877, when the first was made; and in no case has there been a failure of a plate after being put into a boiler, either in the process of manufacture or in working at sea. The mode of working is as follows:—For shell plates, from ⅜in. to ¾in. thick, to warm each to a dark red heat before rolling, having previously drilled a few holes to template for bolting the strakes together; the longitudinal seams are usually lap joints treble rivetted, requiring the corners to be thinned, which is done after rolling. The furnace plates are generally welded two plates in length, and flanged to form Adamson rings, and at the back end to meet the tube plate; the back flame-box plates are flanged, also the tube plates and front and back plates, and wherever work is put on to the plate it is annealed before going into the place. The rivet holes are drilled throughout. In the putting together the longitudinal seams of the thicker plates of the shells, great care is always taken to set the upper and under plates for the lap to their proper angle before they are bolted together, a point generally overlooked by the practical boilersmith. The question of corrosion is one which is gradually being answered as time goes on; and so far very satisfactorily for steel. Some steel boilers were examined a few weeks ago which were amongst the first made; and the superintending engineer reports, "There is no sign of pitting or corrosion in any part of the boiler; the boilers are washed out very carefully every voyage, and very carefully examined, and I cannot trace anything either leaking or eating away. No zinc is used, only care in washing out, drying out, and managing the water." This is the evidence of an engineer with a large number of vessels in his charge. On the other hand, some of our most prominent Liverpool engineers always use zinc, and take care to apply it most strictly. The evidence of one of them is as follows:—"We always fix slabs of zinc to most boilers, exposing not less than a surface of one square foot for every 20 indicated horse-power, and distributed throughout the boiler. This zinc we find to be in a state of oxide and crumbling away in about three months. We then renew the whole, and find this will last twelve months or more, when it is renewed again. Meanwhile we have no pitting and no corrosion; but, on the contrary, the interior surfaces appear to have taken a coating of oxide of zinc all over, and we have no trouble with them." Then the writer considered our present marine engine as to its efficiency and capability of further improvement. The weight of machinery, water, and fuel carried for propelling ships has not had due attention in the general practice of engineers. By the best shipping authorities the writer is assured that every ton of dead weight capacity is worth on an average £10 per annum as earning freight. Assuming, therefore, the weight of the machinery and water of any ordinary vessel to be 300 tons, and that, by careful design and judicious use of materials, the engineer can reduce it by 100 tons, without increasing the cost of working, he makes the vessel worth £1000 per annum more to her owners. That there is much room for improvement in this direction is shown by the following statement, giving, for various classes of ships, the average weight of machinery, including engines, boilers, water, and all fittings ready for sea, in pounds, per indicated horse power:—

	lb. per I.H.P.
Merchant steamers	480
Royal Navy	360
Engines specially designed for light draught vessels	280
Royal Navy, Polyphemus class (given by Mr. Wright)	180
Modern locomotive	140
Torpedo vessels	60
Ordinary marine boilers, including water	196
Locomotive boilers, including water	60

The ordinary marine boiler, encumbered as it is by the regulations of the Board of Trade and of Lloyd's Committee, does not admit of much reduction in the weight of material or of water carried when working. The introduction of steel has reduced the weight by about one-tenth; but it will be the alteration of form, to the locomotive, tubulous, or some other type, combined with some method of forced draught, to which we must look for such reductions in weight of material and water as will be of any great commercial value. The engine may be reduced in weight by reducing its size, and this can only be done by increasing the number of revolutions per minute. It has hitherto been the practice to treat the propeller as dependent upon the size of engines, draught of water, and speed required. This process should be reversed. The propeller's diameter depends on the column of water behind, necessary to overcome the resistance in front of it due to the properties of the vessel. This fixed, the speed will then fix the number of revolutions, which will be found much greater than is usual in practice; and from this the size of the engines and boilers will be determined. Great saving in weight can be effected by careful design and judicious selection and adaptation of materials; also by the substitution of trussed framing and a proper mode of securing the engine to the structure of the vessel, as worked out in H.M.S. Nelson, by Mr. A. C. Kirk, of Glasgow, and in the beautifully designed engines by Mr. Thornycroft, in place of the massive cast iron bedplates and columns of the ordinary engines of commerce. The same may be said of the moving parts. In fine, the hull and engines should be as much as possible one structure; rigidity in one place and elasticity in others is the cause of most of the accidents so costly to the shipowner; under such conditions mass and solidity cease to be virtues, and the sooner their place is taken by careful design, and the use of the smallest weight of material—of the very best kind for the purpose—consistent with thorough efficiency, the better for all concerned. Coming to the question of the consumption of fuel, a considerable saving has been effected in nine years, as shown in the following table:—

Item.	1872.	1881.
Working pressure, lb. per sq. in.	52·5	77·4
Heating surface per I.H.P. sq. ft.	4·64	3·919
Piston speed, feet per min.	376	467
Coal burnt per I.H.P., lb.	2·11	1·828

This shows a saving equal to 13·38 per cent. in quantity of fuel consumed. Mr. Marshall then read a letter from Mr. Alfred Holt, of Liverpool, bearing on this subject, in which Mr Holt spoke favourably of the single-crank engine, and stated his belief that the compound system would ere long be abandoned for the simple engine. He is endeavouring to feel his way to using the steam in one cylinder only, and so far the results have been encouraging; and he is now fitting a 2200-ton vessel on that system. He is also endeavouring to do without a crank shaft, the forward end of the screw shaft carrying an ordinary crank with overhung pin. This experiment also promises satisfactorily. In his opinion the great improvement of the immediate future is to increase the steam production of our boilers. A ton weight of a locomotive boiler produces as much steam as 6 tons of an ordinary steamboat boiler. Mr. Holt speaks of the coal account as one of the minor disbursements of a steamer. He does not give the ratio which coals bear to the total disbursements, but from other reliable sources Mr. Marshall found that, according to the direction of the voyage, it varies from 16 to 20 per cent.—or, say, an average of 18 per cent.—of the total disbursements, in a vessel carrying a cargo of 2500 tons. This will represent to-day about £3000 per annum, and in 1872, at equal prices, the cost would have been £3750—showing a saving of £750, equal to a dividend of, say, 3 per cent. on the value of the ship. Again, the cost of coal per mile run for such a vessel in 1872 would have been at least 16½d.; to-day it does not exceed 13d. The marine boiler as now made is very efficient, but if the quantity of steam used be considered, in relation to the increased pressure, it will be seen that the boiler of to-day is little if any more efficient than that of ten years ago. The present boiler has an evaporative efficiency of about 75 per cent., and cannot be much improved so long as air is supplied to the furnace by the natural draught. To increase the efficiency from 75 to 82·5 per cent. would require about double the heating surface, the weight of boiler and water being also doubled, while the gain would only be 10 per cent. Mr. Blechynden's formula, used in Mr. Marshall's works for weights of cylindrical marine boilers of the ordinary type, and for pressures varying from 50 lb. to 150 lb., is as follows:—

$$W = \frac{(P + 15)\ (S + D^2L)}{C};$$

$$\text{or } W = \frac{2S\ (P + 15)}{C}$$

when $S = D^2L$, which is a common proportion.

Here W = weight in tons.
P = working pressure as on gauge,
S = heating surface, in square feet,
D = diameter, in feet,
L = length, in feet,
C = a constant divisor, depending on the class of rivetting, &c. For boilers to Lloyd's rules, and with iron shells having 75 per cent. strength of solid plate, C = 13,200.

This formula, if correct—and it is almost strictly so—would give the relative weight of boilers per sq. ft. of heating surface, for 105 lb. and 150 lb. total pressure, assuming we wish to increase the efficiency 10 per cent., as follows:—

$$\text{Weight at } 105 \text{ lb.} = 105 \times \frac{1}{C}$$

$$\text{,,} \quad 150 \text{ ,,} = 150 \times \frac{1{\cdot}75}{C} = \frac{263}{C}$$

$$\text{Hence the ratio of weight} = \frac{263}{105} = 2{\cdot}5$$

In other words the boiler with the higher efficiency would weigh two and a-half times that with the lower efficiency. In the case of a vessel of 3000 tons, with engines and boilers of 1500 indicated horse-power, the introduction of locomotive boilers with forced draught would place at the disposal of the owner 150 tons of cargo space, representing £1500 per annum in addition to the present earnings of such a vessel

Mr. Thornycroft has for some years used the locomotive form of boiler for his steam launches, working them under an air pressure—produced by a fan discharging into a closed stokehold—of from 1in. to 6in. of water, as may be required. The experiments made gave an evaporation of 7·61 lb. of water from 1 lb. of coal at 212 deg. Fah., with 2in. of water pressure, and 6·41 lb. with 6in. of pressure. These results are low; but it is to be remembered that the heating surface is necessarily small, in order to save weight, and the temperature of the funnel consequently high, ranging from 1073 deg. at the first pressure and 1444 deg. at the 6in. With the ordinary proportions of locomotive practice the efficiency can be made equal to the best marine boiler, when working under the water pressure usual in locomotives, say from 3in. to 4in., including funnel draught. It has fallen to the lot of the writer to fit three vessels recently with boilers worked under pressure in closed stokeholds. The results, even under unfavourable conditions, were very satisfactory. The pressure of air would be represented by 2in. of water, and the indicated horse-power given out by the engines was 2800, as against 1875 when working by natural draught, or exactly 50 per cent. gain in power developed.

Mr. Marshall then proceeded to refute the arguments which may be urged against the use of the locomotive boiler at sea, and which we need not reproduce. Coming to the engines, Mr. Marshall said that the total working pressure of to-day may be accepted as 105 lb., or

equal to seven atmospheres. If it were boldly accepted that eleven atmospheres, or 165 lb., were to be the standard working pressure, the result would be a gain of 14·55 per cent., provided no counteracting influence came into play. Of course, there are forces which war against the attainment of the full extent of this advantage, viz., the greater condensation in the cylinders and loss in the receiver or passages. In regard to the former, it may be questioned whether by steam jacketing the high-pressure cylinder, correctly proportioning the steam passages, and giving a due amount of compression in both cylinders, this may not be reduced far below the generally received notion; and the latter cause of loss may be considerably reduced in its effect by a more carefully chosen cylinder ratio. The ratio usually adopted, between 3·5 and 4 to 1, whether the pressure be 70 lb. or 90 lb., may well be questioned. With a cylinder ratio of 2·95 to 1, the economic performance is very good, and equal to any with the higher ratio. A lower cylinder ratio has another advantage of considerable value, viz., that the working pressure can be much reduced as the boilers get older, while by giving a greater amount of steam the power may be maintained—at an extra cost of steam, of course, but not so great a cost as with higher ratios. The cut-off in the high-pressure cylinder usually takes place at about 0·6, and the ratio of expansion has decided the ratio of cylinders. The use of separate starting valves in both cylinders obviates that necessity. The difficulties in the way of taking advantage of the higher economic properties of greater pressures than hitherto used on board ship, are, it is submitted, not insuperable, and it would be to the interest of all that they should be firmly and determinedly met. It may be accepted as an average result that the Woolf engine, as usually arranged, will use 10 per cent. more steam than the receiver engine for the same power. Of the three-cylinder receiver type the data are insufficient to form a definite opinion upon; but so far the general working of the Arizona is stated to be as good, economically, as any of the two-cylinder receiver class. The surface condenser remains as it was ten years ago, with scarcely a detail altered. In most engines it remains a portion of the framing, and as such adds greatly to the weight of the engine. It is a question seriously worth consideration whether or no the surface of tubes can be reduced. The practice at present is to make the surface one-half the boiler surface as a minimum, that is, equal to about 2 square feet per indicated horse-power. In practice, the writer has found 1·4 square feet per indicated horse-power to maintain a steady vacuum of 27½in.

Mr. Marshall has just completed six pairs of engines for three twin screw ships, having steel shafts of 10in. diameter, and has in each case run the engines at 120 revolutions per minute, while indicating 1380-horse power from each pair for ten to fifteen hours without stopping; and in no case has a single bearing or crank-pin warmed or had water applied, the surfaces on examination being perfect. In these engines all working bolts, pins, and rods, except the piston and connecting rods, are of steel, all rods in tension being loaded to 8000 lb. per square inch. The boilers are of the Navy type, made throughout of Siemens-Martin steel plates, rivetted with steel rivets, all holes drilled. Furnaces are welded and flanged; the tubes are of brass. In comparison with an ordinary merchant steamer's iron boilers of the double-ended type, they weigh, including water and all appurtenances, as follows:—

	Double-ended Type.	Navy Type.
Weight, tons	135	... 146
I.H.P.	1400	... 2760
Draught	Natural	Forced

The screw propeller is still to a great extent an unsolved problem. We have no definite rule by which we can fix the most important factor of the whole, namely, the diameter. Mr. Froude has pointed out that by reducing the diameter, and thus the peripheral friction, we can increase the efficiency; and this is confirmed by cases—of Iris reduced 2ft. 3in., and the Arizona reduced 2ft. This must of course be qualified by other considerations. The ship has by her form a definite resistance, and a certain speed is required; if the propeller be made too small in diameter, the ship will not be driven at the required speed, except at serious loss in other directions. This question was too large and complicated to be dealt with here, and should, in the first instance, be made the subject of careful and extended experiment, on which a separate paper should be written.

To sum up the whole. Progress has been made during the past nine years, and in the following particulars:—(1) The power of the engines made and making show a great increase. (2) Speeds hitherto unattainable are now seen to be possible in vessels of all the various classes. (3) The consumption of fuel is reduced by 13·38 per cent. on the average; and numbers of vessels are now working on much less coal than that average, while the quality of the coal is in nearly all cases very inferior, so that it is not unfair to take credit for 20 per cent. reduction. (4) The working pressures of steam are much increased on the average, and are still increasing; many steamers now being built for 120 lb. per square inch, while 90 lb. is the standard pressure now required.

This was an admirable paper and fully illustrated by diagrams, which were, however, hardly needed to make the sense of the author quite clear. It was followed by a discussion which was, we regret to say, in no way worthy of the paper. This discussion began when the paper was concluded, and adjourned when the meeting broke up for luncheon, and to visit the works of Sir William Armstrong and Co., and Messrs. Spencer's Steel Works at Newburn. It was resumed, however, on Wednesday morning, and, for the sake of compactness, we give the whole substance of the discussion on both days here. It was commenced by Mr. Kirk, who paid the author of the paper a well merited compliment. He agreed with him that no great step had been made in the last ten years to parallel what had been done before. The result of using higher and higher pressures was that in a sense the advantage of the compound engine in reducing strains had disappeared, and these strains were now as great as in the old simple engine. If still higher pressures were used, they would be driven to use more cylinders. He then referred to the engines with three cylinders designed by Rowan. As to the actual consumption of coal at sea, that might be taken as 2 lb. per horse per hour with North-country and 1·8 lb. with Welsh coal. Concerning the Woolf engine, it was no doubt less economical than the vacuum engine, because there was a greater range of temperature in the small cylinder. To Mr. Cowper he thought was due the credit of introducing the vacuum type of engine, in which the small cylinder was kept warm. The tandem type had the advantage that it could be multiplied almost indefinitely on the same crank shaft, as, for example, in the City of Rome. He then referred to the three-cylinder engine of John Elder; and went on to explain that making engines light made them costly, and shipowners would not pay for them; and weight was after all not always of much importance. As to marine boilers, he regarded the type as fixed for the present, partly by the restrictions of the Board of Trade and Lloyds'. He doubted, too, whether great draught could be made to do on long voyages, but for short voyages to be made at high speeds, he regarded its use as the only solution of a difficulty. As to surface condensers, it made no difference whether the water was inside or outside the tubes. Their efficiency depended on the circulation of the water. After saying a few words in favour of steel, he said that no connection existed between the size of the engine and the size of the propeller, the diameter of which was fixed more by the peculiarities of the shaft than by anything else. Mr. Crowe defended Mr. Holt's type of single crank engine, saying that with steam handling gear they never stuck on the centre or gave trouble.

After a few unimportant remarks from other speakers, Sir F. J. Bramwell caused a good deal of amusement by relating his experiences during a recent trial of the Anthracite, at which Mr. Thorneycroft was present. He worked the engines until the steam pressure fell to zero, and then they kept going at 30 revolutions per minute, we presume, on the vacuum. Mr. Thorneycroft had to take a candle into the boiler room to find the fire, and carried away all that was left in the grate in one hand. The total consumption, including getting up steam, was at the rate of 1·79 lb. per horse-power per hour. Forced draught had been used in American steamers burning anthracite thirty years ago.

Mr. Parker held that the working pressure was now more nearly 100 lb. than 77 lb., as given by Mr. Marshall. The introduction of steel and of corrugated steels had permitted an increase of pressure of 30 per cent. in 2½ years. If boiler shells could be made up of solid rings, they would save the 25 per cent. of strength now lost by the seams, and might carry higher pressures accordingly. As to the higher factor of safety, 6 to 1, required by the Board of Trade, he did not see that it was needed save to guard against loss by corrosion, and a thick plate suffered less in this way than a thin; and allowance should be made accordingly. As to large steamers like the City of Rome, he thought twin screws would have been better than single.

Mr. Rich expressed grave doubts that a higher economy than 1·88 lb. of coal per indicated horse-power per hour had ever been obtained at sea. His experience showed that more could not be got on land with the best engines. Mr. Nicholl followed Mr. Rich, and spoke in favour of forced draught.

Mr. Fox then got up to defend his corrugated flues. In substance what he said was that he has now 3700 flues in use, of which 2472 are in marine boilers. He has had in all eight failures. The evaporative efficiency of his flues is better than that of the ordinary flue by about 450-horse power on 3750-horse power. An experiment carried out in Germany with a land boiler gave an evaporation of 10·85 lb. with his flue. When the side flues were sloped off, a 30ft. flue, 4ft. 3in. diameter, evaporated 8·75 lb. per pound of coal. Only for steel he could not have got over the difficulties which lay in the way of manufacturing these flues. He was followed by Mr. J. Head, Mr. Crampton, and other speakers, who, however, added little to what had gone before of a very practical character. Mr. Marshall replied on the whole discussion, and a vote of thanks was passed to him. A paper was then read on "Printing Machinery," by Mr. Jameson, our notice of which we must reserve, and a visit was then paid to the office of the *Newcastle Chronicle*, where the machine described was seen at work. Subsequently the members and visitors were carried by train to Jarrow, where luncheon was provided by Messrs. Paterson, and the works of the company were inspected. The annual dinner of the Institution took place on Wednesday night, and was numerously attended.

On Tuesday, after the reading of Mr. Marshall's paper, the members were admirably entertained by the local committee, and then proceeded to visit the works of Sir William Armstrong and Co., and the steel works of Messrs. Spencer at Newburn. The first we have already fully described, the second we shall notice in a succeeding impression. A visit was also paid to the swing bridge.

In the evening about 200 members and visitors dined at Jesmond Deane by special invitation of Sir William Armstrong.

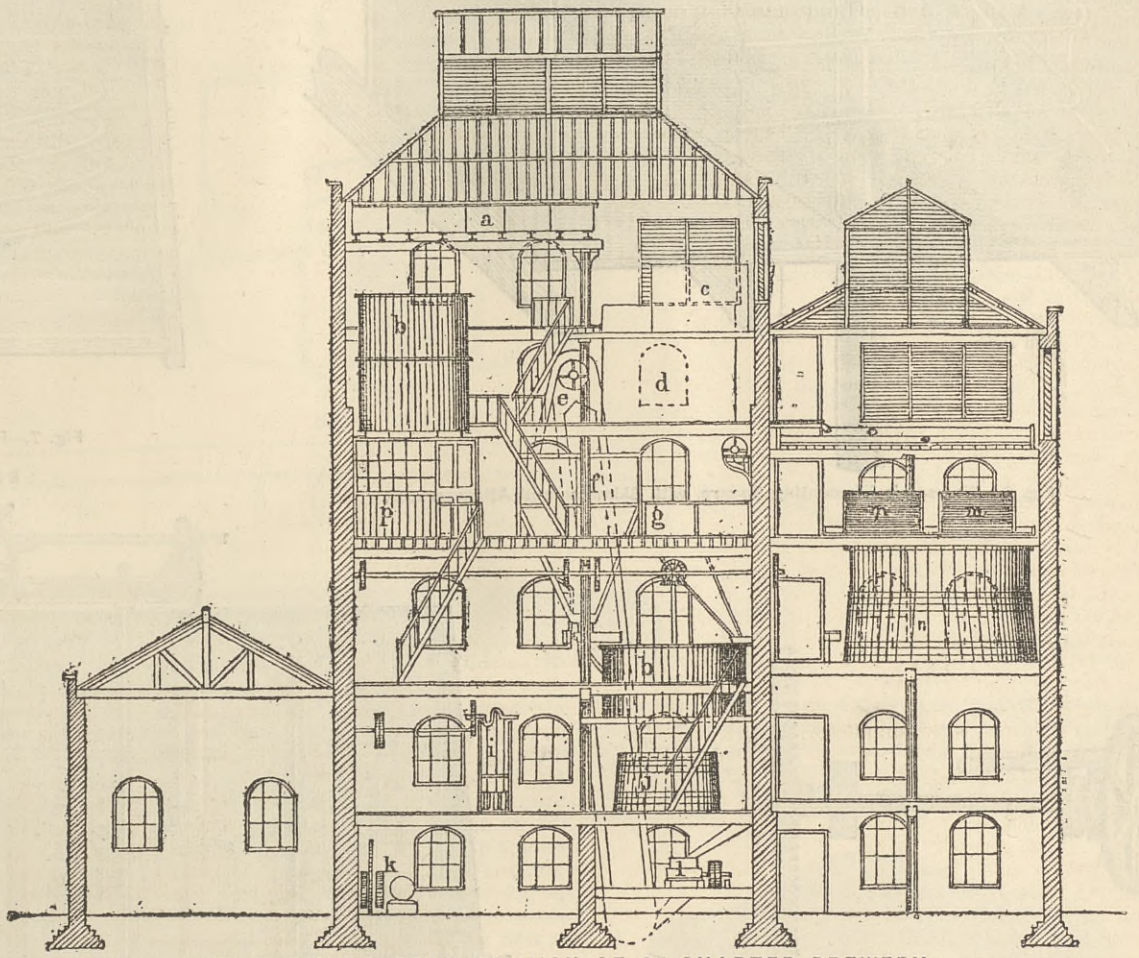


Fig. 1.—TRANSVERSE SECTION OF 35-QUARTER BREWERY.

BREWING IN ENGLAND.

No. IV.

The brewery illustrated in our impressions of the 20th and 27th May was a good example of a first-class brewery of large capacity. In describing some of the plant used in such breweries, we may also illustrate that of some breweries of somewhat smaller size. The general arrangement of a 35-quarter brewery, erected in 1878 by Messrs. G. J. Worssam and Son, of London, may be gathered from the section and plan given herewith. The sectional elevation, Fig. 1, is taken just within the front wall, and the plan, Fig. 2, is of the mash-tun stage and tun room. In these *a* is the cold water tank, *b* the hot water boiling back, *c* the wort receiver, *d* the wort boiling back, *e* the malt elevator, *f* the grist case, *g* the malt case, *h* the mash tun, *i* the wort pump, *j* the under back, *k* the steam engine, *l* the malt mill, *m* the refrigerator, *n* the fermenting tun, *o* the cooler, and *p* the brewers' room. The boiling back, as made by Messrs. Worssam and Son for this and other breweries, is illustrated by Figs. 3 and 4, Fig. 3 being an elevation and Fig. 4 a half plan. These backs are chiefly employed for boiling large quantities of wort, and are fitted with a double arrangement of steam pipes, technically called coils, although they do not partake of that form. In our illustrations S S are the steam coils, having outlets O O and inlets I I. The steam entering at I I passes through the copper pipes in the direction shown by the arrows, the gun-metal main pipe being cast with a diaphragm at *s*, to prevent the steam passing straight through it. A A are two dome-topped copper strainers, which prevent the hops entering the draw-off pipes. These strainers can be raised or lowered at pleasure by a screw worked with a pair of mitre wheels and the hand wheel *h*. C C show the gun-metal chains, broken off, that are used for raising the coils for cleaning purposes. These chains pass over a pair of steel chain wheels *w w*, worked by means of a worm and worm wheel by the large hand wheel H. To the opposite ends of these chains there are attached two counter-balance weights B B. D D are two copper doors hung on hinges, with cast iron frames. This

BREWERY PLANT.—BOILING BACK AND SKIMMING APPARATUS.

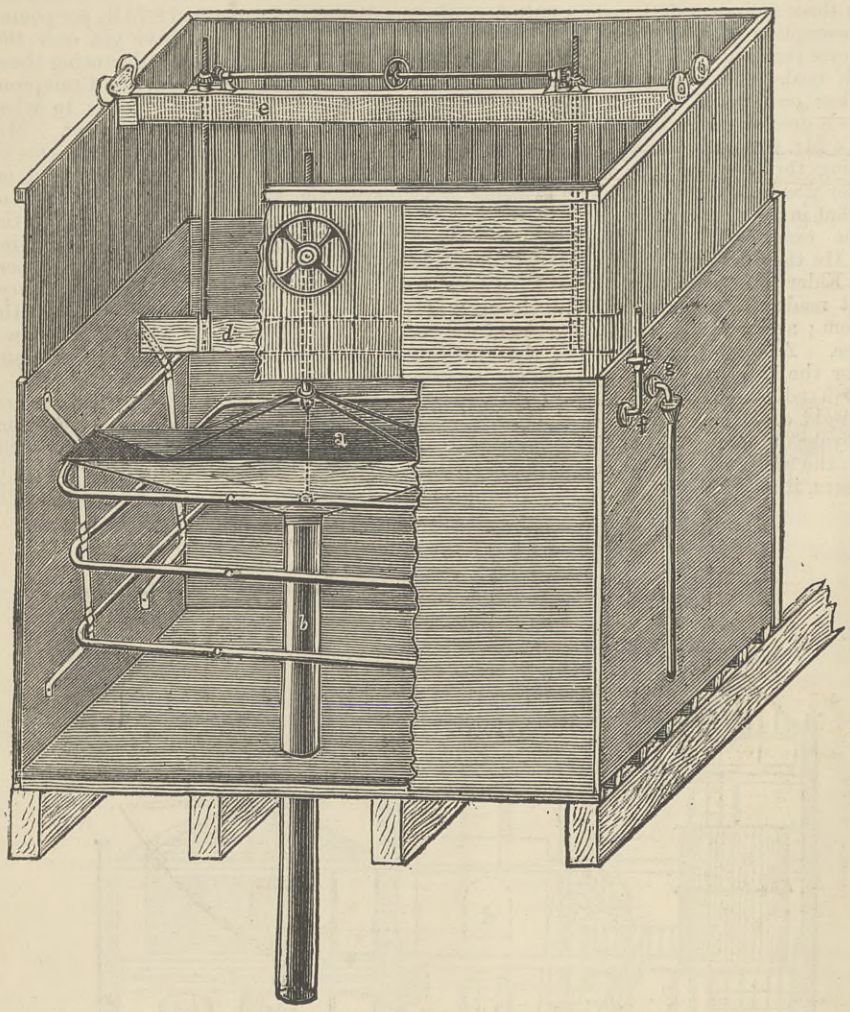


Fig. 6.—Worssam's Fermenting Square, with Skimmer and Attemperator.

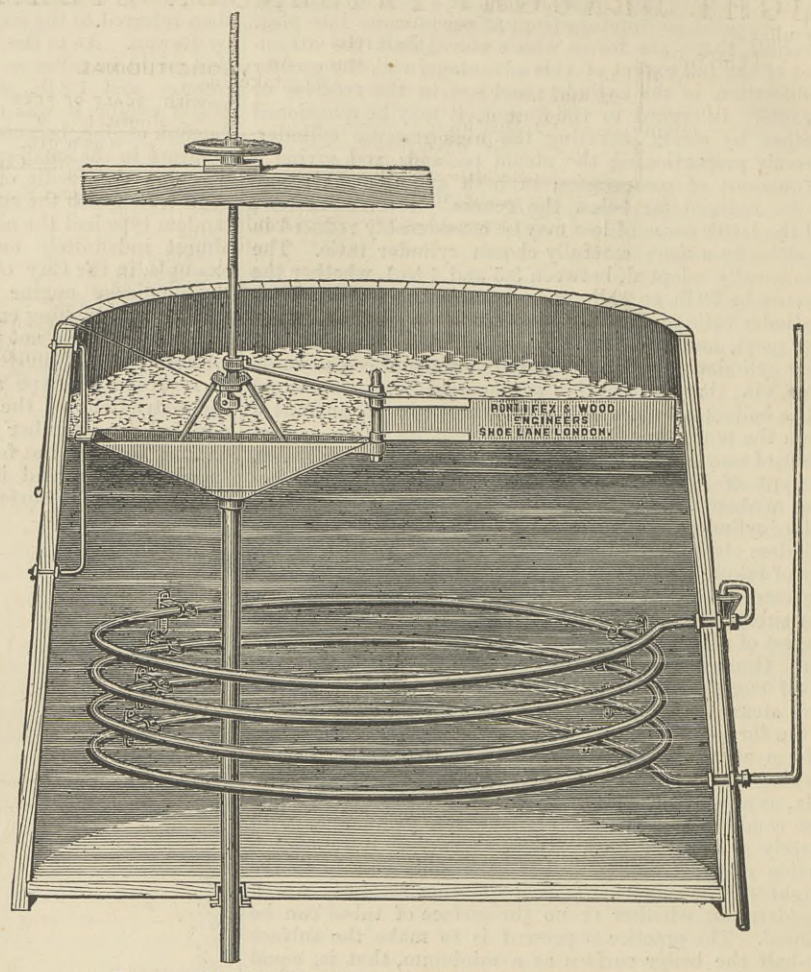


Fig. 7.—PONTIFEX'S FERMENTING ROUND, WITH SKIMMER.

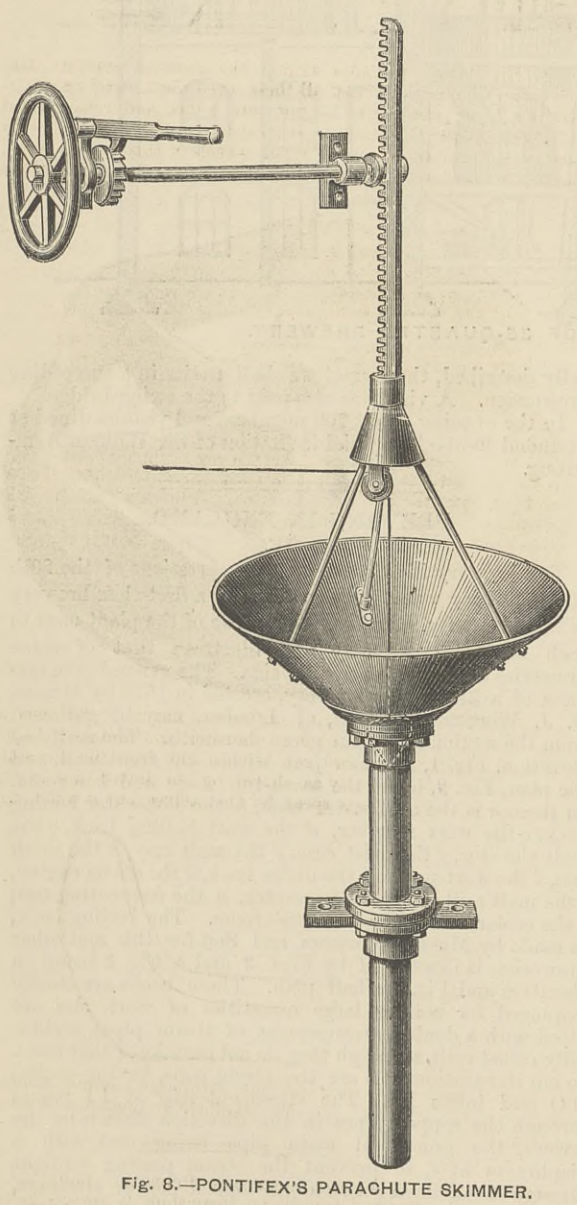
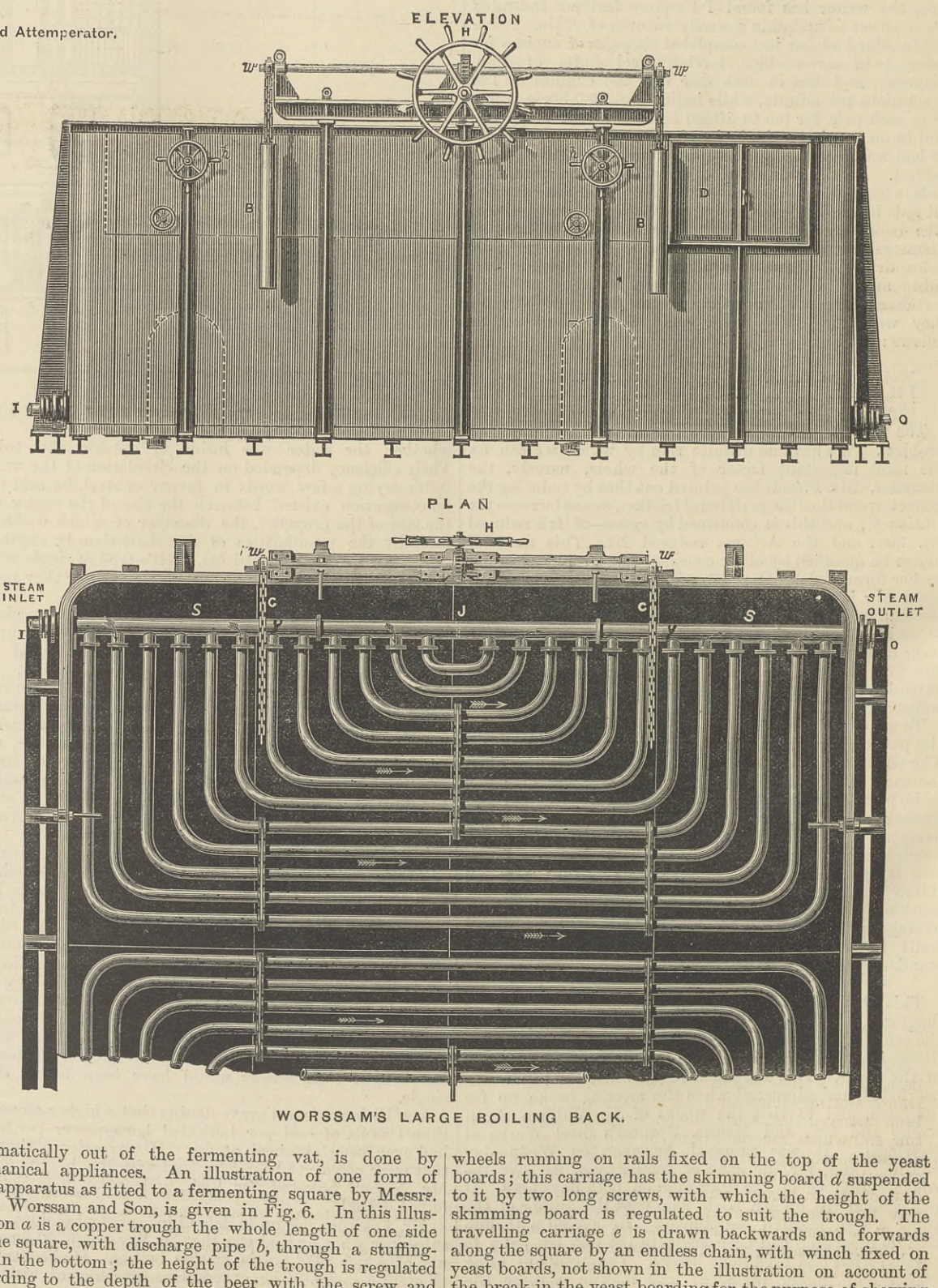


Fig. 8.—PONTIFEX'S PARACHUTE SKIMMER.

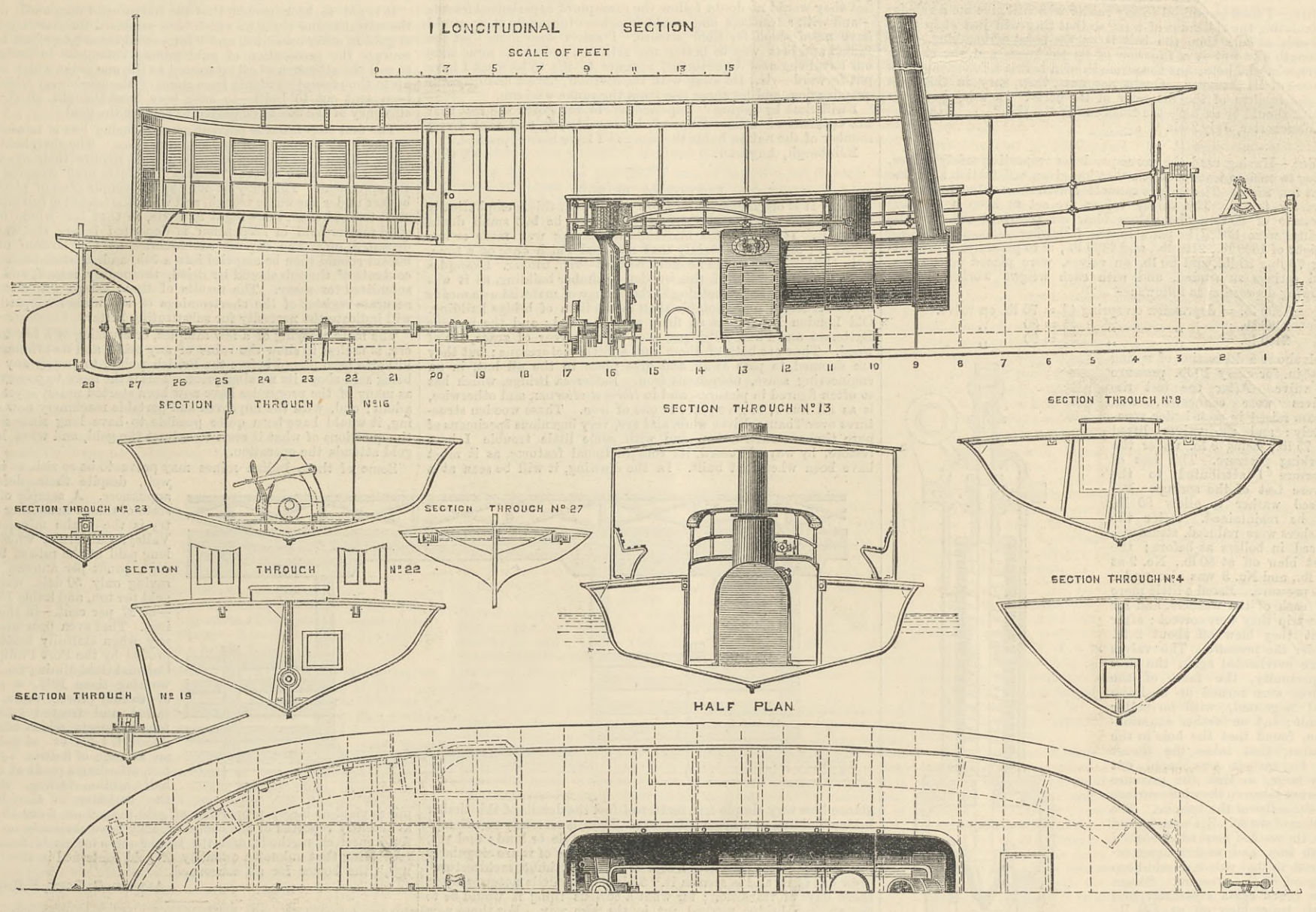


WORSSAM'S LARGE BOILING BACK.

copper boiling back is 21ft. by 20ft. by 8ft. 6in. The two coils are rather more than usually powerful, and contain about 486ft. of copper pipe 4¼in. diameter, giving a heating surface of 540 square feet.

In our impression of the 27th May, reference was made to the "skimming principle," as it is termed, by brewers, that is, the skimming of the yeast from the fermenting squares, instead of being performed by hand by means of a parachute, or allowed to take place unassisted by flowing automatically out of the fermenting vat, is done by mechanical appliances. An illustration of one form of this apparatus as fitted to a fermenting square by Messrs. G. J Worssam and Son, is given in Fig. 6. In this illustration *a* is a copper trough the whole length of one side of the square, with discharge pipe *b*, through a stuffing-box in the bottom; the height of the trough is regulated according to the depth of the beer with the screw and hand wheel as shown; *e* is a travelling carriage with wheels running on rails fixed on the top of the yeast boards; this carriage has the skimming board *d* suspended to it by two long screws, with which the height of the skimming board is regulated to suit the trough. The travelling carriage *e* is drawn backwards and forwards along the square by an endless chain, with winch fixed on yeast boards, not shown in the illustration on account of the break in the yeast boarding for the purpose of showing the internal machinery of the square. The skimming

LIGHT DRAUGHT PASSENGER STEAMER FOR TRIBUTARIES OF THE AMAZON.



board is hinged to the screw, so as to admit of the board tilting up when passing backwards over the yeast, but when being drawn forward the board is rigid. The pipes *c c* constitute an attemperator, water being admitted at *f* and passing out at *g*.

Another form of skimmer with revolving yeast board is shown in Fig. 7, as made by Messrs. Pontifex and Wood, London. In this arrangement the skimming pan is oblong in plan, and a little less in length than the radius of the fermenting round in which it is employed. It is suspended from an adjustable screwed rod which passes through a transom above the round, and the pan is provided with a plug for keeping the yeast back until it is desired to skim it off. The board, which is hinged on a vertical pin at the inner end of the pan, is pushed once or twice round the tun, and the whole of the yeast is thus swept into the pan and carried off by the pipe below, which passes through a stuffing-box in the bottom of the tun. The plug in the skimming pan bottom is raised by a small cord or chain running over a pulley, as shown.

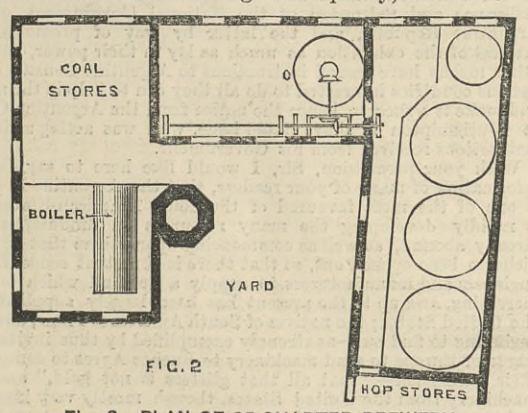


Fig. 2.—PLAN OF 35-QUARTER BREWERY.

A very generally used parachute skimmer, as made by Messrs. Pontifex and Wood, is shown at Fig. 8. Skimming with this is much more rapidly effected than when done wholly by hand, but even with this a good deal of labour is required to skim cleanly after the plug is raised. The arrangement of the apparatus and its adjustment are clearly shown in the engraving.

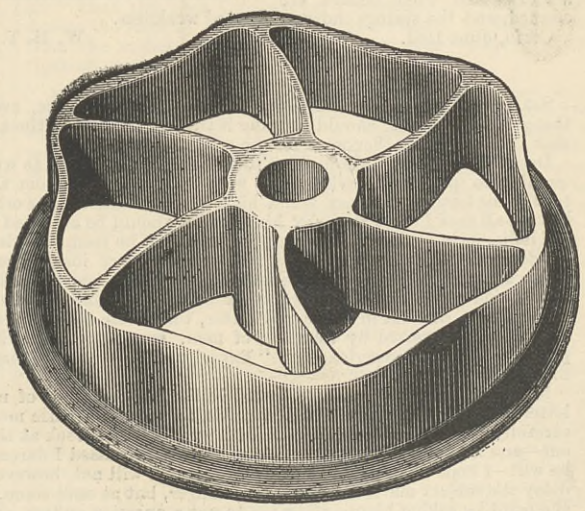
In this place we may refer to the proposal which has been made to filter worts by means of mechanical filters, before putting them into the fermenting tuns. It has been observed that worts, though bright from the washing tun, and which remain bright in boiling, always leave a deposit in cooling. Most of this deposit is found on the cooler bottom or on the refrigerator surfaces, but a good deal of the substance remains in suspension and finds its way into the fermenting tun. This substance, which might be removed by filtration, is of a viscous and strongly glutinous character; and it is assumed that when the yeast is added to the wort the vitality of some of the yeast is probably considerably diminished by the tendency which this suspended glutinous matter will have to attach itself to the yeast cells, and by coating them prevent the endosmosmic action which goes on in the process of fermentation and yeast cell growth between the fluid within the cell and that which surrounds it. Such of the yeast cells as are not sufficiently vigorous to grow in spite of this coating, succumb and fall to the bottom of the vessel. If this view is correct, and affords an explanation of the cause of deteriorated yeast and imperfect fermentation, there would seem to be good reason for removing all suspended matter from worts; and probably no filter would be better for the purpose than the filter presses now so largely used in many manufacturing industries.

LIGHT DRAUGHT SCREW STEAMER.

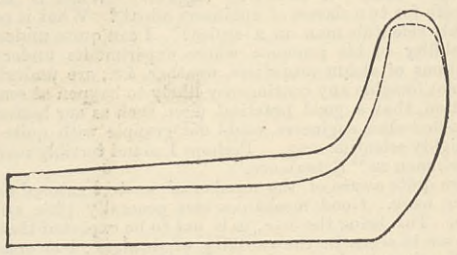
The accompanying engraving illustrates a screw steamer built and engined by Mr. Edward Hayes, of Stoney Stratford, Bucks, to the order of Mr. Alex. Mitchell, of Dundee, and specially designed for passenger traffic on the smaller tributaries of the Amazon. Length over all, 56ft. 6in.; breadth, extreme, 15ft. 10in.; ditto, on water line, 13ft. 10in.; depth amidships, 4ft. 9in.; draft, 4ft. aft., 3ft. forward. The frames, of angle iron, 1½in. by 1½in. by ¼in., spaced 24in. apart.; skin plating of steel, garboard and sheer strakes, $\frac{3}{16}$in.; rest, ⅛in. The keel, stem and stern frames, are of bar iron, and are formed throughout in two thicknesses, so as to admit of the boat being divided longitudinally in two parts, each of which is also divided in two transversely, having double frames at junction; this arrangement will greatly facilitate the shipment of boat by dividing it into four sections of moderate size. The passenger accommodation is arranged in a deck-house aft. The whole length of the boat is covered by an iron sundeck, $\frac{1}{16}$in. thick, carried on light wrought iron columns. The main deck is of teak throughout. The machinery consists of a high-pressure non-condensing engine, having an inverted cylinder 10in. diameter by 14in. stroke, supported on a cast iron frame. The feed pump is worked directly from engine. A bilge injector is fitted for clearing the bilge of water, and a donkey pump for feeding the boiler and pumping on deck. The propeller is three-bladed, of cast iron, 3ft. 7in. diameter. The boiler is of the locomotive type. The fire-grate, 2ft. 9in. and 2ft. 3in.; having fifty-seven tubes, 2in. outside by 6ft. 5in. long, to work at 70 lb. per square inch. The boat is completed, as far as possible, in every detail, so as to reduce to a minimum the work to be done in the way of putting together at Para; the construction of hull and machinery has been carried out under the superintendence of Mr. J. Pollock, 63, Great Tower-street.

STEEL CASTINGS.

All who have had any experience in producing or obtaining steel castings of rather more complex form or heavier than usual will know that a gold medal for solidity, soundness, and toughness in castings varying from a few pounds up to spur wheels weighing over six tons each is not very easily gained. The Hadfield Steel Foundry Company, Sheffield, seem, however to be particularly fortunate in their production of steel castings of various kinds, and especially of steel wheels. A gold medal has been awarded for excellence in steel castings at the Melbourne Exhibition, and especially for steel wheels for colliery and general mining and contractors' use. One of these wheels, taken from stock, was recently tested by hammering when cold with a 14 lb. sledge hammer on an anvil into the form shown by the annexed illustration, which was done without the slightest fracture, and the makers undertake that all these wheels will stand this, and that they may afterwards be put into a fire and rehammered into their proper form and be as good for work as before. One user of several thousands of small wheels of this form at work, took one that with others left upon their axles to continue



working, had run 41,000 miles, and carried about 10,000 tons of coal. The wheels being but 9in. diameter, and weighing 14 lb., had made about 96,190,000 revolutions, and after this the state of the rim was still only as shown by the dotted line in the annexed cut. These facts speak for themselves, but it is not only



with these small steel castings, but with large castings such as those above referred to that Mr. Hadfield's company seems so successful.

Shipbuilding in France and the Proposed Bounties.—In France the proposed bounty on steamships is already taking effect, but while the building of many new steamers may be anticipated, new factories are already being established, which by their competition will prevent any increased profit to existing shipbuilders. Most of the machinery for these factories is, according to Messrs. Matheson and Grant's "Engineering Trades Report," being ordered from England; the iron trade here will probably also share directly or indirectly in the supply of the material; and the vessels when completed will have to compete at low rates of freight, with British-owned ships. In America a bounty on shipbuilding, though talked of, is hardly likely to be granted, for it would be useless unless followed by heavy subsidies.

LETTERS TO THE EDITOR.

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

THE STRENGTH OF NUTS.

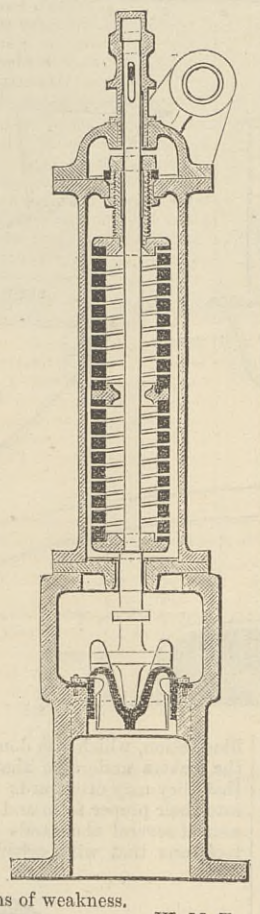
Sir,—I shall be obliged to any reader who will give me a rule for calculating the thickness of nuts, so that they will just strip their threads at the time the bolt is on the point of breaking. The strength of a nut is a function of its thickness and the circumference of the hole; but the strength of a bolt is a function of the square of its diameter. Ought not nuts, then, vary in thickness as the squares of the diameter of the bolts? In using lock nuts which should be on top—the thick one or the thin? Helix.

Manchester, July 25th.

Sir,—Having read the correspondence respecting safety valves, I beg to enclose tracing of one that has given satisfaction after the first few trials. The springs connected with these valves have been severely tested. The safety valves are set to keep a working pressure of 80 lb. The valves blow off freely at 82½ lb. The springs were tested in pairs in the following manner:—A dead weight of 1899 lb., 2168 lb., and 2439 lb., = to pressures representing 70 lb., 80 lb., and 90 lb. on valves, were placed on springs, and springs suspended, and with each weight worked freely, showing depression as follows:—

1899 lb. = depression on spring $\frac{18}{32}$ = 70 lb. on valve.
2168 lb. = ,, ,, $\frac{21}{32}$ = 80 ,,
2439 lb. = ,, ,, $\frac{24}{32}$ = 90 ,,

This shows a depression of spring of $\frac{1}{10}$in. for every 10 lb. pressure on valve. After the test the valves were connected, and steam raised in each boiler separately; and the valves lifted at 75 lb., being 5 lb. under the working pressure. This loss of pressure I attributed to the severe test of the springs. Reduced washer to allow 80 lb. to be maintained. After the washers were reduced, steam was raised in boilers as before; the first blew off at 80 lb., No. 2 at 78 lb., and No. 3 was also under the pressure. Eased a little more off each of the washers, and for one trip they were correct; after that they blew off about 2 lb. under the pressure. The valves were overhauled again the first opportunity, the faces of the valves were turned up in lathe and re-ground, with no better result; and on further examination, found that the hole in the washer, that takes the thrust of the springs, was bored out too large, so that the pressure was not taken on the whole surface of the collar of the spindle. The collars of the spindles were turned up, the washed marked A bushed with iron, and washer again reduced, so that valves should keep a good 80 lb. pressure. Steam was raised again separately, and each boiler blew off at 82½ lb. They have been working for nearly two years without any alteration, and cease blowing when the pressure has fallen about 1 lb. The valve faces are about ¼in. thick, but chamfered off to $\frac{1}{16}$in., and 5⅞in. diameter. The valves are examined when boilers are cleaned, and the springs show no signs of weakness.



Corfu, June 1881. W. M. T.

ENGINE ROOM ARTIFICERS, R.N.

Sir,—I must crave permission for a little more space, even though "Experience" should consider it the height of impertinence that I am to say another word on the subject.

Does "Experience" allow that there is any one living as well qualified to speak as himself? One would imagine not from the tone of his letter. He may stand high in the engineering world, but for all that I can't see why his doctrine should be accepted in the ludicrously humble and unquestioning spirit he seems to wish. No doubt such a being as myself must appear very insignificant when seen from the lofty eminence on which he has taken his stand, and my suggestions are of course in keeping. Let me observe here, as I did in my former letter, that those suggestions I have heard expressed by numbers of men, many of them with possibly as much experience as "Experience" himself; perhaps more.

My object in writing will be found in the first few lines of my letter, and if "Experience" will trouble to read it a little more carefully he will doubtless find it. If he will deign to look at this one—and notwithstanding the contempt he has expressed I daresay he will—I hope he will understand me better. I will not, however, delay the subject under discussion any longer, but at once come to the point by asking him to allow me to put a question or two, and if he will kindly favour me with answers I shall be much obliged, as probably a good many interested ones will be.

Referring to my proposition as being a total failure when tried on the ship Sulphur, let me ask, "Were all the conditions of the trial favourable to the end required?" I doubt it. Also, "What was the 'cause' of failure?" Again, "What is the actual necessity for two classes of engineers afloat? What is required of a highly scientific man on a cruise?" I can quite understand the desirability of his presence where experiments under different conditions of steam propellers, weather, &c., are undertaken, but I cannot imagine any contingency likely to happen at sea, in storm or action, that a good practical man, such as our better Board of Trade first-class engineers, could not grapple with quite as well as the highly scientific man. Perhaps I sound terribly revolutionary to such men as "Experience."

I am quite aware of the number of wasters entered as artificers in the navy. Good mechanics can generally pick up work on shore. This being the case, it is not to be expected that they will go to sea to serve in the capacity of drudges; but once open the way for them to rise to the responsible position, and I don't doubt the result. The U.S.N. works very well, I allow; but would it not work just as well without the division "Experience" advocates? I imagine it would. Certainly the staff could be reduced. The scientific man has his place and the practical man his; the former in our dockyards and factories designing and carrying out work, and the latter manipulating and attending that work when completed, with the exceptions I have mentioned. Once give the artificer better pay, accommodation, &c., and you bring him nearer the level with the engineers. This, to my mind, is a mistake, unless you throw down the division and let the road to the higher position be opened for him. Otherwise jealousy and illwill are sure to arise.

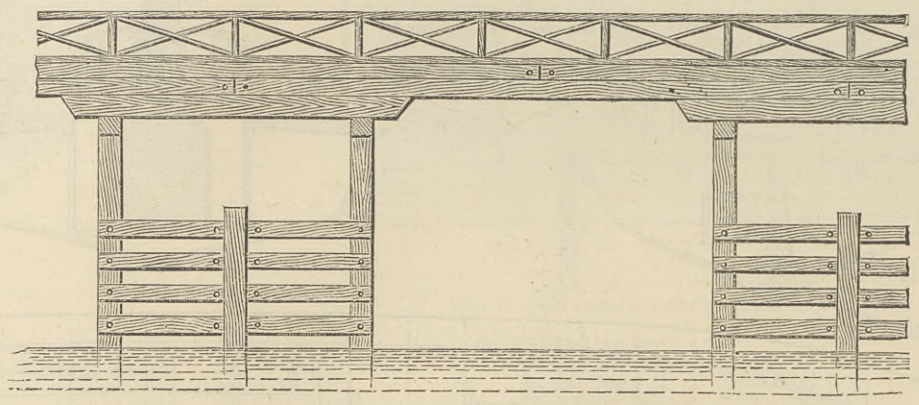
"Experience" evidently has a very low opinion of the mechanic—so have I of some—but I do know from my personal experience that there are numbers capable of qualifying themselves for a position such as engineer on board ship. I am the more convinced of this since I have been in the north. I don't think any one will question the fact of one ounce of practice being worth a pound of theory. This holds good a hundredfold in the engine-room at sea. The question may be asked, "How about our present staff?" My answer is that they can't be damaged, for if they are good practical men they are quite able to hold their own, and even if not they would no doubt follow the example of experienced friends—and with advantage one would imagine—for surely they would have more scope for their science. I assert once more that the fairest and best way to better the artificer, and at the same time our naval engineer department, appears to me to be what I have put forward—viz., Do away with the division, have a decently stiff examination, and let those rise from the ranks who can.

I will close by asking "Experience" to recognise the fact that the opinions of others "must" be considered, and that a vast number of the nation holds the same as I have here expressed.

Edinburgh, August 1. C. C.

BATTERSEA BRIDGE.

Sir,—It is often enough said now-a-days that this is emphatically the "age of iron;" and there certainly can be but small doubt about it. It is so. All materials are giving way more or less before it; and most certainly that material which once on a time, as in Gothic days, was in as much request—viz., timber. Examples there are all about us of this wooden or timber building, as it was in many ways; but in nothing is the change of material as a means of construction more notable than in the item of bridge building. Old London Bridge, as at first, was of wood; and the present Battersea and Putney Bridges, even to this year of grace, are of wood. They are both of them not a little picturesque; but they are doomed to pass away, and give place to the all but, in an engineering sense, ubiquitous iron. Battersea Bridge, which has so often figured in pictures, and in *libres studiorum*, and otherwise, is as all know, to give place to one of iron. These wooden structures over Thames River were, and are, very ingenious specimens of pure timber construction, and with some little trouble I here restore, by way of record, its constructional features, as it must have been when first built. In the drawing, it will be seen at a



glance how very simple and matter-of-fact the details of this timber bridge building of a bygone day was. There is certainly no attempt at architecture or ornamentation, of any style or kind; and yet, the simple constructional and engineering lines of it are singularly picturesque; and thus does a sort or kind of "timber architecture" grow out of it, and is seen in it. This is not a little noteworthy in these days of transition; for what a curious thing it would be to see an iron bridge worked out in the like way. For those now built over the Thames—as at Westminster, and the Blackfriars Railway Bridge—are imitations of stone constructions, and with ornamental details borrowed from a distant past. That the metal iron is taking the place of wood is certain, but when shall we see an iron architecture, as in a bridge, as we see in the past of things architectures of stone and wood? C. Bruce Allen.

GOLD LOSSES AND THE FUTURE OF THE INDIAN MINES.

Sir,—All who have investigated the subject know that, as gold mining is now conducted, the loss of gold throughout the world is enormous. As I showed in my paper before the Society of Arts, on the 19th of last January, there was then a sum of about one million pounds of British capital in gold mining shares which returned no dividend—a circumstance clearly traceable to defects in the appliances used for extracting the gold. The enumeration of a few facts will, perhaps, convince the investing public and the directors and managers of Indian gold mines, that it is not the amount of gold contained in the ore which determines its dividend-paying capacity, but the amount of gold which can be recovered from it at a reasonable cost.

Professor R. W. Raymond, in speaking of the loss occurring in the United States, says in his report to that Government, in 1875, that, "with a few exceptions, from one-third to one-fourth of the assay value of the ores now being worked, amounting to several million of dollars annually, is irretrievably lost."

Almarin B. Paul, in his "Wastage of the Precious Metals" in America, says that, from actual data obtained, he knows that the loss "is fully 50 per cent., and in the majority of mills all 60 per cent., of what the ore contains."

George J. Firmin, who has given much attention to the subject of the waste of gold in America, states in a letter to me of March 18th last, that in the Black Hills, Dakota, "they only obtain from 10 to 15 per cent. of the gold," and that the general result of his inquiries throughout the country is "that not more than 50 per cent. of the assay value is recovered on the average."

Nor are the United States singular in showing such a waste of gold. Edwin Gilpin, A.M., F.G.S., the Inspector of Mines for Nova Scotia, stated in his Departmental report for last year, that since returns have been collected which enable him to ascertain results, 19,000 tons of pyrites, containing on an average 2 oz. 4 dwts. of gold, and 4 oz. 17 dwts. of silver, with a value of £10 10s. per ton, have been thrown away; in other words, over a million of dollars has been thrown into brooks and swamps during the last eighteen years." In a letter to me in March last, he characterises this loss as due to the fact of "the chief idea being to pass as much as possible through the mill, and turn the tailings into the nearest brook."

Walter A. Skidmore, United States Deputy Mineral Surveyor and Assayer, in a recent work on gold mining and loss of mercury, gives the following "table of the losses sustained in gold mining countries:"—Piedmont, 35 per cent.; Hungary, 50 per cent.; Chili, 66 per cent.; Australia, 25 per cent.; Colorado, 40 per cent.; California, 27 per cent.

I have now lying before me a letter written in February last by F. Guinness, Warden and Resident Magistrate of the Collingwood Gold-fields, Nelson, New Zealand, in which he speaks of the melancholy fact that, through the inadequacy of the appliances and the want of knowledge how to extract the gold, the district, after repeated trials, has been deserted and gold mining abandoned—"little or no gold being obtained, yet the analyses of the quartz gave results of most hopeful returns, as much as 4½ oz. of gold to the ton having been obtained from stone which Dr. Hector and myself took out of the reef."

Let me now review some individual mines. The St. John del Rey—Brazil—Gold Mining Company's ore contains about 15 dwts. of gold per ton, of which only 10 dwts. is recovered, showing a loss of one-third—33 per cent. I am given to understand that the Brazilian Gold Company and the Santa Barbara Gold Company, both in Brazil, loses about one-third of the gold contained in their ore. The Chontales—Nicaragua—Gold Mining Company lose 57 per cent. of their gold; and W. Bell Davies, of the London School of Mines, in his report dated the 1st of March last, informs the directors that even with the adaptation of "all improvements in stamping and milling" they will still always lose 40 per cent. Yet not one of the ores worked by these companies can be called refractory; the loss of gold in each instance arises simply from defective treatment.

It is not to be expected that the Indian gold mines will escape the mistakes and blunders which have produced the startling losses of gold in other countries, and I have cited these losses, not to discourage the prosecution of gold mining enterprise in India, but to call the attention of all interested to the one point which seems, up to the present—judging from some of the machinery which has been sent out to India—to have been least thought of, viz., the efficiency of the means employed to recover the gold.

The first step towards preventing or reducing loss is to ascertain correctly what amount of loss is taking place. The shareholders in every Indian gold mining company should require their officers to make a daily assay of the "tailings" or waste mud escaping from the apparatus. This may be done by the simple plan of placing a bucket under the waste trough, and when the bucket is full of water and stamped stuff, allowing it to settle, so that the whole of the solid matter held in suspension is deposited before the water is decanted off. The deposit accumulated at the bottom of the bucket should then be emptied into a tub, and, at stated times, the contents of the tub should be dried, thoroughly mixed, and then submitted for assay. The results of these assays will afford an accurate register of the shortcomings of the means adopted, and will indicate the necessity for substituting better.

The mere assaying of a few samples, or crushing of a few tons of ore, is useless to show the value of any mine, and no evidence has hitherto been placed before the British public to justify any share being sold above its nominal price. This is the more to be regretted as many of the properties have now been started nearly a year and a-half; and, with the improved and portable machinery now existing, it would have been quite possible to have long since settled the questions of what it costs to extract the gold, and what loss of gold attends the operation.

Some of these Indian mines may prove to be so rich as to pay well, despite their defective appliances. A sample of such state of things in another country is the Idaho mine, Grass Valley, California, which has long paid at the rate of 90 per cent. profit per annum, while saving only 50 dols. worth of gold per ton, and losing 18 dols.—or 27 per cent.—in the tailings. That even poor ones will pay when skilfully treated, is proved by the Port Philip and Colonial Gold Mining Co., who, working since 1857, a period of twenty-three years, have raised and treated 1,156,071 tons of quartz, which has produced 474,484 oz. of gold, or an average of 8 dwts. 5 gr. per ton, affording a profit of nearly half a million sterling. Should the majority of the Indian mines yield no larger proportion of gold than 2 oz. from 19 tons, as recently reported of one company, they have obviously no room for imperfect methods, and the sooner some means is found for recovering that unknown quantity of gold contained in the "tailings," the better for all concerned.

Alfred G. Lock, F.R.G.S.

THE BUENOS AYRES EXHIBITION.

Sir,—In your issue of the 22nd inst., I noticed a short letter on the above subject from Senor A. Aldana, Consul of the Argentine Republic, resident at Southampton, stating that he is authorised to receive applications for space from intending exhibitors of machinery, &c. &c. The Engineer of the 15th inst. contained a similar notice from myself as the representative of the exhibition commissioners in this country, and fearing that the second notice emanating from the Argentine Consul at Southampton, whose co-operation in this matter I am glad to have the benefit of, might give rise to some misapprehension to those of your readers likely to be interested in the forthcoming exhibition, I therefore think it will be as well if in a few words I explain how the matter stands. The Buenos Ayres Exhibition then has been originated and will be carried out by a useful body or society well know at Buenos Ayres as "the Club Industrial," which has been established for some years past, and whose principal functions are to promote all that pertains to science, art, industry, and agriculture. From this institution a select number of the leading men of Buenos Ayres were chosen to promote the objects of this exhibition, and to act as commissioners of the same, they again appointing representatives in the various countries likely to be interested, I being officially appointed by them so to act for this country. The commissioners of the exhibition have also been fortunate in obtaining the assistance and patronage of the National Government of the Argentine Republic, and the latter by way of promoting the interest of the exhibition as much as lay in their power, amongst other means have issued instructions to Argentine Consuls in the various countries interested to do all they can to help in the matter and make it a success, hence the notice from the Argentine Consul at Southampton in above dated issue, who was acting strictly to instructions received from his Government.

With your permission, Sir, I would like here to say for the information of many of your readers, that the Argentine Republic is one of the most favoured of the South American States, and is rapidly developing the many resources an dindustries that already abound, as well as commencing upon others that have not hitherto been opened out, so that there is abundant scope for our engineers and manufacturers to supply a demand which is daily increasing, and up to the present has been largely supplied from the United States; the natives of South America are now, however, beginning to find out—as strongly exemplified by thus inviting the whole of Europe to send machinery to Buenos Ayres to compete at their exhibition—"that all that glitters is not gold," and that machinery from the United States, though mostly very ingenious and wonderfully cheap in first cost, is, however, very dear in the end, being generally of too light and fragile a character, and as a result often times worn out before fairly getting to work; now therefore is the time for us to be up and doing, or we shall have by-and-bye the poor satisfaction of seeing that machinery from the United States has been discarded in South America only to be replaced by that from Germany, France, or Belgium, instead of our own, for continental engineers are in several very important branches much more in favour in South America than ourselves, to which result the last Paris Exhibition, I believe, added not a little.

A complete list of prizes to British exhibitors at the recent International Exhibition at Melbourne has been placed in my hands, and it is exceedingly gratifying not only to see the mother country so largely and worthily represented at that important gathering, but also to notice the very large number of prizes accorded to British exhibitors, and I can venture to predict that any firms from this country sending out exhibits to Buenos Ayres, which shall embrace some if not all of the following qualities, viz., simplicity in design and compactness, economical in working, portability, adaptability to the required purpose as well as to the exigences of climate, and last, but not least, moderate in first cost, that they will find their endeavours rewarded, not merely by medals and other prizes of a like character, but by something far more substantial and to be desired, viz., a good and constant supply of profitable orders. John Hayes.

27, Leadenhall-street, E.C., July 27th.

RAILWAY MATTERS.

It has been announced that the Berlin-Charlottenburg Tramway Company intend to introduce electricity as the motive power on a part of its line, about two miles in length.

The tender of Messrs. Wilkes and Company, for the extensions of the North London Suburban Tramways, from Edmonton to Ponder's End, has been accepted, and the works will, we understand, be at once commenced.

Hunting cars have been placed upon the Pennsylvania Railroad. They are fitted with berths, kitchen, refrigerator, ice-chest for game, wine closet, gun closet, ammunition room, accommodation for twelve dogs, and wheels adjustable for broad or narrow gauge roads.

The total length of the St. Gothard Railway, which will connect the Swiss lines with the Italian railway system, will be 152 miles, of which fifty-nine miles, or 17 per cent. of the entire length, is represented by tunnels, fifty-nine in number. The total cost will be £6,800,000. The length of the great St. Gothard Tunnel is nine miles 468 yards—about a mile and three-quarters longer than the Mont Cenis.

On Saturday last the directors of the North-Eastern Railway Company and Mr. Tennant, general manager, visited the colliery villages between Annfield and Chester-le-Street, where it is proposed to construct a new railway for passenger traffic. The directors then proceeded to Bishop Auckland, and drove to Spennymoor, inspecting the district with a view of making a new railway between Spennymoor and Bishop Auckland.

The report of the directors of the Belfast and Northern Counties Railway shows that the miles worked by the company was 179¾, while the total train mileage was—passenger 295,922 miles, and goods 133,705 miles, and the total cost of locomotive power was £13,261 13s. 8d., including salaries, &c. This company's report is printed in a handy octavo pamphlet form, instead of the ugly unwieldy shape and character that makes one desirous of finding a waste paper basket immediately on receipt of those of some companies.

An interesting pamphlet entitled "Notes of a visit to the works of the St. Gothard Railway, from Monte Cenere, near Lake Maggiore, to the commencement of the line at Immensee Lake of Zug," has been written by Mr. C. G. Ethelston, C.E., and published by Messrs. E. and F. N. Spon. It is accompanied by two plates, plans of the north and south approach lines to the great tunnel, and although giving little information not accessible in our own pages or the Proc. Inst. Civ. Eng., the author's description of what he saw during several day's inspection of the several spiral tunnels, the great tunnel and the railways, is interesting, and the collected information is comprised in a handy form.

At the meeting of the Railway Rates Committee on the 1st inst. after the examination of Mr. Farrar, of the Board of Trade, the chairman, Mr. E. Ashley, submitted a draft report, in which the following recommendations were made:—"That the Railway Commission should be continued as a tribunal to deal with railway cases; that the classification of goods rates should be revised; that mileage rates should be separated from the terminal rates; that chambers of commerce and chambers of agriculture and other public bodies should have power to appear before the Railway Commission; and that the Commission should have power to deal with illegal charges and to give damages in cases where such charges have been proved to exist." A second report was submitted by Mr. Barclay, and in the discussion which followed a feeling was expressed against submitting any report to the House of Commons during the present session. The committee adjourned until yesterday.

According to the evidence before the committee of inquiry into the London fish supply, the Great Eastern Railway Company brought 30,124 tons of fish last year to Billinsgate; the Midland Company, 9280 tons to London; the Great Northern, 26,543 tons to Billinsgate; the London and North-Western, 8089 tons; the London, Brighton, and South Coast, 605 tons; the Great Western, 6724 tons; the London, Chatham, and Dover, 2530 tons; and the South-Eastern, 3071 tons; making a total of 86,926 tons of fish carried to Billinsgate by these railways. Mr. W. Birt, general manager of the Great Eastern Railway, said that a return up to June 30th shows that every van which entered Billinsgate was delayed, on an average, four hours at the market. Mr. Oakley, of the Great Northern, said that they allowed three and a-half hours for their vans to deliver fish in the market; but, as a rule, it took from six to seven hours, and sometimes ten. In fact, he said it took a man as long to go from King's Cross to Billinsgate with a load of fish and return as it did to convey the fish by train 200 miles through the country.

Sir James M'Garel-Hogg, chairman of the Metropolitan Board of Works, with a number of the members of that body visited the London and St. Katherine Docks on Saturday last, with the object of judging its capabilities as a site for a general market. The goods stations of various railways meet almost on the spot, and might enable the fish to be discharged there without transferring to vans. The completion of the Inner Circle Railway with a station at Tower-hill will also afford facilities for persons attending the market. The Money Bill of the Metropolitan Board of Works has passed the Commons, and has been introduced in the House of Lords. The following is the clause relating to the markets of the metropolis which was introduced on the motion of Mr. Firth:—"The Board may, as part of their general expenses, pay all costs, charges, and expenses which may be incurred by them up to the 31st day of December, 1882, of and incidental to any inquiry to be instituted with respect to markets for the sale of food supplies within the metropolis, as defined by the Metropolis Management Act, 1855, and preliminary to, in, and incidental to the preparing, applying for, and obtaining an Act of Parliament with respect to such markets or any of such markets."

On Saturday last a trial trip was made between London and Glasgow on the London and North-Western and Caledonian Railways with a couple of new first-class carriages which have been built at the London and North-Western Company's works at Wolverton. They are thus described in the *Times*:—The pair are coupled together by a covered passage, and the great feature of the new arrangement is a gangway running from end to end, into which various small compartments open. At each of the two extreme ends of the coupled carriages a compartment with four seats, available either as seats by day or as two couches at night, and with two sleeping berths to draw down above them from the roof, thus affording in conjunction with the cushioned seats below sleeping accommodation for four passengers, occupies the whole breadth of the vehicle, and has a door opening into a compartment in which an attendant is in waiting. Between the two attendants' compartments so provided—one at each end—a gangway runs, into which the doors of the intervening compartments for passengers open. The compartments are fitted up for four or six passengers each, and have similar, though somewhat modified, arrangements for providing sleeping berths by pulling forward a couch, which, when not in use, forms part of the walls of the carriage. Each of these compartments is provided with windows and doors similar to the first-class carriages in ordinary use; but on the gangway side they open into the gangway, which in turn is provided with doors and windows opposite those of the compartments, so that the view of the passenger is not intercepted and ventilation is secured. Lavatories upon approved principles are provided, and the carriages are lighted with oil gas and heated with coal gas. The great recommendation of the new coaches is that while they give to passengers much of the freedom of the Pullman car, they secure more independence by being divided into a series of small compartments for four or six passengers each. They are beautifully furnished.

NOTES AND MEMORANDA.

At equal temperatures the thermal conductivity of water, glycerine, alcohol, ether, chloroform, benzine, olive oil, citron oil, and various solutions has been found by Herr H. F. Weber to be nearly the same.

The density of mercury has been re-determined by Herr P. Volkmann, who says that the change of volume of the specific gravity bottle by expansion and by pressure when employed on heavy liquids may materially affect the results. His new determination for mercury is 13·5953.

A registering thermometer for medical purposes has been made by M. Marey, who combines the principles of the Bourdon bent tube and the ordinary thermometer. Thus the Bourdon tube acts as the thermometer tube, and registration is effected by an index attached across a chord of the bent tube.

Mr. Edison has proposed a current meter which depends upon the electrolysis of two small pieces of copper hung, in a cell containing sulphate of copper, from the ends of a delicately balanced lever. A known portion of the current is shunted through this apparatus, and as one of the immersed pieces of copper grows less and the other heavier, the beam tips, moves an index, reverses the current, and the exchange of copper recommences.

From a parliamentary return just issued it appears that the amount of sugar consumed in breweries for the year ending September 30th, 1880, was as follows:—England, London, 47,306,196 lb.; the provinces, 95,311,808 lb.; Scotland, 963,249 lb.; Ireland, 4,325,693 lb.; making a total for the United Kingdom of 147,906,146 lb. In 1856 the total consumption in the United Kingdom was only 1,790,529 lb. The whole amount consumed in the twenty-five years from 1856 to 1880 inclusive was 1,108,244,178 lb.

A fine, brilliant, elastic dressing for leather, can be made as follows: To 3 lb. of boiling water add, with continual stirring, a half pound of white wax, an ounce of transparent glue, two ounces of gum senegal, one and a-half ounces white soap, and two ounces of brown candy. Finally, add two and a-half ounces of alcohol, and, after the whole is cooled, three ounces of fine Frankfort black. The dressing is thinly applied to the leather with a soft brush, and after it is dried it is rubbed with a piece of fine pumice stone and polished with a stiff brush.

A correspondent of the American *World* at Mexico reports the discovery of a new Aztec calendar stone, by Captain Eavans, under a dilapidated Indian hut, which stood on the place that once formed the favourite garden of the Texocan "Poet Prince" Netzahualcoyotl. It is a stone slab, 8ft. by 6ft., covered with hieroglyphs, and near the centre of it is a clearly cut calendar—similar to the "Aztec Calendar stone" which is now in the cathedral in the city of Mexico. The stone is to go to the Mexican National Museum. Further excavations are to be made on the same site.

Prof. S. P. Langley has made the following calculation:—A sunbeam one square centimetre in section is found in the clear sky of the Alleghany Mountains to bring to the earth in one minute enough heat to warm one gramme of water by 1 deg. C. It would therefore, if concentrated upon a film of water $\frac{1}{100}$th of a millmetre thick, one millimetre wide, and ten millimetres long, raise it 83⅓ deg. in one second, provided all the heat could be maintained. And since the specific heat of platinum is only 0·0032, a strip of platinum of the same dimensions would, on a similar supposition, be heated in one second to 2603 deg. C.—a temperature sufficient to melt it!

To illustrate the demand for stationery, it is mentioned in the catalogue of the recent printing exhibition, that in 1878 the number of letters, post cards, printed books and circulars, newspapers, &c., delivered through the various post offices in Europe amounted to 5,285,000,000; through the post offices in America, 1,243,500,000; through the post offices in Asia, 169,500,000; through the post offices in Australia, 75,000,000; and through the post offices in Africa, 3,400,000. The averages per head for the population of the world were 3·3 (letters and post-cards) and 1·5 (printed matter). In Great Britain the combined averages were 45 3.

Since the abolition of the paper duty, no statistics giving quantities or value of paper manufactured in this country have been obtainable. Some idea, however, may be gathered from the imports and exports registered by the Board of Trade Returns. In 1879, the value of the stationery articles of British manufacture exported was £2,993,828, and of foreign goods re-exported £223,309. The value of the imports during the same period was £3,377,481. There are 354 paper mills at present at work in the country, employing over 560 paper making machines, and about 16,000 persons. It is estimated that the quantity of paper of different kinds manufactured in the country must exceed 300,000,000 lb. in weight.

The heat in Naples—according to the correspondent of the *Times*, writing July 25th—is, or was then, unusually intense. For several days, he writes, it has been 96 deg. Fah. in the shade. "In 1793," says the *Roma*, "the heat was intenser than ever recorded. The thermometer stood at 100. The spring had been cold, and in June fires were found necessary. The present season has been very similar. We have entered 'Leone' only two or three days, and probably we are doomed to suffer the same heat for another month." "Among the years celebrated for their great heat," says *Roma*, "were 1793, 1822, 1832, and 1842; and 1881 will take its place among them." True it does not last long here, but we seem to be able to stand 96 deg. as well as the Italians, after all.

According to the *Bulletin de la Société Industrielle de Mulhouse*, Hallauer's recent experiments have led him to the conclusion that the difference between engines of one and two cylinders, in point of economy, is very slight. In ranging from 80 to 8000 horse-power, with revolutions varying from 25 to 90 per minute, the expenditure of steam for a given amount of work remains the same for the same type of motor; the consumptions for two cylinder motors are identical for Woolf and compound, whatever may be the volumes of the cylinders, provided the motors are regulated so as to give the maximum efficiency; the expenditures of steam in motors of one, two and three cylinders, suitably regulated and constructed, are so nearly alike that the choice may be governed in each instance merely by the fitness of the type of the engine for the particular purpose desired.

Water glass may be prepared by melting together in a crucible powdered quartz or quartz sand and carbonate of soda. Usually a small quantity of charcoal is introduced, but if the materials used are free from metallic oxides and compounds this is unnecessary. Fine infusorial earth is nearly pure silica and makes excellent water glass. Where quartz or sand is employed it is reduced by grinding together with the calcined soda to a powder, the whole of which will pass through an eighty-mesh wire-gauze sieve. The following are the usual proportions in which the materials are mixed: (1) Clear quartz, 45 parts; carbonate of soda, calcined, 23 parts; charcoal, 3 parts. Or (2) Quartz sand, 100 parts; calcined soda, 48 parts; charcoal, 5 parts. Or (3) Quartz sand, purified, 65 parts; anhydrous carbonate of soda, 34 parts; powdered charcoal, 4 parts. The ingredients, thoroughly mixed, are put into clay pots and gradually heated to bright redness; carbonic acid and oxide escape and the mass gradually becomes liquefied. When effervescence ceases and fusion is complete, the contents of the pots are poured out on clean stone slabs to cool. Cold water scarcely dissolves it at all, but if broken into small pieces and boiled in soft water it gradually dissolves. If the boiling is continued some time and a sufficient quantity of glass is added, a clear sirupy liquid or a nearly colourless jelly, according to circumstances, is obtained. These solutions may be diluted with hot water. The solution containing about 30 per cent. of the glass is most used.

MISCELLANEA.

Messrs. Kennedy Brothers have discovered a large and valuable vein of hematite iron ore at Dallon-in-Furness.

The opening of the Paris International Electrical Exhibition, which has been postponed, takes place on Thursday, the 11th of August inst.

We have received from M. L. Poillon, of 158, Boulevard Montparnasse, Paris, a pamphlet on the Greindl system of centrifugal pump in particular, and containing a great deal of information on the theory of centrifugal pumps in general.

A company of some of the best business men and capitalists of Cincinnati has, the *American Manufacturer* says, been organised under the name of the American Iridium Company, with a subscribed capital of 240,000 dols., for buying, manufacturing, and selling iridium.

A fine masonry arch, carrying the Washington water supply aqueduct over the Cabin John Creek, has a span of 220ft., and is 101ft. in height. It was built in 1853-63, thus being delayed by the civil war. It is not stated who designed it, but General Montgomery C. Meigs was the engineer-in-charge. This must be the largest masonry span in the world.

The death rate in Paris during the hot period of last month from the 15th to the 21st inst., rose 50 per cent. The average number of deaths per day in the French capital varies from 112 to 125. During the heat it rose to 192. There has been no epidemic, but 500 people died in Paris that week who would have survived if the temperature had been normal.

Northallerton is looking to the village of Kepwick, situated at the foot of the lofty range of hills about seven miles to the east of Northallerton, for a supply of water. A stream of water springs from the hill at this place, and an examination of the surrounding ground has been recently made to ascertain if a suitable site for a storage reservoir exists, and whether the supply would be sufficient.

A new iron screw steamer, the Thetford, has been launched from the yard of Messrs. R. Thompson and Son, Southwick, of the following dimensions:—Length, 240ft.; breadth, 34ft.; and 17ft. depth of hold. She has been constructed under Lloyd's survey to class 100 A1, she has a long quarter deck, with short full poop containing cabin. The main, bridge, poop and forecastle decks, together with masts, and chart and wheel house are all built of iron. She will be engined by Mr. George Clark, Southwick, with engines of 130 nominal horse-power.

We learn that Mr. David Brown, of the Chapel Hill Pattern Works, Huddersfield, has recently added to his plant of model or pattern-making machinery, a massive new wheel-cutting and dividing engine, constructed with every recent refinement, and weighing upwards of 4 tons. The dividing wheel is 7ft. 3in. in diameter, and has been divided by a Whitworth's standard. It is noticeable that amongst the cog-wheel patterns, mostly made by Mr. Brown, the semicircular top and bottom tooth, so largely used by the great Rennie for dock and other cranes, is again coming largely into use, especially for steam cranes. The tooth is enormously strong.

The Plynlimon scheme for supplying Aberystwyth with water has been almost completed. The 16 miles of pipes have been laid, and the lake on the mountain has been tapped 14ft. below the surface. The Mayor and other members of the corporation were present. The lake is upward of 11 acres in extent, and the water is among the purest in the United Kingdom. The works have been carried out by Mr. Stooke, and the total cost will only be about £16,000. The works have been carried out for the amounts estimated for. This scheme puts an end to an agitation that has disturbed Aberystwyth for upwards of a quarter of a century. The supply of water is practically unlimited.

At a meeting at Yarm, on the 27th ult., held to consider the prevention of floods, it was stated that the erection of embankment walls for the reclamation of land and deepening the channel by Stockton and Middlesbrough had increased the floods above Stockton Bridge. At the meeting it was resolved—(1) "That the damage by future floods at Yarm can only be lessened by the Tees Conservancy Commissioners shortening the river at Preston and Thornaby, in the same way as was done at Mandale and Portrack." (2) "That the Tees Conservancy Commissioners be requested to dredge the river at the Yarm Bridges, remove all silted material from the arches, and repair all damage done to the property of riparian owners above Stockton Bridge."

A material, called carbolineum, is being largely used in Germany, and to some extent in this country, as a preservative of woodwork, ropes, &c. It is an oil, apparently a petroleum, containing, among other things, about 10 per cent. of carbolic acid and other antiseptic ingredients, and being nearly as liquid as water, is easily applied. It sinks into the wood, and hardens it to some extent, but does not close the pores. It seems to be very effective as a preservative of wood for outdoor use, for wood buried in the ground as posts, or wood constantly wet, or wetted and dried. It is much used on German railways for sleepers, sheds, bridges, and fences, and would be useful to farmers for preserving the woodwork of agricultural implements, among other things.

At a meeting of the Hull Waterworks Committee on the 29th ult., a report was presented by the waterworks engineer on the water supply. The consumption during the previous fortnight amounted to 83,210,290 gallons, and was the highest on record. Owing to the small rainfall and the continued dry weather, with an increased consumption, the water had fallen below the usual level, and unless there was a rainfall within the next few months, there was great danger of the supply falling short. During the discussion it was stated there was a great waste of water by the public, and if they were warned the consumption might be materially lessened. New bores are being put down in connection with the waterworks at Springhead, and the engineer was authorised to see the contractor with a view to accelerating the completion of the work.

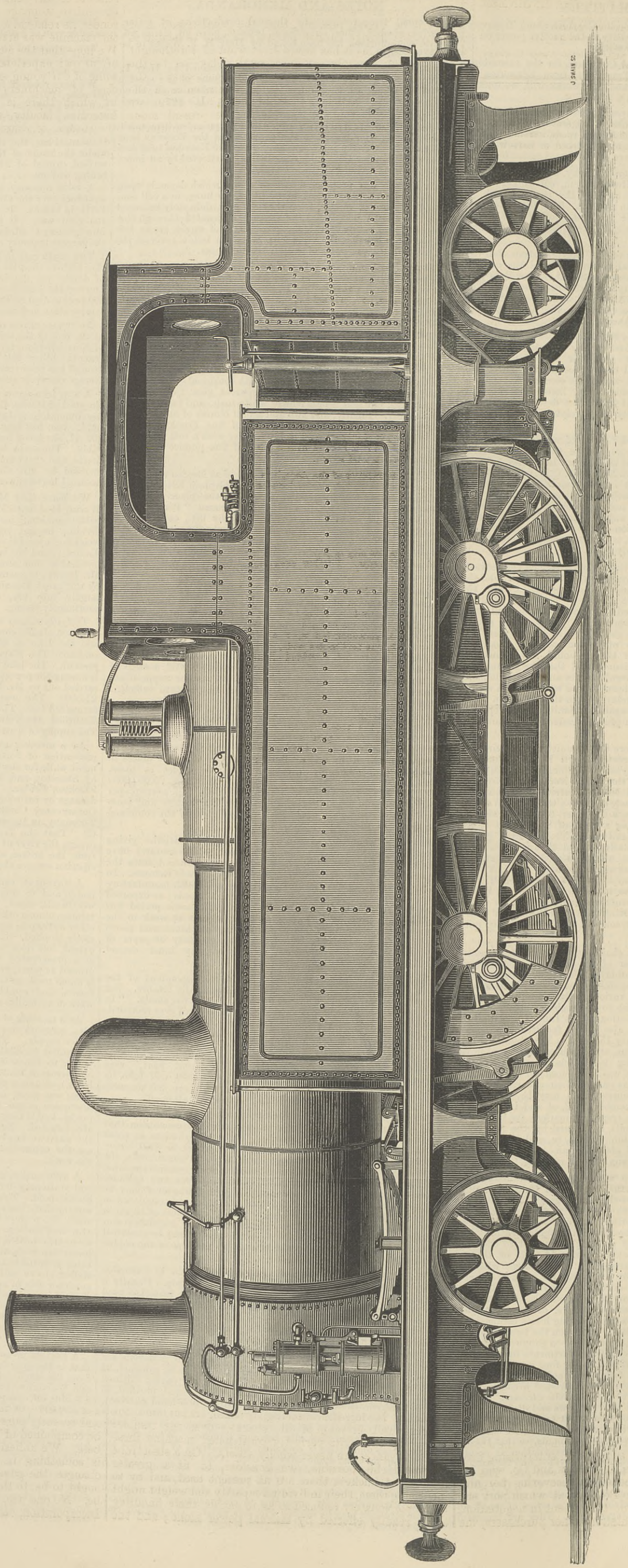
A new torsion governor has been designed for use with marine and stationary land engines, by Mr. E. A. Bourry, C.E., St. Gall, Switzerland. The stationary engine governor really consists of an intermediate motion having as main features two pulleys on one shaft, the pulleys being connected by the intervention of cranked arms and springs. One pulley receives the motor power, and the other transmits it to the machinery to be driven. The springs and levers are thus affected in accordance with the amount of work being transmitted, and as the crank arms, &c., are connected by a sliding sleeve and lever to the steam engine or other motor, the governor acts in anticipation of the engine. As applied to a screw shaft it is modified, but the principle is the same, the two ends of the springs and bell-crank levers being held by discs or arms at a part of the shafting where a coupling would usually be fixed. The arrangement gives great facility for the attachment of indexes, showing the power being used and the fluctuations therein.

A return issued by the American Consul in Birmingham shows that in the quarter just ended the exports to the United States from Birmingham and the neighbourhood, Redditch, Kidderminster, and Wolverhampton, amounted to rather over £190,000. This is a falling off, compared with the corresponding quarter of last year, of £80,000. Of this quarter's total £160,000 is from Birmingham alone, and this is a decrease of £73,000 upon last year. The decline has been chiefly in iron and hardwares, buttons, chains, and hoes, &c. There has been an increase in anvils and vices, chemicals and phosphorus, guns and materials, sheathing metals, pens, saddlery, and sundries; and Wolverhampton has done a largely increased business with the States in hardwares. From Birmingham, hardware and cutlery, steel and iron, was sent to the value of £47,057; anvils and vices, £7075; chains, hoes, and scythes, £15,689; metal for sheathing, £4925; and guns and materials, £41,548. The hardware sent from Wolverhampton totalled £11,899.

TANK LOCOMOTIVE.—DUTCH RHENISH RAILWAY.

MESSRS. SHARP, STEWART AND CO., MANCHESTER, ENGINEERS.

(For description see page 101.)



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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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*** *All letters intended for insertion in* The Engineer, *or containing questions, must be accompanied by the name and address of the writer, not necessarily for publication, but as a proof of good faith. No notice whatever will be taken of anonymous communications.*

R. L. K.—*L. Poillon,* 158, *Boulevarde Montparnasse, Paris.*

G. H. R. (Coventry).—*The circumference of a circle one mile in diameter is* 16,587·6480*ft., and of a circle one mile and one and a-half feet,* 16,592·3604*ft.*

T. R.—*Write to the Secretary of the Institution of Mechanical Engineers,* 10, *Victoria-chambers, Victoria-street, Westminster, S.W., from whom you will obtain all the information you require.*

A. O.—*The arrangement you propose might be employed on small paddle steamers, but in these the difference in draught is not of sufficient importance to make it desirable to lower or raise the wheels. For large vessels it could not be adapted at all, for a large quantity of the straining work of the engines would be thrown on to the sides of the ship instead of taken off, which is the usual desire. The use of gear would alone preclude its use, but the side disc panel would meet with serious objection; and, moreover, engines for large ships could not be made economically subservient to the design. The difference of immersion due to load only is seldom a matter of much importance.*

Balance Weight.—*You show the fly-wheel as* 4*ft. radius to exterior circumference, while the balance weight is shown as within the inner circumference of the rim. In any case you must take the distance of crank pins and weights connected thereto not as the full crank radius of* 1*ft., but as the distance from crank shaft centre to the centre of a chord line connecting the two crank pins, and suppose the whole weight to be balanced to be resident there. This distance in your case will be about* 8½*in.—you must set it out for yourself—and with a weight of* 8 *cwt. here the balance weight will have to be* $8 \div \frac{\text{radius to centre of balance weight in inches}}{8\frac{1}{2}}$

HEATING BY HOT AIR.

(*To the Editor of The Engineer.*)

Sir,—Will any of your readers kindly tell me how I can learn the principle of heating by hot air, as best applied to private houses?

Gisburne, July 31st. G. C. L. C.

SACK AND BAG MAKING MACHINERY.

(*To the Editor of The Engineer*)

Sir,—Kindly allow us to ask through your correspondence columns the address of makers of machinery for the manufacture of bags and sacks.

Stockton, July 29th. W. and M.

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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.*

DEATH.

On the 3rd July, at Cawnpore, N.W. Provinces, India, William Coulthurst Gibbons, Assoc. M. Inst. C.E., of Gibbes, Barbadoes, and Ingleside, Beckenham, Kent, aged 28 years.

THE ENGINEER.

AUGUST 5, 1881.

DREDGING PLANT.

Not long since we called attention to the defects most patent in the class of machines used for dredging. Our attention has recently again been prominently drawn to this subject by the delay, and consequent wasteful expenditure, which have arisen in the dredging operations within the newly-constructed breakwater at Colombo, in the island of Ceylon. The history of the machine there employed has been rather an eventful one. She was sent out from Europe, we believe, by the Dutch Government for operations at Batavia, and while on her voyage out she suffered shipwreck in the harbour so celebrated for similar disasters, Galle, in Ceylon. At first considered to be a total wreck, she was purchased as such by an enterprising firm of Colombo merchants, Messrs. Leechman and Co, who, by a moderate expenditure, succeeded in recovering her, and fitting her for the voyage to Bombay, at which port she was fully refitted. After some time spent in negotiation, she proved a fortunate speculation to her purchasers, she having been bought by the Ceylon Government for the work we have above referred to.

It will be urged, possibly, that the total cessation of work by this dredge cannot properly be said to be due to defective design, as it has arisen from want of forethought—or we may possibly say, accidental delay—as to the supply of the many pieces of spare gearing necessary to the efficient working of a dredge; but in pursuance of the criticism of our article of September 12th, 1879, we would point out that it is due to the present mode of construction of dredging machines that an unlimited supply of spare gearing becomes a matter of such great importance. Perhaps no more cumbrous form of excavator could be devised than the bucket chain fitted to most dredgers in use. Every part of it is subject to the highest degree of frictional wear, under conditions which render that wear more than ordinarily fatal to longevity. The droppings of sand or other detritus from the buckets work into every joint and every bolt hole, and the grinding process soon ends in their destruction. Now the mere failure of a single bolt, it may be said, is not in itself a serious matter; but it must be borne in mind that directly a bolt on one side or the other of the bucket chain gives way, there are only the faced ends of the rollers to prevent the chain, with its heavy load of buckets—filled perhaps to the very cutting lips with ponderous clay—being swung altogether off the ladder. As it requires some little time to signal to the engine-room and stop the machinery, the broken chain is dragged upwards, so that its sound side mounts the roller faces in the same way that a driving band, when slipped on the edge of the drum, seeks its central periphery. Hence the chances are greatly in favour of the chain altogether leaving the ladder and hanging suspended, with its full loaded weight, from the upper and lower tumblers only. Practical dredger engineers know what this means, and the delay that rigging of tackle, &c., for rehoisting the chain into position on the ladder causes in such cases. Further, it is often experienced that the shock of the massive chain leaving the ladder rollers parts the bolt which secures the sound side of it, and then there is a rush, and *presto*, the whole chain and load are at the bottom of the water. It is all very well to say that the latter accident is not of common occurrence. We admit that, fortunately, it is not so, but it is within our own experience, in a case where a dredge furnished for harbour deepening was delivered in rather a worn condition, that fully half the time during which she was kept on the work was taken up by the delay and repairs arising from the fracture of the shackles and their bolts. Now, what do such delays mean in machines of this kind? It is not merely that their crews are to a great extent idle, but the flotilla of barges attendant for the removal of dredged material, which are maintained at far greater cost than the dredge itself, are for the time thrown entirely out of employment. In the case of the Colombo dredge, these fatalities, which appear to have been unprovided against, must have cost the colony a large sum. It would not be possible to dismiss the crews of the mud boats during every temporary delay, and even when it became necessary to cease work altogether pending the arrival of a supply of bolts and shackles, the dismissal of a body of men whom it might be exceedingly difficult to collect again would be a course of impolicy and expense. We do not here propose to inquire as to upon whom the responsibility rests for the non-supply of spare gear. It is only our object to take for our text the imperfections which the failures we have referred to indicate as being inherent in the design of this and of most of our dredging machines.

We have named above only the bolts as liable to give rise by their failure to serious and expensive detention; but the case is far worse, as a rule, when the shoes or shackles to which the mud buckets are rivetted give way. It is the practice to countersink the former so that the rivet heads holding the buckets may be finished off flush with the shoe, and so enable the latter to travel smoothly—if anything in a dredge can be said to travel smoothly—over the ladder rollers. Presuming one of these shoes to break, the bucket is entirely disabled, and must be removed. The weight of this is by no means a trifle, and the chain has to be clamped before its removal can be attempted. It is no light work to effect this latter operation, and quite as heavy to place a spare one in its room. Then it often occurs that the chain has slipped somewhat, and screw gear or tackle has to be brought into play to bring the disjointed ends sufficiently close to admit of the new bucket being shackled in. These are some of the causes of detention which arise from such apparently minor matters as the wear of portions of the ladder gear of ninety-nine out of every hundred dredgers in use. How long will it be before they are obviated by more rational machines? We remarked in our former article that fully 60 per cent. of the engine power of a dredger is expended in overcoming friction; such friction, besides, being most unsatisfactorily developed in bringing about the destruction of the machine and enhancing the costliness of its working. It does not seem to us impossible that steel wire rope might usefully supersede the present chain of shackles bolted together, and the one great element of frictional cause—the sloping ladder—often working comparatively horizontally, be superseded by a perfectly upright lift to the overhead discharge. To insure the efficient working of some such system, it would only be necessary to devise a mode of lengthening or shortening the rope to adapt it to the depth of water worked in; and without pretending to have thought some such plan fully out, it does not appear to us to present any great difficulties. If our idea could be realised, away might go the cumbrous ladder, the creaking, groaning chain, and the banging and slipping of the shackles over the tumbler faces. In the most perfectly constructed machine these last annoyances are never wholly absent. On a steel rope it would be possible, we consider, to fit a greater number of buckets than are at present used, and by so increasing them, their individual capacity and weight might be proportionately reduced so as to enable their handling to be readily effected by manual power alone; and the renewal of any single one would not be a matter entailing the entire stoppage of work, as its small capacity would render its removal a point of unconcern until the action of the machine was arrested for some more important reason. We hope that the suggestions we have made, as the result of our own experience with dredging machines, may induce some of our young engineers to turn their attention to this class of machinery and its improvement. It is a field in which there is wide scope for the exercise of the inventive faculty, and they may be quite sure that the design of improvements which shall bring the 60 per cent. loss of power down to some 20 or 25 will be gladly adopted by dredger builders.

OLIGARCHICAL GOVERNMENT IN TECHNICAL INSTITUTIONS.

If any future historian should set himself the task of depicting our times for the benefit of posterity, and, taking a lesson from Macaulay, should chronicle the conditions under which our great national industries arose and developed themselves, he surely would have a few words to say as to our technical institutions. These are certainly a striking feature of what has been called the "Iron Age." We have our Institution of Civil Engineers, established in 1818; our Institute of Mechanical Engineers, dating from 1835; and the Iron and Steel Institute, which was originated in 1869. These three institutions are all of a distinctly technical character. They deal with applied rather than with pure science; with practical observation and experience rather than with speculative investigations which, though possibly of importance as regards the future, cannot be shown to bear upon the present. They are, or aim to be, national, as distinct from local institutions; and they even deserve to some extent to be considered cosmopolitan. We are of course aware that there are other institutions which are also technical and also national; such as the Institute of Naval Architects, the Society of Telegraph Engineers, and others. But inasmuch as these deal each with one speciality only, they are not of the same interest to engineers generally, and therefore we pass them by. There are also in London, and in the provinces, other technical institutions which are ready to receive papers on any engineering subject whatever, and in that sense may be considered general rather than special in character. But neither do we propose to allude at greater length to these, because as yet they are in the public estimation local rather than national centres of activity.

Our immediate object is to draw attention to the form of government adopted by the three principal technical institutions, and to point out with a view to future remedial action certain defects which are of more importance than is likely at first sight to be apparent, and which may otherwise cause serious trouble some day. The constitution adopted in these, and indeed in all societies having their origin in a combination of equally qualified persons for a common yet specific purpose, is essentially democratic. It is a government of the people by the people and for the people; the people in this particular case being the members who constitute the association. The fundamental principle of the body corporate is equality; equality in qualification required, equality in obligations to be fulfilled, equality in rights and in benefits receivable. This is the theoretical basis of all modern combinations. If conceivably it were ever attempted to found a society wherein privileges were to be accorded to any members which were not equally accessible in like circumstances to each and all, that society would not be likely to command support.

But all associations of individuals must have laws, and officers appointed to administer them, or their efforts could not be steadily concentrated in the desired direction. A committee or council must be appointed to work on the lines laid down by common consent of the members, and recorded in their rules. The principle of representation is here the only one applicable, and if adopted and acted upon heartily and thoroughly, in spirit as well as in letter, it can leave no reasonable ground for discontent. We say reasonable, because unreasonable discontent can obviously never be foreseen nor avoided. But inasmuch as such discontent proceeds from eccentricity on the part of occasional individuals only, it can never gain extended sympathy, and may safely be left to its fate.

It is not, however, always easy to decide at first sight whether discontent on the part of one or a few members, as to acts of administration by the officers, is reasonable or not. In order to test the soundness of questions raised, the officers and the malcontents ought equally to be able to refer back to the first principles of their constitution as we have attempted to lay them down. The officers should in every such case be in a position to reply; "We have administered the laws which were made by the body of the members according to the obvious intention in the minds of their authors when they were made." If they could always conscientiously and truthfully so reply to the dissatisfied, then the latter could have no case should they allege maladministration. But if it should appear that the officers, whilst sticking to the letter, had departed from the obvious spirit of the laws, and from the intention of the framers thereof, then in our opinion the malcontents could not be put down as unreasonable, nor their complaints as unjustifiable. And if it should further appear that the departure on the part of the officers from the spirit of the laws should have the effect of practically altering the constitution of the association from a democratic to an oligarchical form, then we think we should not be exceeding our duty if we characterised such departure as unwise and reprehensible. Let us first consider the case of the Institution of Civil Engineers, and ask ourselves whether there is anything in the policy now and recently pursued by the council which may reasonably be complained of by any important section of the members. We unhesitatingly reply in the affirmative. There is something in the policy adopted which practically changes the government from the democratic, which it ought to be, to the oligarchic form, which it ought not to be. No one who has ever carefully perused the Charter of Incorporation, can fail to be struck by the honest fairness

which is the prevalent spirit thereof. It is clearly intended that the government shall be truly representative—in other words, that all the members shall have equal electoral rights. But unfortunately it is specified in one place that elections for the Council shall take place at a general meeting, and at another, that all questions submitted to any meeting shall be decided by a majority of votes of those present at that meeting. Now, by putting together these two separate detail instructions, and by acting upon them as if they were one, the Council of the Institution has in our opinion virtually converted the constitution from the democratic form, which it was intended to be, to the oligarchic, which it was not. The working of the electoral machinery is thus:—Retirements take place properly and according to rule. Re-nomination and new nominations are made in an equally unobjectionable way, and voting papers are sent round to the members. But when these are duly filled up, and sent in at the appointed general meeting, none are allowed to count unless personally presented by the voter. As the general meetings for this purpose have always been held in London, the practical effect has been that all the members who reside at any considerable distance from London are practically disfranchised. The whole of the voting for members of Council thus falls into the hands of the small proportion of members who happen to reside in or about London. There is, we believe, nothing in the Charter to prevent the general meeting from being held in provincial towns, a step which would obviously give a preponderance of voting power for the time being to residents in any such town selected. This, however, would rather tend to encourage a mischievous partisanship than otherwise, and to direct the attention of members from the only wise and legitimate object entertainable, viz., to put the right men in the right place. The only cure for the evil is to cease to follow the highly-strained, though perhaps literal interpretation of the law, and to look henceforth rather at the spirit of it; for, so regarded, it is the very essence of liberality, equality, and fairness. If it be necessary to alter the wording of the Charter, by all means let it be altered. If it be necessary to give it up and adopt the limited company constitution, as the Institution of Mechanical Engineers have lately done with so much advantage, let that course be adopted. But whatever is done, let not the Institution continue to consolidate itself into an oligarchy. Let not the great mass of members all over the country, and all over the world, feel that they are disfranchised by a quibble, as it were, and for no fault of their own. Let not the non-residents, who constitute the chief strength of the Institution, and who really make the difference between a national Institution and a mere metropolitan club, continue to feel that they can only take part in electing the officers who dispose of their money and who manage their affairs, provided they submit to a fine every time they vote equal to the cost of a journey to London and back.

The wisdom of deciding all questions brought before Institution meetings by a majority of votes of those present only is obvious in all cases except elections for the Council. The reason clearly is that those questions may admit of discussion, and should not be voted on by those who, by absence, have not heard what may have been said on both sides. But Council elections do not admit of discussion at the time. The qualifications of the nominees cannot be suitably discussed openly on the night of election. That is a case where each member should have made up his mind on receipt of his nomination list, and should without discussion make his selection and send in his voting paper. In fact, so clear is the reason for personal votes only in ordinary cases, and so manifestly absent is that clear reason in the case of voting for the Council, that we are forced to the conclusion that the inclusion of the latter case must have been an oversight on the part of the originators of the Charter. Or if it was not an oversight, it must have arisen from the circumstance that when it was drawn up the non-residents were few and far between, and there being neither railways nor penny post, any voting by them would have been out of the question.

Of the Institution of Mechanical Engineers we do not propose here to say anything further than that their constitution, as recently modified, is absolutely democratic in form; and, as at present administered, is truly representative and all that can be desired. We wish we could say the same of the Iron and Steel Institute. Here there is no defect of written law, as might reasonably be urged with regard to the Charter of the Institution of Civil Engineers. The rules of the Iron and Steel Institute relating to the election of members of Council are almost identical with those of the Institution of Mechanical Engineers. But the two Councils administer what are virtually identical rules in so different a way that in the one case the democratic principle is maintained, and in the other case it is lost.

Let us briefly consider the electoral rules of these two Institutions, so far as regards Members of Council, and their operations respectively. In both cases there are fifteen Members of Council, five of whom retire annually and may be re-elected. In both cases the Council may fill up any vacancies which may occur during their year of office. In the Institution of Mechanical Engineers such occasional appointments last only until the next general meeting. In the Iron and Steel Institute there is no such limitation. In both cases a voting list containing nominations by the Council, and possibly others by ordinary members, are ordered to be forwarded to the members in time for them to vote and return before the general meeting. Now, as to the difference in practice. The Council of the Institution of Mechanical Engineers duly send round their voting list. They present not only the names of those retiring Councilmen who are again willing to be put in nomination, but they also add a few new names, the total nominations amounting to several more than the vacancies, so as to give the members a choice. Other names may be added by the members, but it is well understood that except in case of an elaborate outside combination no one not nominated by the Council has a chance of being elected. The above is a fair and satisfactory mode of carrying out the rule, and secures the gradual admission into the Council of those who are considered most deserving of the honour by the members; and, what is not less important, it secures the gradual retirement of those in whom the members may have ceased to have confidence. The point to be kept well in view is that the whole of the members may equally take part in elections, and so feel that those who are elected are their representatives, and not the representatives of London only, as is the case of the Institution of Civil Engineers; nor of a still smaller number of of constituents, as we shall show is the case with the Iron and Steel Institute. The way in which the Council of the latter Institution works has latterly been thus: If a vacancy occurs it is, of course, known to the Council during same year of office; and it is an easy matter to fill it up without an election under the provisions of the casual vacancy clause. That being done, there is, of course, never any vacancy! There being no vacancy, and the Council not caring to nominate any more than the retiring members, there is, we suppose, in their opinion, no need for a contest, or even an election. At any rate, they have latterly sent round no voting list of any kind, notwithstanding that they are thereby distinctly infringing the rules. Casual vacancies have occasionally been announced as having occurred, and in the same breath as having been filled up by the Council. Certainly for some years the members have not been troubled to exercise their electoral rights, although the rules seem to provide carefully that it shall be the duty of the Council to see that this be done annually.

Let it not be supposed that in the case of either of these Institutions we are objecting in any sense or degree to the eminent men who administer their affairs, nor to any of their nominations. If they were all dismissed, and we were invited to select others, we might probably re-elect the same men. It is not the men who have been so placed on the Council, but the mode of appointment we condemn. This has laid them open to the imputation that they are not *bonâ fide* representatives of the members, as they ought to be, but, on the other hand, merely nominees of the rest of the Council, which keeps all in its own hands like a happy family. And even if it could be clearly shown that there had been always a total absence of favouritism in these appointments, still a reasonable suspicion might dwell in the minds of members, which is not a healthy feeling to be permitted to grow up. The words of warning we are giving may by some be considered superfluous, or, at all events, inopportune. It may be argued that at present all seems quiet among the rank and file of these technical institutions, and that the Councils are composed of really able men who maintain their popularity with the members. We say nothing to the contrary. We simply urge that that is not the question at issue. We claim we have shown that, however good the Councils and Council men may be, they cannot be said in two of the institutions under notice to represent the members generally who pay the income, who own the accumulated funds, and who constitute the body corporate. "Peace" is sometimes ejaculated when really there is no peace, or when it is destined sooner or later to be broken. We have recently witnessed at least two serious convulsions which did not subside until great changes had been effected. We refer to that which ended in locating the Mechanical Engineers in London, and that which gave birth to the class of Associate Members at the Great George-street Institution. If once the general body of members perceive they are denied their rights, they may again rouse themselves into a state of activity which will not subside until a corresponding effect has been produced. What is wanted is altogether to abolish oligarchy and paternalism, of howsoever benevolent a character, in the government of our technical institutions. Give the members their full democratic rights, and equal privileges in return for their equal responsibilities. This ought to be done and done quickly, and all the better if initiated quietly by existing Councils, and not left for discontent and revolution to accomplish amid stormy proceedings, which may be amusing to outsiders, but are surely humiliating to all immediately concerned.

WAGES SLIDING SCALES.

The modern method of adjusting wages in the coal and iron trades by a sliding scale, whose working is regulated by the prices obtained for the commodity on which the labour is expended, is getting steadily into wider adoption. Among the most recent applicants that it may be applied in their case, are the colliers of South Yorkshire. It is already working well amongst those in Yorkshire West. And though notice has been given for the expiry five months hence of the scale which applies to the blast furnacemen of Cleveland, and the miners of that district and Durham, the notice should be regarded as seeking only an alteration in the basis of the scale, and must not be looked upon as a protest against the system. Indeed, it has just been declared by a conference of the operatives concerned, that the system has worked advantageously to the men. And it is gratifying that on the same occasion a protest was entered against "the action of agitators," who were advising resistance to the 2½ per cent. reduction last declared. With no less firmness the method is being worked out in the finished iron branches. The boards at Darlington and Wolverhampton appear soundly established. If in the latter centre there is more need of funds than in the former, insufficient breadth of representation is perhaps the cause; but this, it is fair to conclude, will be removed, as the result of the appeal which the employers and operatives' secretaries are this week respectively making to the members of the iron trade in Lancashire, Cheshire, Derbyshire, and South Yorkshire, whose wages arrangements are all regulated by the proceedings of the Wolverhampton Board.

THE LONDON WATER SUPPLY.

Considerable attention has been again directed to the London water supply question, chiefly by the local shortness of water for a few hours during the recent hot days, and the Government have been led to promise legislation on the subject next session. No opportunity is lost by those who imagine all the evils of an imperfect water supply are to be removed by its removal from the water companies, or by those who think everything is to be made right by going a long way off for a new source of supply; but it is somewhat reassuring to find that the unreasoning sentimental condemnation of the existing source of supply is not now so influentially urged as it was some time ago. The Local Government Board has provided itself with the means of forming an accurate judgment of the quality of the water supplied, and the simple fact that a little sewage or sewage effluent finds its way into the Thames, will not in future be of itself taken as condemnatory of the Thames water, but its real effect will be considered. If the very minute quantity of sewage is entirely lost by oxidation and precipitation in the enormous bulk of the rivers' waters, and careful analyses fail to detect any deletereous constituents, any albuminoid ammonia, then there can be no reason for going beyond the Thames Valley for water for a big city in the Thames basin. It is satisfactory to notice that all the analyses of Thames water are more than ever in its favour, and it is further satisfactory to find that a disposition is evident to acknowledge that however good the water supplied by the London companies' mains may be, the bad water, where that is to be found, is made bad by its storage in dirty house cisterns. There are thousands of these never cleared out. Many are awkwardly situated, and only a small proportion of the tenants, of the smaller houses especially, have either time or disposition to attend to these water polluting boxes, these relics of a bad and wasteful system of supply, a system which would be gladly discarded by water companies if they had power to enforce the adoption of good water fittings.

THE SOLENT TUNNEL.

The connection of the Isle of Wight with the main land by railway is again directing attention to the proposals for a tunnel under the Solent. A tunnel was proposed and designed many years ago by the late Mr. Vignoles, but a more suitably placed tunnel designed with reference to existing railways and probable extensions has been now for several years placed before the public by Mr. Hamilton Fulton, and last year he prepared elaborate surveys, plans, sections, and Parliamentary notices for an application for an Act for the construction of a railway from Southampton to the Isle of Wight, with a Solent tunnel from the mainland at Lepe, near Beaulieu, to Cowes. From the investigations made by Mr. Fulton, as referred to by us on previous occasions, the undertaking would appear to be practicable, and its completion would accelerate the journey by one hour and a-half between London and Ventnor, bringing London within two and a-quarter hours of Cowes, and obviating the necessity of change of carriage. An important point, moreover, is that it would obviate to a great extent the collisions of vessels in the Solent which so often occur, and would facilitate the present traffic. From a letter by Mr. Thomas Price to the *Times*, it seems that some of the influential shareholders of the Didcot and South-Western Companies are said to be strongly in favour of the undertaking, and it is most probable that the Great Western Railway Company would take a great many passengers from the west who now stay away or go elsewhere, because of the crossing by boat. The scheme is one which should command attention.

LITERATURE.

Sewage Disposal. Ten years' experience in works of Intermittent Downward Filtration, separately, and in conjunction with Surface Irrigation; with notes on the practice and results of Sewage Farming. By J. Bailey Denton. London: E. and F. N. Spon. 1881.

This may be said to be chiefly a defence of that system of sewage disposal with which the author's name is identified; but it is also a general description of what has been done at the several places whereat intermittent downward filtration has been adopted, together with rules to be observed when adopting that mode of sewage disposal, and notes upon experiences and results of sewage farming. As much abuse has, perhaps, been heaped upon this system as upon any of the others which have been prominently placed before the public during the past fifteen years, but it seems very difficult to get at that part of the story which lies between the two sides. Mr. Denton has told his side of the story, and his opponents have told theirs, and another story has been told by those who have written on sewage disposal generally, without any evident partiality for any particular system. The latter version is not, however, satisfactory, as in most cases the evidence seems to have been obtained more or less at second hand, as to some of the chief facts which modify one of or, perhaps, the most important objection to sewage disposal by intermittent downward filtration, namely, the cost. In some cases, that which Mr. Denton has to tell under this head, tends to the conclusion that that system is not necessarily in itself expensive, or more expensive than surface irrigation. It is impossible, however, to read his book without feeling that he might have told more of the actual details of the working of the system—at Merthyr Tydvil for instance. We mention that town because it has been customary to look upon the system as there exemplified; and although some of the circumstances under which it was there carried out were extremely unfavourable from a financial point of view, Mr. Denton might have said more in reply to certain allegations as to its want of complete success in a sanitary sense, For instance, he might have been expected to have told us. in a book professing to give the results of ten years' experience, the character of the effluent water in the year 1880 instead of giving only the analysis of 1871. From this it is impossible to form any conclusion as to the effects on the filtering areas of long-continued use, and it is left to detractors to continue the assertion that the effluent is not as good as it should be, and that consequently the sewage of only 500 people instead of 1000 can be applied per acre; or that the character of the effluent is greatly affected by the large quantity of subsoil water of the Taff Valley, and that without this the effluent would be bad. From Mr. Denton's own statements it does not appear that the sewage of 1000 people is regularly applied per acre to the intermittent filtration area, although it is stated by Dr. Dyke, the medical officer of the district of Merthyr, that occasionally the 20 filtration acres had to receive the sewage of about 40,000 inhabitants for three or more weeks together. The character or quality of the effluent at such times is not stated; but it may be inferred

that the system is deemed to be in successful operation by the authorities of Merthyr, Aberdare, Mountain Ash, and Treharris, as they have arranged to deal with the sewage of the combined populations, about 100,000, on an area of 212 acres, which includes the 75 acres upon which the Merthyr sewage disposal was previously effected. We are not told what proportion of this is to be prepared as intermittent filtration beds, though it is left to be inferred that a considerable proportion will be so prepared, as 212 acres is so much less for a population of 100,000 than the 375 acres originally actually secured by the Merthyr authorities for 50,000, and such a quantity could only be treated on such an area by the filtration process. Mr. Denton explains that the high cost per head of population of the Merthyr sewage works, is due chiefly to the purchase, with a view to sewage disposal by irrigation, of 300 acres of land, about ten miles from Merthyr, which, it seems, have never been used for sewage disposal; for the 75 acres near Merthyr were found to be sufficient after the filtration system had been tried. Why this 300 acres, ten miles away, should still saddle the paying 75 acres, it seems difficult to understand; for, if it is not wanted, surely Merthyr could let or sell it to those to whom it would be of use, and thus remove, or at least reduce, this burden. If, on the other hand, this land already pays something, Mr. Denton's objection does not seem to hold good.

Besides Merthyr Tydvil, the sewage disposal works of Kendal, Abingdon, Forfar, Great Malvern, Halstead, Barnsley, Hitchin, and Oakham, and works on a small scale at Earlsdon and Radford, are briefly described, and the results of working given. In most places the land obtained for filtration areas has been of a most suitable character; but at Hitchin the land employed is said to consist for the most part of peat mixed, where shallow, with gravel, sand, and clunch, and the sewage is very highly diluted with surface and subsoil water. The effluent is, however, satisfactory; but 22 acres has to be employed for the population of 8000, yet of course much must be allowed in this case for the very unsuitable character of peat, some of which is too boggy for filtration. Kendal, again, possesses 66 acres of land purchased at a cost of £13,000, out of the total outlay for land of £16,371, which have never been used for sewage disposal. The cost per head, or in the pound, for sewage disposal at most of the places where the system is adopted, is given by Mr. Denton, as we gather from different parts of the book, as follows;—Kendal, population about 13,500, filtration only, 4d. in the pound, but would be, the author says, reduced to 1½d. if the cost of the 66 acres were excluded; Merthyr, filtration and irrigation, cost, not given; Abingdon, population 6000, filtration and irrigation, farm pays 2⅝ per cent. on outlay; Great Malvern, population 4000, filtration and irrigation, farm will pay 2 per cent. when £5 per acre is obtained from it; Hitchin, population 8000, filtration and irrigation cost 3d. in the pound; Halstead, population 6000—filtration and irrigation—farm will pay 2 per cent. when £5 per acre is obtained from it. It does not appear when the income from the Halstead and Great Malvern farms is likely to reach that amount, but it certainly is not a very high return, though those who maintain that vegetation and filtration do not go well together, may think it not realisable. Forfar, population 12,500—filtration and irrigation—farm returns a profit. Barnsley, population 25,000—filtration and irrigation—cost not given. Thus under some and favourable circumstances filtration farms may be made to dispose of the sewage at no cost to a small town. It is not clear that the farming on a very large scale required for large towns could be conducted with similar success. Mr. Denton may at least be said to show that high cost does not belong to the system itself any more than it does to irrigation; that the two systems may be successfully worked together, if not on a very large scale, still up to 100,000 population; and that a much smaller area of land may be employed than when irrigation only is employed.

It is quite clear that intermittent downward filtration areas need to be carefully prepared, and the subsequent operations and farming must be carefully carried out. It is often urged that the sewage has to be applied in too great a quantity to permit the growth of crops, but it is, nevertheless, clear that if sufficient care is taken, crops may be grown on wide ridges with properly kept furrows. This involves constant care in removing the thin solidified sludge coating from the furrows to the ridges at intervals and digging the sludge in when the crop is off; but there is nothing gained without trouble in these matters, and if it becomes profitable to ratepayers to pay for a small farm on the intermittent downward filtration system or that system, combined with irrigation, instead of irrigation only on a large one, then the care and trouble must be taken. It must not be supposed that the filtration areas can go on filtering sewage indefinitely with equal efficiency, nor can we agree with Mr. Denton's opinion or hypothesis that the effect of filtration is to increase the porosity of the filtering soil, because the perishable organic substances from the sewage decay and leave the spaces they occupied, while the solid particles, being chiefly fine silicious sand, remain to act as efficient filtering material. This may be true, but the decomposed organic remains or the semi-fluid particles would not find their way into the earth were there not already interstices for them to go into, and these last must, therefore, be gradually filled up with finer particles than were there before, and so on, until the bed would be impermeable. This system, however, provides against that for a long time by the aëration which the sludge film gets when broken up and laid on the ridge, so that the organic remains are wholly oxidised and removed, and by the digging or ploughing up by which the fine sand is worked in with the coarser earth, which may, of course, be from time to time aided by coarser material. Those who object to intermittent downward filtration very commonly argue against it as they would against some highly organised mechanical and chemical filter needing delicate attention, and only competent to operate upon comparatively pure water. It is, however, clear that there is a wide difference between an intermittent downward filtration area drained 6ft. or 7ft. below surface and a filter proper of any kind. There have not been many books brought out recently on sewage disposal, and though it is now several months since that we are writing on was published, it will no doubt afford food for thought and opposition to a good many. It is useful as emanating from one who represents a system holding an important place amongst the best systems, and no doubt will be widely read.

The pages are fortunately furnished with side notes, or it would be somewhat difficult of reference, as the index is bad.

Practical Blow-pipe Assaying. By George Attwood. 8vo. London. 1880. Sampson, Low and Marston.

In this volume the author records the methods of assaying adopted by himself during a lengthened period of foreign travel, for the benefit of investigators who may have similar work to do when at a distance from completely equipped laboratories or assay offices. The processes recorded are essentially those of Plattner's quantitative blow-pipe assaying, and the illustrations, which are numerous and carefully executed, represent the best forms of apparatus as developed by the skill of the Freiberg instrument makers under the supervision of Plattner and his successors. Besides these we have additions made by the author, including fine and coarse balances, a modification of Plattner's charcoal holder, and several varieties of retorts and condensers for the quantitative assay of mercury ores. These latter have already formed the subject of a communication by the author to the Chemical Society. This application in practice is described in detail in Part III., which is the best section of the volume, containing a full account of the assay of gold and silver ores, the use of Harkort's scale for measuring metallic globules which are so small that they cannot be weighed with certainty, and other accessories required for this peculiar branch of blow-pipe investigation. Amongst these processes we are glad to see that of scorification prominently noticed. It is exceedingly useful, and may be made more so if practiced exactly in the same way as on the large scale, namely, by casting the softened and enriched lead, instead of breaking up the scorifier when cold, as recommended by the author. The mould in this case may be the top of the flatting anvil. The author's mercury assay methods appear to be simple and practical, and thanks are also due to him for the notice of Domeyko's method of detecting small traces of this metal. We do not, however, find any notice of the most delicate of all mercury condensers—a water cooled gold surface, which is now used both in assaying and testing the waste furnace gases in the quicksilver works of the Austrian Alps.

In the section on qualitative determination, the promise made in the preface of laying down methods for the direct determination of each one of the sixty-five elements is very imperfectly fulfilled; and it is scarcely possible that it could have been otherwise, considering that the author has compressed his matter into about fifty not very closely printed pages—a space quite insufficient for even a superficial treatment of the subject. Considerable laxity is also shown in the handling of numerical quantities, and more particularly in the departure from units in common use without sufficient notice being given. Thus, the chemical equivalents given are those of the old notation, and the assay tables for gold and silver ores are computed for avoirdupois instead of troy ounces, changes which should have been more distinctly mentioned in the text than has been done.

The volume will be useful, as presenting quantitative blow-pipe methods in a convenient form; and to this extent it may be recommended as supplementary to such works as those of Brush and Landauer, which are confined to qualitative determinations.

ACHILLE DELESSE.

The death of this distinguished man must be recorded. An interesting *résumé* of his labours by M. Daubree has appeared, from which we take the following facts. After a training in his native town at the Lyceum of Metz, which furnished so many scholars to the Polytechnic school, Delesse was admitted at the age of twenty to this school. In 1839 he left to enter the Corps des Mines. From the beginning of his career the student engineer applied himself with ardour to the sciences to which he was to devote his entire existence. The journeys which he undertook then, and continued later, in France, Germany, Poland, England, and Ireland, helped to confirm and develop the bent of his mind. He soon arrived at important scientific results, and was rewarded, in 1845, by having conferred to him by the University the course of mineralogy and geology in the Faculty at Besançon, where Delesse at the same time fulfilled the duties of Engineer of Mines. Five years later he returned to Paris, where he continued his university duties, at first as deputy of the course of geology at the Sorbonne, then as master of the conferences at the Superior Normal School. Besides this, he continued his profession of Engineer of Mines as inspector of the roads of Paris. The first original researches of the young *savant* concern pure mineralogy; he studied a certain number of species, of which the chemical nature was yet uncertain or altogether unknown, and his name was appended to one of the species which he defined. He studied also, and with success, the interesting modifications called pseudomorphism—the mode of association of minerals, as well as their magnetic properties. The attributes of a practical mineralogist aided him greatly in the culture of a branch of geology to which Delesse has rendered eminent services, in the recognition of rocks of igneous origin and of others allied to them. He studied in the field, as well as by investigations in the laboratory, for fifteen years, with an intelligent and indefatigable perseverance, and, aided by the results of hundreds of analyses, eruptive masses of the most varied kind, the knowledge derived from which threw light upon the principles of science, from granites and syenites to melaphyres and basalts. After thirty years of study and progress, other *savants*, without differing from him, progressed further in the intimate knowledge of rocks; but the historian of science will not forget that Delesse was the precursor of this order of research. His studies of metamorphism will long do him honour. The mineralogical modifications which the eruptive rocks have undergone in the mass are the permanent witnesses which attracted all his attention. The chemical comparison of the metamorphic with the normal rock pointed out distinctly the nature of the substances acquired or lost. One of the principal results of these analyses has been to lessen the importance attributed until then to heat alone, and to show in more than one case the intervention of thermal sources and of other emanations from below, to which the eruptive rocks have simply opened up tracks.

It is not only upon subjects relating to the history of rocks that Delesse has touched. Witness his work on the infiltration of water, as well as his volume relating to the materials of construction, published on the occasion of the Exhibition of 1855. The nature of the deposits which operate continually at the bottom of the sea offers points of interest which well repay the labour of the geologist. He finds there, indeed, a precious field to be compared with stratified deposits; for in spite of the enormous depth to which they form a part of continents, they are of analogous origin. Delesse laboriously studied the products of the innumerable soundings taken in most of the seas. He arranged the results in a work which has become classical with the beautiful atlas of submarine drawings which accompany it. Though he never slackened in his own especial work, he made much of the work of others. The "Revue des Progres de la Géologie," with which he enriched the "Annales des Mines" for twenty years would have been sufficient to engross the time of a less active scientific man, and one less ready to grasp the opening of a discovery. This indefatigable theorist never neglected the applications of science—the nature and the changes of the layers which form the under earth; the course and the depth of the subterraneous sheets of water; the mineralogical composition of the earth's vegetation, were represented by him on several charts and plans drawn out in proper form. His maps which follow the route of many of the great French lines of railway explain the kind of soil upon which they are laid, and are of daily use. In the pursuit of his numerous scientific works, Delesse never failed in discharging his duties in the Corps des Mines. Having in 1864 quitted the service of the Government of Paris, which he had occupied for eighteen years, he was made Professor of Agriculture, of Drainage, and Irrigation, at the School of Mines, where he established instruction in these before being called to found the course of geology at the Agricultural Institution. Promoted to be Inspector-General of Mines in 1878, and charged with the division of the south-east of France, he preserved to the end of his life these new duties, for which, to the regret of the School of Mines, he gave up his excellent lessons there. During the year of 1870 Delesse fulfilled his duties as a citizen, as engineer in preparation of cartridges in the departments.

His nomination to the Academy of Sciences, which took place on the 6th of January, 1879, satisfied the ambition of his life. He was for two years President of the Central Commission of the Geographical Society; he was also President of the Geological Society. He was not long to enjoy the noble position acquired by his intelligence and his work. He suffered from a serious malady, which, however, did not weaken his intellect, and he continued from his bed of suffering to prepare the reports for the Council-General of Mines, and that which recently he addressed to the Academy on the occasion of his election. The greatness and the rectitude of mind of Delesse, his astounding power of work, his profound knowledge of science, his sympathetic sweetness, which were associated with sterling modesty and loyalty of character, made him esteemed and cherished throughout his whole career. He died on the 24th of March.

TENDERS.

BREWERY AT DERBY.

For the erection of a new 40-quarter brewery at Derby for Messrs. Stretton Bros. Messrs. Scamell and Colyer, Engineers, 18, Great George-street, Westminster, S.W. Quantities by Messrs. R. L. Curtis and Sons.

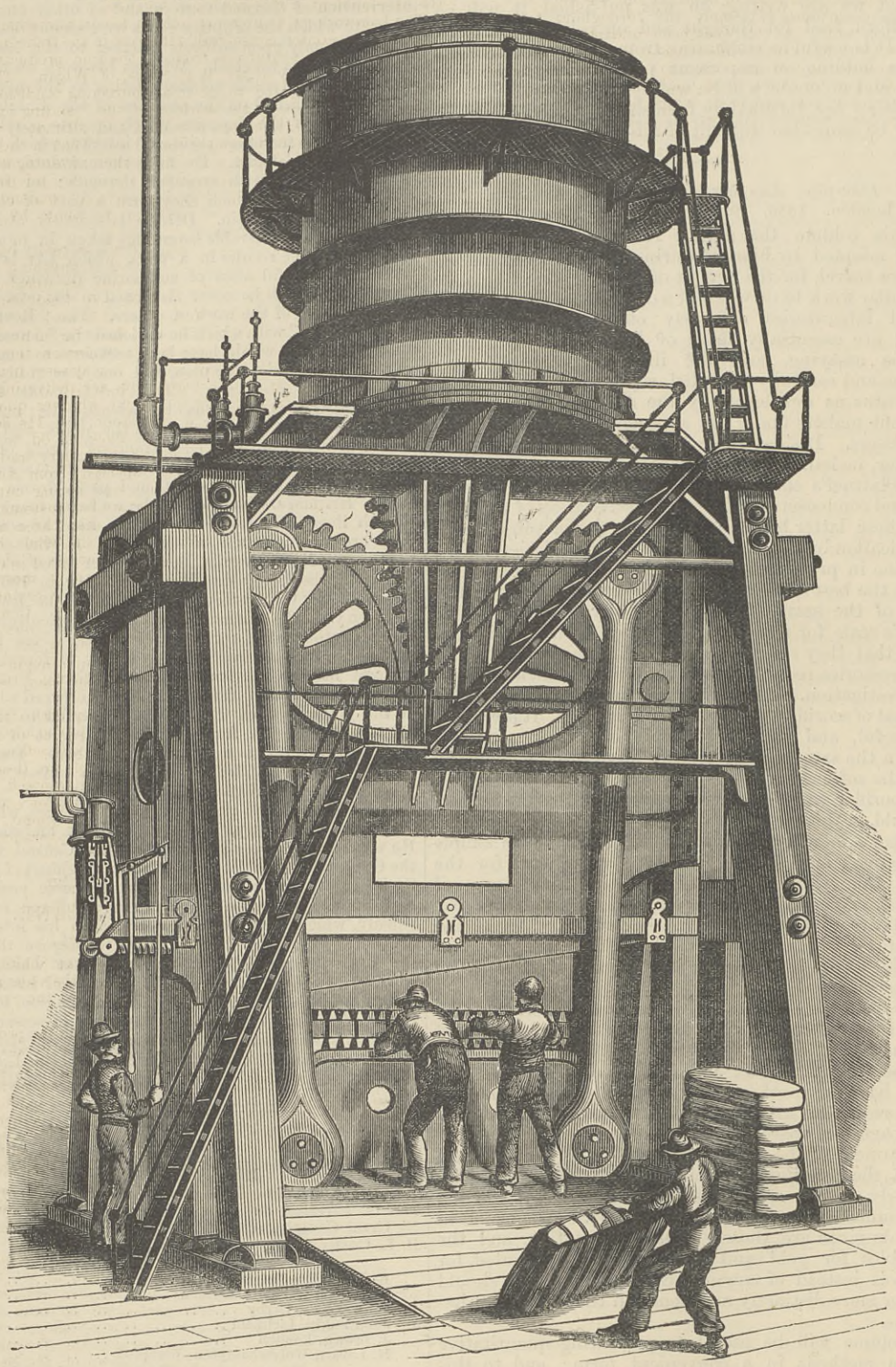
	£	s.	d.
Contract No. 1.—Building.			
Kirk and Randall, Woolwich	6928	0	0
Grimwood and Sons, London	6378	0	0
John Woods, Derby	6246	0	0
John Dakin, Lichfield	6222	0	0
J. Brown, London	6200	0	0
H. Lovatt, Wolverhampton—accepted	5845	0	0
Contract No. 2.—Girders and Columns.			
Morewood and Co., Birmingham	1730	0	0
Piggott and Co., Birmingham	1600	0	0
Horseley Iron Company, Tipton	1585	0	0
Handyside and Co., Derby	1465	0	0
Thornewill & Warham, Burton and Derby—accepted	1325	0	0
Contract No. 3.—Boilers.			
Hill and Sons, Heywood	925	0	0
Thornewill and Warham, Burton and Derby	775	0	0
J. Walley, Derby	772	0	0
Thos. Piggott and Co., Birmingham—accepted	760	0	0
Contract No. 4.—Millwrights.			
J. Bennett, London	2765	0	0
Wilson and Co., Frome	2600	0	0
H. Woods and Co., Manchester	2460	0	0
Wm. Abell, Derby	2300	0	0
Thornewill and Warham, Burton and Derby	2297	0	0
Contract No. 5.—Coppers and Underback.			
Shears and Sons, London	891	0	0
Blundell Bros., London	850	0	0
J. Bennett, London	823	0	0
J. Smith, Derby	780	0	0
Bindley and Briggs, Burton-on-Trent—accepted	735	0	0
Contract No. 6.—Backmakers Work.			
J. Colyer and Co., London	569	0	0
J. Bennett, London	542	0	0
Church and Co., London	373	0	0
Oxley and Co., Frome	360	0	0
Wilson, Frome—accepted	359	0	0
Contract No. 7.—Slate Backs.			
J. Brindley and Co., London	145	0	0
J. and J. Sharp, London	140	0	0
Braby, London	134	0	0
Stirling, London	130	0	0
Ashton and Green, London—accepted	102	0	0
Contract No. 8.—Pipe Connections, &c.			
Wilson and Co., Frome	1196	0	0
Morton and Co., Burton-on-Trent	972	0	0
Blundell Bros., London	955	0	0
J. Smith, Derby	925	0	0
Thornewill and Warham, Burton and Derby	910	0	0
Bindley and Briggs, Burton-on-Trent—accepted	900	0	0
Contract No. 9.—Refrigerators.			
Lawrence and Co., London—accepted	166	5	6

LOCOMOTIVE FOR THE DUTCH RHENISH RAILWAY.

In our impression for July 22nd we gave a section of a double-ended tank locomotive, one of several built for the Dutch Rhenish Railway, by Messrs. Sharp, Stewart, and Co., of Manchester. We now give on page 108 an elevation of this engine taken from a photograph. We have nothing to add to what we have already said concerning it.

The Chesterfield and Derbyshire Institute of Mining, Civil, and Mechanical Engineers will hold a meeting at Derby on Saturday, 13th August, 1881. Three papers are down for reading, and the members will also visit the Midland Railway Company's Works and the Derby China Works.

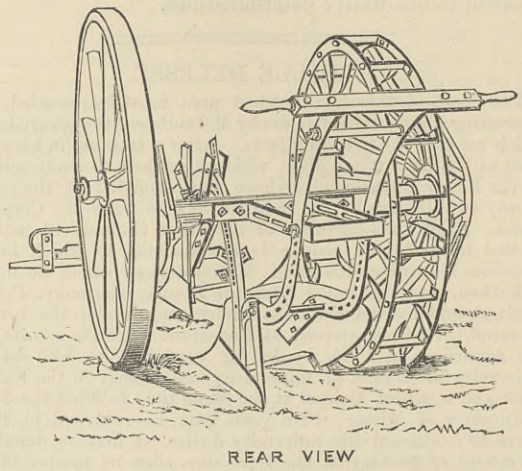
THE MORSE COTTON BALING PRESS.



The large cotton baling press, which we illustrate above, is known as the Morse "Compress," and is being introduced into this country by Messrs. John H. Ladd and Co., of 19, Queen Victoria-street, E.C. It will be seen that the lower part of the press is the moving part, and receives its motion from a pair of quadrants, to which it is connected by two pairs of huge eye rods. The quadrants have a cycloidal pitch line, and receive their motion from a rack, the teeth of which are on a curved pitch line. By this arrangement the greatest power is exerted as the compression is increased, and this is augmented by the fact that the connected rods have the greatest range of motion for equal amounts of compression just as the compression is completed. The toothed rack is attached to a steam piston in a cylinder, 90in. in diameter, and the total pressure on the bale is calculated to reach from 4,000,000 lb. to 5,000,000 lb. The strength may be inferred from the weight of some of the main parts :—Cylinder, 250 cwt.; sectors, 196 cwt. each ; lower platen, 366 cwt.; upper platen or beam, 517 cwt.; four eye bars, 89 cwt. each ; piston rod with rack, 129 cwt. The pins are 14¼in. in diameter, and, with the eye bars, made of the best hammered iron. Though very big the press is simple, and seems to accomplish a very great quantity of work, the writer of a testimonial stating that the Jefferson Metropolitan Compress Company pressed 407 bales in five hours. About 44 lb. per cubic foot, or denser than fine pine, is about the average density to which cotton bales are apparently pressed with it, though a density much higher than this has been effected. The value of such presses to cotton shippers may thus be easily understood. The press is complete in itself, except, of course, as respects the boiler necessary to supply steam, and there does not seem to be much or anything in it to get out of order.

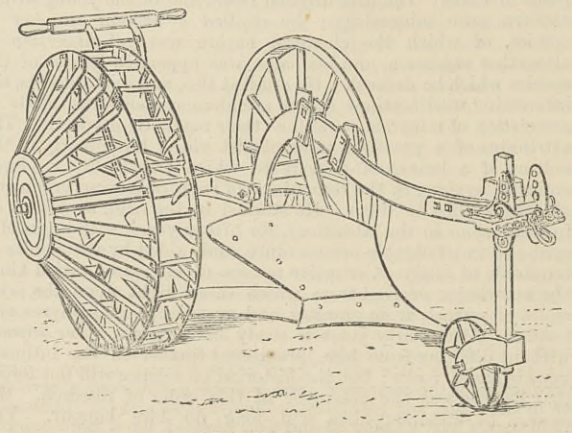
COMBINED PLOUGH AND CLOD BREAKER.

The implement illustrated by the annexed engravings has been designed by Mr. C. E. Sackett, of the Matilda Furnaces, Mount Union, Pa., and the *American Manufacturer*, from which we reproduce it, seems to think the combination a very important one. For a few purposes it may undoubtedly be useful, but it is questionable whether two separate implements would not any time be much better. It is seldom advantageous to combine implements made to carry out two distinct processes when that combination involves any complication, or when the disarrangement or want of repair of one part involves the standing still of the other. The idea here conveyed may not, however, be wholly useless. The plough is fitted with a skim coulter for the usual purpose. and the implement generally is thus described :—"It consists of a complete iron beam plough adapted in all respects to the uses of a common beam plough, and differing but little from one, This is combined with an axle, crossing it at right angles, and carrying, on one end, the harrowing wheel or pulveriser, which runs in the furrow last opened right alongside the mouldboard and receives the earth from it for pulverisation. On the other end of the axle is a common wheel, or land wheel, of the same



REAR VIEW

size as the pulverising wheel. These two wheels, with a forward gauge wheel, operating on a sliding post, constitute the running



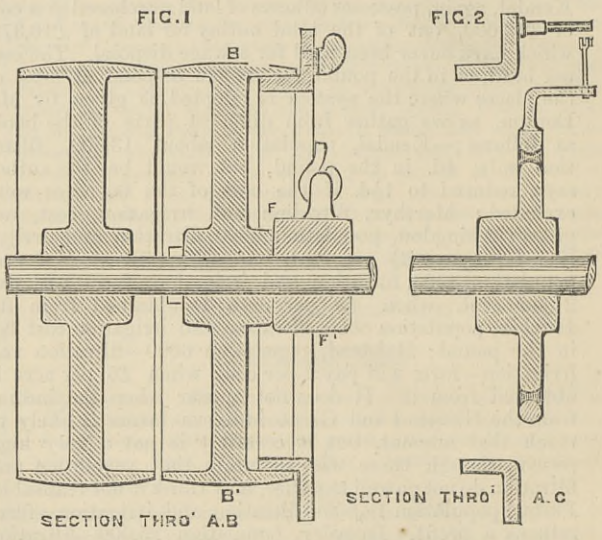
FRONT VIEW

gear of the implement, and enable it to be transported over the roughest roads without having to be lifted or loaded upon a wagon or sled as ploughs and harrows must be."

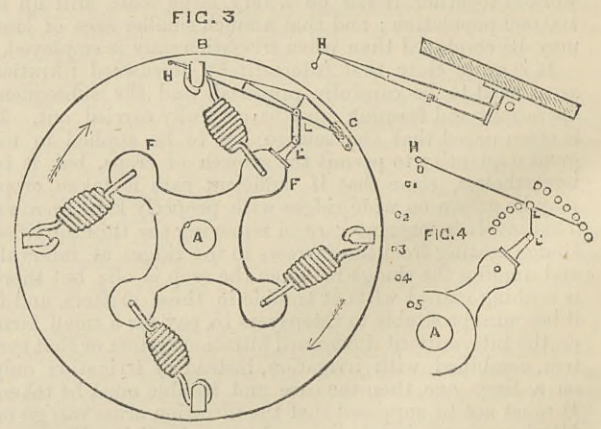
Our agricultural implement makers and agriculturists will form their own ideas of what this plough and pulveriser may do, but this is what our American contemporary says on that subject :—"The implement, in effect, mechanically applies to the farm the same method of tillage as that of the best and most costly garden tillage—that is, "hand forking." The wheel teeth, always below the earth, represent the tines of the hand-fork, the wheel spokes a succession of fork handles, each one lifting its load of earth. The quick motion of the wheel tosses, pulverises, and lays the earth in a lighter and more effectual manner than the most experienced hand labour could do it. By the use of this implement all after-trampling of the ploughed soil by teams in the usual process of harrowing is avoided. It is well known that the great fault of American farming is that it is not thorough enough. Better pulverisation would in many instances double the crop. Land in England is often ploughed four or five times to produce pulverisation, and sixty to seventy bushels of wheat to the acre is not uncommon. (*Sic.*) The usual western three-horse team is ample power for this implement. It has been tried on several farms in the vicinity of Mount Union, and at Newton Hamilton, Pennsylvania, with most satisfactory results, and with a two-horse team, mostly also in stiff clay soil."

A TRANSMISSION DYNAMOMETER.

At a recent meeting of the Society of Telegraph Engineers Professors Ayrton and Perry described a dynamometer constructed by them and used by Professor Ayrton in his lectures at the City Guilds Institute Classes. This dynamometer can be permanently attached to any shaft, and the horse-power transmitted by the shaft to any machine is shown. B B^1, Fig. 1, is a loose pulley used to drive the machine by means of a strap; F F^1 is a boss keyed on the shaft driven by the steam engine. This boss has four stout arms, Fig. 3, each attached by spiral springs to the rim of the loose pulley. If the shaft be driven, and the motion of the loose pulley resisted, the springs will be stretched, and the amount of such stretching combined with the speed of rotation, will measure the power transmitted. So far Messrs. Ayrton and Perry have followed General Morin. The stretching of the springs, that is, the relative twist between the loose pulley and the keyed boss, has to be measured. Such a twist produces a tangential motion, and the designers of this



dynamometer prefer to convert the tangential motion into a radial one for such measurement. H C is an arm, which, to combine considerable stiffness with lightness, is trussed in the plane of rotation as well as in a plane at right angles to this, as seen in the upper part of Fig. 3. This arm turns about C, a pivot on the rim of the loose pulley, and is moved by means of a link L L^1 attached at L by a pivot to the arm, and at L^1 by a pivot to the end of one spoke of the keyed boss F F^1. If now the



loose pulley and the keyed boss receive an angular twist, the end H of the arm, to which a bright bead is attached, moves almost radically towards the shaft. The exact path of the bead H is shown in Fig. 4 for different positions of C. To measure, then, the power transmitted by the engine to the machine, all that is necessary is to observe on a scale placed in a suitable position the radius of the circle traced out by the bright bead H, and the number of rotations per minute, both of which can be ascertained without stopping the machinery.

An alternative arrangement employed with very stiff springs is to have a small pinion at L^1, which works into a short spur segment on the pulley. A very small relative angular motion of F F^1, and B B^1, produces in this case a great angular motion of the pinion, and therefore of a light arm which turns with the pinion, at the end of which is a bright bead. It can easily be seen that this form of transmission dynamometer would work as well when the machine is driven direct as by the interpolation of a strap.

South Kensington Museum.—Visitors during the week ending July 30th, 1881 :—On Monday, Tuesday, and Saturday, free, from 10 a.m to 10 p.m., Museum, 10,422 ; mercantile marine, building materials, and other collections, 5332. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 6 p.m., Museum, 2238 ; mercantile marine, building materials, and other collections, 683. Total, 18,675. Average of corresponding week in former years, 17,875. Total from the opening of the Museum, 20,178,475.

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

(From our own Correspondent.)

Upon 'Change in Birmingham this—Thursday—afternoon, as also in Wolverhampton yesterday, the increased activity which of late has marked the finished ironworks was reported to be fully maintained. It could, however, be scarcely said that the improvement had extended to branches not hitherto affected. Thus the better state of things is pretty much confined still to sheets, hoops and strips, and common bars. The demand from the galvanisers for sheets is unabated, and, indeed, there was more anxiety displayed by them this week to place forward contracts than for some weeks past. To an almost equal extent there was an increased disposition on the part of sellers to refuse offers of this description. Singles were again priced at £7 15s. to £8, doubles at £8 10s., and lattens, £9 15s. to £10. Black sheets are going in large quantities to Australia, New Zealand, Russia, and India.

Hoop makers announced that in many cases they were declining to quote for orders, as they are already booked as far ahead as they think it prudent. Merchants continue to offer contracts freely on United States account, but now that trade is improved, work for this market is regarded with less favour than ever. For Germany, Italy, and Spain, hoops are likewise being freely bought. In the last two countries they are required for wine casks. For ordinary hoops £6 10s. to £6 15s. at the works is demanded, and for superior, £7 to £7 10s. Common gas strip is £5 17s. 6d. to £6. Thin strips for the making of tubes to be subsequently cased with brass and used up in the manufacture of bedsteads are realising £8 5s. at the works.

Boiler plates, it was announced, were without improvement, and makers are unable to secure any advance upon former prices, which therefore stand at £8 10s. to £9 10s., and £10 according to quality.

Marked bars continue in slow sale, yet makers who demand £7 10s. declare that they are meeting with as much trade as those who quote £7. Earl Dudley's common bars still stand at £7 12s. 6d. Medium quality bars were upon the market in abundance at £6 10s., and common sorts might have been had at a little under £5 15s. It is in these two last qualities that most is doing in the bar trade.

Best tin-plate firms stated that they had plenty to do, but that prices are difficult to get up at all.

There were not very many new sales of pig iron this afternoon, but makers were in a position to announce that stocks are declining and the deliveries are increasing. To-day's prices were: Staffordshire all-mine pigs, £3 5s. to £3 7s. 6d. nominal; Shropshire hot blast all-mine, £3; and cold blast, £4; Barrow and Tredegar hematites, 65s., without business; native part-mines, £2 10s.; Derbyshire, Northampton, and similar quality pigs, £2 5s. nominal; and Staffordshire cinder sorts, £2 to £1 17s. 6d.

The North Staffordshire finished iron trade fully maintains the recent improvement. It is satisfactory that not only are more foreign orders arriving, but that the home demand is also improving. Already an advance of a good 2s. 6d. to 5s. per ton has been established upon bars and some other merchant sections. For the better class of pigs prices average about £2 15s., but for the common quality about £2.

Colliery owners view with undisguised dissatisfaction a proposition made by the South Staffordshire Mines Drainage Commissioners to apply to Parliament for powers to double existing maximum ratal on coal, making it 1s. per ton. The expenses of pumping in the Great Tipton District is between £27,000 and £30,000 yearly, and the income only about £20,000. The recent loan of £100,000 obtained by the commissioners has been nearly all swallowed up in providing for the discharge of old debts and other charges that hung over the commission.

Touching the foreign demand for hardwares, the trade with the Australian colonies is satisfactory, and advices for the immediate future are cheerful. An encouraging lot of work has been received from the New Zealand markets, while British Indian business is increasing for shelf goods, and materials are wanted in large quantities for railway construction, and the erection of large buildings.

In the half-year ending June 30 the Water Committee of the Birmingham Corporation have received an income of £59,855, which after deducting working expenses, law charges, bad debts, &c., leaves a gross profit of £35,111. The reserve again is increased by the addition of £12,800, making a total of £40,800 now available for contingencies, and for depreciation of the plant and machinery of the water department.

The sale of gas during the half-year ending June 30th of the Birmingham Corporation, was 1,397,870,000 cubic feet, an increase of 9,128,800 upon the corresponding period of last year; but after deducting the amount supplied in 1880 to the district of West Bromwich not now supplied by the Corporation, an increase of 7,831,000 cubic feet, or about 6 per cent.

The Gas Committee of the Birmingham Corporation have placed contracts for 279,000 tons of coal for the coming year on favourable terms. On examining the tenders it was found that a large portion of the coal offered could be purchased for two years at present prices, and the committee have, therefore, also made contracts for 245,000 tons of coal to be supplied in the year ending 1883.

At the half-yearly meeting of the Union Rolling Stock Company, Limited, held on Tuesday, the directors recommended a dividend on the ordinary shares at the rate of 10 per cent. per annum—a rate which from the commencement of the company they have been able to recommend every six months.

NOTES FROM LANCASHIRE

(From our own Correspondent.)

Manchester.—In the iron trade of this district, business, so far as the raw material is concerned, has been decidedly dull during the past week. As I pointed out some time back, when the recent spurt in trade was commencing, the large make and heavy stocks, in proportion to present requirements, are too much of a dead weight to enable makers to maintain permanently any very material advance in prices. Just now order books being well filled by the recent sales makers in most cases are firm at the slight advance upon late rates, but where producers are not so fully sold, signs of weakness are already evident. Consumers on the other hand having apparently mostly covered their requirements for several months to come, enquiries are tending more towards deliveries for next year, and although there is a strong disinclination on the part of sellers to commit themselves to long forward engagements, it seems very probable that no very large further business will be done until makers commence booking for at least the early portion of 1882.

Lancashire makers of pig iron are tolerably well sold for pretty near the remainder of the year, and although but few new orders are coming in, they are very firm at 44s. for No. 4 forge, and 45s. for No. 3 foundry, less 2½ per cent. delivered equal to Manchester.

In some of the outside brands which come into this district there has been a little giving way. Lincolnshire forge iron delivered equal to Manchester has been quoted at 43s. 4d., less 2½, which is 9d. to 1s. per ton under what has lately been asked, and inferior brands of Derbyshire iron are being offered at very low figures, but this does not apply to makers generally, those who are well sold being still firm. Middlesbrough iron delivered equal to Manchester is quoted at 45s. 4d. per ton net, but there are very few buyers here at this figure.

The finished iron trade maintains a better tone than pig iron, for although there has not yet been any largely increased demand for actual home requirements, a considerable business is being done for shipment, and makers generally are holding out firmly for an advance upon late rates. Local and North Staffordshire bars delivered into the Manchester district are not now quoted under £6 per ton; hoops average about £6 10s.; common plates, £6 12s. 6d.; and ordinary merchant sheets, £7 15s. to £8 per ton.

Founders are also better employed, and there is a considerable amount of fire-proof mill work in hand for this district.

The coal trade continues extremely dull throughout, and a reduction in prices which has this week been unexpectedly made by the leading colliery firms in the Manchester district has tended to still further unsettle and weaken the market. In some cases reductions of 10d. per ton have been made on all classes of fuel, including both round coal and slack, whilst in other cases engine fuel has only been reduced 5d. per ton. In other districts no announced reductions have yet been made, the action of the Manchester firms having come as a surprise, but here and there less money has been taken for round coal, and it is not improbable, although prices already are extremely low, that the downward movement will become more general. So far, however, as engine classes of fuel are concerned, it is scarcely likely that there will be any general giving way, as good slack in most of the colliery districts is rather scarce, and in some cases has been showing a tendency towards stiffness. The average pit prices may be given about as under: Best coals, 8s. to 8s. 6d.; seconds, 6s. to 6s. 6d.; common coals, 4s. 6d. to 5s. 3d.; burgy, 4s. 3d. to 4s. 9d.; good slack, 3s. 9d. to 4s. 3d.; and inferior sorts, 3s. to 3s. 6d. per ton.

The reduction of prices in the Manchester district is being accompanied by a similar movement in the wages of the men. So far as the miners are concerned, they are being reduced 10d. per load, and 3d. per yard, and the underground day men 1s. per week, which is equal to about 15 per cent., and will put the colliers employed at the Manchester pits in much about the same position in which they stood in December last, prior to the advance made previous to the late strike and the further advance which has since been conceded.

The bridging over of the Irwell at that portion of the river lying between the Manchester Cathedral on the one side and the large new station which is being erected by the London and North-Western Company in Salford on the other, is just now a question which is exciting a good deal of interest here. The question has been raised, in connection with a proposed additional bridge which the railway company wish to construct as an extra approach to the new station, but which the Manchester Corporation have refused to sanction, and it is now being urged that in the place of two new bridges, which would make no less than five bridges crossing the stream within a very limited area, the whole of the river embraced within these bridges should be covered in, and thus afford additional and valuable space to one of the busiest thoroughfares of Manchester. At present the matter is under the consideration of the engineers connected with the Corporation and the railway company, and I understand that it is not improbable that some scheme for bridging over the river as suggested above may be recommended.

The London and North-Western Railway Company, has just completed an addition to its London-road station, 500ft. in length by 150ft. in width, the whole of which is carried upon 3ft. iron columns, and plate and box girders, divided into two spans one of 80ft. and the other of 70ft. The upper portion of the structure consists of ornamental brickwork covered in with a roof supported on cast iron columns and lattice girders similar in design to the old portion of the station. By the adoption of iron columns as supports for the upper structure the whole of the ground space has been economically utilised, and with as little obstruction to the light as possible, for the goods traffic requirements. Upwards of 3000 tons of iron have been used for the columns and girders which have been supplied by Messrs. Eastwood and Swingler, of the Victoria Ironworks, Derby, and the work has been carried out from the designs of Mr. Stevenson, the company's engineer.

The largest girders which have probably ever been constructed for railway street bridge purposes are just now being erected by the Manchester and South Junction Railway Company to carry an extension of their line about 900ft. in length over several streets adjoining the new additions to the London-road station referred to above. Over one of these streets the girders, which are being erected on the skew, have a span of 180ft., and including the portions built into the brickwork, have a total length of 200ft. They may be briefly described as hog-backed box girders, 16ft. high in the centre and 12ft. at the ends, constructed of ½in. web plates with flanges top and bottom and 16 plates thick in the centre. They are connected to the cross girders by means of iron knee pieces, the cross girders being 2ft. 6in. deep in the centre, and carrying ½in. flooring plates. These girders, which weigh about 200 tons each, and are being erected on platforms, have been supplied by the Horseley Iron Company, and the work is being carried out from the designs of the railway company's engineer, Mr. Woodhouse.

Barrow.—I have to report that no change of any moment has taken place in the position of the hematite pig iron trade of this district. The demand is steadily maintained all round, and the business which has been done during the past week is quite up to the general average of the last few months. I note that on foreign accounts sales represent a heavy weight of metal, and both America and the colonies are, I am informed, taking large parcels of Bessemer and forge iron, but the chief export business is in finished and other classes of steel. Blooms are being largely shipped, as well as rails, fish-plates, and other accessories of permanent way. I anticipate that more trade is likely to be done in blooms than has hitherto been the case. Steel traders are selling well, and I am told, on undoubted authority, that in the steel trade orders are in hand which will find employment for some months to come, notwithstanding the extra demand which has sprung up for blooms. The consequence of this is, of course, that the whole producing power of the Bessemer department is at work. This, I may mention, is a new feature at works in this neighbourhood. It is now possible at Barrow, by new arrangements, to produce more than double the tonnage of metal with a less number of converters than it was a few years ago. Heavy contracts in the iron shipbuilding line have recently been booked, and at present the yards are busily employed. In this department of industry there will, during the ensuing winter, be great activity. Engineers are also very busy, whilst at the same time boiler-makers are busily employed.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

Notwithstanding the depressing accounts as to trade during the past six months, and the award of the Board of Arbitrators in the North of England, because of which some local houses have given their ironworkers notices of reduction in wages, there is a more cheerful tone noticeable in the iron market. In accordance with this award, the Parkgate Iron Company announced a reduction of 2½ per cent. on tonnage wages and 3d. per ton on puddlers' wages, the alteration to take effect from the 1st August. There is little likelihood of any serious difficulty arising between the parties.

Last week there was a general rise in the price of raw irons, amounting on the average in this district to about 1s. per ton; and on this basis further transactions are recorded. The sheet and plate trades are exceptionally brisk, and best boiler plates are now fetching as high as £14 10s. per ton. Steel plates for similar purposes—principally used on steamships—where the temperature is more even, are finding a ready market on the basis of £18 per ton. On account of the activity in the shipbuilding yards, many of the sheet and plate mills are running full time here, with every prospect of increased business during the autumn months.

In the armour-plate works there is the utmost activity. The introduction of the composite armour-plate has worked a revolution in the trade, and both Messrs. John Brown and Co., Limited, and Messrs. Charles Cammell and Co., Limited, have more orders on hand in this line than they can execute for many months to come. Such is the result of the patents of Mr. Ellis and Mr. Wilson—the former for John Brown and Co. and the latter for Charles Cammell and Co. We are given to understand, however, that another very heavy order for these armour-plates is about to be issued, and will be received by these Sheffield houses. The demand for Russian and Swedish irons is on the increase through the development of this branch of business.

The Ironworkers' Conference held at Leeds, and which closed on Monday, has excited considerable interest in the trade here. There were present representatives from all the iron producing districts, under the presidency of Mr. Wm. Shaw, of Wigan. The funds of the society were stated to be in a flourishing condition. A long discussion took place on the working of the "sliding scale," which has led to the late reductions in wages, and ultimately the following resolution was unanimously passed:—"That in the opinion of this Conference the sliding scale has worked advantageously to the workmen, and the action of agitators who are advising to resist the 2½ per cent. reduction is hereby strongly condemned." This shows the willingness of the workmen to abide by arbitrators' awards and thus avert strikes.

The coal districts are distressed. Trade is really bad so far as the coal interest is concerned, and prices if anything are on the decline. Many of the South Yorkshire pits are working at a loss; many hundreds of colliers are only allowed "half time," and in some instances notices have been given this week to the men discharging them. Competition is very keen for deliveries to the Yorkshire sea-ports, and Lancashire pit owners on their side seem to be doing their best to cut up trade. It may seem incredible, but many of the colliery owners hereabouts are delivering best Silkstone on the line at 6s. 8d. per ton. Out wharves quotations are as follows:—Best branch, 13s. 9d.; Silkstone, best, 11s. 3d.; seconds, 9s. 6d. to 10s. 6d.; nuts, 9s. to 9s. 6d.; slack, 4s. 6d. to 6s. per ton.

Since the closing of the quarter-day the cutlery trades have not revived much, and colonial orders, especially from Australia, are backward. Some good lines in table and spring cutlery are in course of execution for the United States; but customers there are not ordering quite so freely as was the case three months ago. Business is good with American buyers on the whole, but the lull is caused by houses having to await indications of the probabilities of the "Fall" trade. Razor makers have more orders on hand than they can conveniently execute, and German agents in the town are booking surplus orders in this line. Competition in scissors between Sheffield and German houses is every day becoming intensified, and there is scarcely a factor in the town but is now compelled to keep a stock of these German-made second-class goods. In best qualities Sheffield holds the lead, both against German and American makers.

In the cast steel department there is very little fresh to note, excepting that the spring—railway—trade is a shade busier, and the men better employed. Best cast steels are selling freely, but common qualities are neglected in the face of the Bessemer-made branded billets, which are now offered of guaranteed "tempers" for £6 15s. upwards per ton. File houses are very badly off for work, and many file cutters are out of employment. There are decided prospects of an improvement in the local trades during the autumn and ensuing months of the year.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

The attendance at the Cleveland iron market held at Middlesborough on Tuesday was considerably under the average. Several of the ironmasters were at Newcastle attending the meeting of the Institution of Mechanical Engineers.

The price of pig iron was much the same as the previous week, but the tone of the market was flat. No. 3 g.m.b. was sold at 37s. for prompt f.o.b. delivery, forge being 36s., and warrants 38s. net cash. Buyers generally held out for lower prices, and not much business was actually done. The stock of iron in Connal's (Middlesbrough store) is now 184,510 tons, being an increase of 982 tons during the week. The shipments for July have been published. They amount to 87,595 tons of pig, and 25,494 tons of manufactured iron, or a total of 113,089 tons. Compared with the previous month this shows a decrease of 4082, 2650, and 6632 tons respectively. Under these circumstances no one looks for a rise of prices at present, and it is not improbable that next market day will witness a fall.

The finished iron trade continues steady at the prices of the previous week. The reduction of 2½ per cent. in the ironworkers' wages, which took effect from last Monday, has been, on the whole, loyally accepted. Great efforts were made by some unprincipled agitators to induce the workmen to strike against it, and these attempts were, unfortunately, successful at the Weardale and one other ironworks. It is not thought, however, the men at these places will remain long out.

The strike of the platers' helpers at Stockton and at Middlesbrough has terminated in a concession of 1s. 6d. per week extra to the helpers by their fore hands, and the shipyards at those parts are now once again in full activity. At Sunderland, however, where the same question is complicated with some other ones, the strike continues, and but slow progress is being made in ship construction. It is said that the employers there scarcely understand themselves what the several points in dispute are. These petty local strikes, which are continually occurring in some department or other of the constructive trades, are having a most baneful effect on the prosperity of the northern counties. They are also giving an enormous advantage to the newly founded shipbuilding industries of the foreign North Sea ports, which are not at all troubled at present from similar causes.

The Erimus Steelworks at Stockton are showing signs of greatly increased activity. Mr. Evans, the new manager, arrived a few weeks since, and has taken charge of the practical operations. The new machinery has been tested, and has been found generally to work well. Blowing will probably commence the fourth week in August, that is immediately after the Stockton race week, when all the manufactured ironworks will be laid off. The new North-Eastern Steel Company have freely issued their prospectus. It is not known how the shares are being taken up. As regards the Cleveland district, the drainage of capital during recent years, owing to the loss of the iron rail trade, has been so great that not many shares are likely to be purchased there. Other and distant districts must therefore be mainly looked to for the means of proceeding with this or any similar enterprise.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The different branches of the Scotch iron trade, with the exception of pig iron, are in a healthy state. As regards pigs, the demand is quieter this week, and business in the market has been sluggish. The inquiry from abroad has so far proved rather disappointing, and the steady rate at which production is maintained, with the consequent increase in stocks, is opposed to the expectation of a more lively condition of the market being reached at an early date. There are 119 furnaces in blast, producing on an average fully 200 tons per week. Stocks in Messrs. Connal and Co.'s stores amount to 574,000 tons, with warrants in circulation for about 544,000 tons, and it is estimated that there are 340,000 tons in makers' yards, besides the stocks which are held at the North-Western English ports, to which Scotch pig iron is shipped. The past week's shipments, coastwise and abroad, have amounted to only 9285 tons as compared with 12,705 in the preceding week, and 10,015 in the corresponding week of last year. The feeling in the Glasgow market this week has been somewhat despondent, and unless some unexpected turn in affairs should speedily take place, the probability is that prices will decline. If the iron had not been largely held in strong hands, the quotations must have given way before this time.

Business was done in the warrant market on Friday at 47s. 1½d. to 46s. 9d. cash. Monday being a bank holiday, the market was closed. On Tuesday transactions were effected down to 46s. 9d. There was rather more animation in the market on Wednesday, when business was done at 46s. 9d. ten days. To-day—Thursday—the tone was steady, with transactions at 46s. 10d. cash and 46s. 11½d. one month.

The slow demand for makers' iron has made quotations slightly easier:—Gartsherrie, f.o.b. at Glasgow, No. 1 is quoted at 54s. 6d. per ton; No. 3, 48s. 6d.; Coltness, 56s. 6d. and 49s.; Langloan, 56s. 6d. and 49s.; Summerlee, 55s. and 47s.; Calder, 54s. 6d. and 48s. 6d.; Carnbroe, 51s. and 47s.; Clyde, 50s. and 46s.; Monkland, 47s. 6d. and 45s. 6d.; Quarter, 47s. 6d. and 45s. 6d.; Govan, at Broomielaw, 47s. 6d. and 45s. 6d.; Shotts, at Leith, 56s. and 49s.; Carron, at Grangemouth, 52s. 6d. and 51s. 6d.; Kinneil, at Bo'ness, 47s. 6d and 45s. 6d.; Glengarnock, at Ardrossan, 51s. 6d. and 47s. 6d.; Eglinton, 47s. 6d. and 44s.; Dalmellington, 47s. 6d. and 44s. 6d.

The various departments of the manufactured iron trade continue busy, and in some cases works have been greatly increasing the number of operatives employed.

In the coal trade there is a continuance of activity, especially for shipments; and prices, although not officially altered, are a shade firmer. Still, contracts are being entered into at the old rates, and a temporary difficulty in obtaining railway wagons for carrying the coals to the ports of shipment is believed to have something to do with the stiffer feeling in the market. The competition is so great that it is expected an abundant supply of coals will be obtained at the low rates hitherto prevailing. There has been a light improvement in the demand for household coals. In the eastern mining districts the shipping demand is very brisk, this being especially the case in Fifeshire, and a large business is being done at fair prices. On the whole the tone of business in the coal trade has become decidedly more cheerful, although it is not anticipated that prices will in the meantime materially advance.

The amount of new shipping put out of the Clyde shipbuilding yards during the past month has been unprecedentedly large, having never been exceeded in July in any previous year.

Messrs. Denny, shipbuilders, Dumbarton, are constructing a large new dock in connection with their Leven shipyard. Its length on one side will be 650ft. and on the other 920ft., with an extreme breadth of 250ft. The dock will admit the largest vessels, and powerful machinery is to be constructed alongside it, to put machinery and fittings on board.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

The coal and iron trades retain their firmness, and the first industry is in particular brisk and improving. The firm tone which has characterised it for the month of July may be said to have become settled, and coalowners are not only tardy in taking orders for immediate delivery, but ask advanced prices for future deliveries. A large buyer, perhaps one of the largest in Cardiff, was unsuccessful in many cases last week in securing for immediate delivery, and for the ordinary supply periodically in advance was asked 11s. f.o.b. for best qualities.

Cardiff retains the great lead it has taken, and it is remarkable how little variation there has been for the last two or three months. In no case since March last have the totals of foreign exports of coal fallen below 100,000 tons.

One of the leading authorities in the coal world believes that the maximum of quantity has been reached, but considering that the lower measures in Monmouthshire remain in most quarters virgin fields, and that the deep sinkages of Glamorgan have not come up to anything like the quantity they are capable of turning out, the statement may be received with some degree of hesitation.

The Cardiff Art Exhibition was opened last week, but as it is not yet in a completed state I shall defer noticing the leading features until my next. On the eve of my despatch the Glamorganshire Agricultural Society had their annual meeting at Merthyr. The days selected are Wednesday, Thursday, and Friday, and the show of implements, from the first hasty view that I have had, is a fine one. In the lower part of the country the farmers are yearly showing more willingness to avail themselves of machinery in the various processes of agriculture, but the hill farmers are much behind. Even at Dowlais, where there are fine large fields, the utmost advance made has been in mowing, where a horse machine has replaced the ordinary scythe to a considerable extent.

Tin-plate continues dull, and I am assured on the best authority that the trade is coming to a crisis. One large ironworks lost £5000 lately by the failure of a tin-plate works, and makers of tin-bar are in most cases refusing credit. As numerous tin-plate makers made the four months' credit they obtained for pig and tin-bar their capital, this shutting off supplies means ruin.

The clearances of coal during last week from all Wales were 140,000 tons, and of this Cardiff contributed 122,000 tons. The exports of iron and steel amounted to 5000 tons.

I noticed more activity at the Blast Furnace Company, Swansea, than has been of late. The minor industries are doing well, patent fuel in particular.

Rhiwderin tin works are to be started after a long period of cessation.

An important meeting of colliers was held at Aberdare this week representing 50,000 men, when it was resolved to agitate for the adoption of the sliding scale throughout the kingdom.

Naval Engineer Appointments.—The following appointments have been made at the Admiralty:—Albert V. Blake, acting assistant-engineer, to the Inflexible, complement incomplete; and William John Anstey to be acting assistant-engineer from the 1st of July last.

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.

26th July, 1881.

3252. Ship's Pendulum, J. Short, London.
3253. Colours, W. Majert, Heidelberg.
3254. Cables, H. H. Lake.—(*D. Brooks, jun., U.S.*)
3235. Waterproof Bed, B. Genn, Ely.
3256. Pumps, H. H. Lake.—(*P. E. Jay, U.S.*)
3257. Gauze, &c., C. D. Abel.—(*G. H. Gruner, Dresden.*)
3258. Steam Engines, D. Halpin, London.
3259. Funnels, C. D. Abel.—(*O. Petzold, Sebnitz.*)
3260. Gaseliers, C. Abel.—(*Keyling & Thomas, Berlin.*)
3261. Glazing, T. W. Helliwell, Brighouse.
3262. Mordanting Fabrics, J. Knowles, Manchester.
3263. Skate, H. J. Haddan.—(*F. Bittner, Remscheid.*)
3264. Barrels, H. J. Haddan.—(*W. Stewart, Guelph.*)
3265. Astronomical Apparatus, H. J. Haddan.—(*J. Blanc and C. Dumas, Lyons.*)
3266. Motors, H. J. Haddan.—(*J. Rahtjen and J. F. N. Steffen, Hamburg.*)
3267. Commodes, H. J. Haddan.—(*W. H. Daniell, U.S.*)
3268. Fire-arms, H. Dufrené.—(*J. Sugan-Jame, Lugas.*)
3269. Knitting Machines, J. Bradley, Lowell, U.S.
3270. Planing Machines, E. A. Brydges.—(*J. C. Eckardt, Würtemberg.*)
3271. Prisms, A. McLaren, London.
3272. Bicycles, J. H. Johnson.—(*W. Rennyson, U.S.*)
3273. Propelling Apparatus, W. A. Pope, London.
3274. Lamp Casings, &c., D. Graham, jun., Glasgow.
3275. Engines, R. Ord, Devizes.
3276. Adjusting Apparatus, C. Bulling, London.
3277. Looms, J. L. Byrom, Delph.
3278. Teeth, S. Pitt.—(*C. M. Richmond, U.S.*)
3279. Brakes, W. R. Mortimer, Sussex.
3280. Films, A. M. Clark.—(*B. Day, U.S.*)
3281. Oils, W. A. Barlow.—(*J. H. Chandet, Paris.*)
3282. Shoes, S. Pitt.—(*A. Hutchinson and Co., Paris.*)
3283. Electric-generators, S. Pitt.—(*S. J. Bear, U.S.*)

27th July, 1881.

3284. Glycerine, F. J. O'Farrell, Dublin.
3285. Paints, A. B. Rodyk.—(*N. Dennys, Singapore.*)
3286. Deodoriser, R. Goolden and A. Mackay, London.
3287. Governors, F. W. Durham, New Barnet.
3288. Rivetting, F. A. Paget.—(*J. Haswell, Vienna.*)
3289. Bicycles, W. K. Hydes, Sheffield.
3290. Buttons, L. A. W. Lund, London.
3291. Retorts, T. F. Haldane, Glasgow.
3292. Fastenings, A. Sclanders.—(*J. P. Black, Nelson.*)
3293. Gas, A. J. Hallam aud J. Walsh, Lancashire.
3294. Pianista, W. F. Schmoele and A. Mols, Antwerp.
3295. Spinning Yarns, &c., T. Lawson, Leeds.

28th July, 1881.

3296. Connectors, E. Alexander.—(*A. Violette, Paris.*)
3297. Paper, &c., H. Armstrong, Darlington, and J. A. London, London.
3298. Sewing Machine, D. Mills, London.
3299. Cranes, W. Hunter, London.
3300. Gun, F. J. Cheesbrough.—(*J. Nemetz, Vienna.*)
3301. Lighting Gas, E. B. Burr, Walthamstow.
3302. Furnaces, C. Pieper.—(*A. Faber, Magdeburg.*)
3303. Artificial Stone, &c., J. H. Johnson.—(*La Société Anonyme de Certaldo, Paris.*)
3304. Protecting Iron, &c., F. S. Barff, Kilburn, and G. and A. S. Bower, St. Neots.
3305. Electric Lights, Sir C. T. Bright, London.
3306. Fastening Boots, &c., E. Wright, Birmingham.
3307. Weighing Machines, J. Cluett & W. Hanchard, London.
3308. Bronze, H. H. Vivian, Swansea.
3309. Lasting Boots, H. H. Lake.—(*G. Copeland, U.S.*)
3310. Valves, A. E. Carter and D. Young, London.

29th July, 1881.

3311. Vegetable, &c., Substances, J. H. Johnson.—(*A. I. Mahu, Paris.*)
3312. Treating Waste Sand, H. J. Haddan.—(*F. J. Motte, Dampremy.*)
3313. Fire-arms, W. Gedge.—(*M. Kaufmann, Brussels.*)
3314. Treating Maize, T. Muir, Glasgow.
3315. Submerged Propellers, P. Amati, Nice.

30th July, 1881.

3316. Spinning, &c., J. J. Broadbent and E. Mitchell, Bradford.
3317. Vehicles, W. Jeans, Christchurch.
3318. Furnaces, W. H. Poole, Bolton.
3319. Match Boxes, H. Woodward, Birmingham.
3320. Holds of Colliers, C. H. Mowll, Dover.
332. Loom Pickers, J. Holding and E K. Dutton, Manchester.
3322. Controlling Steam, S. Hallam, Manchester.
3323. Mounting Spindles, C. H. Openshaw, Bury.
3324. Cleaning Boiler Tubes, E. Lofts and H. J. Barker, Cherry-Hinton.
3325. Engine, H. Boyd, Weston-super-Mare.
3326. Valves, H. H. Lake.—(*F. Rice & S. Murphy, U.S.*)
3327. Alarums, J. L. Rastrick, London.
3328. Washing Machine, H. H. Lake.—(*C. Jouffray and J. Chevalier, Vienne, France.*)

1st August, 1881.

3329. Ploughs, J. Cooke, Lincoln.

Inventions Protected for Six Months on deposit of Complete Specifications.

3256. Pumps, H. H. Lake, Southampton-buildings, London.—A communication from P. E. Jay, New York, U.S.—*26th July*, 1881.
3263. Skate Attachments, H. J. Haddan, Kensington, London.—A communication from F. Bittner, Remscheid, Germany.—*26th July*, 1881.
3269. Circular Knitting Machines, J. Bradley, Lowell, U.S.—*26th July*, 1881.
3278. Artificial Tooth Crowns, S. Pitt, Sutton.—A communication from C. M. Richmond, New York, U.S.—*26th July*, 1881.

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

2965. Valves, H. H. Lake, Southampton-buildings, London.—*25th July*, 1878.
3027. Ventilators, J. Norris, Wood-green.—*30th July*, 1878.
3247. Permanent Way, S. Nicholls, St. Clement Danes, London.—*16th August*, 1878.
2979. Biscuits, J. Taylor, Preston.—*26th July*, 1878.
2983. Boot, &c., Trees, L. M. Carmichael, Aldershot.—*27th July*, 1878.
3025. Planting Potatoes, L. A. Aspinwall, Chancery-lane, London.—*30th July*, 1878.
3042. Paper-making Machines, G. Holloway, Chartham.—*1st August*, 1878.
3141. Pulleys, &c., G. Tangye, Birmingham.—*8th August*, 1878.
3214. Safety Valves, R. Gill, Sidcup.—*14th August*, 1878.
3019. Folding Boats, &c., J. W. D. McDonald, Bembridge.—*30th July*, 1878.
3632. Warp Lace Machines, H. Hill, Nottingham.—*31st July*, 1878.
3036. Filters, F. Wirth, Frankfort-on-the-Maine.—*31st July*, 1878.
2999. Cutting, &c., Fire-wood, F. Kingston, Catherine-grove, Greenwich.—*29th July*, 1878.
3000. Printing Presses, &c., T. Dupuy, Paris.—*29th July*, 1878.
3073. Dyeing, &c., T. Holliday, Huddersfield.—*3rd August*, 1878.
2998. Knife Cleaner, J. Trecziok, Mount Pleasant, Clerkenwell, London, and A. H. Bower, Vernon-street, London.—*29th July*, 1878.
3065. Heating Buildings, &c., T. Ritson, Pollokshields.—*2nd August*, 1878.
3313. Opening and Cleaning Cotton, &c., H. H. Lake, Southampton-buildings, London.—*22nd August*, 1878.
3054. Steam Plough, J. H. Johnson, Lincoln's-inn-fields, London.—*2nd August*, 1878.
3119. Explosive Compounds, E. Cotte, Boulevard de Strasbourg, Paris.—*7th August*, 1878.

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

2816. Releasing Ingots from Moulds, A. Wilson, Dronfield.—*15th August*, 1874.
2621. Refrigerating Apparatus, J. Gamgee, Great Winchester-street, London, and R. A. Purkis, Cheam.—*27th July*, 1874.
2641. Cartridges, S. Davey and J. Watson, Rouen.—*29th July*, 1874.
2796. Drawing-off Apparatus, H. W. Whitehead, Holbeck.—*13th August*, 1874.
2674. Engines, J. Bernays, Newgate-street, London.—*1st August*, 1874.
2682. Clothes Wringer, P. Whiteside, Liverpool.—*1st August*, 1874.
2734. Loaf Sugar, C. D. Abel, Southampton-buildings, Chancery-lane, London.—*7th August*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 19*th August*, 1881.

1278. Making Pulp, J. Fisher, Southampton-buildings, London.—*23rd March*, 1881.
1281. Watches, H. Aspinall, Liverpool.—*23rd March*, 1881.
1289. Soap, P. Jensen, London.—A communication from J. Weineck.—*23rd March*, 1881.
1304. Binding Scaffolding, J. Rettie, Hatton-garden, London.—*23rd March*, 1881.
1309. Safety Wicket, &c., A. C. Henderson, Southampton-buildings, London. — A communication from J. M. A. Montclar.—*24th March*, 1881.
1310. Charcoal Box Irons, G. Asher, Birmingham.—*24th March*, 1881.
1318. Sewing Machines, C. T. Bastand, Albany-road, London.—*24th March*, 1881.
1321. Recording the Performance of Steam Engines, &c., J. B. Moscrop, Stretford.—*24th March*, 1881.
1337. Looms, W. Priestley and W. Deighton, Laisterdyke.—*25th March*, 1881.
1342. Brewing, &c., Liquors, C. Clinch, Exeter.—*25th March*, 1881.
1347. Combing Wool, &c., J. Midgley, Bradford.—*26th March*, 1881.
1370. Burning Hydrocarbon Oils, &c., A. J. Boult, High Holborn, London.—A communication from C. Holland.—*28th March*, 1881.
1385. Drawing, &c., Frames, J. Clayton, Bradford.—*29th March*, 1881.
1404. Regulating the Speed of Engines, W. H. and J. Sutcliffe, Todmorden.—*30th March*, 1881.
1412. Carbons, J. Scott and W. H. Akester, Newcastle-on-Tyne.—*31st March*, 1881.
1451. Feeding Paper to Printing, &c., Machines, P. M. Justice, London.—A communication from the Sedgwick and Stuart Manufacturing Company.—*2nd April*, 1881.
1462. Arranging, &c., Types, F. Wicks, Glasgow.—*4th April*, 1881.
1502. Preparing Warps, G. C. Taylor, Huddersfield.—*6th April*, 1881.
1519. Cravats, &c., J. Hinks, T. Hooper, and F. R. Baker, Birmingham.—*7th April*, 1881.
1536. Electric Lamps, J. L. A. Dupont-Auberville, Paris.—A communication from V. Delaye.—*8th April*, 1881.
1604. Astral Lanterns, F. H. Bailey, Hillsdale.—*12th April*, 1881.
1704. Refining Camphor, G. Atkinson, Aldersgate-street, London.—*19th April*, 1881.
1730. Keyless Watches, H. A. Dufrené, Finsbury, London.—A communication from M. Vuillemin.—*21st April*, 1881.
1901. Harvesters, E. P. Alexander, London.—A communication from S. D. Maddin.—*3rd May*, 1881.
1920. Harvesting Machines, B. Samuelson and W. G. Manwaring, Banbury.—*3rd May*, 1881.
2847. Collecting Fares, W. R. Lake, London.—A communication from J. J. Greenough.—*29th June*, 1881.
2909. Crushing, &c., Mills, W. N. Nicholson and W. Mather, Newark-upon-Trent.—*4th July*, 1881.
2944. Telegraph Wire Ropes, &c., J. P. Hooper, Lombard-street, London.—*5th July*, 1881.
2995. Signalling Apparatus, A. C. Brown and H. A. C. Saunders, London.—*7th July*, 1881.
3031. Earrings, T. Perks, jun., Birmingham, and B. J. Perryman, Aston.—*9th July*, 1881.
3063. Yeast and Vinegar, J. Jensen, Newcastle-on-Tyne.—A communication from N. Rasmussen.—*13th July*, 1881.
3077. Speed Indicators, H. S. H. and E. Shaw, Bristol.—*14th July*, 1881.
3091. Fluid Meters, T. R. and T. W. Harding, Leeds.—*15th July*, 1881.

Last day for filing opposition, 24*th August*, 1881.

1087. Fastening Folding Cards, G. W. von Nawrocki, Berlin.—A communication from J. L. Peschkes.—*14th March*, 1881.
1371. Omnibuses, H. W. Hart, Palace-chambers, London.—*28th March*, 1881.
1377. Airing Articles, W. Sachs, Berlin.—*29th March*, 1881.
1378. Travelling Trunks, &c., W. H. Jones, Wolverhampton.—*29th March*, 1881.
1381. Boots, I. Kay, Sheffield.—*29th March*, 1881.
1388. Gas Engines, J. A. Ewins and H. Newman, Birmingham.—*29th March*, 1881.
1399. Coating Metallic Sheets, I. Matthews, Abercarne.—*30th March*, 1881.
1400. Treating Biscuits, F. H. F. Engel, Hamburg.—A communication from W. Gaedke.—*30th March*, 1881.
1405. Springs for Pistons, D. Blackadder, Sheffield.—*30th March*, 1881.
1416. Pneumatic Revolution Indicators, A. Budenberg, Manchester.—A communication from C. F. Budenberg and B. A. Schaeffer.—*31st March*, 1881.
1421. Punching, &c., Documents, C. G. Beddoe, Lambeth-road, London.—*31st March*, 1881.
1427. Measuring Earthworks, J. Imray, London.—A communication from J. Canale.—*31st March*, 1881.
1431. Knitting Machinery, W. Morgan-Brown, London.—A communication from H. Schuerer.—*1st April*, 1881.
1433. Keyless Watches, C. H. Errington, Coventry.—*1st April*, 1881.
1435. Enclosing Materials in a Covering of Cylindrical, &c., Form, W. A. G. Schönheyder, Stoke Newington, London.—*1st April*, 1881.
1436. Photography, L. Warnerke, Champion-hill, London.—*1st April*, 1881.
1444. Millstones, W. R. Lake, London.—A communication from E. H. Streitz.—*1st April*, 1881.
1446. Venetian Blinds, T. Kauffmann, Cologne.—*1st April*, 1881.
1461. Preparing Condensed Milk, A. M. Clark, London.—A communication from R. Bravais.—*2nd April*, 1881.
1479. Making Wire Healds, &c., H. B. Barlow, Manchester.—*5th April*, 1881.
1487. Colouring Matters, E. G. P. Thomas, Brentford, London.—*5th April*, 1881.
1488. Machine Guns, T. Nordenfelt, St. Swithin's-lane, London.—*5th April*, 1881.
1524. Pickers, M. Holt, Todmorden.—*7th April*, 1881.
1527. Effecting Concentration, &c., of Soda Solutions, J. Imray, Southampton-buildings, London.—A communication from J. Buffet.—*7th April*, 1881.
1531. Breech-loading Fire-arms, P. T. Godsal, 52nd Regiment Light Infantry.—*7th April*, 1881.
1567. Air Refrigerating Machine, T. B. Lightfoot, Dartford.—*11th April*, 1881.
1619. Umbrella, &c., Furniture, G. G. Lusher, Birmingham.—*13th April*, 1881.
1617. Sewing Machines, F. Heyrich and F. Quenstedt, Berlin.—A communication from Frister und Rossmann.—*13th April*, 1881.
1668. Curtains, &c., G. Hurst, Nottingham.—*16th April*, 1881.
1683. Electric Signalling, A. M. Clark, London.—A communication from A. d'Auriac.—*16th April*, 1881.
1758. Wire Brushes, G. W. von Nawrocki, Berlin.—A communication from C. E. Flemming, sen.—*23rd April*, 1881.
1806. Preparing, &c., Metal Pipe or Tube, A. M. Clark, London.—A communication from H. von Hartz and O. Fix.—*26th April*, 1881.
1942. Electric Arc Lamps, J. Brockie, Brixton, London.—*4th May*, 1881.
2300. Cots, &c., T. Hansell, London-road, St. Albans.—*25th May*, 1881.
2310. Bleaching, Dyeing, &c., W. Mather, Manchester.—*26th May*, 1881.
2482. Magneto, &c., Machines, E. G. Brewer, London.—A communication from T. A. Edison.—*7th June*, 1881.
2492. Electric Lamps, P. Jensen, London.—A communication from T. A. Edison.—*8th June*, 1881.
2632. Plaiting Fibrous, &c., Materials, N. Fraser, Arbroath.—*16th June*, 1881.
2840. Treating Grain, W. R. Lake, London.—A communication from T. A. and W. T. Jebb.—*28th June*, 1881.
2860. Sound Ingots, &c., A. Longsdon, London.—A communication from F. A. Krupp.—*30th June*, 1881.
2872. Treating Paper, F. Nowlan, Soho-square, London.—*1st July*, 1881.
2900. Packing Eggs, &c., W. J. Young, Bristol.—*2nd July*, 1881.
2908. Growing Water-cress, G. C. Pimbury, Cheltenham.—*4th July*, 1881.
2912. Vertical Steam Boiler, G. Kingdon, Kingswear.—*4th July*, 1881.
2933. Valve-gear, W. Hargreaves and W. Inglis, Bolton.—*5th July*, 1881.
2954. Magneto, &c., Machines, P. Jensen, Chancery-lane, London.—A communication from T. A. Edison.—*6th July*, 1881.
3975. Bricks, &c., E. Johnson, St. Helen's.—*7th July*, 1881.
3057. Boots and Shoes, C. Lion, Spitalfields, London.—*12th July*, 1881.
3061. Ever-pointed Pencil Cases, W. E. Wiley, Birmingham.—*13th July*, 1881.
3995. Mining Machines, W. Mather, Manchester, and F. M. Lechner, Columbus, U.S.—*15th July*, 1881.
3142. Purifying Alcoholic Liquors, W. R. Lake, London.—A communication from the Purifying and Maturing Process Company.—*19th July*, 1881.
3278. Artificial Tooth Crowns, S. Pitt, Sutton.—A communication from C. M. Richmond.—*26th July*, 1881.

Patents Sealed.

(List of Letters Patent which passed the Great Seal on the 29th July, 1881.)

5397. Horizontal Saw Frames, T. N. Robinson, Rochdale.—*23rd December*, 1880.
414. Lining Furnaces, H. H. Lake, Southampton-buildings, London.—*31st January*, 1881.
416. Low Water Alarm and Safety Valve, G. Wilson, Old Kent-road, London.—*31st January*, 1881.
433. Lamps, W. H. Bulpit, Birmingham.—*1st February*, 1881.
435. Dressing Millstones, E. Scholes, Ashton-under-Lyne.—*2nd February*, 1881.
438. Heating Liquid, B. W. Maughan, Cheapside, London.—*2nd February*, 1881.
441. Joints for Pipes, J. S. Fairfax, St. Paul's-road, London.—*2nd February*, 1881.
446. Metal Tubes, J. R. Cassels, Glasgow, and T. Morton, Motherwell.—*2nd February*, 1881.
452. Blacksmiths' Hearths, R. R. Gubbins, Newcross, London.—*2nd February*, 1881.
458. Brewing, A. Manbré, Finsbury, London.—*3rd February*, 1881.
462. Spinning, &c., Machinery, T. Craven and J. Crabtree.—*3rd February*, 1881.
469. Permanent Way, R. Long, Clayton-square, Liverpool.—*4th February*, 1881.
472. Paper-making, J. Collins, Bowling.—*4th February*, 1881.
490. Nailing Machines, W. Morgan-Brown, London.—*5th February*, 1881.
503. Skate, J. P. Becker, jun., Remscheid, Prussia.—*5th February*, 1881.
514. Driving Small Machines, L. Boye, Dresden, and E. Müller, Saxony.—*7th February*, 1881.
525. Breech-loading Small-arms, J. F. Swinburn Birmingham.—*7th February*, 1881.
538. Cutting, &c., Tea, D. Whyte, Glasgow.—*8th February*, 1881.
560. Sugar, J. H. Johnson, Lincoln's-inn-fields, London.—*9th February*, 1881.
573. Transcribing all Musical Compositions, A. P. Hodgson, Paris.—*10th February*, 1881.
646. Packages or Cases, W. E. Gedge, Wellington-street, London.—*15th February*, 1881.
649. Governors for Steam Engines, R. Schmitz-Werotte, London.—*15th February*, 1881.
664. Painting in Oil upon Fabrics, J. C. Mewburn, Fleet-street, London.—*16th February*, 1881.
687. Dressing Flour Middlings, T. F. Hind and R. Lund, Preston.—*17th February*, 1881.
698. Fountain Pen-holders, M. Benson, Chancery-lane, London.—*17th February*, 1881.
700. Trough or Multiple Water-closets, H. B. Scott and H. V. R. Read, London.—*17th February*, 1881.
714. Sewing Machines, S. W. Worssam, Chelsea, London.—*18th February*, 1881.
882. Open Links, &c., W. A. Ingalls, Sackville-street, London.—*1st March*, 1881.
1147. Transparent Ice, H. J. West, Southwark Bridge-road, London.—*16th March*, 1881.
1231. Kiln, &c., R. Ballard, Clifford's-inn, London.—*21st March*, 1881.
1233. Horizontal Wind Motor or Windmill, L. A. Purper, Paris.—*21st March*, 1881.
1294. Gases, C. F., A. W., and A. L. Lawton, Rochester, U.S.—*23rd March*, 1881.
1534. Money Tills, &c., F. Hawkins, Disraeli-road, near Stratford.—*7th April*, 1881.
1876. Brushes, G. W. von Nawrocki, Leipziger-strasse, Berlin.—*2nd May*, 1881.
1971. Lacing Hooks, &c., H. J. Haddan, Strand, Westminster.—*6th May*, 1881.
1988. Spinning Machines, A. Munzinger, Olten, Switzerland.—*7th May*, 1881.
2072. Treating Date Fruit, T. F. Henley, Palmerston-buildings, Old Broad-street, London.—*12th May*, 1881.
2101. Securing Railway Rails, W. H. Nevill, Ferryside, South Wales.—*13th May*, 1881.
2150. Trunks, &c., W. R. Lake, Southampton-buildings, London.—*17th May*, 1881.
2256. Supporting Structures, W. R. Lake, Southampton-buildings, London.—*24th May*, 1881.
2262. Railway Switches, &c., W. R. Lake, Southampton-buildings, London.—*24th May*, 1881.

2264. CABLES, &c., W. C. Barney, Bernard-street, Russell-square, London.—*24th May*, 1881.
2281. VENTILATORS, J. E. Ellison and H. Fourness, Leeds.—*24th May*, 1881.
2398. TELEPHONES, R. M. and W. V. O. Lockwood, New York, U.S.—*31st May*, 1881.

(*List of Letters Patent which passed the Great Seal on the 2nd August*, 1881.)

384. TOBACCO PIPES, C. M. P. H. Triscott, Cheapside, London.—*28th January*, 1881.
442. EXTINGUISHING FIRE, J. C. Hudson, Elmcroft, Wimbledon.—*2nd February*, 1881.
470. AIR COMPRESSORS, C. T. Owen, Chesterfield.—*4th February*, 1881.
491. SECURING SCARF PINS, J. Foxlow, Manchester.—*5th February*, 1881.
493. CONDENSING APPARATUS, J. W. Cade, Rock Ferry.—*5th February*, 1881.
498. KILNS, E. Edmonds, Fleet-street, London.—*5th February*, 1881.
501. TURNING over LEAVES, R. H. Padbury, Stoke Newington, London.—*5th February*, 1881.
505. CHIMNEYS or FLUES, T. Rowan, Ryde, Isle of Wight.—*5th February*, 1881.
516. REFRIGERATORS, &c., G. Gilbert, Bedford-park, London.—*7th February*, 1881.
520. LOOMS, G. Lendrum, T. Beardsell, and S. Mitchell, Thongsbridge.—*7th February*, 1881.
522. LOOMS, J. Hollingworth, Dobcross.—*7th February*, 1881.
535. GAS CONDENSERS, F. Morris, Brentford, and S. Cutler, Millwall, London.—*8th February*, 1881.
552. DIGGING, &c., J. Parker, Springfield.—*9th February*, 1881.
565. GAS ENGINES, A. T. Allcock, Newark-on-Trent.—*9th February*, 1881.
582. LAMPS, &c., I. Sherwood, Birmingham.—*10th February*, 1881.
596. ENGINES, P. Giffard, Paris.—*11th February*, 1881.
601. BRACELETS, &c., W. West, Birmingham.—*11th February*, 1881.
607. TELEGRAPHIC APPARATUS, P. M. Justice, Southampton-buildings, London.—*11th February*, 1881.
621. VIOLINS, &c., H. J. Haddan, Strand, London.—*14th February*, 1881.
627. STEAM ENGINES, &c., W. F. Goodwin, Stelton, U.S.—*14th February*, 1881.
654. SORTING, &c., SEEDS or GRAIN, K. H. Sander, Zweinaundorf, Germany.—*15th February*, 1881.
743. COMPOUND STEAM ENGINES, H. H. Lake, Southampton-buildings, London.—*21st February*, 1881.
976. SECURING HOSE, &c., upon COUPLINGS, W. R. Lake, Southampton-buildings, London.—*7th March*, 1881.
1056. ARTIFICIAL FLOWERS, W. Spence, Quality-court, Chancery-lane, London.—*11th March*, 1881.
1280. VARIABLE VALVE GEAR, W. Johnson, Liverpool.—*23rd March*, 1881.
1301. TOBACCO POUCHES, H. A. Fleuss, Haverstock-hill, London.—*23rd March*, 1881.
1641. LIQUID METER, J. H. Blum, Bienne, Switzerland.—*14th April*, 1881.
2051. HATS, J. H. Neave, Macclesfield.—*11th May*, 1881.
2157. CALENDERING, &c., MACHINES, A. J. Boult, High Holborn, London.—*17th May*, 1881.
2309. PRINTING MACHINES, J. Smale, Hayles-street, Southwark, London.—*26th May*, 1881.
2500. DIRECT-ACTING PUMPING ENGINES, A. M. Clark.—Chancery-lane, London.—*8th June*, 1881.
2578. FOOT-POWER MECHANISM, A. M. Clark, Chancery-lane, London.—*14th June*, 1881.

List of Specifications published during the week ending July 30th, 1881.

4942, 4d.; 5000, 2d.; 5005, 2d.; 5008, 2d.; 5019, 2d.; 5168, 1s.; 5211, 2d.; 5217, 4d.; 5223, 2d.; 5277, 2s. 6d.; 5303, 6d.; 5329, 6d.; 5344, 8d.; 5345, 6d.; 5346, 6d.; 5347, 8d.; 5363, 8d.; 5386, 6d.; 5388, 6d.; 5390, 8d.; 5394, 4d.; 5404, 6d.; 5408, 6d.; 5412, 6d.; 5415, 6d.; 5436, 6d.; 5441, 2d.; 5442, 6d.; 5443, 4d.; 5444, 2d.; 5445, 6d.; 5448, 2d.; 5449, 2d.; 5451, 2d.; 5452, 2d.; 5454, 2d.; 5455, 2d.; 5456, 6d.; 5457, 8d.; 5458, 6d.; 5459, 6d.; 5460, 2d.; 5461, 6d.; 5462, 1s. 2d.; 5464, 2d.; 5465, 6d.; 5468, 6d.; 5470, 2d.; 5471, 1s. 2d.; 5472, 6d.; 5473, 2d.; 5474, 6d.; 5475, 2d.; 5476, 2d.; 5477, 6d.; 5478, 6d.; 5479, 6d.; 5480, 2d.; 5481, 6d.; 5482, 6d.; 5483, 2d.; 5484, 6d.; 5485, 2d.; 5486, 6d.; 5487, 2d.; 5488, 2d.; 5491, 6d.; 5492, 4d.; 5494, 2d.; 5495, 6d.; 5496, 6d.; 5497, 2d.; 5498, 4d.; 5499, 4d.; 5501, 2d.; 5502, 6d.; 5504, 10d.; 5505, 6d.; 5506, 2d.; 5508, 6d.; 5510, 2d.; 5513, 6d.; 5515, 2d.; 5516, 8d.; 5517, 2d.; 1, 2d.; 2, 6d.; 4, 6d.; 5, 6d.; 2, 2d.; 7, 2d.; 8, 2d.; 9, 8d.; 10, 4d.; 12, 2d.; 14, 6d.; 15, 2d.; 16, 6d.; 17, 4d.; 19, 4d.; 20, 6d.; 21, 2d.; 22, 4d.; 23, 8d.; 24, 2d.; 26, 6d.; 32, 6d.; 52, 4d.; 87, 6d.; 116, 6d.; 117, 6d.; 118, 6d.; 143, 6d.; 196, 6d.; 206, 6d.; 320, 6d.; 388, 6d.; 419, 6d.; 1469, 6d.; 1477, 4d.; 1743, 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.*

4942. FILTERS, *G. Mant.*—*27th November*, 1880.—(*Not proceeded with.*) 4*d.*

One of the objects is to facilitate the cleaning of the filtering medium. The filtering chamber and subsiding tank are made separate, and the top of the latter or the bottom of the former is provided with a stationary perforated metal diaphragm on which the filtering medium rests. The upper portion of the filtering chamber is furnished with a diaphragm capable of a rotary motion to separate and stir the filtering medium in cleaning it, and a vertical motion to compress the medium to the required density.

5000. RAG ENGINES, *R. K. Miller.*—*1st December*, 1880.—(*Void.*) 2*d.*

A narrow deep circular or oval chamber stands on edge, and the plate box or knife is carried in a circular centre piece, with a backfall. The grinding roller is such as is usually employed, and may be raised simultaneously at both sides.

5005. SECURING TOGETHER EDGES OF SHEETS OF PAPER, &c., *L. de Horvath.*—*1st December*, 1880.—(*Void.*) 2*d.*

The two edges to be joined are subjected to compression between two striated or grooved surfaces, so as to form projections and indentations which interlock and bind the two parts.

5008. IMPROVEMENTS IN ELECTRO-MAGNETIC INDUCTION MACHINES, *H. Wilde.*—*1st December*, 1880.—(*Void.*) 2*d.*

This invention consists of a method of constructing electro-magnetic induction machines with multiple armatures, by which their efficiency would be greatly increased.

5019. WIRE NAILS, &c., *J. Sheldon.*—*2nd December*, 1880.—(*Provisional protection not allowed.*) 2*d.*

The nail is made of oval or double convex form in the section of the shank, or of the section of a double cone, so as to enable them to be driven truly.

5168. IRON AND STEEL, *E. Ellinor.*—*10th December*, 1880. 6*d.*

This relates to the removal of phosphorus, sulphur, and other impurities from iron and steel by the use of calcium hydrate, or magneso calcium hydrate, or quicklime or lime, or magnesium lime in any intermediate state of hydration, or their carbonates, in combination with a fixed oil or fat, or solid or liquid hydrocarbon oil; and further, as a modification the combination with the above chemical agents of a highly oxidising agent. The drawing shows the apparatus employed as applied to a Bessemer steel converter. A is a range of blast pipes, B generators, chargers or mixers for charging the blast with hydrocarbon oil; D a hydrate of lime box by which the

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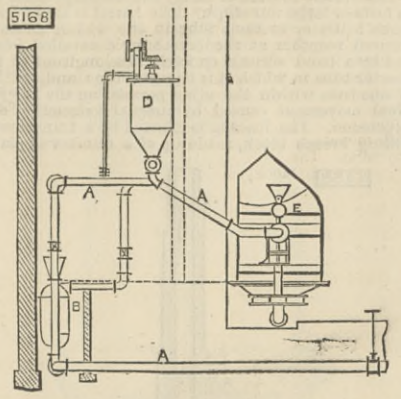


blast is charged with hydrate of lime; E a vessel for charging the blast with nitrate of sodium or its equivalent.

5211. LIGHTING MINES, *P. Adie.*—*13th December*, 1880.—(*Provisional protection not allowed.*) 2*d.*

This consists in an electric light burning in a vacuum, the wires being so supported by the lamp that if the lamp were broken the electric current would at once be broken and the light extinguished.

5217. PISTONS, *J. Wavish.*—*13th December*, 1880. 4*d.*

This relates to means for easily and accurately adjusting the pistons in position in the cylinders. Recesses are formed in the piston running from the circumference towards the centre, and in each a spiral spring is placed and has a plate on one end which bears against the inner surface of the packing ring. A plate is also placed at the other end of the spring, and to it is connected a bolt with nuts so as to adjust the pressure of the springs.

5223. KEY PLATE FOR PRIVATE CORRESPONDENCE, *W. Brierley.*—*13th December*, 1880.—(*A communication from J. Pignol.*)—(*Provisional protection not allowed.*) 2*d.*

This consists of a plate with holes cut in it to be placed over the post card, and the words written in the spaces, the blank spaces being afterwards filled in. The person to whom the letter is sent must have a similar plate to decipher the writing.

5229. MORTISING MACHINES FOR CUTTING TENONS, *E. Cory.*—*14th December*, 1880. 4*d.*

The chisel holder is attached to a frame for carrying two or more vertical saws, capable of being fixed at different distances apart, and strained tight in the frame, which reaches below the holder or saddle of the machine and is free from contact with the work during its vertical retrograde motion.

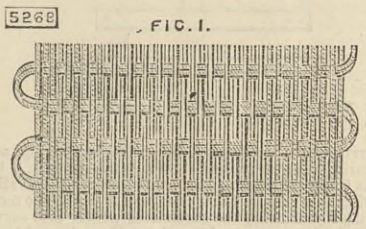
5233. ANTI-FRICTION BEARINGS, *E. P. Lacoste.*—*14th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates to wheels which revolve on a fixed axle, and it consists in forming a groove therein, and also in the hub which revolves on it, a number of steel rollers being placed in the space formed by the two grooves, and maintained at proper distances apart by a ring common to all.

5268. APPARATUS FOR TRANSMITTING DRAWINGS, CHARACTERS, AND WRITING BY ELECTRICITY, &c., *A. W. L. Reddie.*—*15th December*, 1880.—(*A communication from J. André.*) 6*d.*

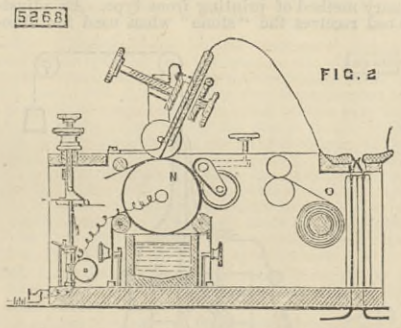
This invention consists in the use of a band of composite tissue or web of convenient length formed by the grouping of a variable number of metallic conducting wires, which are insulated from one another by means of a weft of textile material, the warp threads being formed by the conducting wires themselves, as shown in Fig. 1. In applying this conducting

5268 FIG. 1.



web to telegraphic purposes over long distances, the gauge of the wires should be large. At each intermediate station on the line the ends of the conductors are bound together with rubbing surfaces or brushes of a similar web, but formed of finer wires, each of which corresponds to one of the wires of the main conducting web. The ends of the wires of the main web are not fastened directly to the wires of the brushes of transmission, but are connected by a commutator. Fig. 2 shows a sectional side elevation of the apparatus used in reproducing a tracing. The reproduction is effected as follows:—The tracing is made to pass under one end of a brush at the transmitting station at the same time that a receiving surface, formed of a continuous band of paper O, is caused to pass under the corresponding brush at the

5268 FIG. 2



receiving station. This paper O is chemically prepared, so as to be changed by the electric current, which reproduces the original design. O passes over a metal cylinder N, rotated by clockwork and governed by a fan. One of the poles of the battery is in communication with earth, whilst the other is connected with receiving cylinder N, communication with line being established by means of the brushes.

5272. SAWING MACHINES, *E. Rayner.*—*16th December*; 1880. 6*d.*

This relates to sawing machines with reciprocating blades, and consists in the use of two or more blades secured and guided so as to cut two or more boards at once.

5295. WINDOW SASHES, &c., *W. Phillips.*—*17th December*, 1880. 6*d.*

This relates to means for turning the sashes, so as to clean them from the inside, and consists in forming a vertical groove in each sash stile to admit a rod pivotted on pins in the centres of the stiles, and so arranged that they may be moved outwards carrying the rods clear of the grooves and into recesses in the pulley stiles, when the sashes can be reversed.

5297. CHURNS, *C. E. Ashborn.*—*16th December*, 1880. 6*d.*

A cylindrical copper vessel is carried on trunnions, so as to tilt it to turn out contents, but while being worked it is retained by a bolt. Round the rim water can circulate to regulate the temperature, the water passing through holes in the rim, and playing on the outside of the vessel. The milk is agitated by two frames, one within the other, and rotated in opposite directions.

5303. VENTILATING SEWERS AND DRAINS, &c., *T. Rowan.*—*17th December*, 1880. 6*d.*

The object is to cause sewer gases to pass through a suitable purifying medium before being discharged into the open air. For this purpose the gas passes into a receiver fitted with a cowl or other means to produce an induced current, and the receiver is charged with coke saturated with carbolic acid or other antiseptic or disinfecting material.

5329. JACQUARD APPARATUS, *J. Irving.*—*20th December*, 1880. 6*d.*

This relates to jacquard apparatus employed in weaving goods with figured designs, and particularly to make changes in such designs during the weaving, and it consists in the use of a supplementary jacquard apparatus, on which the additional cards are mounted, such apparatus being set in action at the times when

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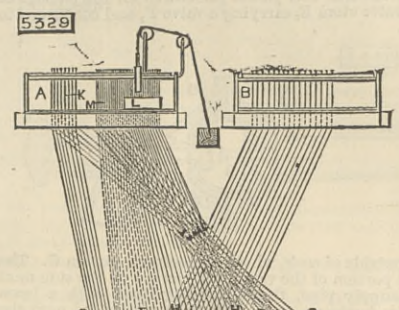

the change has to be effected. In the drawing A is the ordinary apparatus, B the additional apparatus, and C the fabric. The mails G operate on the ends which are lifted for weaving the borders and are connected with needles K, operated by a set of border pattern cards. The mails H operate on the ends which are woven into the central design, and are connected with needles L, and also with needles in the apparatus B. The mails I operate on the ends lifted to form the ground pattern, and are not woven into the side borders or central design, and are connected by cords with needles at M.

5344. MOULDING MACHINES, &c., *H. Wren and J. Hopkinson.*—*20th December*, 1880.—(*Partly a communication from G. Sebold and F. Neff.*) 8*d.*

This relates to improvements on patent No. 3327, A.D. 1879, and consists in making the moulding box

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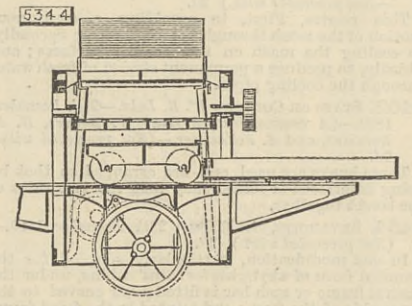

in halves, joined together by pins fixed to the pattern plate and fixed in position in holes in the two halves by cotter pins. The gits and runners are formed with the mould by the pattern plate. The drawing is a longitudinal section of the moulding machine.

5345. BRANDING WOOD, &c., *J. Richmond and W. Whiting.*—*21st December*, 1880. 6*d.*

The device to be branded is raised on a flat metal plate secured to a heating box connected to a cross-head sliding between standards. Below the plate is a bed to receive the wood. The heating box is provided with a gas and an air pipe, so as to produce a flame which shall heat the metal plate bearing the device.

5346. WARMING AND VENTILATING ROOMS, *J. Smith.*—*21st December*, 1880. 6*d.*

Two regulated currents of air are admitted from outside the building by separate passages, one serving to supply oxygen to the fire-grate, and the other to introduce fresh air for breathing and for chimney draught.

5347. ENGINES WORKED BY STEAM, AIR, OR GAS, *S. Robinson.*—*21st December*, 1880. 8*d.*

This consists in the use of two pistons working in cylinder A with independent rods C passing out at opposite ends and connected with rods for giving motion to the other parts of the engine. The valves are arranged to alternately admit steam, air, or gas between the pistons, forcing them to opposite ends of the cylinder, and then allow the motor to exhaust,

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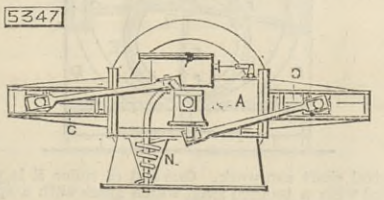

either into the atmosphere, in which case steam, air, or gas is afterwards admitted behind the pistons, or into a condenser N of conical form, closed at its larger end, and connected to the exhaust passage. It is made of thin metal, and is caused to rotate. Within it is a coil of light tubing, through which water circulates.

5363. GUNS AND VESSELS FOR SUBMARINE WARFARE, &c., *H. E. Newton.*—*21st December*, 1880.—(*A communication from J. Ericsson.*) 8*d.*

This relates to guns the muzzles of which are presented through and fitted water-tight within openings below the water-line in the bows of the vessels, and also to guns which may be loaded on board the vessel, and then placed on supports outside the vessel and fired below the water-line. One improvement consists of a metal piston fitted to work gas-tight in the bore of the gun, and applied between the projectile and the charge of powder for the object of causing the whole force of the explosion to be effectively employed in propelling the projectile. Another improvement consists in a box containing the charge, and of smaller diameter than the bore of the gun, which is attached to the piston. Other improvements relate to the vessel, so as to provide means for working the gun, also to preventing the vessel sinking; in hanging the rudder so that no part is above the water-line. The invention further relates to the explosive projectiles and the means for firing them.

5386. APPARATUS FOR PRACTICAL METEOROLOGY, *F. H. F. Engel.*—*22nd December*, 1880.—(*A communication from W. Klinkerfues.*) 6*d.*

This relates to an instrument for indicating changes of weather, and it requires either the metallic vacuum box—Vidi's system—or the ring—Bourdon's system—of an aneroid barometer. If the former is used the instrument consists of a shaft carrying the indicator, and to which a lever is fastened, and gives an inertia to turn the shaft. Within a short distance of the shaft, and parallel to it, a string of hygroscopic threads, such as human hair, is fastened and connected to the lever by an eye. The arm exerts a pressure on the string, which forms a convex curve, the convexity of which increases or diminishes with the degree of moisture in the hair, and accordingly the hand falls or rises. At the same time the string is subject to the influence of air pressure, being fastened to the diaphragm of the metallic vacuum box. When the Bourdon system is used the string is connected to projections on the end of the ring.

5387. IMPROVEMENTS IN MICRO-TRANSMITTERS, *W. Johnson.*—*22nd December*, 1880. 6*d.*

This invention is a new arrangement of Prof. Hughes' microphone. In carrying it out the inventor arranges a microphone consisting of two carbon pencils, supported on a diaphragm, and between the ends of these pencils he connects bobbins of insulated wire so as to cause them to resist the passage of an electrical impulse. The apparatus is then coupled up as shown in the figure, the electrical connections being as follows:—The positive current from F passes through the primary E of induction coil D to central block B;

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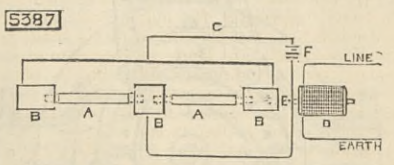

it then divides between the arms, or takes the arm or pencil which offers the least resistance, being either A or A^1, and completes the circuit through a connection. If contact is momentarily interrupted in the arm A, A^1 allows the circuit to be completed, and *vice versa*, thus a breakage in the primary circuit is obviated; in order, however, to render the manifestation in the receiving telephone of such a breakage impossible, a branch circuit C is introduced, so that if a breakage occur in the circuit through the microphone, the circuit can be made through C. This arrangement is claimed to obviate induced currents and to procure clear articulation.

5388. WIRE FENCING, *J. Shaw.*—*22nd December*, 1880. 6*d.*

In the standard slots are punched, and at right angles at the end of each a recess is formed to receive the wire. A wedge, having a shoulder or step, is driven into each slot, and serrations on its upper face bind it in position and prevent the wire springing out.

5390. UTILISING THE UNCONSUMED GASES OF COMBUSTION, PREVENTING SMOKE, &c., IN FURNACES, *R. Paulson.*—*22nd December*, 1880. 8*d.*

The bars A are made with a deep web extending along the exposed or underside so as to rapidly radiate the heat and prevent them burning. They are

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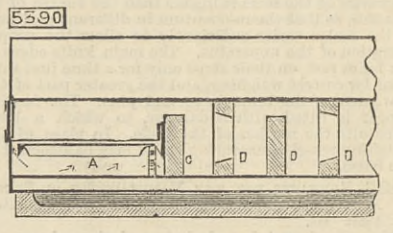

formed with a groove through which tubes pass, and are continued to the bridge C, so as to supply heated air which facilitates the combustion of the smoke and gases. A number of bridges or baffles D cause the complete mixture of the heated air and gases. Where the air issues into the furnace it meets a current of fresh air.

5394. MANUFACTURE OF BICARBONATE OF SODA, *W. Weldon.*—*23rd December*, 1880.—(*A communication from A. R. Pechiney.*) 4*d.*

This relates to improvements on patent No. 2098, A.D. 1880, in which a cylinder divided internally by a horizontal diaphragm perforated with holes was used, and it consists in substituting for the one diaphragm

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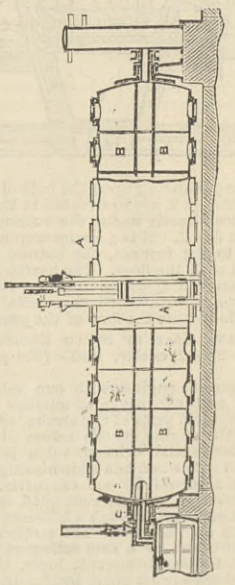

two perforated diaphragms B placed a little apart, the gases passing into cylinder A through trunnion C, entering the chambers formed by the vertical diaphragms through the horizontal diaphragms B.

5404. LOCKING AND UNLOCKING RAILWAY SIGNAL AND POINT LEVERS, *M. C. and T. J. Denne.*—*23rd December*, 1880. 6*d.*

The object is to lock the signal lever by hand, and

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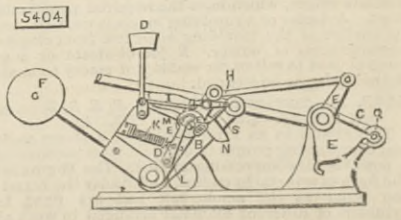

afterwards release the locking bolts by electric current or by compressed air, when the lever can be operated

the usual manner. Bridge pieces are placed along the line of rails, and when a train passes such pieces are depressed and complete a circuit, when magnet K attracts armature L, and thus moves lever E, so that stud M is in line with the curved slot in it. The disc can then revolve by means of hammer D, and causes stud N to come in contact with the bottom of slotted link S, thus moving a short crank downwards, which being connected to a detent H, causes it to rise out of the notch in quadrant I, and by means of weight F the lever D is moved, and causes lever C to rise above the centre by means of bell crank E coming in contact with a long stud Q to allow the lever B to be pulled back.

5408. Kilns for Burning Blue Bricks, Glazed Goods, &c., *E. E. Street.—23rd December*, 1880. 6*d.*

A continuous kiln is formed with burning chambers arranged in detached groups connected by short underground flues at each end, and in each flue is a damper, so that any group can be isolated and effectually closed after the burning is complete.

5412. Rotary Machines to be used as Motors, Pumps, Blowers, or Fluid Meters, *W. R. Lake.—Dated 23rd December*, 1880.—(*A communication from A. Kaiser.*) 6*d.*

A rotating piston A fixed on a shaft is of heart or shield-shape, and hollow, and revolves in a chamber B with two series of inlet and exhaust ports E separated from ports F by a partition, the admission of the fluid being controlled by valves D bearing on the periphery

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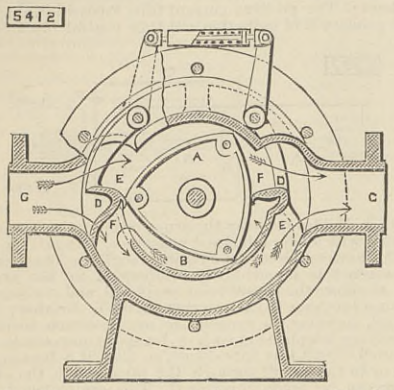

of the piston, and connected by rods with a link uniting the valves and ensuring their simultaneous action. Chamber B is surrounded by an annular channel G which conveys the fluid to the ports, where it is admitted through ports E at two opposite sides of the piston, so as to act on two faces at once, and passes out through ports F at two opposite points simultaneously.

5415. Weighing and Measuring Grain, &c., *W. R. Lake.—23rd December*, 1880.—(*A communication from A. Kaiser.*) 6*d.*

The weighing machine consists of a scale beam with a weighing vessel at one end, so that it is freely suspended only when in equilibrium, and consequently moves with the beam as if attached to it; the other end of the beam carries a counterweight. The centre of gravity of the scale is higher than the centre of its rotation, so that the momentum in different positions of the scales varies sufficiently to allow the proper operation of the apparatus. The main knife edges of the beam rest on their steps only for a time just sufficient for correct weighing, and the greater part of the movement of the beam is around pins. The feeding hopper is fitted with a damper, to which a lever transmits the motion of the scale. In place of the weighing vessel a measuring vessel may be attached to the beam.

5436. Furnaces for the Manufacture of Steel, *A. C. Wylie and T. Lockerbie.—Dated 24th December*, 1880. 6*d.*

The side flues A for admission of air and gas are built on the main substructure of furnace B, and entirely independent of the deflecting roof C, their entering face towards the furnace being turned arches D concave to the hearth E, which they overhang to a considerable degree, so as to give an effective impinge-

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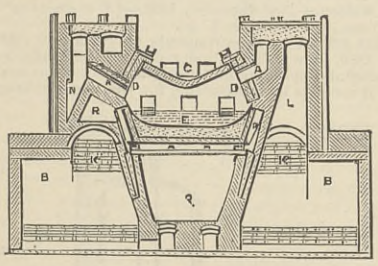

ment of the gas and air upon the bath of molten metal. The regenerators K are so situated in the substructure that they are directly under the current of hot gases escaping at flue L. N is a cinder trap in each gas exit flue close to the furnace, the bottom of the pocket being level with the floor. The hearth E is supported over an open area Q communicating round the sides of the furnace, with ventilation exits R. A valve is employed to reverse the flow of the gases.

5441. Valve Gear of Steam Engines, &c., *J. A. Stott.—27th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates to engines with one valve to regulate admission and exhaust, and another to cut off the steam at variable parts of the stroke, according to the load upon the engine, by the action of the governor. The admission and exhaust valve is worked by a tubular rod connected to a slide moving in a guide, the rod being actuated by an excentric. Within the tubular rod is a spindle connected with the cut-off valve, and actuated through a bell-crank lever having its fulcrum on the slide. The motion of the cut-off valve is governed by a cam acting on bowls on a rod connected to the bell-crank lever, the cam being moved endways on its shaft by the direct centrifugal action of the governor.

5442. Card Grinding Appliances, *J. S. Dronsfield.—27th December*, 1880. 6*d.*

This relates to the grinding rollers used to grind cards employed in the preparation of fibrous materials, and which are coated with particles of emery caused to adhere by glue or cement. To cause the particles to penetrate to some extent between the dents of the cards, the emery is moulded into a fluted form, so as to obtain ridges, which have the required penetrating effect. A doctor or a revolving brush is used to keep the surface of the moulding roller free from clogging accumulations of emery. A jet of steam or a gas flame is used to soften the coating of emery to enable the moulding to be effected.

5443. Air-compressing Engines, *F. E. B. Beaumont and D. Greig.—27th December*, 1880. 4*d.*

This relates to an arrangement of a steam engine and compressing pumps in compact form to constitute a portable air-compressing engine. The engine is in the form of a portable engine, and under the barrel of the boiler at the smoke-box end are fixed two cylinders of different diameter arranged to work as a compound engine, their piston rods being connected to cranks at right angles to each other. From the pistons of these cylinders rods extend to the pistons of two air pumps, placed one in line with each cylinder, and in a tank through which water circulates to keep them cool.

5444. Safety Apparatus for Locomotive Engines, &c., *W. R. Lake.—27th December*, 1880.(—*A communication from H. Ruelle.—(Not proceeded with.*) 2*d.*

This relates to a device for maintaining upon the road the whole weight of the vehicles that leave the rails, and for utilising this weight for obviating all disastrous effects which might ensue when two or more wheels leave the rails. In front or behind the end wheels is a part of a cylinder of sheet steel, which forms a slide or skate and extends across the rails. It is solidly attached by a guard plate made in one piece with the longitudinal framing of the vehicle, and catches are provided on the cylindrical surface, so as to keep the vehicles which leave the rails upon the roads.

5445. Valves, Taps, or Cocks, *T. Meacock and A. W. C. Ward.—28th December*, 1880. 6*d.*

This relates to a valve which will gradually close of itself when no longer acted upon. The arrangement shown in the drawing consists of a broad seating A to receive a conical india-rubber plug or valve B, the outer portion of which forms a hollow sphere, which fits into a brass pan C held in position by lugs D. On the front side this pan is perforated for the passage of the valve stem E, carrying a valve F, and continued to

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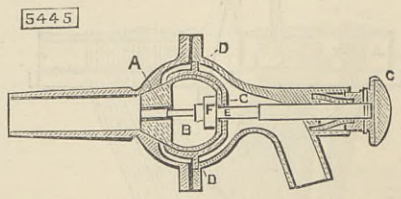

the outside of cock, where it receives a button G. The solid portion of the valve B is pierced on the side next the supply pipe, the hole being lined with a brass ferule, having a small hole in it at the end next the source of supply.

5448. Bicycles and Tricycles, *I. T. Townsend.—28th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates, First, to the steering of tricycles, and consists of cutting a helical groove, which passes through the nut in the end of the arm of a lever hung on a bracket, the other arm of the lever being attached to the rod which passes on to the lever of the steering wheel. Inside the nut on the arm of the lever, where the handle stalk passes through, is a friction roller working in the groove, so that as the steering handle is turned the lever is actuated, and moves the arm attached to the steering rod. The invention also relates to mounting the saddle of a bicycle on springs.

5449. Fog Signals for Navigation, *W. B. Barker.—28th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates to making different signals by means of a horn, reed instrument, or whistle, by even sustained notes and vibrating notes, and in the mechanism for producing the different sounds.

5451. Mash Cooling Apparatus, *W. Brierley.—28th December*,1880.—(*A communication from A. Nohring.*) —*Not proceeded with.*) 2*d.*

This relates, First, to providing a continuous motion of the mash through the mash pipes; Secondly, to cooling the mash on two cooling surfaces; and Thirdly, to produce a permanent stream of fresh water through the cooling pipes.

5452. Stays or Corsets, *W. R. Lake.—28th December*, 1880.—(*A communication from W. Bowers, H. B. Doremus, and A. Fellheimer.—(Not proceeded with.*) 2*d.*

Three busks are used, and are arranged so that by being interlaced or folded they hold the two sides of the corset together.

5454. Skylights, *A. Forbes.—28th December*, 1880.—(*Not proceeded with.*) 2*d.*

In one modification, particularly adapted for the rounded form of skylights for ships' cabins, under the central frame or sash bar is fitted a bar curved to the inner side of the frame and jointed to the fixed frame of the window, below the inner edge of the window frame, to be raised and lowered with the hinged movable skylight frame. The outer end of the bar slides on a rail fixed to the underside of the skylight frame.

5455. Ships and Vessels, *F. H. Danchell and R. Blum.—28th December*, 1880.—(*Not proceeded with.*) 2*d.*

The ship is formed as it were with two hulls one within the other, the space between them being divided into water-tight compartments.

5456. Rotary Pumps, *G. Waller.—28th December*, 1880. 6*d.*

The cast iron cylinder A is fitted with end covers, and has an inlet C and an outlet D. Within A is a roller E bored longitudinally at three points to receive slotted rollers F, through which slides G hinged to a

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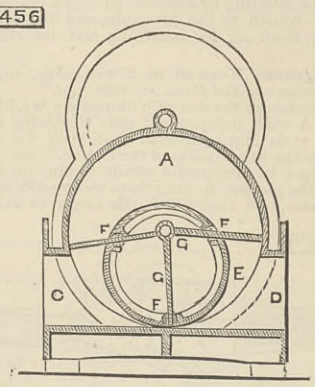

central shaft can work. One end of roller E is provided with a toothed ring, which gears with a spur-wheel driven from a suitable motor.

5457. Blow-pipe Revolving Furnace, &c., *B. J. B. Mills.—28th December*, 1880.—(*A communication from G. Duryee.*) 8*d.*

O is a fuel furnace formed with a hearth having a blast underneath and adapted for burning coal, wood, oil, gas, or any preferred fuel. A is a revolving cylinder formed with an enlargement A^1 at its lower end, and supported in inclined position on rollers B being rotated by gearing C. The lower end is formed

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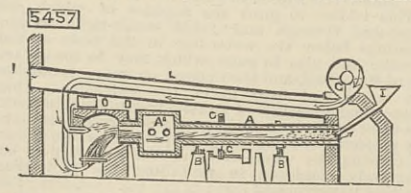

with an annular flange D fitting a recess in the face of furnace O so as to receive the products of combustion. The gases passing through A are carried off through the inclined stack L. The ores are fed in through hopper I and delivered in the upper end of cylinder A. G is a fan for driving a blast of air through a pipe which is carried through the inclined stack L for the purpose of heating the blast.

5458. Heavy Ordnance, *B. J. B. Mills.—28th December*, 1880.—(*A communication from J. H. McLean and M. Coloney.*) 6*d.*

This relates to guns of heavy calibre adapted for use in forts or large war ships. The barrel is made up of three tubes or sections slipped one within another, secured together at the breech by dovetailed joints and by a band shrunk on each tube in front of the shorter tube in which it is encased, the simple fitting of one tube within the other permitting the longitudinal movement caused by unequal contraction and expansion. The loading is effected by a transversely sliding breech block, made up of a number of plates

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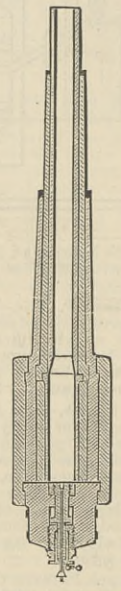

bolted together, and having two chambers, one of which is presented externally to receive the cartridge, while the other is in rear of the bore. The chambered breech slide moves in an opening of the breech which is made up of three parts, and hydraulic engines are used to feed the cartridges in succession to the slide chambers, shift the slide alternately in opposite directions, and drive the cartridge within the bore, the engine which effects the last duty also serving to take up the recoil and remove the empty shell.

5459. Machine Guns, *B. J. B. Mills.—28th December*, 1880.—(*A communication from J. H. McLean and M. Coloney.*) 6*d.*

This relates to a machine gun with a horizontal range of a number of barrels, and a breech slide having a reciprocating movement and provided with one or two sets of load chambers, each corresponding with the barrels, so that when the slide is elevated one set of chambers will be in firing position, and when depressed the other set. The frame A can swivel on

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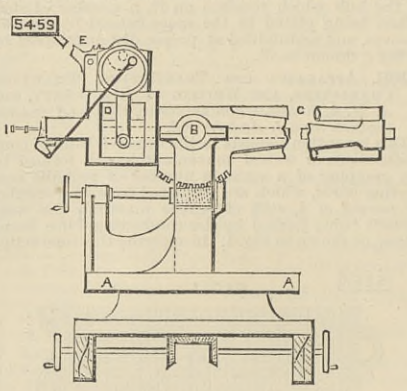

the carriage and is actuated by suitable gearing, and has bearings for trunnions B on a plate to which the barrels C are attached. Behind the barrels the slide D having two sets of load chambers is caused to move vertically by lever E, the motion of which also serves to cock the hammers and to release them in rapid succession so as to fire the gun. Similar ranges of magazines are arranged above and below the barrels, so that when one set of chambers is in position for firing the other set is in position for loading.

5460. Pirns and Spindles of Spinning Machinery, *A. W. L. Reddie.—28th December*, 1880.—(*A communication from J. C. Zeller.—(Not proceeded with.*) 2*d.*

The springs in the pirns which serve to keep the bobbins in place are replaced by projecting spirals wound round the tapering shank.

5461. Lithographic and Letter-press Printing Machinery, *W. C. Kritch.—28th December*, 1880. 6*d.*

This relates to the adaptation of one machine to printing by the lithographic process as well as by the ordinary method of printing from type. An adjustable bed receives the "stone" when used for litho-

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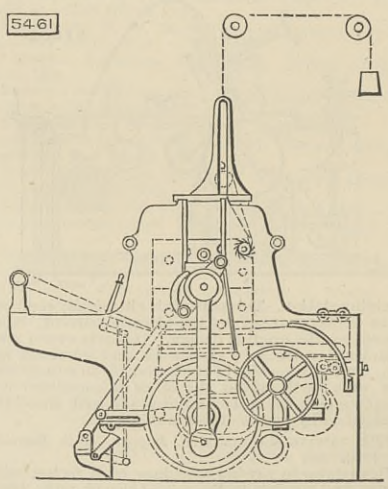

graphic printing, and is adjusted by set screws until the surface is brought to a proper position for printing from. When used for letterpress printing the same bed and adjustment is used for the usual type "chase" or "formes."

5462. Preparing, Spinning, and Rope-making Machinery, *A. M. Clark.—28th December*, 1880.—(*A communicatiom from La Société Anonyme des Corderies Parisiennes.*) 1*s.* 2*d.*

The invention relates to spreading and drawing machines, spinning machines for spinning the fibres into yarns, machines for twisting the yarns into strands, and laying machines for laying the strands into ropes, all four operations being based on the employment of a cylindro-conical device, whereby the lengths of all the yarns are made mathematically equal, by causing the diameter of the cylinder or cylinders on which the yarns are wound to diminish gradually and inversely to the increase in the diameter of the yarn or strands. The device consists of a spindle to be placed in a twisting flyer carrying a boss fixed to a bevel wheel to drive it. From the boss conical pins project, and on them fits a movable disc caused to incline itself to the spindle. The disc has cylindrical holes corresponding to the pins on the boss, and it is free to oscillate in every direction.

5464. Furnaces for the Prevention of Smoke, &c., *J. Jackson.—29th December*, 1880.—(*Not proceeded with.*) 2*d.*

Two chambers are formed, one in front of the furnace and the other behind the bridge at the back of the furnace, and into them air is admitted and passes into the furnace.

5465. Raising Sunken Vessels, &c., *W. Aitkinson.—29th December*, 1880. 6*d.*

This consists of a buoy with suitable valves which allow water to enter and sink it, and when placed in position on the sunken vessel such water is forced out by air forced through a tube, by means of a suitable pump, when the float assists in floating the submerged body.

5467. Destruction of Field-mice, &c., *H. A. Bonneville.—29th December*, 1880.—(*A communication from L. A. Couteau.*) 6*d.*

A box with longitudinal openings in the four sides near the bottom allows the mice to enter. From each opening an inclined plane proceeds towards the centre, where there is a recess, in which a poisonous substance is placed. By this means poultry and game will not be able to get at the poisoned food.

5468. Moving Dampers, &c., *R. Walker.—29th December*, 1880. 6*d.*

This relates to the use of various combinations of worm, worm-wheel, screw, rack or ratchet, or a series of studs with spur and pinion gearing, and it consists in arrangements of mechanism whereby the worm and screw or ratchet may be used to open and close one window, shutter, or damper, or a series of such, the opening and closing being operated from any convenient point, however distant, and by means of pulleys and chains or cords, or by cranks and connecting rods.

5470. Velocipedes, *W. Andrews.—29th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates, First, to increasing the length between the bearing centres without proportionately increasing the length of the head of the steering apparatus; and Secondly, to a new form of pedal.

5471. Gas Motor Engines, *R. Hutchinson.—29th December*, 1880. 1*s.* 2*d.*

The engine is worked with the gaseous mixture in a state of considerable compression. The power is developed in one or two single-acting cylinders, having combined therewith another cylinder of reduced diameter. The working cylinder A has two semicircular castings B, forming passages which, as well as the space

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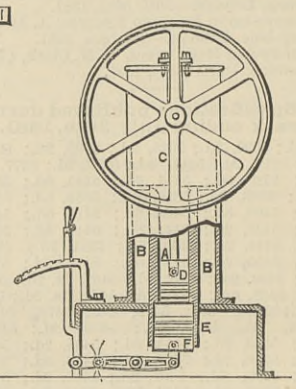

C above the cylinder, sometimes communicates with the open air. The motion of piston D acting as a double-acting pump causes a strong current of air through the passages, thereby preventing overheating of cylinder and piston. The compressing cylinder E is of larger diameter than the working cylinder A, and in it is a plunger F which can be moved so as to increase or diminish the capacity of cylinder E, and thus regulate the compression of the charge.

5472. Glazing, &c., *C. F. Elliot.—29th December*, 1880 6*d.*

Anchor-shaped iron is used for the sash bars, and the glass is attached to it by spring clips bolted to the web of the anchor. A cap slides under the clips and fits over them and the web of the iron. The ends of the edges of the anchor iron are channelled to receive a suitable packing on which the glass bears.

5473. Window Sashes, *J. Terrey, R. Judson, and G. Smith.—29th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates to windows with sliding sashes, and consists in means for turning them inwards, when the weights are detached, so that they may be cleaned entirely from the inside.

5474. Preparing Seeds for Crushing in Manufacture of Oil and Composition Cakes, *C. Eskrett and W. H. Searle.—29th December*, 1880. 6*d.*

This relates to machines for preparing the seed for the finishing press, and is designed to obviate the creasing and injury to the cloths in which the seed is enclosed within the wrapper or envelope. A board fitting the inside of the frame is swung in such a position that when the cloth and seed are in position the board is brought down and pressed on the seed before folding over the sides of the cloth, whereby the bagging or overhanging of the cloth is avoided.

5475. Ornamentation or Colouring of the Surface of Hard Rubber, &c., *W. P. Thompson.—29th December*, 1880.—(*A communication from The Dickenson Hard Rubber Company.—(Complete.*) 2*d.*

The design is produced on the surface of hard rubber by a mixture of pigment colours with a thick solution of shellac dissolved in alcohol, and when dry subjecting it to pressure between smooth heated metallic plates or blocks.

5476. Treating and Transporting Human Excreta, &c., *R. Hoodless.—29th December*, 1880.—(*Not proceeded with.*) 2*d.*

This consists in the employment of air-tight carts, and sleeves so as to transfer the excreta from one receptacle to another without causing any disagreeable smell in transporting from towns to the fields where it is used as manure.

5477. Saddle Bars, *Sir F. Dancer and E. Chappell.—29th December*, 1880. 6*d.*

The object is to provide a saddle bar which shall automatically unlock and release the stirrup leather when the rider is thrown. A plate is rivetted to the saddle, and to it are hinged two bars, one vertical and having a projection or cam at the hinge end, and the other horizontal and slightly cranked or curved at the hinge end. The lower end of the first bar has an eye into which the free end of the second bar passes, a spring keeping it in position. When the stirrup leather pulls against the saddle bar, the two bars are unlocked and the stirrup leather freed.

5478. Ammonia, *H. A. Dufrené.—29th December*, 1880. —(*A communication from La Société l'Alzote.*) 6*d.*

The object is the extraction of nitrogen from the air

and the manufacture of ammonia. For this purpose nitrogen is combined with hydrogen, and the ammonia produced may be used either alone or in combination with a suitable acid for commercial or agricultural purposes to serve as a manure. To ensure the combination of the nitrogen and hydrogen, the action of porous bodies either in a hot or cold state is utilised.

5479. OBTAINING AND APPLYING MOTIVE POWER, *J. Graddon.—29th December*, 1880. 6*d*.

The object is to produce motive power by means of fluids expanded or compressed separately or in combination with each other, such as air compressed, or gas or gases produced from any matter, or steam produced or compressed by suitable means, such as a coil or coils of tubes, arranged so that the coils lie close to each other, and thus form a long pipe, which is again

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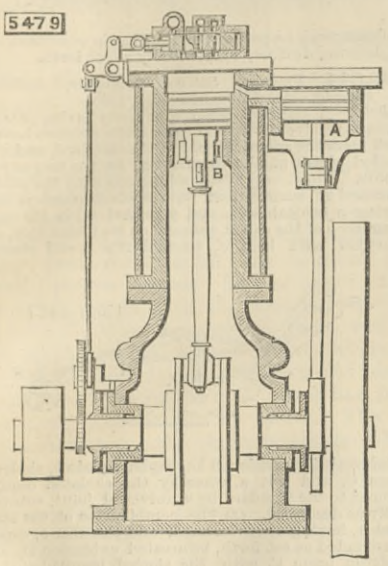

coiled in the form of a scroll, and heat passed within and without the first and other coils, so as to convert the water into steam or explosive matter into gas before it arrives at the end of the tube forming the coil. The drawing shows an engine to be worked with coal gas and fitted with a compressing cylinder A attached to the working cylinder B.

5480. PUMPS, *A. M. Clark.—29th December*, 1880.—(*A communication from W. H. Triplett.*(—(*Not proceeded with.*) 2*d*.

This relates to a simple compact pump for household, garden, and other purposes, in which the force can be regulated at will, and it consists in the employment of an air chamber placed round the pump barrel, preferably near the water level, into which chamber the water is forced by the pump plunger, and the air, being thereby compressed, the water is forced to the desired place.

5481. SOFA BED, *R. E. Parr.—29th December*, 1880.—(*A communication from F. Laeremans.*) 6*d*.

This relates to a combined sofa or lounge with a bed, and consists mainly in an improvement by which, in connection with an ordinary sofa frame, a movable back is employed, which acts both as a back to the sofa and as a bed by sliding it forwards, so that it rests over the top of the couch.

5482. TELEPHONIC APPARATUS, *C. J. Wollaston.—30th December*, 1880. 6*d*.

This invention has for its object the construction of a portable telephonic apparatus suitable for use in military and naval operations, mine explorations, &c. The apparatus is composed of a box, with hinged cover at top, this box is divided into compartments, in one of which is the battery, in another is the receiving telephone with accessories, in another is the signal bell. In the upper portion of the box is located a

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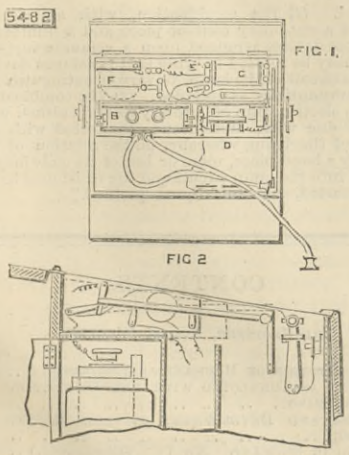

transmitter, by the side of which is pivotted the switch for throwing the bell, transmitter, and receiving telephone in and out of circuit. The switch is so arranged that by the action of closing the lid of the box the battery is cut out of circuit. The box also contains bell key, button, terminals, binding posts, &c. The apparatus when used in connection with diving apparatus or for other purposes of same nature, is provided with extra terminals for an additional wire, and a switch is so arranged as to bring the home battery or an additional battery at the home station into connection with the distant transmitter, which is placed in the helmet of the diver. For example, Fig. 1 shows the arrangement of the apparatus in the box; Fig. 2 shows the arrangement of the switch; B is the telephone receiver, D electric bell, in the compartment marked E is the microphone transmitter consisting of an arrangement of multiple carbons, G is the induction coil, F the battery.

5483. WHEELS FOR COLLIERY CORVES, &c., *J. Trippett and T. Walton.—30th December*, 1880.—(*Not proceeded with.*) 2*d*.

This consists of a hollow bossed wheel with, first, two internal bosses, fitted tightly into the hollow boss, one on each side, and bearing on the axle, so that when worn they can be readily replaced; and, secondly, a perforated cylinder extending over and fitting on to the outside of the bushes, through the perforations of which the lubricant in the hollow boss passes slowly to the axle.

5484. PUMPING APPARATUS, *E. H. Greeven.—30th December*, 1880.—(*A communication from G. A. Greeven.*) 6*d*.

This relates to pumping apparatus known as "pulsometers," in which chambers are provided for the receipt and discharge of liquid, and the desired effect is obtained by the action of steam through a suitable valve on the liquid in the chambers alternately by condensation to create a vacuum for the inflow, and then by acting on the surface to produce the discharge of the liquid aided by suitable valves. Small pipes A and B with taps C for regulating the influx of steam, branch off from the main steam pipe S, and supply both chambers P. A valve chamber is formed in the pipe I, and receives a valve D which

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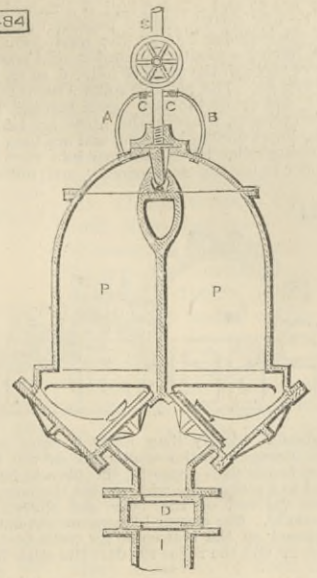

serves to throttle the suction water as it rises in pipe I.

5485. WATER-PROOF CLOTHING, *J. Neville.—30th December*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to cutting out the material so that the garments have fewer seams than usual.

5486. CUBES OR BLOCKS OF SUGAR, &c., *G. Jager, jun.—30th December*, 1880. 6*d*.

The boiled mass from the vacuum pan is, while still, hot pressed into moulds formed in a plate, which rests on a table with a piece of calico beneath it to form a joint and prevent the cubes running into each other. The cubes are then put aside to harden, and afterwards, while still in the moulds, are treated in a stamping mill with stamps spaced and shaped to fit each hole. The cubes are then removed from the moulds and conveyed by a belt or hopper into wire baskets, which are placed in a centrifugal machine, so as to cause all liquor to fly out, after which they are dipped into a trough of saccharine liquor, and again placed in the centrifugal machine.

5487. WINDING YARNS, *J. Grayson.—30th December*, 1880.—(*Not proceeded with.*) 2*d*.

The spindle on which the cop is wound is caused to rise and fall for the purpose of laying on the yarn uniformly. The rising and falling motion is obtained by a cam, and the rotation by a frictional disc. The conductor or guide for the yarn is provided with means to move it so as to suit the length of the cop as it is being formed.

5488. COMBINED SEAT AND LIFE-SAVING APPARATUS, *J. Wetter.—30th December*, 1880.—(*A communication from B. King.*)—(*Not proceeded with.*) 2*d*.

The ends of the seat are in the shape of hollow rollers to contain provisions and water, and have sufficient buoyancy to keep several persons afloat. The back is pivotted so as to be capable of turning to allow persons to sit on either side of the seat, while the footboard is also pivotted so as to turn them into position to be used as a seat when the seat and back are removed, the apparatus being used as a buoy.

5490. ILLUMINATED CLOCK, *C. H. Leycester.—30th December*, 1880. 4*d*.

This relates to forming dials so that when illuminated from within at night, and also during daylight, they will give a distinct indication of the time. The dial is in three parts, the central one being opaque except for a glazed radial slit shaped as the minute or hour hand. Outside this disc is a ring also opaque except for glazed slits forming the figures, and outside the latter is another opaque ring having one glazed triangular opening with its apex pointing towards the hour ring, which remains stationary, while the disc revolves once in an hour, and the exterior ring once in twelve hours.

5491. WEB PRINTING MACHINES, *J. Foster.—30th December*, 1880. 6*d*.

This relates to means for securing facility for placing and breaking the web, convenient access to place or remove the stereo plates and ink distributors, and to obtain increased rapidity of operation and accuracy of delivery. A is the roll of paper mounted in standards in front, and which, in passing between the first forme cylinder F^1 and the first impression cylinder I^1 is printed on one side, and then passing between im-

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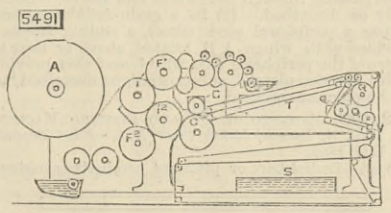

pression cylinders I^1 and I^2, and between I^2 and the second forme cylinder F^2, is printed on the other side. The web is then carried between the cutting rollers C, which partly cut it into sheets that are separated by the drag of the more rapidly moving rollers, carrying tapes T. These tapes convey the sheets to the three rollers Q, round which they are guided as long as the vibrating roller V is in position shown, so that six, seven, or other number of sheets are gathered round rollers Q. When roller V is by a cam moved out, the sheets collected are directed downwards and are all delivered together on to delivery board S. The forme cylinders are placed so as to be easily accessible for placing, adjusting, or removing their formes.

5492. DETERMINING RECIPROCATING MOTION IN A STRAIGHT LINE, *H. M. Brunel.—30th December*, 1880.—(*Not proceeded with.*) 4*d*.

This relates to apparatus for determining motion in a straight line by a combination of radial arms rocking on centres but in different planes.

5494. HOLDING AND SUSPENDING FABRICS, &c., *G. Allex.—30th December*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to hooks or holders for attaching curtains to rings, and also to modifications to render them applicable as connecting links for chains, and it consists in bending a bar with a broad flattish portion at one part and a turned-up end, and in again bending and curving the end, so as to form a spring to hold the appliance firmly on the rod or other support. The first bend is at right angles to the pointed leg to be passed through the fabric, and is again bent parallel with the pointed leg, the bend being at right angles to bring the spring leg close to the other leg.

5495. REGULATING THE ADMISSION OF AIR TO FIREPLACES, *R. Burchell.—30th December*, 1880. 6*d*.

A screen of metal is fitted in front of the fireplace, and can be drawn up or down and retained in any position, so as to regulate the admission of air to the fireplace.

5496. CENTRIFUGAL MACHINES, *R. Lafferty.—30th December*, 1880.—(*Not proceeded with.*) 6*d*.

This relates to a machine to effect the continuous separation of liquid from solid matters by providing means for a continuous feed of the material and a continuous discharge of the separated liquid and solid constituents thereof, and it consists of a rotating receiving vessel combined with a series of separating vessels connected to and communicating therewith, and a fixed case having separate receptacles and discharge passages for the separate constituents.

5497. APPARATUS TO INCREASE EFFICIENCY OF FIRE OF TROOPS, *A. M. Maude.—30th December*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to a rest in which the fire-arms are supported, so as to enable a steadier aim to be taken.

5498. TREATMENT OF ARTICLES OF CAST IRON, *J. J. Shedlock.—30th December*, 1880. 4*d*.

This relates to treating articles of cast iron, so that they may resist the action of moisture, and also other corrosive agents, whether solid, liquid, or gaseous, and it consists in the formation of the surfaces of the articles of a graphite skin, the pores and surface of which are filled and covered with a material capable of resisting oxidising agents, such as a less oxidisable metal applied thereto, either by electro-deposition or by immersion in solutions of the metal.

5499. COMPOUNDS, PUTTIES, OR CEMENTS FOR JOINTS AND JOINT BACKINGS IN VAPOUR ENGINES, &c., *J. R. Blumenberg.—30th December*, 1880. 4*d*.

This relates to a compound capable of resisting the influence of the vapours of sulphide of carbon, ammonia, and other fluids of the same class used for motor purposes, and also the influence of dampness or moisture, and high heat. Yellow litharge is used in combination with lamp-black and glycerine, and forms the compound.

5501. FASTENERS FOR WINDOWS, DOORS, &c., *H. Fletcher.—31st December*, 1880.—(*Not proceeded with.*) 2*d*.

The lower bar of the upper sash is connected to the upper bar of the lower sash by a plate laid over both bars and fastened by screws.

5502. VALVES FOR PUMPS, *N. Foley—31st December*, 1880. 6*d*.

A suitable metal rod is bent in the form of a coil, the convolutions of which lie close together, and when the coil is secured to the centre of the valve seat pressure on one side will raise the outer convolutions, while on the opposite side it will force them tight down on the seat. Two or more coils may be placed over each other, or the rod may be bent into a conoidohelical coil, of which pressure would cause the convolutions to separate.

5504. PRODUCTION OF SULPHATE OF AMMONIA FROM NITROGEN OF PEAT, TURF, &c., *W. L. Wise.—31st December*, 1880.—(*A communication from Dr. H. Grouven.*) 10*d*.

This consists, First, of the conversion into ash of moist peat or turf by means of glowing steam, in a furnace shown in the drawing, the retorts A of which lie horizontally, and are connected as shown, so as to cause the vapours evolved in the freshly charged retorts to pass through all the other glowing retorts before they leave the furnace and enter an ammonium furnace;

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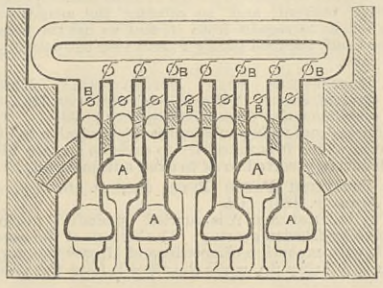

Secondly, in the manner of disconnecting each retort from the system by means of the throttle valves B; Thirdly, in the renewal at regular intervals of the upper surface of the peat in each retort, so as to prevent admission of air, and without disturbing the process; Fourthly, of the construction of an ammonium furnace for the conversion of the vapours into carbonate of ammonia, carbonic acid, carbonic oxide gas, and hydrogen gas.

5505. STEAM TRAPS, &c., *H. Lancaster.—31st December*, 1880. 6*d*.

A box A having at top two loose lids B secured by a cross bar acted upon by a screw and hand wheel contains a hollow metal ball or float F, connected with a tube G, having at its front end a semi-globular valve

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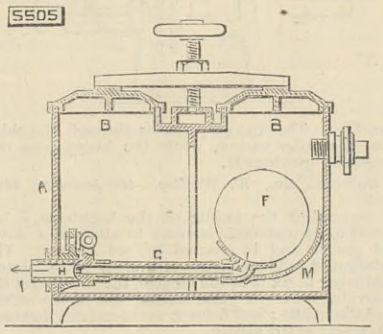

H, fitting into one end of the exit pipe I. A spring M bears on the underside of the tube G, its pressure being adjustable.

5508. MACHINERY FOR PREPARING AND FEEDING FIBROUS SUBSTANCES ON TO SCRIBBLING AND CARDING MACHINES, *W. Fox and J. Hall.—31st December*, 1880. 6*d*.

This relates to means for dispensing with the pro-

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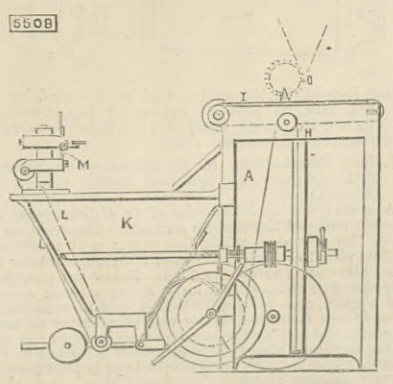

cess of weighing the material in small quantities, and depositing the same on to a "server or lattice sheet." A box A has a false bottom capable of being raised or lowered by cords from the first doffer shaft through suitable gearing. Rakes H are carried on chains I, and take the material from box A and deposit it in box K, from which it is conveyed by a toothed sheet L to the scribbling machine, being first acted upon by a beater M revolving at a high speed, so as to beat back any clotted or large material into box K, until it is reduced to the proper size, when it can pass to the stripping roller and thence on to the "licker in" and breast.

5506. PLOUGHS, HOES, AND CULTIVATORS, *H. J. Allison.—31st December*, 1880.—(*A communication from H. Wagner.*)—(*Not proceeded with.*) 2*d*.

This relates to the employment of a movable curved point sliding at the front of the plough in a groove made in the body of the implement, and maintained in position by the mould board, being set by a set screw, so as to regulate the depth to turn over the soil. When worn the point can be easily removed and sharpened or replaced.

5510. SAFETY VALVE, *T. Sturgeon and J. W. de Villemary Galwey.—31st December*, 1880.—(*Not proceeded with.*) 2*d*.

This consists of a main valve working in conjunction with a secondary valve, and so arranged that when pressure in the boiler exceeds the desired amount the primary valve opens and admits steam to a piston connected with the secondary valve which is thereby caused to open and allows steam to escape from the boiler to the atmosphere.

5512. DRAIN PIPES, &c., *W. R. Lake.—31st December*, 1880.—(*A communication from C. W. Durham.*) 6*d*.

This relates to the manner of constructing, supporting, and mounting the different drains, pipes, and other fittings of the entire system of a building, so that the settling of the different parts will not occasion the loosening of joints or the breaking of any part of the apparatus, and it also consists in the form, arrangement, and construction of different parts of the apparatus.

5513. MANUFACTURE OF GAS, *P. J. Wates.—31st December*, 1880. 6*d*.

In order to simplify the connection of gas retorts to the pipes which lead the gas away, the outlet in the lid of the retort has the connecting pipe adapted to it by a spherical joint. At the other end of such pipe a second spherical joint connects it to the fixed receiving pipe or gas channel. Inside the lid an arrangement of wire is fixed and forms a tar separator.

5515. CRUCIBLES AND REFRACTORY VESSELS FOR THE REDUCTION AND DISTILLATION OF ZINC, *A. Landsberg.—31st December*, 1880. 2*d*.

This consists in the construction of crucibles and vessels composed of an exterior layer of fire clay and an inner layer of graphite and fire clay, or of charcoal, coke, or coal and fire clay, whether with or without graphite.

5516. PRODUCING DESIGNS OR FIGURES ON OR IN WOOD IN IMITATION OF CARVED WORK, *A. Guattari.—31st December*, 1880. 8*d*.

This relates to improvements on patent No. 843, A.D. 1878, in which the designs are produced by heat and pressure applied by heated metal moulds, and it consists in graduating the pressure as well as the heat of the moulds, and also in providing vent holes in the moulds, so as to permit the free escape of the vaporised moisture of the wood as it is evolved by the heat.

5517. TREATING PORK, *A. M. Clark.—31st December*, 1880.—(*A communication from J. B. F. Chaumont.*)—(*Not proceeded with.*) 2*d*.

This consists in submitting pork after being scalded and salted to a superficial grilling or singeing, so as to give it a better appearance, and also give the skin a firmer and less gelatinous consistency.

1. IMPARTING MOTION TO VENTILATING, PUMPING, AND OTHER APPLIANCES ON BOARD SHIP, *G. D. Robertson.—1st January*, 1881.—(*Not proceeded with.*) 2*d*.

The rolling and pitching motion of the vessel is utilised to actuate machinery on board ship, through a beam free to oscillate on a centre pin.

2. PLAYING UPON PIANOFORTES, &c., *E. Underwood.—1st January*, 1881. 6*d*.

In order to enable unskilled persons to play on the piano, a frame to be placed over the keyboard contains a series of finger rods projecting through the under side, and attached to levers actuated by a perforated tune plate, which is caused to travel by means of a crank and suitable gearing.

4. SHAPING AND CURLING HAT BRIMS, *T. Rowbotham.—1st January*, 1881. 6*d*.

The brims are bent to impart the required "set," and also curled or turned over at the sides in one operation. A press is fitted with side moulding plates, which move towards the brim, and act in conjunction with an expanding former, so as to form the curl, the former also acting vertically in conjunction with the block, so as to produce the required "set."

5. CENTRAL FIRE CARTRIDGES, *F. Wirth.—1st January*, 1881.—(*A communication from G. Bloem.*) 6*d*.

This relates more particularly to anvils for central fire cartridges, and has for its object to ensure its correct position with regard to the cap, to offer a solid and safe resistance to the impact of the hammer, and to facilitate the manufacture of good cartridges. The anvil consists of a short metal pin, having a shoulder in the centre to butt against the base of the anvil cup

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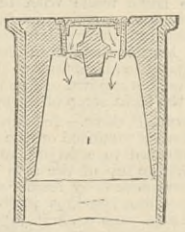


—through which the pin partly passes—and hold the pin in the centre of the cup. The cup is perforated in the centre to receive the pin, allowing a slight clearance for the passage of the spark. The top of the anvil is either hollowed out or provided with a rounded point or radial ribs or projections.

6. COMMUNICATING BETWEEN PASSENGERS, GUARDS, AND DRIVERS ON RAILWAYS, *H. Morris.—1st January*, 1881.—(*Partly a communication from A. Trigaux.*)—(*Not proceeded with.*) 2*d*.

This relates to improvements on patent No. 4417, A.D. 1877, and consists of mirrors so placed that the driver can see the whole length of the train, in order to see if a signal, consisting of a disc or lamp, is exposed, such signal being actuated by the passenger desiring to communicate with the guard or driver.

7. ARTIFICIAL FLOORS FOR FOOTBALL, BOWLING, LAWN TENNIS, &c., *R. L. Rylance.—1st January*, 1881.—(*Not proceeded with.*) 2*d*.

The surface on which the game is to be played is levelled and covered with asphalte, concrete, planking, or other suitable material, over which a covering of india-rubber or caoutchouc is laid.

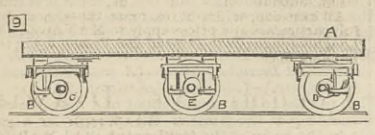
8. ROASTING COFFEE, &c., *W. Parnall.—1st January*, 1881.—(*Not proceeded with.*) 2*d*.

A cylinder supported in standards has both ends covered with wire net, and is heated by a set of gas jets impinging on its outer surface, so as to roast the contents, the cylinder being caused to revolve.

9. RAILWAY VEHICLES, *H. H. Lake.—1st January*, 1881.—(*A communication from J. W. Chisholm.*) 8*d*.

This relates to means for connecting the body of the vehicle with the frames in which are the axles, so as to provide for lateral movement of each pair of wheels without transmitting any considerable portion to the frame. To the underside of platform A are connected three pairs of wheels B with their axles and frames. The two end axles C and D are susceptible of a lateral movement relatively to and independently of the vehicle body, and a swinging or twisting movement to cause them to radiate relatively to a curved line, and

move from positions directly transverse to the vehicle body in either direction. The middle axle E and its frame can only move laterally independently of the



vehicle body. The end frames are suspended by pendulous links from the axle-boxes.

10. Photographic and other Chemical Printing, *A. M. Clark.*—1st *January*, 1881.—(*A communication from L. Corbassiere dit Christian and A. Liebert.*) 4*d.*

This relates to means for obtaining a number of prints from a negative with the same warm tints as are obtained by photographic papers in ordinary use, without the aid of light, and according to one method it consists in adding a mixture of a suitable binary or tertiary compound of silver in very small quantities to the paper pulp, or to the surface of the paper. The negative is placed on the paper with the varnished side downwards and exposed to light. To obtain the tint required the print after washing is immersed in a bath of sulphuric acid, sulpho-cyanide of potassium, protochloride of tin and fermented albumen, after which it is washed and immersed in a second bath composed of a base which gives the tint desired.

11. Compressing Air, *F. Wirth.*—1st *January*, 1881.—(*A communication from F. Honigmann.*) 4*d.*

This relates to an improved method of compressing air up to ten atmospheres, and consists in using a compressor which draws in air at one side of the piston and compresses it up to the pressure of the air in the reservoir, into which it is then forced. On the other side of the piston, in place of using water or steam to work it, compressed air of the same pressure as that contained in the reservoir issued. This air serving as a motive power, has a much greater volume than the air being compressed on the other side, and works by expansion down to the normal pressure of the atmosphere; this air is highly heated on its way to the cylinder.

12. Motive Power Engine, *G. O. Topham.*—1st *January*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to a motor in which the pressure of water in mains, or from a fall of water is utilised, and it consists of a bellows-like apparatus with an inlet and outlet valve, one side being connected to a crank shaft.

14. Portable Furnaces, *J. Tenwick.*—3*rd January*, 1881. 6*d.*

The furnace is more particularly applicable for brewing purposes, and it is made of iron and is square, the three sides of the furnace being lower than the front plate, in which a door is formed to feed the fuel and remove cinders. The inside is lined with fire-brick. On the front plate a lever is pivotted and serves to revolve the fire bars. On the back end and sides is a dip flange running into a bed of sand. The furnace is mounted on a truck with wheels to run on a rail or on the floor.

15. Elevators, *W. Dover.*—3*rd January*, 1881.—(*Not proceeded with.*) 2*d.*

A frame contains an endless chain of buckets, made adjustable or telescopic, and is hung from a carriage by a rope to allow for lateral adjustment. An adjustable shoot with nozzles is combined with the elevator to distribute the material elevated. A hydraulic or steam motor is fixed to the frame and serves to adjust and drive the elevator.

16. Screw Steam Ships, *T. F. Irwin.*—3*rd January*, 1881. 6*d.*

The object is to increase the speed, facilitate steering, increase the carrying capacity, and the strength of the vessel. For this purpose screw steam ships are made with a single body from the bow to the waist, but from the latter aft the hull is divided at the keel into two gradually separating portions, each terminating in a stern of ordinary form. The central portion where the hull divides gradually rises, so that from the stern to the waist there is a gradually contracting channel or way. Each stern is fitted with a screw propeller and rudder.

17. Yeast, &c., *S. Fulda.*—3*rd January*, 1881. 4*d.*

With 2¼lb. of rye-flour sufficient cold water is mixed to form a paste, to which 6 lb. of steamed potatoes are added, and then 4 gallons of boiling water is well stirred in. A wine glass full of the following solution and 1½ oz. of ordinary brewers' yeast is then added. The solution consists of 4 oz. glass gall, 4 oz. alum, 6 oz. borax, 2 oz. tartaric acid, 2 oz. carbonate of soda, well dissolved and reduced with water to show 1 deg. to 5 deg. on the hydrometer. The temperature of the mixture is then lowered to 60 deg. Fah. by stirring in cold water, and allowed to stand two or three hours to ferment. 10 lb. of farina and a little water is then added and the whole well blended, when it is pressed into a dry state.

19. Boots, *Colonel E. Harnett.*—3*rd January*, 1881. 4*d.*

This relates to boots made with long leg pieces extending from the foot over the leg of the wearer, its object being to facilitate their putting on or removal. A slit about 4in. long is formed in front, extending from the instep past the ankle and up the lower part of leg piece. Over this a guard or flap is fitted, and is kept in place by the front strap of the spur.

20. Dental Engine, *P. Shaw.*—3*rd January*, 1881. 6*d.*

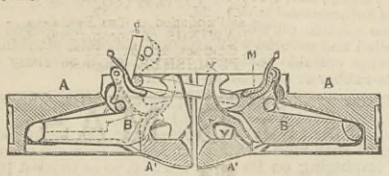
The driving wheel is mounted on the side of a rigid upright arm connected to a tripod, and is situated near the floor. At the top of the arm is mounted a horizontal arm connected by means of a telescope tube, and a brace whose bearings surround the arm. In the horizontal arm runs a shaft capable of being driven at different speeds by pulleys. The special feature of the invention is a universal joint attached to the horizontal arm, and which allows the shaft to which the hand piece is attached to move in every direction. The two shafts are connected by a spiral.

21. Extinguishing Fire on Ships, &c., *O. Wolff.*—3*rd January*, 1881.—(*A communication from A. Lehmann.*)—(*Not proceeded with.*) 2*d.*

This relates to water reservoirs in the form of a flattened six-sided pyramid, from which perforated pipes are led all over the vessel, and are fitted with suitable valves or cocks to control the supply of water to them.

23. Coupling Apparatus for Railway Vehicles, *H. H. Lake.*—3*rd January*, 1881.—(*A communication from G. P. Adams.*) 8*d.*

This relates to automatic couplings in which a link



attached to one draw-head is engaged with a hook forming part of the opposite draw-head. A is the draw-head having a bottom plate A¹, cheeks or side pieces with vertical buffer faces and a rear wall, forming a draw-head open at top and front. The front side or face of plate A¹ is inclined rearwardly and upwardly to deflect upwards the link which strikes its face; B is the coupling hook arranged centrally within the draw-head, to which it is pivotted at the back, its front end resting on plate A¹. The hook has an upper claw X and a lower claw Y, with either of which the link of the opposite draw-head may be engaged. The upper part of the face of hook B is inclined upwardly and backwardly to lift any link which may strike this portion of the face of the hook over the upper claw, and the lower portion of its face is inclined downwardly and backwardly to cause the link to pass under claw Y. By raising blade M the link is lifted clear of claw X.

22. Manufacture of Articles of Cast Iron Required to Withstand the Action of Acids, *C. F. Claus.*—3*rd January*, 1881.—(*A communication from Dr. H. Uelsmann.*) 4*d.*

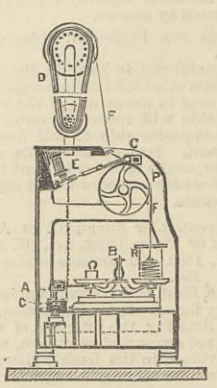
To produce a pig iron capable of withstanding the action of acids, First, considerably less lime or limestone is added to the charge of the furnace; Secondly, so as to be able to run the furnace with the highly acid slag, a blast more highly heated than usual is employed; and Thirdly, the quantity of coke in the charge is increased. The iron produced is cast in the ordinary manner.

24. Holding or Securing Pictures, Curtain Cornices, &c., *H. H. Lake.*—3*rd January*, 1881.—(*A communication from M. M. Goldenstein and Co.*)—(*Not proceeded with.*) 2*d.*

A plate is let into the wall, leaving a projecting broad part in which is a slot to receive a sliding piece. At the bottom of the slot are notches into which the sliding piece takes by means of a spring. This sliding piece has two eyes, one to receive the pin of the cornice and the other a decorative filling piece, to hide the device which supports the cornice.

26. Weighing Yarn or Thread, &c., *J. H. Johnson.*—3*rd January*, 1881.—(*A communication from J. L. Mouchère.*) 6*d.*

This relates to apparatus for determining the quantity of yarn or thread unwound from a skein, in order to be ultimately made up into balls of a given weight, which is capable of being changed at pleasure. The thread F passes from skein D under a presser roller G, which at the desired moment presses it against a feed



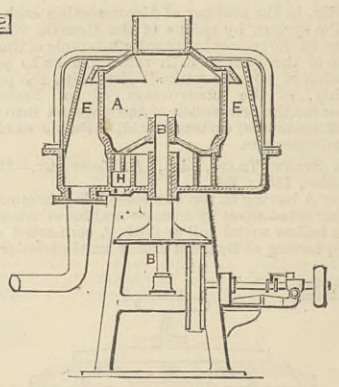
pulley P, which delivers the yarn to a receptacle R placed on a balance B. When the weight of yarn or thread causes the balance to turn, needles A are withdrawn from the mercury cups C, thus interrupting an electric current, and so causing the armature of magnet E to recede from it, and so lift the presser roller G off the feed pulley P, and stop the delivery of the yarn.

29. Receptacles with Automatically Moving Covers, &c., *F. C. Glaser.*—4*th January*, 1881.—(*A communication from H. Schomburg.*) 6*d.*

Articles containing substances it is desirable to hide, or from which it is necessary to exclude air, are fitted with covers pivotted so as to close automatically.

32. Straining Paper Pulp, &c., *D. Bentley.*—4*th January*, 1881. 6*d.*

A cylindrical cage A is carried by shaft B made to revolve by friction gearing. The bottom of the cage is solid, with exception of openings at H, and the top is open to admit pulp, while the sides E form the straining surface. The fine pulp passes through the sides E into the outer casing, while the knots pass out through the openings H.

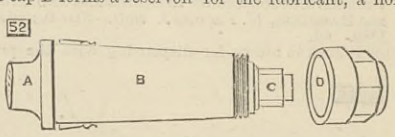


35. Bicycles, &c., *W. Woolley.*—4*th January*, 1881. 6*d.*

So as to shift the saddle on the backbone, a bar attached to its underside is made to slide in a dovetailed groove and is secured by set screws. The foundation of saddle consists of a steel plate having a middle bar to fix it to the bicycle, the rear end of the bar carrying a curved plate having the figure of the rear of the saddle; and from it arms extend towards the fore part of the saddle.

52. Axle-boxes, *C. D. Abel.*—5*th January*, 1881.—(*A communication from G. D. Labbé.*) 4*d.*

On the axle-tree A a box B is retained by nut C, over which fits the cap D screwed to the end of the box B. The cap D forms a reservoir for the lubricant, a hole



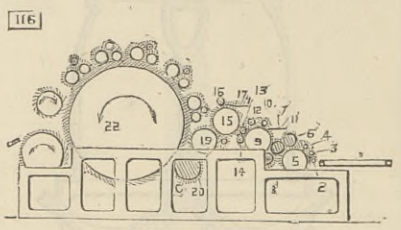
being formed in its centre and surrounded by an internal rim to prevent egress of the lubricant. Within box B near its inner end is a helical groove to distribute the lubricant.

87. Gas Regulators, *H. E. Newton.*—7*th January*, 1881.—(*A communication from Messrs. Avoiron and Clément.*) 6*d.*

A cylindrical case is made of two diameters, the smaller being at the bottom and screw-threaded to fit it to the gas pipe, while the upper part receives a hollow plug to which the burner is fitted, a hole in the plug allowing the gas to pass. Below the plug is a circular dish or tray with an opening on one side of the bottom, and to the bottom a disc is attached so that it can turn and bring one of a series of holes opposite the hole in the tray. These holes in the disc are of different sizes. A hollow tube is caused to rise and fall so as to open or close openings in a hollow plug as the pressure varies.

116. Carding Engines for Wool, &c., *P. L. Klein and G. Hundt.*—10*th January*, 1881. 6*d.*

The endless feeding table 1 carries the wool in large flakes to rollers 2 and 3, which have teeth extending over their surface in a spiral line. A spiral furrow is cut between the teeth, which are arranged in opposite directions on the two rollers, the teeth of one entering the groove in the other. The stripping roller 4 and roller 5 have also spiral grooves and teeth. By these means a soft and regular feed is obtained, and the wool is not torn. Before passing to the picking roller the cylinder 7 takes the wool from roller 5, which, having a greater circumferential speed, draws the wool through the teeth of roller 6, so as to loosen the burrs, &c. The picking roller 9 turns faster than 7 and 8, and draws the wool again through the teeth of this cylinder, whereby the fibres are laid parallel and the burrs further loosened, and are then taken by the burring roller 10 and thrown into receptacle 11. The roller 12 has the same velocity, and rollers 13 and



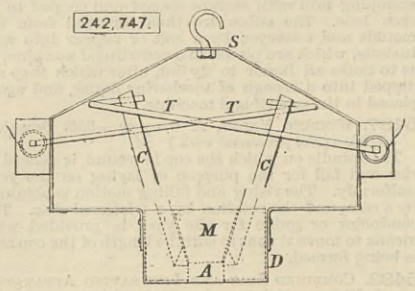
14 a greater velocity than roller 9, thus producing another draught of the wool, and as the roller 15 revolves faster than roller 14, the fibre is here again exposed to a certain draught, so that the burr roller 16 removes the rest of the burr and throws it into receptacle 17. The clearer 19 presents one-half of the wool placed on the bottom of its teeth to the main cylinder 22, and the roller 20 offers the other half.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

242,747. Electric Lamp, *Antoine Bureau, Ghent, Belgium.*—*Filed May* 27*th*, 1880.

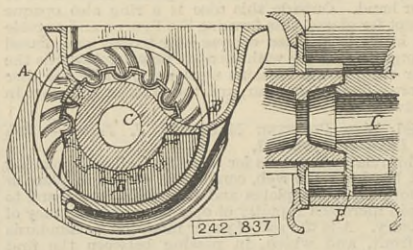
Claim.—In an electric lamp, the combination with two converging electrodes arranged to be fed by gravity, of a block of refractory material provided with converging passages or sockets in which the poles of the electrodes are received and hidden from view, the lower face of the block being cut out like a vault for



the light, substantially as set forth. (2) The combination of carbons C with guide block M, and conducting rods T, turning on centres, substantially as and for the purpose described. (3) The combination of carbons C with guide block M, inclosed in casing D, conducting rods C turning on centres, and suspension frame S, substantially as and for the purpose described.

242,837. Grain-drill Distributor, *James Noxon, Ingersoll, Ontario, Canada.*—*Filed December* 23*rd*, 1880.

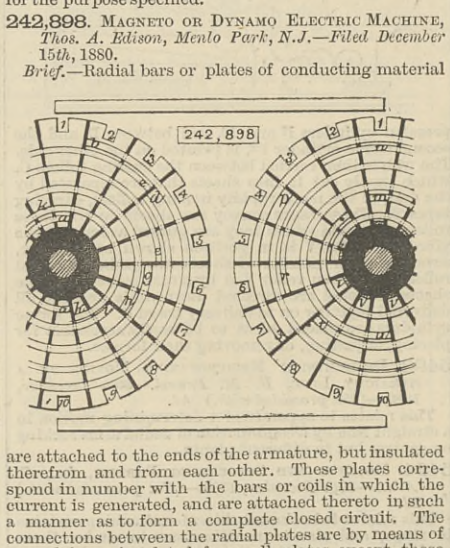
Brief.—The sliding sleeve is provided with wings, one being above, and the other on or near a plane passing through the axis of the sleeve. *Claim.*—(1) The combination, with a scalloped rotary feed wheel, of a



sliding sleeve C provided with wings A B, one wing being arranged above, and the other in or near a horizontal plane passing through the axis of said sleeve, substantially as described. (2) In a grain-drill distributor having a peripheral seed wheel, a sliding sleeve C, provided with wings A B located above or near the centre of the peripheral seed wheel, and also provided with a division plate E, substantially as described, and for the purpose specified.

242,898. Magneto or Dynamo Electric Machine, *Thos. A. Edison, Menlo Park, N.J.*—*Filed December* 15*th*, 1880.

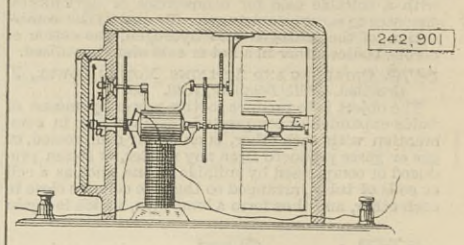
Brief.—Radial bars or plates of conducting material



are attached to the ends of the armature, but insulated therefrom and from each other. These plates correspond in number with the bars or coils in which the current is generated, and are attached thereto in such a manner as to form a complete closed circuit. The connections between the radial plates are by means of curved bars, insulated from all plates except those which they severally connect. The commutator is formed by binding the ends of certain bars at one end of the armature outward at right angles.

242,901. Electric Meter, *Thomas A. Edison, Menlo Park, N.J.*—*Filed March* 3*rd*, 1881.

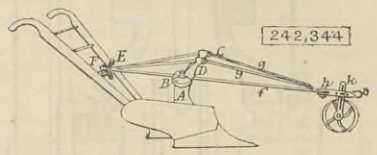
Claim.—(1) The combination, with an electric circuit containing translating devices, of an electro-motor having a definite loading and apparatus for registering the work done, substantially as set forth. (2) The combination of an electric circuit, an electro-motor, a fan driven thereby, and a registering apparatus, substantially as set forth. (3) The combination of an electric circuit, an electro-motor, a fan or blades driven thereby, a vessel or tank in which the fan or blades are placed, and registering apparatus, substantially as set forth. (4) The combination of an electric circuit, an electro-motor, a fan or blades, a vessel or tank filled with liquid, in which the blades or fan are placed, and registering apparatus, substantially as set forth. (5) An electric meter consisting of a motor having a



definite work to perform or loading to overcome, and registering devices, substantially as set forth.

242,844. Plough, *Samuel Seegmiller, Goderich, Canada.*—*Filed November* 10*th*, 1880.

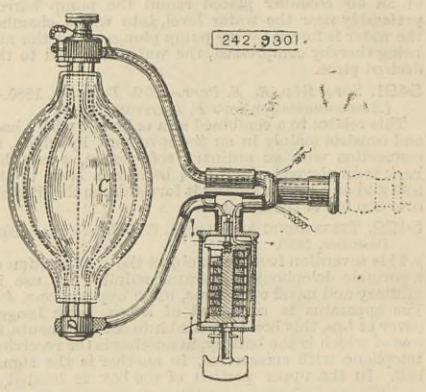
Brief.—A skeleton beam with a cap having divided arms to receive the several rods, and a concave base to rock upon the spherical head of the standard, and with slotted plates at the handle end for the two adjustments. *Claim.*—(1) The combination with the plough standard A, surmounted with a semi-spherical head having a conical hole, and provided with the open chamber *b* of the cap B, concave on its under face, and provided with hole *d*, parallel ribs *e*, and channel



c, bifurcated extension D having base plate *k*, skeleton beam C, and bolt *n*, whereby the skeleton beam is secured to the standard by a universal joint, substantially as described. (2) The combination of the standard A, having a convex head, and chamber *b*, cap B, constructed as set forth, bifurcated extension D, and skeleton beam C, with the slotted handle-brace F, plate E, having slot *o* and ear *r*, and bolts *n m s*, substantially as described, and for the purpose set forth.

242,930. Electric Lamp, *Charles A. Hussey, New York, N.Y., assignor, by mesne and direct assignments, to the Hussey Electric Company, same place.*—*Filed November* 20*th*, 1880.

Claim.—The combination, in an electric lamp, of a body capable of being rotated or turned, containing within it two or more independent carbons and means whereby, when said body is rotated or turned, the ends of the carbons are shifted to bring the carbons successively into the electric circuit substantially as



specified. (2) The combination, with an electric lamp, of a stationary contact piece and a number of resistance devices arranged upon a common support, which may be rotated to bring said resistance devices into the circuit of the lamp, to vary or extinguish the light, substantially as specified. (3) The combination with an electric lamp of a rotary spool furnished with coils of fine wire, and means, connected with the circuit of the lamp, whereby, on the rotation of the spool by a hand piece, more or less of its coils may be thrown into the lamp circuit and the resistance in the circuit varied, substantially as specified.

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The Engineer, August 5th, 1881.