MISCELLANEOUS EXHIBITS AT THE NAVAL AND SUBMARINE EXHIBITION.

A great deal was shown at the Naval and Submarine Engineering Exhibition which can hardly be classed with advantage under special heads, and concerning which we have yet to say something.

Under the head of ventilators in the index of the catalogue of the Naval and Submarine Exhibition will be found as many as sixteen stands, where are to be seen the various appliances for removing foul air or supplying fresh, either by applying power or by utilising the forces of currents of air. Messrs. C. Kite and Co. claim for their ship ventilators and cabin stove cap the following advantages : — They require no moving, acting equally well from whichever quarter the wind is blowing, the exhaust constantly producing an up current, and the injector a down draught. The principle upon which the exhaust is constructed is that by an arrangement of deflectors the wind is prevented directly from entering the pipe, and in passing out of the openings it exhausts the air from the interior of the pipe, and so produces an up current. The injector is made to give precisely the opposite result. The ventilators should be fixed on the top of hollow iron masts—communications being made for the emission of the vitiated air from the parts to be ventilated into the mast, and for the admission of the fresh air from the down draught shaft—and also on the ordinary ventilating shafts.

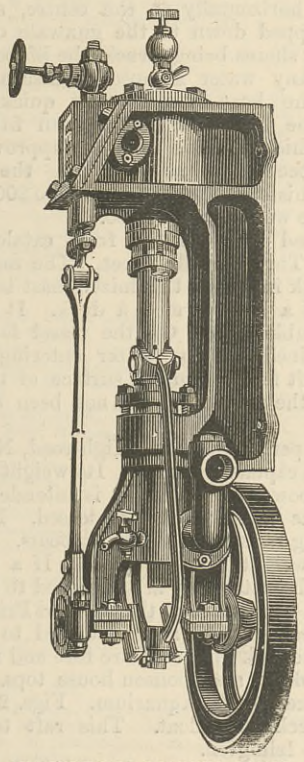
At Stand 126 Mr. Thomas Utley exhibited a patent automatic ventilator, and models of its application to portholes, hatches, and other openings of a ship. It is a valve composed of cork and faced with india-rubber, which closes by its buoyancy when the sea reaches it. It has been tested in very stormy weather with success, and should prove of excellent service in vessels loaded with coal or live stock.

There were, of course, a large number of mushroom ventilators differing more or less from the simple form. At Stand 129 Messrs. Sharp and Co. showed some very effective forms for uptake pipes, and working models illustrating the effect of a current of wind upon the ventilator.

Messrs. McWhister and Roberts at Stand 158 showed by models the system of Dr. Edmond, as applied to the ventilation of troopships, &c. The main ventilator, which has a cowl of the usual description, communicates below with a system of air passages extending fore and aft on both sides of the ship. At times when an ordinary breeze is blowing the ventilator can be used either as an uptake or downtake, according as the cowl is turned from or to the wind, but in calms, ventilation by uptake can be carried on by means of a steam blast with which the apparatus is provided.

Messrs. Alfred Jeffery and Co., of Stratford, E., showed models of yacht decks payed with marine glue ; models of air-tight compartments of lifeboats, made with wood and marine glue in combination with canvas, as adopted by the National Lifeboat Institution ; models of cabin and chart-house roofs coated with marine glue in combination with canvas ; cork buoys made in segments attached by marine glue ; small specimens of cork, india-rubber, felt, canvas, leather, attached to wood, iron, and other substances. Marine glue is now too well known to need much comment, but its use might be extended in new directions, we think.

A donkey pump made by Messrs. Mumford, of Colchester, was exhibited. A great many of these pumps are now in use, and earning a very good reputation for themselves. The accompanying cut illustrates its construction.



MUMFORD'S DONKEY PUMP.

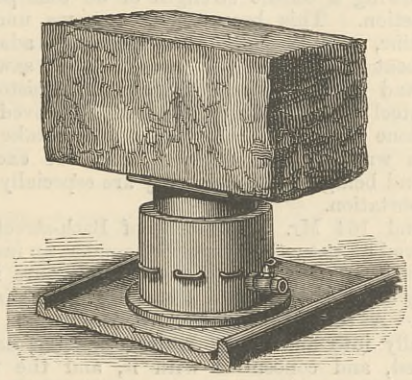
It is a simple straightforward type of pump and is carefully made.

Messrs. Legrand and Sutcliffe, Bunhill-row, exhibited numerous examples of their well-known tube wells and dwarf piles for signal posts, &c., which piles deserve attention, being exceedingly simple arrangements for supplying a firm foundation, for, say, a lamp-post, with a minimum of trouble and expense.

The Hancock Inspirator Company exhibited inspirators of various sizes. This instrument is as well known now as any other form of the injector, and is in extensive use. It is really a double injector, one half of it lifting and delivering the water with some force into the other half, from whence it is sent into the boiler. The instrument requires no adjustment for changes in steam pressure and water supply. Experiments made in America show that the inspirator has almost invaluable powers as a water lifter. From a report by the Park Benjamin Scientific Experiment Office, New York, we learn that in June 1879, trials were made with a stationary inspirator, No. 20, at higher lifts than had been previously employed. The lifting jet used was proportioned for a steam pressure of about 60 lb. per square inch, at a maximum lift, and the results of the trials were very good. For a lift of 26ft. 7in. the steam pressure required to start the inspirator was 60 lb. per square inch, and the time employed in starting was—from time of opening steam valve to lifting water, 10 seconds ; and from time of opening steam valve until inspirator was in operation with a water pressure equal to that of the steam, 38 seconds. After the inspirator was started the water pressure was increased to 95 lb. per square inch, the steam pressure being 60 lb., before the jet broke. The lift was then increased to 27ft., and the inspirator lifted water in 11 seconds with 63 lb. of steam, and delivered water against a pressure equal to that of the steam in $52\frac{3}{4}$ seconds. The water pressure was then increased to 95 lb. per square inch before the jet broke ; and to show the range of this particular lifting jet, the steam and water pressure were simultaneously reduced to 10 lb. per square inch, and then increased to 70 lb. before the inspirator ceased to operate.

Among the pumping engines exhibited none better deserved attention than those shown by Messrs. W. H. Allen and Co., York-street, Lambeth. This firm exhibited self-contained centrifugal pumping engine used on board a ship, very similar to one of a pair which we illustrated in our pages not long since. The firm also showed several separate parts of another engine. Nothing can be better than the finish and proportion of these engines.

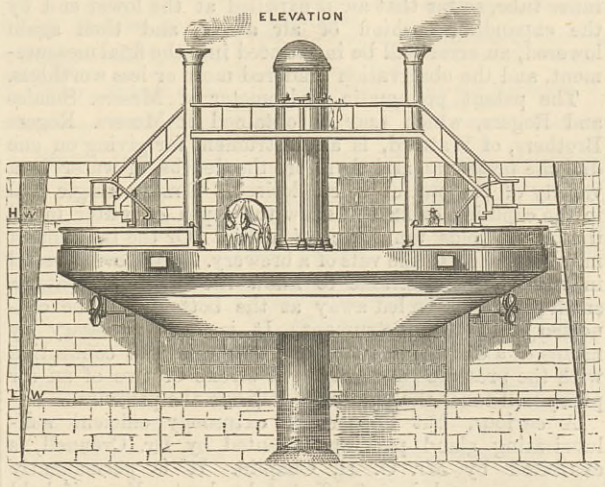
Messrs. Duncan Bros., Queen Victoria-street, showed a very curious hydraulic lifting and sliding jack, invented by M. Maignen, which we illustrate. The jack stands



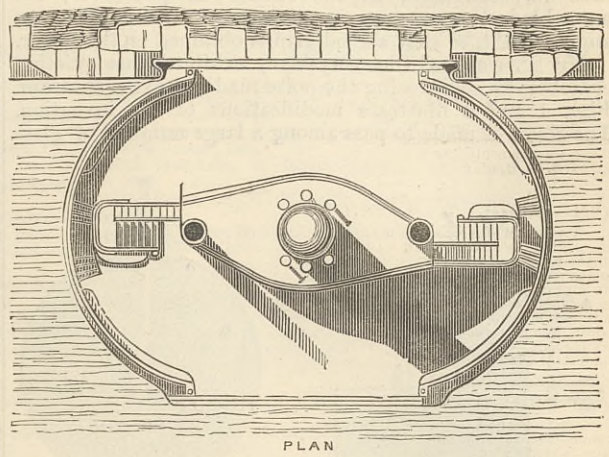
MAIGNEN'S SLIDING HYDRAULIC JACK.

upon a plate or trough of planed iron, any convenient length, which can be carried about with it. When the load has to be moved a great distance, two or more of these plates are used, one being placed in front of the other as the weight and jack travel. Eye-bolts are fitted on the jack, to which a rope, chain, or rod may be attached, and the movement of the load and jack takes place by the direct pull of either man, horse, or other power. It would be impossible to move an ordinary hydraulic jack bearing a heavy load any great distance by a direct pull from either one or two men, but the construction of Maignen's patent jack is such that the load is supported by a column of water, which rests on the surface of the travelling plate, and is encased by the cylinder of the jack. The packing between the base of the cylinder and the travelling plate is such that a very small discharge of water is allowed to take place. This serves as a sliding surface of contact between the travelling plate and the cylinder, thus enabling the whole mass to be moved with great ease. We have tested this jack and find that it complies with the statement of the inventor ; a film of water finds its way between the plate and the packing, and on this the weight of the jack is carried ; the weight of the load is carried by the column of water, as stated.

A model is exhibited by Messrs. Bell, Stoney and Rich's hydraulic steam ferry, which is of considerable interest, especially in view of the urgent need of efficient ferry accommodation across the Thames below London. The

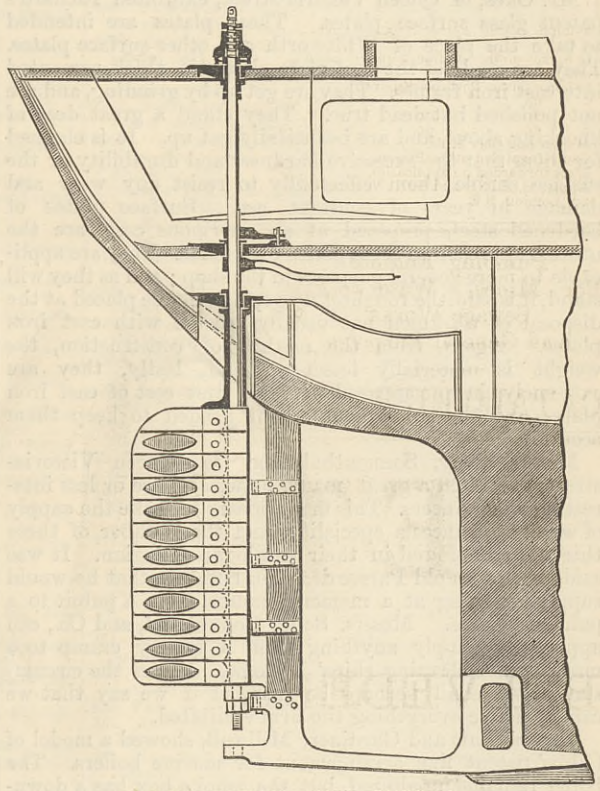


general idea of this ferry vessel is illustrated by the annexed engravings. The vessel is furnished with a vertical hydraulic cylinder and ram of very large diameter, fitted in the centre of the boat, and incorporated with its structure. When the vessel is berthed this ram, which is cup or bell-shaped at the bottom, is lowered down upon the foundation, consisting of a conical boss secured in masonry. The ram is then worked by very powerful pumps, driven by the whole horse-power of the vessel's engines, which will rapidly raise the vessel till the decks are on a level with the quays at any state of the tide. Strong undercut guide pillars are set on the wharves, with corresponding hook guide blocks securely fitted to the vessels—as shown by the black hooks on the plan—and actuated by hydraulic power capable of sustaining the vessel in a vertical position, so as to insure the whole weight of the vessel coming perpendicularly upon the ram. The vessel discharges her cargo of passengers and vehicles, and immediately receives the return cargo ; the ram is then raised and the vessel lowered into the water, the guides unshipped or withdrawn inboard, and she at once proceeds on her journey across the river, another vessel takes her place and is discharged and loaded in a similar manner, and thus a continuous circulation of traffic is



maintained, and in such a river as the Thames, the whole operation of loading, crossing the river, and discharging, need only occupy a very few minutes. It is proposed that the vessels shall be fitted with the electric light, which will enable them to work at night as well as during the day, and also during foggy weather. The construction of these vessels, with their hydraulic machinery, is in the hands of Messrs. Easton and Anderson.

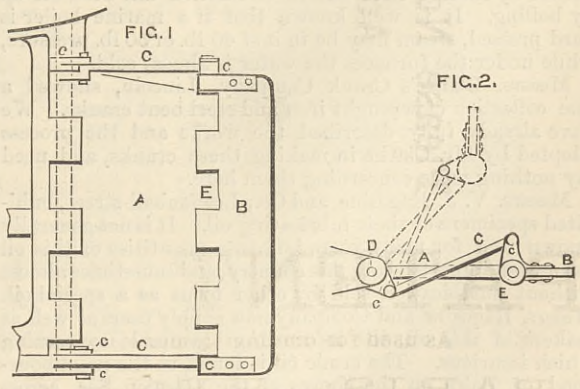
Sir J. E. Commerell exhibited a model of his admirable jury rudder, which we illustrate. When a ship's rudder is carried away, Admiral Commerell first replaces the rudder post by an iron bar with a slot cut along it. This is dropped in from above. Down this post are then dropped a series of blades—as shown in our engraving—each blade being secured at the post end between the jaws of a clip encircling the post, by a pin, the end of which is shown in each blade. The blades being dropped down



COMMERELL'S JURY RUDDER.

vertically, pass through a small opening in the deck, and falling down, subsequently assume the position shown in the engraving. The ends of the blades projecting beyond the hinged pins go into the slot in the jury rudder post. Thus a new rudder is literally lowered down through a small hatch in the deck. The Commerell rudder has been very severely tested, always with the most satisfactory results, and is one of the most ingenious devices exhibited.

Mr. Herman Wedekind, of Fenchurch-street, exhibited



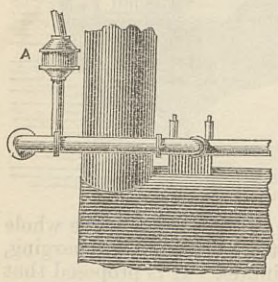
WEDEKIND'S COMPOUND RUDDER

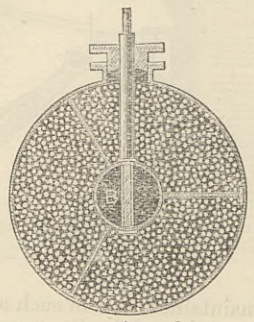
a large model of a curious double rudder, which we illustrate—although we know nothing concerning the efficiency

of the device—because of its singularity. The rudder is divided, as shown at A B, the parts being hinged one to the other in such manner that the outer part B can be swung to and fro like a door, simultaneously with the swinging or movement of the rudder A, which is secured in the usual way to the stern-post, and turned by the shaft D. To effect the swinging of the outer part B, two connecting rods C are pivotted on arms or levers *c*, as shown, one of the arms being fixed on the stern-post, and the other on the rudder B, and serving to actuate the outer blade B. The angle and distance of the arms and length of the connecting rods are decided by the arc which the outer blade is desired to move through. It will thus be seen that, as the rudder is put over, the outer blade B is put over in advance of it, and forms an angle with it, so that a good grip is obtained on the water.

Mr. P. Justice, Chancery-lane, exhibited his quieting chamber, for suppressing the noise made by exhaust steam. Figs. 1 and 2 illustrate modifications of the invention. The steam is made to pass among a large number of glass

Fig. 1





Plan Fig. 2

marbles, packed between frames, as shown. In Fig. 1 is shown the quieting chamber attached to the safety valve funnel of a steamer. In Fig. 2 is a section of a quieting chamber which would answer for road locomotives, being fitted with a throttle valve, which can be opened when noise is of no consequence. The apparatus is very efficient.

Mr. S. De Bay exhibited a modification of his well-known double screw propeller to act as a fan. The two interlacing propellers are caused to revolve in opposite directions by two Hodgson rotary engines. The arrangement is very simple and compact, and the screws drive a very powerful current of air away from them. We shall have more to say concerning the apparatus.

Mr. Okes, of Queen Victoria-street, exhibited Richard's patent glass surface plates. These plates are intended to take the place of Whitworth and other surface plates. They are made of the best plate glass, $\frac{1}{2}$in. thick, cemented into cast iron frames. They are got up by grinding, and are not polished but dead true. They stand a great deal of knocking about, and are beautifully got up. It is claimed for them that the excessive hardness and durability of the surface enable them effectually to resist any wear and damage in years of constant use. Surface plates of hardened steel, prepared at an enormous cost, are the nearest approach to these plates ever made. They are applicable to more general purposes in the shop ; and as they will stand, it is said, the roughest usage, they can be placed at the disposal of workmen not usually trusted with cast iron plates. Again, from the method of construction, the weight is materially lessened ; and, lastly, they are extremely cheap compared with the first cost of cast iron plates and the subsequent labour needed to keep them accurate.

Messrs. Selig, Sonnenthal, and Co., Queen Victoria-street, exhibited a great many articles, more or less interesting to engineers. This firm appears to make the supply of small appliances a speciality, and the number of these things to be found in their catalogue is legion. It was said once of an old Parsee dealer in Bombay, that he would supply anything at a moment's notice, from a pulpit to a pair of skates. Messrs. Selig, Sonnenthal, and Co., can apparently supply anything from a quarry cramp to a machine for cleaning ships' bottoms. Under the circumstances we shall perhaps be excused if we say that we cannot notice everything the firm exhibited.

Messrs. Rait and Gardiner, Millwall, showed a model of Gibbs' patent flue arrangement for marine boilers. The boiler remains unaltered, but the smoke box has a down-take instead of an uptake, and the hot air is carried under the boiler to the funnel. In this way the front of the boiler in the steam space is spared some wear and tear, and possibly overheating, and the bottom of the boiler being heated from the first moment the fires are lighted, these last may be pushed from the first without fear of straining the boiler by unequal expansion. The invention seems to be worth the attention of shipowners, especially of those whose steamers are in the coasting trade ; because in such boats it is almost impossible to avoid injuring boilers by forcing fires before circulation has been set up by boiling. It is well known that if a marine boiler is hard pressed, steam may be in it of 40 lb. or 50 lb. pressure, while under the furnaces the water is almost cold.

Messrs. Clarke's Crank Company, Lincoln, showed a fine collection of wrought iron and steel bent cranks. We have already fully described the works and the process adopted by Mr. Clarke in making these cranks, and need say nothing more concerning them here.

Messrs. V. J. Ragosine and Co., Leadenhall-street, exhibited specimens of their lubricating oil. It is not generally known that for many years immense quantities of this oil have been imported into this country, and sometimes almost without modification sold by other firms as a special oil. Messrs. Ragosine and Company now supply users as well as makers of this oil, the information available concerning which is curious. The crude oil is found in the neighbourhood of Baku on the shores of the Caspian Sea, across which it is transported in barges, and ultimately finds its way into civilised Europe by the Danube. The oil wells in that district have been worked for many years for the sake of the burning oil obtained by a rough and simple process of distillation from the natural product ; but the heavy residuum was allowed to run to waste until quite recently, and the first attempt to utilise it on a large scale for the manufacture of lubricating oils was that instituted by Mr. Victor Ragosine, the founder of the company, in 1879. The enterprise which he began has since developed into a company, chartered by the Russian Imperial Government, carrying on refining works on a large scale at Balachna and Constantinoff, and having branch establishments in Paris, Vienna, St. Petersburg, and London. It is claimed for these oils that while possessing all the essential lubricating properties of the fatty animal and vegetable oils, they are entirely free from the great defect inseparable from all these oils, namely, the presence of acids, which oxidise and destroy the metals to which they are applied. The recognition of this serious drawback to the use of vegetable and animal oils has been steadily gaining ground for some years past, but the difficulty has been to find mineral oils with sufficient body or viscosity to serve as substitutes. That the Ragosine oils possess this body to a most remarkable degree we can testify from personal experience. In addition to their lubricating oils, this firm exhibited a safety burning oil prepared from the same crude product, and specially intended for use on board ship. This oil has a flashing point of over 250 deg. Fah., and is practically as safe as colza, while the cost is less than half. It burns with a clear white light like that of standard petroleum, in any of the lamps constructed for burning heavy mineral oils, some of which, manufactured by the Silber Light Company, could be seen at their stand.

Messrs. Lewis Olrick and Co., of Leadenhall-street, exhibited Field's patent boilers and tubes, and specimens of a malleable bronze, invented by a French chemist, which has been tested in sheets, plates, and bars, by M. Thomasset, of Paris, and Professor Kennedy, of London, the sheets showing a tensile strength of 50 tons per square inch of section. This bronze does not, we understand, contain zinc, and is therefore particularly adapted for torpedo boat plates. At the same stand we saw Messrs. Mather and Platt's patent elastic metallic pistons, with weldless steel coils, and Blake's patent improved "Challenge" stone breakers. As these crushers take all their strains on wrought iron or steel, they are exceedingly strong ; and being "sectional," they are especially adapted for transportation.

At Stand 164 Mr. T. Bassnet, of Bath-street, Liverpool, showed his patent atmospheric sounder, an instrument constructed on the principle that as the pressure increases a quantity of air subjected to it has its volume diminished inversely. A tube, having both ends open, is inserted hermetically into another of larger diameter, having its ends closed, and concentric with it, and the two are enclosed in a brass tube having a slit, by which any contained water may be observed, and along which a suitable graduation is engraved. The whole is attached to the lead-line, and, as the instrument is carried downwards, water is pressed into the inner tube, and arrives at the top of this tube when a pressure is reached, depending upon the relation between the capacity of the inner tube and the total air space. If the internal tube is of small calibre compared with the outer one, this occurs very quickly. As the pressure increases after this, the water flows over the top of the internal tube and falls to the lower end of the outer tube, where it is permanently retained and brought up to the surface with the instrument, affording a means of estimating the pressure, and therefore the depth to which the instrument has been exposed. The lower end of the outer tube rests upon an india-rubber washer, having two holes in its inner rim corresponding to two in the brass cap, which screws into the lower end of the instrument, and through which the inner tube is fixed hermetically. The two holes in this cap turn outwards to the circumference, and round this a tight-fitting collar turns with two holes, which, when it is desired to drain the instrument, correspond to the two in the cap, and afford a passage for the water, but which, when the instrument is beneath the water, are turned away at 90 deg. from the others. The merit of this method of taking the depth consists in the fact that it is unnecessary that the lead line should descend vertically, but it should be carefully remembered that if from any cause or accident the instrument should be raised, after the water has flowed over the top of the inner tube, so far that air is expelled at the lower end by the expanding cushion of air above, and then again lowered, an error will be introduced into the final measurement, and the observation rendered more or less worthless.

The patent pneumatic hydrometer of Messrs. Smales and Rogers, which may be obtained of Messrs. Rogers Brothers, of Watford, is an instrument for giving on one dial the pressures, and therefore the depths, of water in a variety of receptacles when desired. Thus, a single dial in the captain's cabin will show the depth of water in all the bilges, holds, tanks, &c., of a ship. Or the instrument may be applied to the vats of a brewery. From every vessel in which it is desirable to know the depth of water a small pipe must be led away at the bottom, and be connected with the instrument. It is only necessary by means of a distributing tap to bring this into connection with the pressure gauge, when a stroke or two of an air pump will cause the pointer to indicate the pressure.

A curious, but apparently extremely efficient self-lubricating gland packing, invented by Dr. Crennell, is exhibited by Mr. G. H. Chaplin. It is permanently unguentous, and is not affected by heat. Even if held over a spirit lamp it does not char or lose its greasy character.

No. 118, Hollands, New Bond-street, showed climax safety hammerless guns. This design is embodied in duck guns and in smaller pieces. Safety is secured in three ways. (1) The hammer is wholly inside the stock, therefore any danger from its projecting is avoided; (2) there is a capital safety bar, which renders it impossible for the hammer to touch the piston should the sear spring slip or be jerked so that the hammer descends without the trigger being drawn; (3) a safety bolt prevents the trigger from drawing until it is pulled back. Thus to fire the piece the safety bolt must first be withdrawn, and then the trigger must itself be pressed. This appears to us to be a good efficient arrangement. Messrs. Holland has also a special non-fouling system of rifling for very small bores, which they claim acts well even with a rapid spiral.

The Explosives Company, Stowmarket and Bishopsgate-street Within, exhibited gun-cotton, dynamite, fuzes, and sporting powder, as well as lead cylinders, iron plates, and rails, showing the effect of charges of well-applied cotton, &c. This subject we do not propose to take up here, but any reader will find a long illustrated description of this company's works, with experiments, &c., in The Engineer for December 2nd, 1881.

In a former impression we referred to some of the wire and other ropes exhibited. We have now to refer to the collection exhibited by Messrs. John and Edwin Wright, of the Universe Works, Birmingham, and of Millwall. It may be mentioned that these works have been established more than a century, and employ over 1000 hands. Messrs. Wright have made wire traction cables at their Birmingham works, of 6000 yards in one continuous length, and weighing upwards of 45 tons each, and have recently supplied from their London works a white manilla rope, 6$\frac{1}{2}$in. circumference, of a continuous length of twelve miles, to be used for picking up one of the Atlantic cables. All the ropes and cables they exhibited were what have been manufactured for actual use. They had seven show cases altogether, in the principal of which they exhibited sections of steel cables and hawsers as supplied to the Admiralty, the largest being 8in. circumference, with a guaranteed breaking strain of 160 tons. The other cases contained varieties of iron and steel wire ropes for mining and engineering purposes, transmitting power, steam ploughs, and running gear, and flexible steel wire ropes for working over small sheaves. Amongst the other samples were ropes for aërial tramways. They also exhibited in a large coil, weighing over 3 tons, an improved galvanised steel wire hawser similar to those supplied to the Admiralty, and which is 300 fathoms long and 5in. circumference, the Admiralty breaking strain being 59 tons, though it has actually been tested to 70 tons without breaking. They also exhibited a galvanised steel wire hawser of the same circumference and breaking strain, and having twelve outside strands of nineteen wires each, forming a perfect circumference, the rope containing altogether 270 wires in the section. We must not omit to mention a length of large coir rope labelled "Jumbo," the largest rope in the world, being 3ft. 6$\frac{1}{2}$in. circumference. There were also on their stand three nippers or stoppers of different patentees, viz., Harfield's, Archer's, and Mitchell's. The first-named is undoubtedly the best, and is that exclusively supplied to the Admiralty.

LIFE-SAVING APPARATUS AT THE NAVAL AND SUBMARINE EXHIBITION.

Under this heading were exhibited rafts, boats, buoys, belts, buoyant bridges, decks, clothes, beds, and the like. It would be well to classify the designs under these separate headings, but in many cases it is difficult to do so, and many exhibitors had two, three, or more of the above, so that it may be shortest and simplest to take them in the numerical order of the catalogue.

No. 10 and 517 was a "bridge lifeboat," by John White, Medina Dock, Cowes, Fig. 1, page 303. This lifeboat is held on the bridge athwart ship, which consists of a launching way which pivots horizontally at the centre, so that either end can be tipped down to the gunwale on either side when, the dog shores being struck, the lifeboat shoots into the water. Any water shipped is discharged through valves, and the boat is thus very quickly and easily launched. The Orontes has long been fitted with this boat bridge, which has been so highly approved of that the system has been now adopted for the Tamar and Himalaya. This boat carries from 150 to 200 men. Filled with water she would support 100.

No. 39A2 and 214—omitted from catalogue—Captain Fewsters, 38, Threadneedle-street. The saloon and portion of the deck in which the mizen mast is fixed is made in the form of a boat termed a duck. It contains fresh water and double sides. On the vessel foundering this duck is sustained by the water entering beneath its bottom, and left floating on the surface of the sea. This works well in the model. It has not been applied on an actual ship.

No. 82 is Roper's, Lewisham High-road, New Cross, life raft forming a captain's bridge. Its weight is given as 5$\frac{1}{4}$ tons, floating power 80 tons. It is intended to be self-launching on its fastenings being released. Mr. Roper has also self-floating raft decks for river boats. These simply rest by their weight in their place. If a vessel settled down in smooth water they are designed to float off with the passengers. A model of the ill-fated Princess Alice is fitted with decks which are calculated to support 900 passengers. The decks proposed are fore and main and fore and aft saloon decks and sponson house tops. The design took a first prize at the Aquarium. Figs. 2 and 3 show the raft on deck and afloat. This raft took the 100-guinea prize at Islington.

No. 86. Jeffery's, Marshgate-lane, Stratford, cork buoy in segments attached by marine glue.

No. 101—omitted from catalogue—Milburn, Blyth. Self-righting boat; deck or cover closing over passengers; specially intended for most helpless. Man steering has his head out. Has been carried out in an actual boat at Blyth; boat righted with four men inside her in a second. She can only be propelled when cover is opened. She ought to be provided with valves to discharge water quickly, and either left to float or towed by a boat subsequently launched from a wreck until the covers were opened.

No. 144. A patent rocket-discharging apparatus by the International Machine Company, White Horse-street, Commercial-road, E.

No. 140. Rose, Leadenhall-street, life-buoy seat, consist-

ing of two thin iron buckets screwed together at the bottom with tops closed. They may be used as buckets, or a buoy, or to render a hencoop seat buoyant—*vide* Figs. 4, 5, and 6. The cushions of the hencoop seats are life belts. A specimen made for Sir T. Brassey's yacht, the Sunbeam, was shown.

No. 150A. Patent swimming plates of Dunlop, Kent Gardens, Ealing.

No. 156 was a circular life-buoy of Whitby's, Royal Naval College, with foot chains and lights which are self-igniting. By day the smoke furnishes a mark, and the light at night. There are cells in the buoy containing another light, a whistle, and a bottle of spirits. This is a business-like useful design.

157. A life-saving shot gun, Low and Duff, Dundee. One peculiarity is in the coiling of the rope, which passes through a hole in the axis of the gun. The main coil is in the canister which constitutes the shot. The axial position of the line may favour accuracy in flight, but we fail to see how any shot can compete with a rocket for carrying. A rocket, though naturally very liable to be deflected, is kept in its true direction by the pull of the line, and the gradual burning of its composition is of course better suited to draw a line out, than the sudden shock or discharge of powder.

163. Schönrock's waistcoat of india-rubber cloth, Sewell's Works, Salford. It is worn like an ordinary waistcoat. The coat is removed at need, and the waistcoat blown out easily.

189. Meiter and Co., Gracechurch-street, boat-seats of cork and india-rubber. Each seat consists of fourteen separate air-tight compartments. On the backs are life-belts. There was also a small folding boat of waterproof canvas, called the Stanley life-boat.

190. Stone, Deptford, life-buoy; Admiralty pattern. There are life-buoys which claim to have greater floating power than this, but we think that this one retains the advantage of having the safest and least tiring seat. Indeed, it is almost the only one that can be said to provide a seat.

198. Peacock, Regent House, Starcross, safety bathing dress. Made on a simple principle that is utilised now in several designs, namely, that wet linen is air-tight, and a dress made double can be readily blown out. Whatever measure of safety is secured is obviously here obtained at a minimum of expense and inconvenience.

201. Safety seats, Sexton, Great Winchester-street. The principles here observed are the subdivision into a number of india-rubber cells, and also the use of vaseline to render the material non-absorbent. Ordinary cork is said to take up 75 per cent. of water. Its buoyancy is greatly increased, of course, by preventing this. There is a kilt stuffed with non-absorbent cork to support a man in the water. This is said to act well. To us it looks as if it needed provision to guard against the probability of capsizing the wearer if used awkwardly. This does not touch the principles of Dr. Sexton's designs, which look good and serviceable.

203. Timms, Great George-street, Westminster. A patent method of stowing boats along the centre of a ship so as to be protected against accident and available for launching on either side. This deserves more notice than is possible here; also a reversible raft or boat fitted with cellular wood.

208. Sayers, Hunter-street, Brunswick-square. An invention to prevent ships sinking by an arrangement for attaching enormous balloons fixed to standards along the sides of the sinking ship. The necessary operations, in our opinion, are such that it would be useless to attempt them unless the ship was slowly settling down in smooth water—a high sea would carry all away—and the gear, &c., is too much to stow away conveniently.

223. Rees, Royal Naval College. Horseshoe life-buoy, whistle, signal light, rocket, and flag. This belt holds on the back by means of a spring. It is no doubt easily put on. The question is the security when on. Mr. Rees is a practical man and should be able to judge of this.

229. Watkins, Blackwall. Life-raft, reversible.

264. Royal National Lifeboat Institution, John-street, Adelphi. Models of the national lifeboats, life-buoys, cheap jackets for fishermen, and special ones for the crew.

273. F. Wentworth and Co., Museum-street. The "Kredemnon" cork life cape, on to which may be fixed sable, lace, or other dress worn by passengers, perforated to prevent the unpleasantness of india-rubber clothing, being made to allow air to pass through them.

298. Dixon, Stephens, and Co., Tottenham-court-road. White life-saving dress, luminously painted, with whistle, &c., attached.

309. Birt, Dock-street, London Docks. Life-saving apparatus which obtained the gold medal from the Society of Arts in 1879, made of cork, &c. There was here one bench rendered buoyant with air vessels. The 50-guinea prize was awarded to Messrs. Birt.

319. Captain Miller, commanding Mercantile Marine Cadet Schoolship, Liverpool, air-tight sliding shutter for closing the hatchways of ships' holds which contain coal, as well as air pump to exhaust the hold of air in case of fire.

334. Steedman and M'Alister, Glasgow. Cork life-belts, buoys, and bed-frames with cork sides and netting bottom to act as a raft.

356. Copeman, Downham Market. Raft constructed of seats by means of connecting rods, spars, and grating seats. This was put together by two men in less than two minutes repeatedly at the Exhibition (see Fig. 7.) It is a very serviceable strong and simple arrangement. The inventor claims that the expense is small—about £5 extra on each seat—that the space occupied is no more than that of ordinary seats, that it is always ready for use, and when in the water cannot be upset. Masts and oars are carried. The strength and simplicity of this will probably commend it. It is to be tried shortly for the Prince of Wales.

368A. Cornish, 81, Fenchurch-street. Life-saving mattrasses, couches, seats, &c. Solid cork is employed. The life-buoy is a special shape, like an H, instead of a circle. It is claimed that men get much more easily into this form of buoy, and help others better, and that untaught men are extremely puzzled to get inside the circle of a circular buoy. This is true, probably; at the same time we think that, once inside, a man is much safer in the circular buoy. If he places his arms through the ropes he might even faint without losing the buoy. For the work of a boat, full of inexperienced people, only likely to be upset near to shore, we think this buoy would be very good indeed; but not for a wreck in the open sea, when a man may be for hours in rough water.

400. Edgington, London Bridge. A bed or hammock, with cork bolster and side pieces to give buoyancy, so as to support two men on it, or four in the water. Willesden waterproof canvas is employed.

432. Wilkins, Tunbridge Wells. Life-saving dress: helmet protecting the head, and giving buoyancy by air-tight cells as well as a belt. In some cases, no doubt, the helmet would be a valuable protection.

434. G. Knott, The Barges, Folkestone. Life-raft, containing wood tubing and cork, with lines on each side; designed to support forty men. and, if broken up, to form life-buoys.

435. Surf-boat, Flatman, John Burnett, Pevensey-road, Eastbourne. This has very shallow draught, and small wheels between the double keel to enable it to land well. As a surf boat the tanks, &c., are empty, for a lifeboat they may contain provisions, &c. The boat supports 1½ tons. It is proposed to encircle it, if needed, with a barrel raft, which enables it to support 3 tons. This seems good, especially as a surf-boat.

436. Baharie, Adamson, Sunderland. Patent lifeboat, buoyancy supplied by cork and india-rubber, water-tight compartments below deck, protected by cork and india-rubber from striking a ship's side.

450. Boats and models and life-saving appliances, Conolly, Harbour-street, Ramsgate. These are simple, business-like things, made cheap and strong by a practical sailor, such as rope girdle inflating jackets, depending on being wet, to hold air; also some of oilskin. There were netting jackets, which are to be used as bags for keeping spare cork in, in this state available as life jackets. There was a novel and ingenious application of nets fixed on to a lifeboat in the manner of two carriage heads, intended to close over the passengers' heads and prevent washing away. There was a boat made of masts and spars, and one or two rough notions that appear raw as yet.

452. Wreck escape, Hodgson, Emmett-street, Poplar. This, the work of another practical man, eminently qualified to judge as to what may be done in a moment of danger, having earned eight or nine medals for saving life himself, and also so ready to point out anything good in designs of others, that one must respect the honesty of his opinions. Two wreck escapes, one of wood tubes and cells, the other steel; weight, 7 to 17 cwt., supporting twenty to seventy-five men; rope bottom reversible. May be used as an ordinary boat, the resistance being brought down to much less than is usual in bottomless boats, it is stated that it has been actually tried and obtained good speed. The form appears to be a very good one for a bottomless boat. It was tried with success before Admiral Mends in 1869. It is, we believe, the first and also the best reversible boat. It is possible for a man under it to open the ropes asunder and creep through the bottom.

453. Dicey, Breakspear-road, Brockley. The Castalia life-raft, in metal compartments, &c., takes forty persons.

458. Todd, Mount-street, York. Drawings of a gun anchor, life crane, and life-saving apparatus.

461. Humane Society, Trafalgar-square, London. All the well-known drags, and a rather new ice-boat to draw easily over ice.

465. Morgan, 12, Hopwood-street, Liverpool, life-saving deck.

471. Dickie, King William-street, London, patent aqua-aërial wave ship, with peculiar form of flat bottom.

494. Board of Trade life-saving apparatus. Capitally carried out, with life-saving rocket line stretched as if to a wreck, and breeches buoy moving on it; wagon, &c., also exhibited.

501. Norton, Arthur-road, Stoke Newington. Models of wreck-raising boat, with flexible air chamber or double cover to save from sinking, or cork protectors to fix on. The air chamber is simply a double india-rubber sheet drawn round the boat's bottom and inflated. The same objection applies as we made to another design—that such a thing takes up too much room, and could not be applied except when a boat was settling down leisurely in smooth water. There is a much better arrangement for lifting sunken wrecks by means of two old boats rendered air-tight and connected with pumps, which are sunk on each side of the wreck and their connections made to act as a camel by having the water pumped out of them.

523. Davis, Bayham-street, Camden Town, London, Mermaid life-belt. Consists of four lumps of solid cork, hermetically enclosed in covers. The two larger lumps rest on chest and back, and certainly would act as good protectors against being struck against rocks. There are other belts here of less merit we think.

525. D. W. Leah, Castle-road, Kentish Town. Life-saving deck seats forming small V-shaped lifeboats or floats; there was also a carbonic acid fire extinguisher, and an arrangement to prevent collision by extra lights.

532. Macwatty and Co., Albert-buildings, Liverpool. "Kahnweller Never Sink" cork jacket, elastic felt life-buoy, cushions, &c.

533. Snoulten, High-street, Poplar. Crescent lifeboat, reversible, and hinged longitudinally, so as to hang up in less space on a ship's side; made of thin Bessemer steel plate; claims to take the room of one boat and to hold four times as many, having a buoyancy of 6½ tons. It opens and bolts itself in proper form in the act of lowering. Also cork Union life raft ladder-shaped. Has been tried before Board of Trade and said to be highly spoken of.

540. Sutherland, Bridge-street, Leith. Ice ladder and raft pivotting on oblong sledge, and lowering at either end as required; appears to be simple and good.

American Shipping Agents are offering grain freights to Liverpool at an eighth of a penny per bushel, but there is such a stagnation in freights that even at this low offer freights are not forthcoming.

LETTERS TO THE EDITOR.

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

THE FOUNDATIONS OF MECHANICS.

Sir,—I do not wish to unnecessarily use your space for the discussion of this subject, and have, therefore, been waiting for an explanation of the matter by "Φ. Π." himself, but I see that in your last issue he has not done so, and I will, therefore, endeavour to answer the simple questions which he asks, as I consider the answer of your other correspondent as being an evasion of the questions asked. A ton weight is drawn up a pit for a distance of 100ft. with an uniform velocity of 16ft. per second; required:—(1) The pull to be given or the strain upon the rope; and (2) if the strain upon the rope varies at different parts, to give these differences, and to state the law by which they are ascertained. This was, I believe, the substance of the questions, but I have not the number at hand at present in which they were asked. (1) The pull upon the rope is equal to a force of 1 ton, and (2) the pull does not vary at different parts of the rope, but is equal at all parts of it. The problem is very simple, because the pull of 1 ton imparts no velocity to the moving body. It has a certain velocity at the beginning of the 100ft., and the same at the end; the force acting upward upon the weight has moved through 100ft. against a resistance of 1 ton, and has consequently done 100 foot-tons of work, but the forward motion of the body pulled, although balanced by the resistance, presents no difficulty at all, for the parts through which the force and the resistance act do not move relatively to one another, but move as a whole with the initial velocity. It will be readily seen that the same holds no matter what the velocity is, whether 16ft. or 16,000ft. per second, so long as that velocity is an uniform one.

I will give another question, which is the only difficult point in the discussion, and that is the case when the state of motion of the body is undergoing change. As before, a weight of 1 ton is moved upwards through 100ft., and its velocity is continually being increased, it is undergoing uniform acceleration. Required the pull or strain on the rope; and why, if action and reaction are equal and opposite, the force pulling it upwards being balanced by the resistance acting downwards, the motion of the weight takes place at all, or, if already in motion, that motion is being changed. The pull acting is something more than one ton, and is dependent upon the velocity which it acquires in moving through the given distance, and may be divided conveniently into two parts, one of which, equal to one ton, does not affect its velocity, but simply does work as it passes through the resisting space, as in the foregoing problem, and another part which imparts the increase in motion, with which I will now deal. This portion of the total force which is producing motion, if Newton's law be true, is opposed by an equal force or resistance in the opposite direction; and if I understand the matter rightly, this resistance to the force producing motion is "the resistance of inertia," which every body presents to forces changing its position in space. This resistance is one which is dependent upon the velocity which is being imparted, being directly proportional to such velocity, and is exactly equal to the force imparting it. The question why, under such circumstances, motion is imparted at all, is readily seen to be answered by this fact—the pull is not balanced except when the motion is being imparted, and it is this balancing at this point which causes the relation of forces acting, masses moved, and velocity acquired, to be a constant one in regard to time. For instance, leaving this balancing out of the question, there is no reason why the velocity imparted by any particular force should be what it is known to be any more than it should be greater or less; but taking this "resistance of inertia" into account, we see at once that the imparting a greater velocity means a greater resistance to motion which the force cannot overcome; and therefore such greater motion is not imparted; and, on the other hand, the resistance of inertia being less, the force would not be balanced, and a portion would be neither producing motion nor be opposed by an equal amount, which would be impossible.

It is not worth while occupying your space by introducing any calculations, the principle being stated; and judging by the amount of correspondence upon the subject, it does not appear to be of interest to many of your readers. If "Φ. Π." does not consider my explanation correct, he will, I hope, give his, and so enlighten "the inquiring students," among whom I include myself.

Smethwick, Birmingham, April 12th. Arthur Adams.

MESSRS. PIGGOTT'S COLD AIR MACHINE.

Sir,—We beg to call your attention to several inaccuracies that appear in your report of the refrigerating machinery at the Naval and Submarine Exhibition, published on the 14th inst. Your report apparently endeavours to compensate for the sparse and uninteresting character of these exhibits by describing an ice machine that was not exhibited, and in re-describing a machine fully noticed a week or two previously.

As far as our own machine goes, we would remark that it had been working during several months before it was sent to the hall, and as evidence that we experienced no scarcity of steam, we would say that the machine has run continuously at the Exhibition from 10 till 5.30 daily since midday on the 11th at a piston speed of 250ft. to 300ft. per minute with practically no snow, certainly not ½ lb. during any one day. As your reporter has mistaken our welded steel condensing cylinders for cast iron, he has no doubt formed an exaggerated idea of the total weight of the machine; in point of fact, we can show a considerable advantage in this respect over other makers, and the circumstance that our machine will deliver 9000 cubic feet of air per hour, and is provided with an air pump condenser for the engine, will account for the space it occupies. The salient points of the machine have somehow strangely escaped his notice.

We have referred to these matters as we do not think you would wish your report to convey a wrong impression.

Thomas Piggott and Co.

Atlas Engine Works, Birmingham,
April 20th.

[We were informed at Messrs. Piggott's stand that the engine could not be worked up to its proper speed for want of steam, and that the longest run it had made was fifteen consecutive hours. We have said nothing concerning the weight of the machine, but only that it was too straggling for use on board ship, as Messrs. Piggott will quickly find out. As we have already said, the machine has excellent points, but requires re-arrangement.—Ed. E.]

Oxford Military College.—We learn that General Sir Garnet Wolseley has joined the council of the Oxford Military College, thus swelling the list of eminent officers already serving on that body.

The Institution of Mechanical Engineers.—On Thursday and Friday, the 20th and 21st inst., the annual spring meeting of this Institution took place at Westminster. After a brief discussion relating to reports of the committees on annealing and hardening of steel, and on rivetted joints, the discussion was taken on Mr. E. B. Ellington's paper, read at the last meeting, "On Hydraulic Lifts for Passengers and Goods." This was a lengthy discussion, and gave some indication that those interested in its subject had embraced the opportunity which the postponement of the discussion had given to make themselves conversant with the paper. A paper was then read "On Improved Appliances for Working Under Water or in Irrespirable Gases," by Mr. W. A. Gorman, and a discussion took place upon it. Other papers were read on the second day's meeting, when the attendance was not quite as good as usual. Owing to pressure on our space we are compelled to reserve our report of the papers and discussions until another impression.

SECTIONS OF RACING YACHTS.

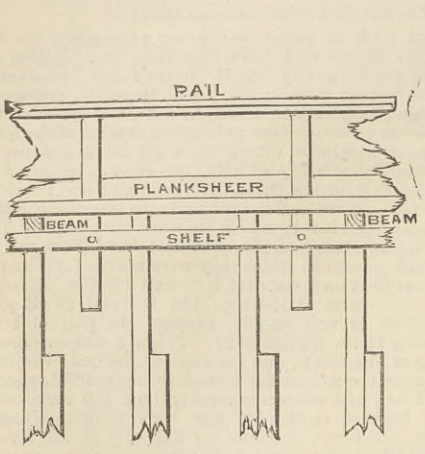


FIG. 1

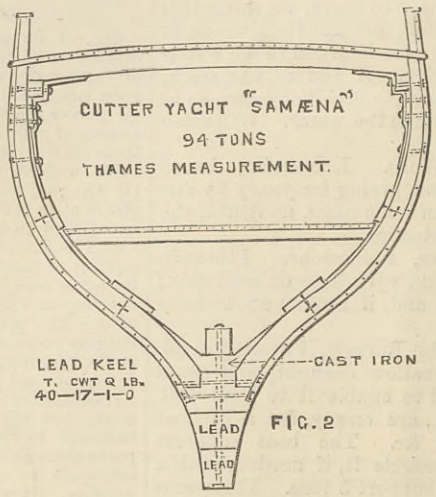


FIG. 2

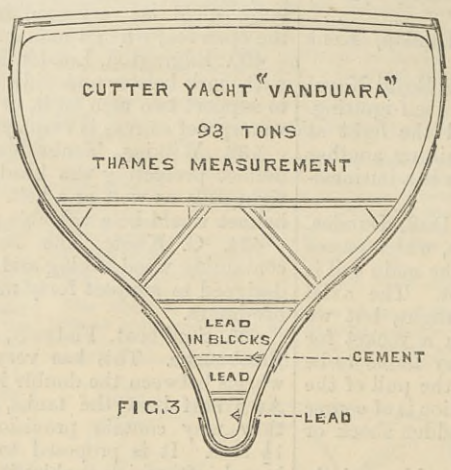


FIG. 3

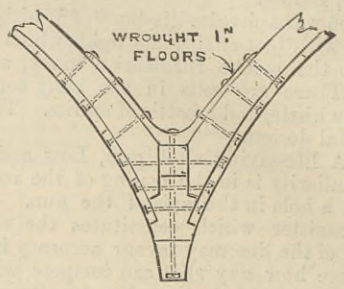


FIG. 4

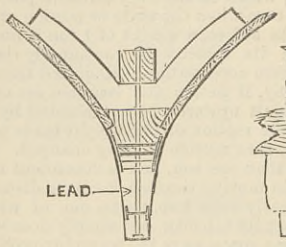


FIG. 5

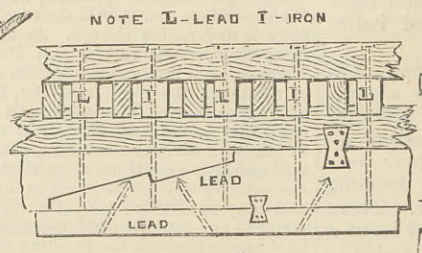
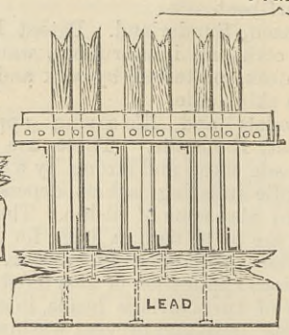
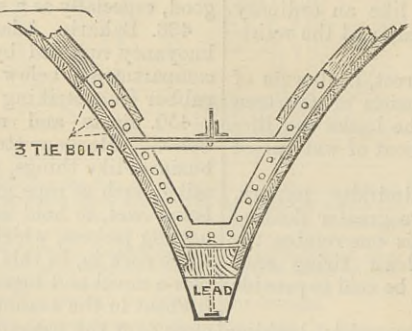


FIG. 5A

FIG. 6





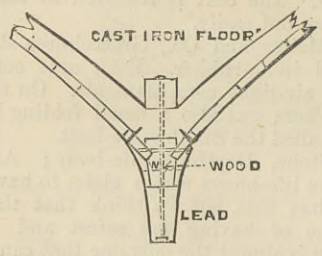


FIG. 7

THE INSTITUTION OF NAVAL ARCHITECTS.

On Friday evening, the 31st March, Mr. Phillips read a paper on

The Durability, Construction, and Ballasting of Yachts.

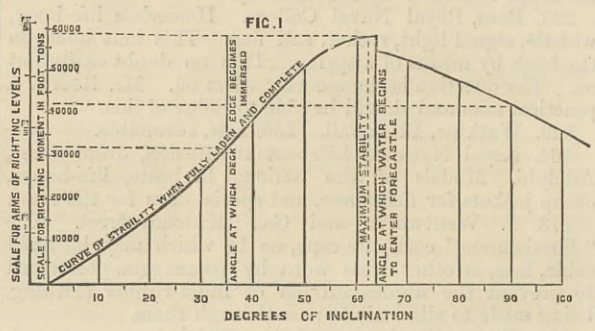
This paper dealt almost altogether with the ballasting of yachts, very little being said on the other subjects included in the title. At the present time there are several yachts built of wood which were in existence in the year 1835, and are stated to be in an excellent state of preservation, and to have received only trivial repairs, so that wood yachts would appear to be not so liable to decay as is the case with wood merchant vessels. The author insisted on the importance of repeated examinations of all the parts of a yacht, and proved his remarks by saying that there have been several cases during the past ten years where the wrought iron floors shown on Fig. 4 have been completely rusted away, and have had to be renewed, or additional wrought iron floors have been fitted, and the cases of several composite yachts which have had their floors and frames badly eaten by galvanic action from contact with lead prove most conclusively the dangers that will arise from proper care not being taken in regard to the removal of lead ballast from time to time in order to clean and properly paint the ironwork in the bottom. Cases could be quoted where, from want of access to the sides of iron yachts, plates have ultimately had to be removed, having wasted away by leakage from side ports, which may be, when open, the means of admitting water. The water-tanks in the bows of yachts just under the deck for the supply of the forecastle water-closets have been known by leakage to produce decay in the stem, knightheads, and deadwood in several cases in a very severe form, and which might have been prevented by using a force pump in lieu of the water-tank. The general adoption at one time, with some builders, of English elm for deadwoods, had resulted in extensive repairs becoming necessary after a few years, but it is now becoming obsolete. In several cases, also within his knowledge, where pitch or red pine has been used in the outside planking in the range of the waterline, large repairs have been needed, where the vessel has been lying up in harbours, and thus part of the bottom planking becoming wet and dry alternately. In dealing with the construction of yachts, the author used the diagrams which we reproduce on a reduced scale to explain his theory. A sketch is shown on Fig. 1 of a plan that has been adopted for the purpose of lightening the topsides, and it will be noticed that the whole of the timbers are not extended to the gunwale, and the shelf is simply bolted to the bulwark stanchions. This system, it is evident, does not produce sufficient strength in the topsides. It is now pretty generally admitted that a fast racing yacht can be produced from a strong hull, and it is certainly time that the old theory that a vessel, to be a successful racer, should be allowed to work a little while under way, should be thrown aside by yachtsmen, for it has been disproved in a special manner by the successes of the cutters Samœna and Vanduara, of which vessels sketches of the midship section are shown in Figs. 2 and 3. The former is a strong wood yacht, well fastened, and classed 15 A1; and the latter yacht is built of steel, and is classed 100 A1 in Lloyd's Yacht Register. The question of the proper and efficient ballasting of yachts deserves careful attention and consideration, and particularly so where heavy keels and blocks of lead are carried not only by racing yachts, but by those built for ordinary cruising purposes. Before proceeding directly to the consideration of lead keels, it might be mentioned that in several yachts portions of the deadwoods have been formed of lead, keelsons of cast iron and of lead have also been fitted, and in one or two instances the garboard strakes have been fitted of lead, bolted to the frame, and caulked in the usual manner. As, however, the smoothness of the lead was found to cause considerable difficulty in keeping the garboard seams watertight, this latter plan has not become so general as was anticipated. Another method of ballasting is the use of lead or cast iron floors, and in the case of a schooner yacht—see Fig. 5—recently built, a system combining floors of lead and cast iron has been carried out. In the case of the cutter yacht Vanduara, shown in Fig. 3, the keel is of a trough form, and a large portion of the ballast is of lead run between the floors, the bottom being first thoroughly cemented, and after the lead had cooled, the interstices, due to shrinkage, were filled in with cement in a liquid condition, and the upper surface of the solid lead ballast was covered by a thick layer of cement, on which the loose lead ballast rests. Where a lead keel is fitted to a new yacht to supplement the pig iron or lead ballast on the inside, the same will usually be small, and the arrangements for the securing of it will not be required to be of any extraordinary character, but consist generally of yellow metal dovetailed plates, fitted about every 6ft. of the length of the lead keel, and bolted to the wood and lead keels, and short metal bolts driven upwards about 2ft. apart, in an oblique direction into the wood keel. With a heavy lead keel, such as was fitted to the yacht Samœna—see Fig. 2—it was found necessary to have it in two depths, and which had the advantage of affording a shift of butts to the different pieces of lead forming the keel, whereby the strength of the vessel was increased considerably in comparison with the usual arrangement of fitting a lead keel in one depth only, and with square butts in the different pieces forming it. The Samœna's lead keel was fastened by 1½in. and 1¼in. yellow metal bolts, driven downwards in every floor, which are 2ft. apart, and nuts were hove up on the points of the bolts. In a schooner yacht of 160 tons, shown on Fig. 5, the different pieces of the main lead keel were scarfed together, and the up and down bolts were 1¼in. yellow metal in each floor, and the attachments of the lead and wood keels were supplemented by dovetailed plates of yellow metal placed on each side of the keel 6ft. apart. The false keel of lead in this yacht was secured by ⅞in. yellow metal bolts driven into the main lead keel, and by means of yellow metal dovetailed plates attached to the lead keel. In other cases of new yachts a similar arrangement to the preceding has been adopted in the fitting of heavy lead keels, but in several instances, especially in the mode of construction shown on Fig. 4, the wood keel is first fastened through each of the wrought iron floors, and the lead keel is fastened by means of up and down bolts intermediate between the wrought iron floors. An arrangement very similar to the preceding has been adopted in the case of the yawl yacht Lorna, shown on Fig. 6; but here it will be seen that the bolts through the lead keel are also supported by the angle iron floors, so that the chances of the bolts being driven downwards are greatly reduced. It will be noticed that in the whole of the previous arrangements the wood keels are exceptionally large in point of sectional area, as they are made to conform to the shape of the bottom. The wood keel of the yacht Samœna is 23in. sided by 18in. moulded, and the two trees from which it was obtained contained as much as seven loads of timber; and in the case of a small yacht of only 7 tons, built last year, the wood keel amidships was 22in. sided and 7in. moulded, to carry a lead keel of 6½ tons. A yacht that had originally on the bottom only 3½ tons of lead, and of the same siding as the main keel, was, in 1880, fitted with an entire new lead keel, weighing 17 tons, and the hollows of the garboards were filled in with slabs of lead weighing 6 tons, as shown in Fig. 7. The usual hangings for lead keels consist of yellow metal bolts and dovetailed plates, but in several instances the lead keels have been fastened with plain or galvanised iron bolts, and it may be stated that these iron fastenings have been found to be considerably wasted by galvanic action, in one case 1¼in. iron bolts, in twelve months, being reduced to ½in. in the vicinity of the lead keel; and in a second case, when the original lead keel was taken off to fit a larger one, the galvanised iron bolts at the centre line were wasted to such a serious extent that it was a matter of astonishment that the lead keel had not fallen off when the vessel was under way. It had come to the author's notice that in two yachts the lead keels fell off when in harbour through the breaking of the yellow metal bolts. The yacht builder, under whose notice the broken metal keel bolts was brought, now uses copper bolts for centre line fastenings, and has to increase the size of the copper bolts to obtain a corresponding stiffness for driving to be obtained with yellow metal bolts.

The discussion on this paper turned entirely on the best means of fastening on leaden keels, and it was stated that Muntz's metal bolts sometimes lost the whole of their zinc by electrolytic action, leaving a spongy copper bolt behind, which broke short off under the least strain.

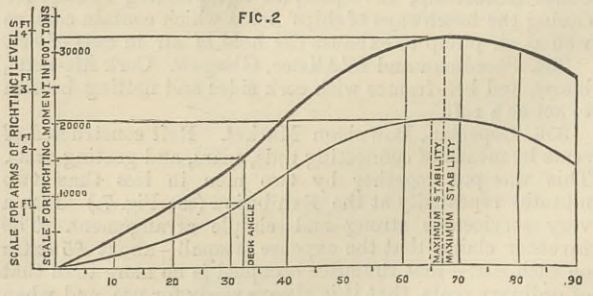
A vote of thanks was passed, and Mr. Biles then read his paper

On Curves of Stability of Some Mail Steamers.

The object of the paper was to lay before the Institution the results of some investigations into the stability of certain Atlantic and other mail steamers, and also to show the method of deducing these results by the aid of Amsler's integrator, an instrument which Mr. Merrifield called the attention of this Institution to in 1880. The curves given are all for ships built by Messrs. Jas. and Geo. Thomson. Fig. 1 is the curve of stability of the Cunard Royal Mail ss. Servia when loaded to 26ft. mean



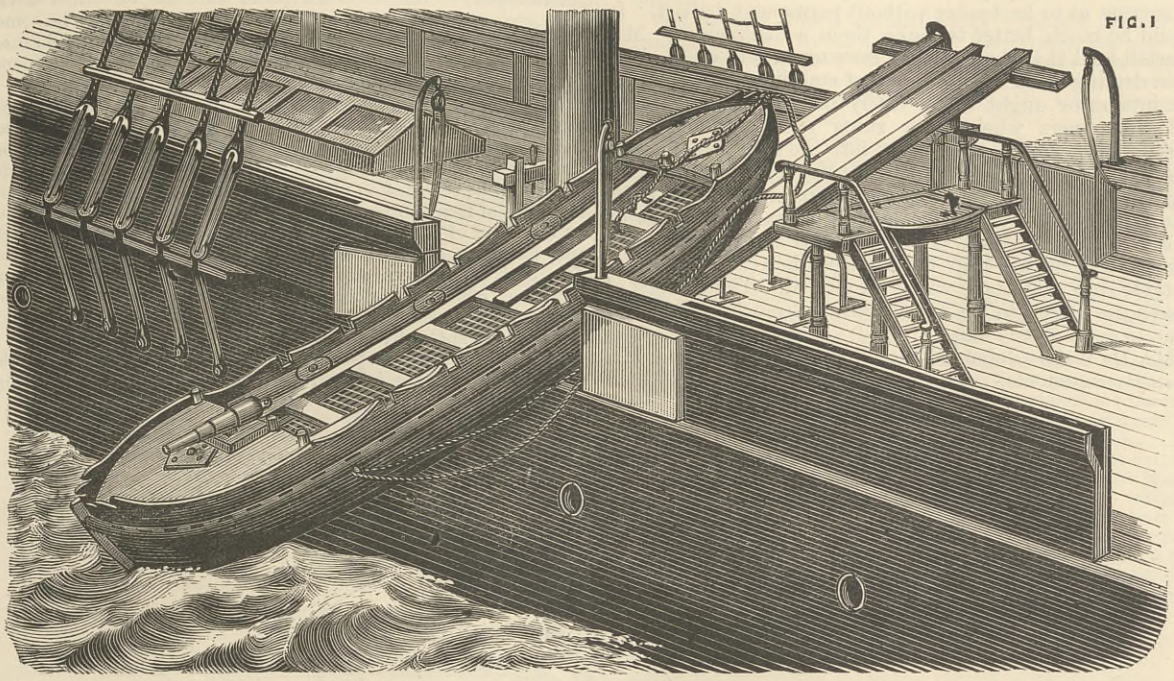
draft, with 1700 tons coal and 3000 tons cargo, assumed to be stowed homogeneously. The dimensions of this ship are:—Length between perpendiculars = 515ft., breadth moulded = 52ft., depth moulded to upper deck at side = 41ft., so that loading her to 26ft. gives her a freeboard of 16ft. 2in. to top of deck plank. Her metacentric height in this condition is 3·6ft., and her centre of gravity is at 48·8 per cent. of her moulded depth, above



the top of keel. The consequence is that her range and angle of maximum stability are both large, her stability at 90 deg. being 33 per cent. more than when her deck edge begins to be immersed. The ship has a forecastle 120ft. long, which is assumed to be water-tight up to the angle at which the door of the forecastle begins to be immersed. The break in the curve is caused by the assumed admission of water into the forecastle at that angle. None of the other deck erections are assumed

LIFE-SAVING APPLIANCES AT THE NAVAL AND SUBMARINE EXHIBITION.

FIG. 1



WHITE'S BRIDGE LIFEBOAT

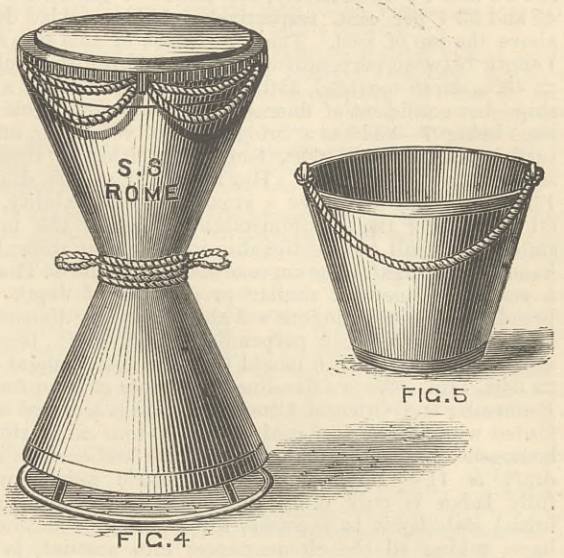


FIG. 4

FIG. 5

ROSE'S LIFE-BUCYJ

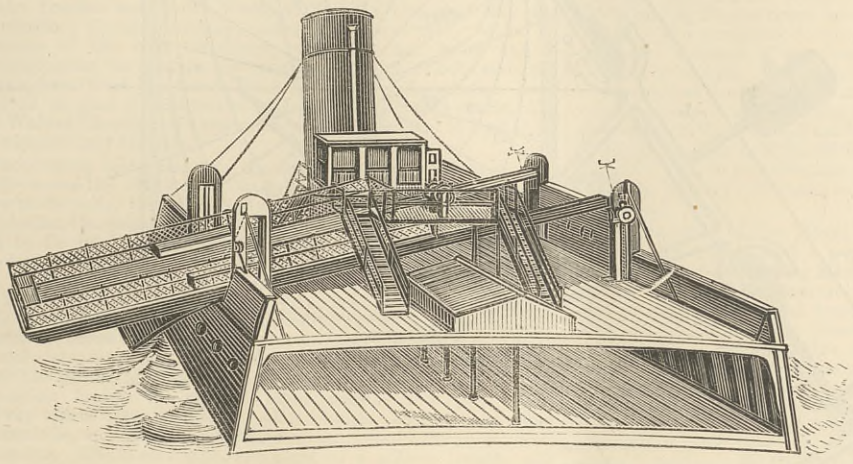


FIG. 2

ROPER'S LIFE RAFT

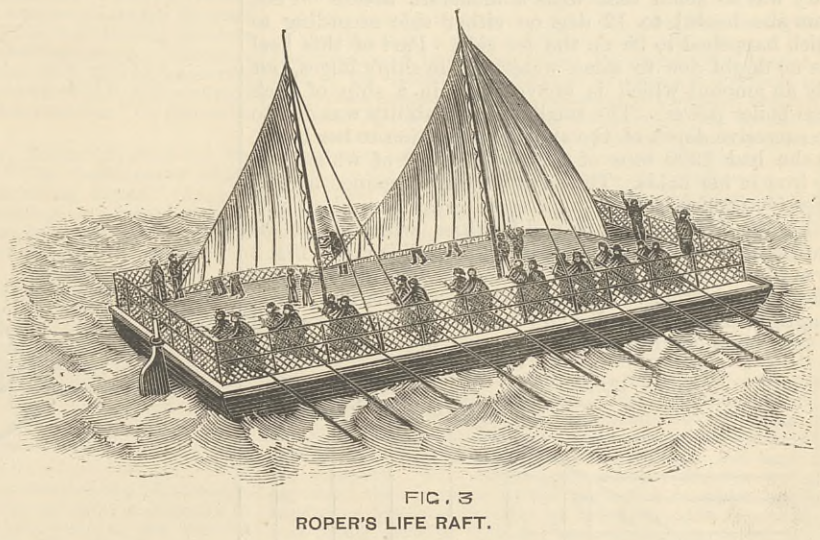
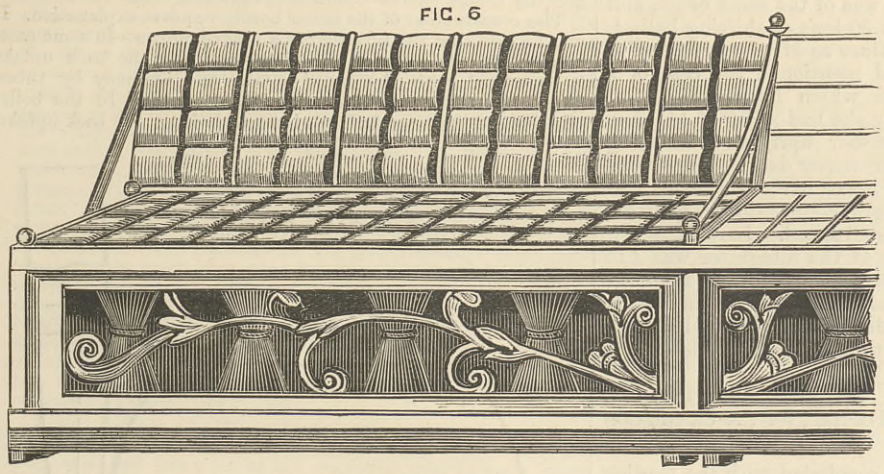


FIG. 3

ROPER'S LIFE RAFT.

FIG. 6



ROSE'S LIFE SEAT.

FIG. 8

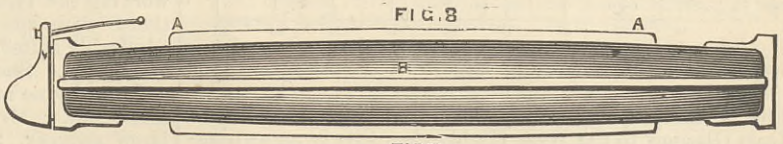


FIG. 9

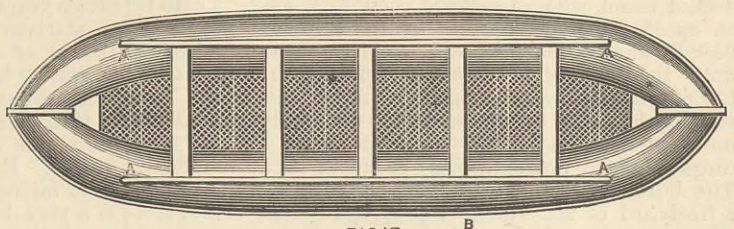
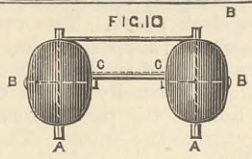


FIG. 10



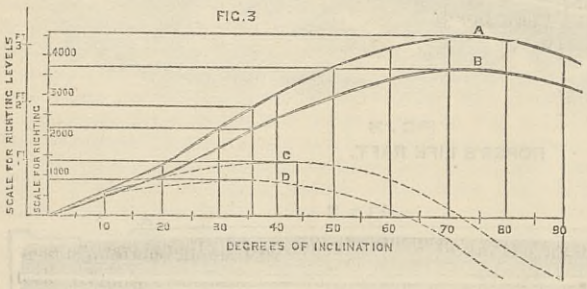
HODGSON'S WRECK ESCAPE.

FIG. 7

COPEMAN'S LIFE RAFT.

to give stability. Fig. 2 shows the curve of stability of the Cunard Royal Mail ss. Catalonia when loaded to 24ft. mean draft, with 970 tons coal and 2950 tons of cargo. The curve marked A is deduced on the assumption that the ship is loaded with a homogeneous cargo to the lower deck, that marked B when she is loaded to main deck. Her metacentric heights in these two conditions are 2·5 and 1·0 respectively, the centre of gravities being 49 and 53·4 per cent. respectively of the moulded depth above the top of keel. The dimensions of this ship are : Length between perpendiculars = 430ft., breadth moulded = 43ft., depth moulded, 35ft. She is comparatively a full ship—her coefficient of fineness based on under deck tonnage being ·7—and has a bridge house 140ft. long, and a turtle-back forecastle 60ft. long, but neither of these is assumed to give stability. Her freeboard at 24ft. draft is 12ft. 5in. This gives her a great range of stability, but on account of the small metacentric height the initial stability is small, so that the ship is somewhat difficult to handle when light. The curve of stability of the ss. Thames a vessel of somewhat similar proportions of depth and breadth to the preceding one was also given. Her dimensions are :—Length between perpendiculars = 392ft., breadth moulded = 42ft., depth mould to upper deck beam at side = 34ft. 1½in. She is a fine-lined passenger steamer for the Peninsular and Oriental Company. She is assumed to be loaded with 600 tons of coal and 2700 tons cargo, stowed homogeneously to the main deck. Her freeboard on 24ft. draft is 11·4½in., and her metacentric height when fully laden is only 6in. The question of how much initial stability it is necessary for a passenger steamer to have, taking all the circumstances into account, is one which can only be decided by experience, accompanied by observation of the actual metacentric height in various conditions. It may be interesting to state that the Thames went from Glasgow to London on a mean draft of about 19ft. with a metacentric height of 7in. Her initial stability was so small that with a moderate breeze on her beam she heeled to 12 deg. on either side according to which happened to be on the lee side. Part of this heel was no doubt due to some water in the ship's bilges, but only an amount which is unavoidable in a ship of such large boiler power. The small initial stability was due to the excessive depth of the ship in proportion to her beam, for she had 1300 tons of deadweight, 700 of which was pig iron in her holds. The advantage to be gained by this excessive proportion does not seem great enough to outweigh the necessarily great difficulties which must be continually met with in working ships of this class. Fig. 3 gives the curves of stability of the ss. Claymore in four different conditions. The dimensions of this vessel are : Length between perpendiculars = 220ft., breadth moulded = 29ft. 6in.; depth moulded to main deck = 15ft. 3in.

FIG. 3



She is the property of Mr. David McBrayne, and runs from Glasgow to the West Highlands. She is an awning-decked vessel, with an enclosed poop 75ft. long. There is an opening the full breadth of the ship in the awning deck forward at the forehatch, so that if steadily heeled until the deck edge became immersed, the ship would begin to take in water at this opening in the deck. The stability has been calculated on the assumption—(1) That no cargo is carried above the main deck ; and (2) that cargo is carried homogeneously to upper or awning deck. The draft in each case is assumed to be 14ft., which gives a freeboard of 2ft. 2in. to top of main deck plank, and 9ft. 8in. to top of upper deck plank. Two curves have been deduced for each case—one supposing that no water gets into the opening forward, that is, that it is covered by a tarpaulin or something temporarily placed there ; the other is supposing the whole of the part before the poop on the main deck to be open to the water. These curves have been given as they represent distinct types of steamers, and it has been thought that they may be of service to the profession. The method of deducing them differs from that of Mr. Barnes's in the fact that the volumes and moments of the wedges of submersion and emersion are found directly from the body plan by means of Amsler's integrator instead of by rectilinear and polar integration by Simpson's rules. A tracing is made of the ordinary body plan of a set of lines, and the deck lines are drawn to each section. The water-line in the upright, and also that in each inclined position, is drawn, the latter being placed to the best of the judgment of the calculator, so as to cut off the same volume of displacement as in the upright position. The integrator is set with its axis for moments on a line through the intersection of the inclined water plane with the upright one, and perpendicular to it. Each wedge section is then traversed round by the pointer of the instrument, and the reading of the areas' and moments recorders' are taken off and set up on a curve, the abscissæ of which represent the positions of the stations at which the sections are made. The curves thus obtained are then traversed round by the integrator—which instrument is illustrated by Fig. 4—the readings, when affected by the necessary constants for scale, giving the volumes and moments of the wedges. The determination of the righting lever is then made direct, as in Mr. Barnes's method. A full description of this, with a specimen calculation, was given in an appendix.

Mr. White said that in 1880 he had suggested that the integrator would be very useful for calculating curves of stability, and it was so used now to some extent at the Admiralty. Having complimented Mr. Biles, he then considered at some length the peculiarities of the ships whose curves of stability Mr. Biles had illustrated. Mr. Walls held that it was a pity to make ships of but 12 or 13 knots so narrow as to be tender without permanent ballast. It would be much better to make them a little wider. Mr. Martell held that the tonnage laws must not be lost sight of in dealing with this question of stability. He thought the integrator ought to be freely used, because it would tell shipowners when their ships were and were not unsafe. Mr. Denny then went into the question of metacentric heights, and explained that the stevedore must be a genius who could load a tender ship as she ought to be loaded, seeing he would always need to have 1000 tons or so of something in her, and must load and unload at the same time. Such a ship must choose her cargo, whereas a staple ship could take whatever offered. The comfort of passengers ought to be considered, and much ought to be done to get a steady ship.

Mr. De Russet defended the Thames, and disputed Mr. Denny's arguments. There was no trouble met with in working the Thames. It ought to be borne in mind that there were special trades for which such ships were admirably suited. The Pekin was of the same beam, and 1ft. deeper. She worked with 30 tons of shifting ballast, and was by no means such a failure as Mr. Denny tried to make out. Mr. E. Henwood mentioned the case of a large steamer, 250ft. long, on which he experimented fifteen years ago. When empty she had a list of 11½ deg. to starboard, but he brought her upright by shifting 13 tons of dead weight on her upper deck. Her centre of gravity he found was 2·95ft. below her metacentre.

Mr. Biles replied at some length, going into the question of rising floors, and their effects on speed. In reply to Mr. Jordon he said that the price of the integrator was £15 to £18. It was sold by Messrs. Elliott, Strand. It might be of interest to say that the maximum roll of the Servia in a very heavy gale was 30 deg. to leeward and 11 deg. to windward, with 750 tons between her lower decks and 450 tons on the orlop deck.

After a vote of thanks to Mr. Biles, a paper by Mr. Normand, "On Approximate Formula for the Calculation of Trim," was taken as read.

The business of the meeting concluded with the reading of Mr. Denny's paper

On the Reduction of Transverse and Longitudinal Metacentric Curves to Ratio Curves.

Last year, in the course of the discussion on Mr. White's paper, "On the Stability of Certain Merchant Ships," Mr. Denny brought before the Institution a method of reducing transverse metacentric curves to curves of ratios. He had since managed to reduce longitudinal metacentric curves by a similar method, and thought it would be of advantage to bring the subject before the Institution again this year, treating it as a whole, and more completely than it was possible to do in the short note appended to the "Transactions" of last year. His paper was illustrated by curves for six sea-going steamers and three paddle steamers, which were not referred to last year. Having explained the nature of these curves, Mr. Denny drew certain deductions from them, as, for example, that when a tender steamer, completely finished in her light condition, shows a marked want of stability, it is the general experience that even the successive addition of considerable amounts of ballast have for a time very little effect in stiffening her. The curves showed the cause of this, and that, while the ballasting of the steamer is lowering her centre of gravity, it is at the same time deepening her draught of water and lowering the metacentre, and until a sufficient weight of ballast is got on board to lower the centre of gravity faster than the lowering of the metacentre, no approach can be made to stability.

The discussion was got over in a few minutes, and was of no practical importance.

Messrs. Cochran's Launch Boilers.

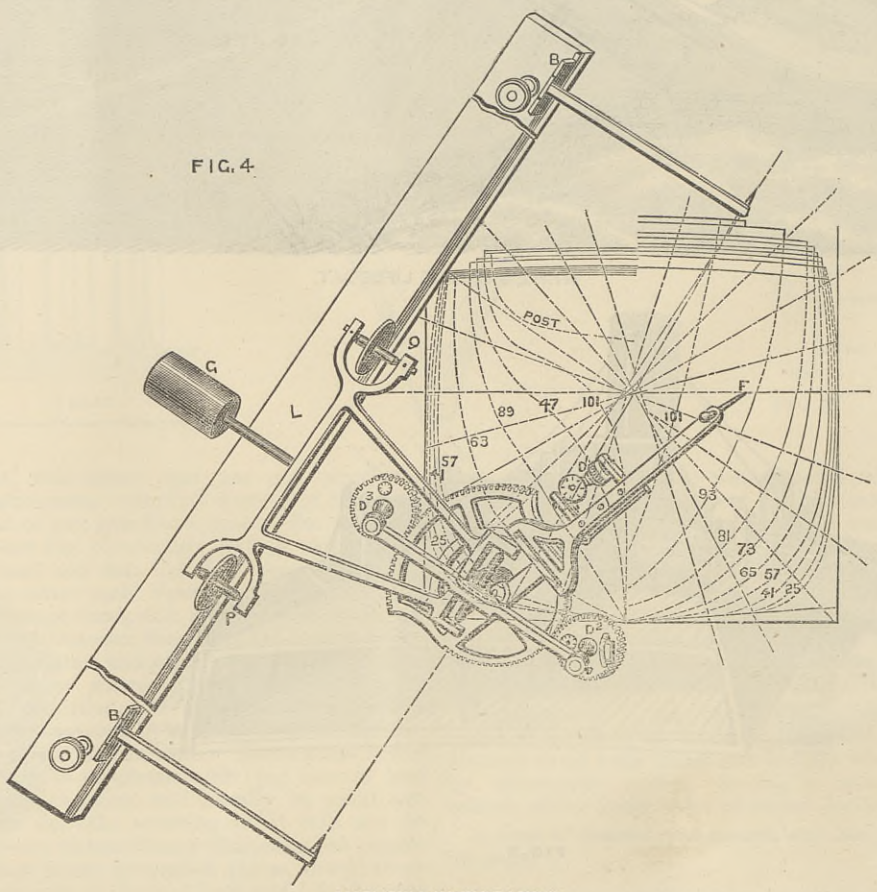
Messrs. Cochran and Co., of Birkenhead, have adapted their patent boilers to use on board steam launches, for which work they are well suited. They are in this case modified in some degree as compared with the much larger boilers of the same type now fitted by Messrs. Cochran in a large number of steamers for supplying steam to ship winches and hoists.

In our last impression we referred at some length to a large steam launch being built by Messrs. Forrestt, of Millwall, for the use of missionaries in Africa. We illustrate below the boiler for this launch, which is being supplied by Messrs. Cochran. This boiler will be sent out in pieces, as it will have to be carried on the backs of negroes some hundreds of miles to Lake Tanganyika, on the shore of which it will be rivetted up by a boiler-maker and his mate, provided with a portable forge to heat the rivets. The boat herself goes out in sections. The boiler is 6ft. 6in. high and 3ft. 9in. in diameter, and is being made of the best material and with the greatest possible care, as repairs and renewals are not easily effected in the wilds of Africa.

Boilers of this type possess the great advantage that while their cubic capacity is small they have a good deal of heating surface, and as there is plenty of room between the sides of the boiler and the tubes, circulation is not impeded. As a result they give dry steam, and no trouble from priming is incurred.

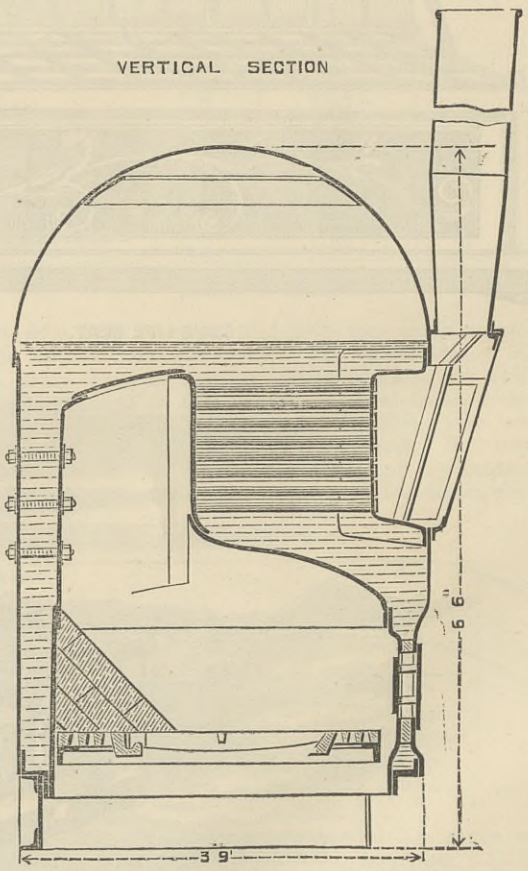
The construction of the boiler hardly requires explanation. It will be seen that the furnace has a welded crown—in some cases it is hammered up out of one piece—and that the back uptake is connected with the front uptake and chimney by tubes. Access is obtained to both ends of these tubes. In the boiler illustrated a man can drift the inner ends from the back uptake, but in other boilers made by Messrs. Cochran, doors are provided lined with fire-brick for the purpose. These boilers have of necessity very large grates, and it is of advantage to brick them up in most cases. It may be useful to some of our readers to call attention to this fact, as we believe many vertical boilers are worked with much too large and too thin a fire. The bricks should be laid on the bars all round until the best size is ascertained.

FIG. 4



AMSLER'S INTEGRATOR.

VERTICAL SECTION



RAILWAY MATTERS.

The New South Wales South-West Railway is now open as far as Carrathool, or 320 miles in a continuous line from Sydney.

Interesting evidence was given in the late Parliamentary inquiries respecting the South Wales railways and the heavy gradients worked thereon. It transpired that on the line from Brecon to Newport there is a gradient of 1 in 38½ for a length of seven miles, and 1 in 40 for eight miles, and both excellently worked.

On Tuesday the Select Committee of the House of Commons passed the Bill which authorises the incorporation of a company for the construction of an electric railway from Charing Cross, commencing at a point near the north-west end of Northumberland-avenue, passing under the river Thames and terminating near Vine-street under the loop-line station of the Waterloo terminus. Messrs. Law and Chatterton and Messrs. Siemens are the civil and electrical engineers.

The railway tunnel under the St. Lawrence at Montreal, Canada, is to have the following dimensions:—Entire length, about 21,700ft.; open cuttings on Hochelaga side, 2500ft., and on the Longueuil side, 4220ft.; actual length of tunnel proper, 14,980ft. It is to be 26ft. wide inside and 23ft. high. It will be lined with brick masonry throughout, except the fronts, which will have façades of stone. The arch will vary from 20in. to 30in. in thickness, according to the character of the ground to be supported.

In his report on the collision which occurred on the 15th February, at Peterhead, on the Great North of Scotland Railway, Major F. A. Marindin says: "The action of the pointsman, in turning the passenger train on to the sidings, was no doubt taken with the best of motives, and, by causing the collision between the two engines to be direct instead of oblique, may possibly have had a good effect; but, although it shows that the man was prompt and had his wits about him, it was a tremendous responsibility for him to take upon his shoulders, and I am not prepared to recommend that a similar course should be adopted in other cases of the sort."

Our Birmingham correspondent writes:—"This district is likely to be benefitted considerably if the Birmingham and Cannock Chase Railway Bill, now before Parliament, is carried through. The construction of a fresh line between Cannock Chase and Birmingham has long been wanted, for the route is at present monopolised by the London and North-Western Railway Company and the Birmingham Canal Company, and traders have every reason to complain of the high freightage rates that are being called. Manufacturers hereabouts are hoping for the relief, and the Birmingham Coal Merchants' and Consumers' Association have resolved to send a deputation to London in support of the Bill. The Walsall Chamber of Commerce have also decided to lend it all the support they are able."

Progress is being made in the operations for the erection of a bridge across the Forth at Alloa. This viaduct and railway are being made under the Alloa Railway Act of 1879, and will give the Caledonian Company direct access to ground hitherto exclusively held by its rival the North British Railway. The branch of the Caledonian to South Alloa accommodates a harbour which has sprung into more prominence since it obtained railway communication. But South Alloa is separated by a wide rapid tidal river from the town of Alloa proper, and from the coalfields of Clackmannan and Fifeshire. Since the line was opened, the Caledonian Company has maintained a steam ferry between the two sides of the river, which has proved of value for passenger purposes, but has left the connection broken as regards other traffic. The new Alloa Railway starts from the South Alloa branch about a mile from its terminus, and taking a westward sweep, crosses the river above both ports. The channel, about a third of a mile in length, will be crossed by twenty-one lattice girder spans, with a clear height above high water of 24ft. of a double swing span in the central channel, which will provide a clear way of 60ft. on each side. The spans next this opening north and south are to be 100ft., then one of 80ft., and the rest of 68ft. each. The works on the line are now being actively pushed on, a service line having been made to the south end of the bridge.

The financial position of Swiss railways leaves the shareholders much to desire. In several instances even debenture holders have had to go for years without interest, and some companies have utterly collapsed. On the moderate basis of 4 per cent. there is a capital of 249 millions—£9,960,000—which yields no return whatever. In other words, the net receipts are no more than sufficient to pay 4 per cent. on 28 millions sterling out of the total 38 millions invested. Some of the lines included in the returns, however, form virtually a part of the St. Gothard system, so their position can hardly be considered normal. But this can affect the general result but very slightly; and the fact remains that in 1880 the receipts of Swiss railways available for interest and dividend were only at the rate of 3·10 per cent. and there are some lines which made no more than their working expenses. Of the net revenue, 27½ million francs went for interest on loans and "special funds," leaving for the ordinary shareholders a poor 5¼ millions, equal to about 1⅜ per cent. These figures do not include the claims of shareholders and creditors on the seven railways which during the last few years have gone into liquidation, and which have either been sold to new companies or are being worked by liquidators. These railways are the Eastern and Western, the National, the Berne-Lucerne, the Jougne-Eclepens, the Rigi-Scheideck—twice liquidated—the Jura Industrial—twice liquidated—and the Ligne d'Italie, also twice liquidated. The total sum lost by the shareholders and creditors of these enterprises is estimated at 100 million francs.

A new steamer, the Haidar Pasha, intended for service between Galata and the terminus on the Asiatic coast of the Ismidt Railway, was tried last week at the measured mile in Long Reach. The vessel, which is of iron, has been built by Messrs. Samuda Brothers, of Poplar. She is 366 tons burden, her length is 155ft., breadth 22ft., and draught 5ft. There are saloon cabins on deck, as well as cabins below, both fore and aft, with a hurricane deck, on which seats are arranged crosswise, as on some of the Swiss Lake boats, and over which an awning will be stretched. She is a paddle-wheel steamer, and has a rudder at both stem and stern, so that she can run out of harbour either end foremost. Her engines, which have been constructed by Messrs. Maudslay, Sons, and Field, are a pair of oscillating surface condensers, of 80-horse power nominal, intended to work up to about 450-horse power. The cylinders are 37in. diameter, and give a 3ft. stroke. Four trials of the speed of the Haidar Pasha were made on the measured mile about the time of high water, twice with the tide in her favour, and against a fresh wind, and twice against the tide and with the wind, the mean speed being about 11½ knots per hour, with about 42 revolutions per minute. At a luncheon on board, Mr. Samuda said that the line with which, by a passage of about a mile and a-half, this boat would connect Constantinople, ran from the suburb of Scutari, down the coast, and as far as Ismidt. This railway was intended by the Turkish Government to be carried to Bagdad and the Persian Gulf, and, continuing the line by sections, it was the wish of Sir W. P. Andrew and others to enable travellers to go through from London to Calcutta direct, with no more delay than, perhaps, a wait of less than half-an-hour at Haidar Pasha. A convention had recently been concluded between the Austrian and Turkish Governments, and when the "missing link" of the existing system—a line from Sofia to Adrianople—had been supplied, a passenger from London would be able to reach Constantinople in fifty to sixty hours, and to make a pleasant excursion into Asia Minor by the Ismidt Line. This line was at present only about fifty-seven miles in length. but it would before long be carried to Ada Bazar, about twenty-eight miles further inland, and thence—a convention having been already concluded with the Turkish Minister for Public Works—by sections to Bagdad and the Persian frontier, with the object of ultimately reaching Kurrachee.

NOTES AND MEMORANDA.

The electric conductivity of phosphor bronze is given as two and a-half times that of iron and steel, and one-third that of copper.

The *Comptes Rendus* contains a note "On the Electrolysis of Distilled Water," by M. Tommasi. His experiments prove that water may be electrolysed, even by the current of a very weak battery, provided the calories liberated by this battery are at least equal to the calories absorbed by water in being decomposed, about sixty-nine calories.

Some experimental observations "On Difference of Temperature with Elevation" formed the subject of a recent paper read before the Meteorological Society, by Mr. George Dines, F.M.S. His observations were made at Walton-on-Thames during the last six years. Two stands, almost identical in size and construction, were used, one being place on the ground and the other on the top of the tower of the house; the bulbs of the thermometers in the former being 4ft., and in the latter 50ft. above the ground. The results show that the average maximum temperature for every month is always greater, and the average minimum lower, on the ground than that on the tower.

It is well known that the conversion of starch into sugar is greatly assisted by pressure; not only is the diastatic action of the soluble albumenoids increased, but under considerable pressure the small percentage of free acid, which is a normal constituent of all cereals, is sufficient to rapidly convert starch into sugar. It is, therefore, as the *Brewers' Guardian* remarks, somewhat surprising that no practical attempts have been made to mash under pressure. In the use of raw grain, a closed mash-tun capable of withstanding a moderate amount of internal pressure, would be a most valuable appliance; its construction and working would be attended with no real difficulties, and the existence of such a vessel in our breweries, as a supplement to the ordinary open mash-tun, would afford valuable aid to the brewer in his efforts to use ungerminated grain successfully.

At a meeting of the Chemical Society on the 20th inst., Dr. Ramsay read a paper "On the Atomic Volume of Iodine." The author has determined the atomic volume of boiling iodine. The experiment was somewhat difficult owing to the opacity of iodine vapour. The results of four experiments were:—34·07, 39·27, 35·62, and 37·79, the mean being 36·69, with a probable error of 0·7749. The numbers deduced by Kopp and Thorpe from the molecular volumes of compounds containing iodine were respectively 37·2 and 36. The author concludes that it may, therefore, be accepted as proved that elements in compounds occupy the same volume as elements in the free state. Thus, the following elements give values in the free and combined states respectively:—Bromine, 27·13, 28·1; iodine, 36·69, 36·6; sulphur, 21·6, 22·6; phosphorus, 20·9, 20·7; nitric peroxide also gives values free 32·0, and combined 31·5. Dr. Ramsay also read a second communication "On Molecular Volumes."

At a meeting of the Royal Society, Edinburgh, April 3rd, Sir William Thompson read a paper on "The Conditions of Stable Equilibrium of a Rotating Mass of Gravitating Liquid." Laplace proved that a given moment of momentum in a given mass of fluid of oblate spheroidal form, such as had been shown to be a form of equilibrium by Newton and Maclausin, required for equilibrium a unique value of the excentricity. Jacobi had extended the theorem to the case of an ellipsoid rotating round the shortest of its three unequal axes. By considering the Jacobian ellipsoid which differed infinitely little from a spheroid of revolution, Sir William found a certain value for the moment of momentum, such that the equilibrium of the spheroid would be stable if, and only if, its moment of momentum were not greater than this critical value. He also discussed the conditions under which a disc-shaped ellipsoid would split up into two distinct masses, and the limiting values of the excentricities in the Jacobian figure consistent with stability.

Mr. C. Wolcott Brooks has sent an abstract of a paper which he read on March 21st at the Californian Academy of Sciences to *Nature*, giving the temperatures of the ground in the Forman shaft of the Comstock lode, at Virginia City, Nevada, taken by Charles Forman, superintendent, and forwarded by him for presentation to the Academy. They are taken from the surface to the depth of 2300ft., as ascertained by drilling holes not less than 3ft. deep into the rock, and inserting into the hole a Negretti and Zambra slow-acting thermometer, of the pattern adopted by the Underground Temperature Committee of the British Association, and standardised at Kew. These holes were closed with clay, and the thermometers were left in for twelve hours, not less than three holes being tried at each point. The following are the depths in feet, and temperatures in degrees Fah.:—100ft., 50½ deg.; 200ft., 55 deg.; 300ft., 62 deg.; 400ft., 60 deg.; 500ft., 68 deg.; 600ft., 71½ deg.; 700ft., 74⅜ deg.; 800ft., 76¼ deg.; 900ft., 78 deg.; 1000ft., 81⅓ deg.; 1100ft., 84 deg.; 1200ft., 89¼ deg.; 1300ft., 91½ deg.; 1400ft., 96½ deg.; 1500ft., 101 deg.; 1600ft., 103 deg.; 1700ft., 104½ deg.; 1800ft., 105½ deg.; 1900ft., 106 deg.; 2000ft., 111 deg.; 2100ft., 119½ deg.; 2200ft., 116 deg.; 2300ft., 121 deg.

The following rule for ascertaining the true gravity of a wort at 60 deg. Fah., when the gravity has to be taken by the hydrometer at a higher temperature, is given in Allen's work on "Organic Analysis":—To unity add ·004 for every degree of specific gravity above 1000 (g) shown by the hot wort, and ·01 for each Fah. deg. of temperature (t) above 60 deg. Fah. Multiply the sum of these by one-tenth of the number of Fah. deg. above 60 deg. Fah., and the product, added to the density of the hot wort, will give a number representing the specific gravity of the liquid at 60 deg. Fah. The rule is expressed by the following formula:—

$$G = \left\{ 1 + \frac{(g-1000)\,4}{1000} + \frac{t-60}{100} \right\} \frac{t-60}{10} + g.$$

Thus, if the wort be found to have density of 1052 at a temperature of 110 deg. Fah., then by the formula—

$$G = \left\{ 1 + \frac{(1052-1000)\,4}{1000} + \frac{110-60}{100} \right\} \frac{110-60}{10} + 1052.$$

$$G = (1 + \cdot208 + \cdot5)\,5 + 1052$$

$$G = 1{\cdot}708 \times 5 + 1052$$

$$G = 1060{\cdot}54$$

Corrections of densities of cane-sugar solutions for temperature may be made by the same formula.

At a recent meeting of the Cleveland Literary and Philosophical Society, held at Middlesbrough, Mr. T. Hugh Bell read a paper on "The Salt Deposits of the Tees." He explained the probable way in which these deposits were originally formed, viz., by water containing saline matters being impounded and then evaporated. In the Caspian and Dead Seas something of the same sort is now in progress. The conditions attending the formation of salt deposits were always lacustrine. It was believed that the Cleveland deposit was coeval with that of Germany, and anterior to that of Cheshire. It was originally discovered by Messrs. Bolckow and Vaughan when seeking for fresh water by boring. Subsequently Messrs. Bell Brothers put down a bore hole on the other or northern side of the river. They found the salt at a little less depth than it existed on the south side. Going still deeper they passed through the magnesian limestone, and from thence issued large quantities of marsh gas, which to this day can be lighted by applying a lighted match. Another bore hole 26in. in diameter at the top, and tapering to 16in. at the bottom, has since been put down, the portion traversing the salt bed being perforated with holes. Inside is placed a second tube, open at the lower end. Water is run down the annulus formed by these two tubes, and becoming saturated with salt, it rises in the internal tube till it is balanced by the annular column of fresh water. On account of the different specific gravites of fresh and salt water, the latter stands at a considerably lower level than the former.

MISCELLANEA.

The two new lighthouses on St. Paul's Island, Canada, have been illuminated since March 14th.

On the 19th inst. Messrs. Edward Finch and Co., of Chepstow, launched from their yard a finely modelled iron screw steamer, the Rougemont, built to the order of Messrs. John Cory and Sons, of Cardiff. Her principal dimensions are, length 250ft., breadth 35ft., depth of hold 18ft. 3in., with a dead weight carrying capacity of 2000 tons. The engines are compound surface-condensing of 130 nominal horse-power, and two large boilers, working pressure 80 lb. per square inch, are to be fitted by the builders.

At a meeting of the Sanitary Institute of Great Britain, on the 19th inst., a paper was read by Henry C. Stephens, F.C.S., on "An Obstruction by Law to Sewage Disposal," in which he particularly dealt with the claims of what is commonly known as the "separate system," and showed that the advantages which are supposed to be derivable from the separate system are lost because owners and occupiers under the Public Health Act are entitled to drain any premises into the sewers of a district.

It was reported at the fifth annual meeting of the Mining Institute of Scotland, held at Hamilton a few days ago—Mr. Ralph Moore, Inspector of Mines, in the chair—that the finances of the Institute were in a healthy state, and that 104 new members had been added during the past twelve months. A committee has been appointed to examine and report on the different safety lamps in use throughout the district, and they are expected to present their report at next meeting. A deputation was also appointed to visit Shipley Collieries, near Derby, to report on the system of getting coal by the use of caustic lime. A paper was read at the meeting by Mr. D. Johnstone, of Glasgow, "On the Annealing of Iron."

The Lea Conservancy has served notices on the St. Pancras and Islington authorities to abate an alleged pollution of a brook, a tributary of the Lea, which runs near the Finchley cemeteries of these parishes. The brook in question was open, and a few years ago contained fish, while now it is an unquestionable nuisance for a considerable part of its course. The authorities of St. Pancras and Islington allege that it is polluted by the drainage of the township which has sprung up at Finchley. The pollution of the Lea is also occasioned by the township of Leyton, on the eastern side of the river, which has now a large population. To meet the necessity of purifying the drainage into the river Lea, the local authorities propose to adopt the plans of the Rivers Purification Association, of Gresham House, London.

At the fortnightly meeting of the Liverpool Engineering Society, on the 12th inst., a paper was read by Mr. Jas. Morgan "On the Construction of Impervious Street Pavement, with special reference to the Methods Practised in Liverpool." Previous to 1872 impervious pavements had no existence in Liverpool, and although the late Mr. Newlands, in his published report to the Health Committee in 1848, strongly recommended on sanitary grounds the construction of pitch-jointed impervious pavements, no action was taken for twenty-four years, when the carriageway of North John-street was re-constructed. The obvious advantages of the system soon became so apparent that at the present time there are within the city not less than 650,000 superficial yards of impervious pavement, all laid within nine years by the workmen of the corporation.

Sir Henry Parkes, K.C.M.G., Premier of New South Wales, accompanied by Mr. Saul Samuel, C.M.G., Agent-General for the Colony, and a number of ladies, visited the works of Messrs. Richard Hornsby and Son, Limited, at Grantham, on Wednesday last. A saloon carriage was placed at the disposal of the party at King's Cross, and on arrival at Grantham they were met and conducted into the works from the station entrance by Messrs. James and Wm. Hornsby (the managing directors of the company), Messrs, Marley and Ward (directors), and the manager and secretary of the company. The visitors were shown round the works, and expressed their surprise at the perfection to which mechanical appliances had been brought at the Spittlegate Ironworks, and were highly gratified with the various implements and machines designed especially for Australian use, in which Sir Henry took a great interest. After luncheon at the George Hotel, the party returned to town in the afternoon.

The Austrian Government, after a trial of Nordenfelt 1in. bullet guns and Hotchkiss 1½in. revolving cannon in 1878, decided in favour of the Nordenfelt, and purchased a large quantity of them for their Navy, which proved so unsatisfactory that the question was opened again last year, and another trial made with the Hotchkiss revolving cannon of three sizes of naval guns—light 37mm., long 37mm., and 47mm. guns—firing projectiles of 1 lb., 1¼ lb., and 2½ lb. They have adopted the 47mm. gun, firing 2½ lb. projectiles, and give as the reason for their decision that at all ranges the 47mm. gun, on account of its larger calibre, is much more effective than the 37mm., and at long ranges the proportion is still more in favour of the 47mm., owing to its heavier projectiles losing their velocity less rapidly. In consideration of these facts the 47mm. is not only effective against steel torpedo boats of 10 to 15mm. thickness even at long ranges, they can also be usefully employed in fighting torpedo rams or torpedo vessels, such as are recently being constructed, also against modern cruisers, for which the smaller guns in most cases would not be sufficiently powerful. The rapidity of fire of both sizes of guns being about equal, the commission gives the preference to the 47mm. Hotchkiss revolving cannon.

Our Birmingham correspondent says:—"An engineering contract is just now under execution in that district which, when delivered, will form one of the objects of interest which will be inspected by the Institute of Mechanical Engineers during the visit to Leeds in August. It is the construction by Messrs. Joseph Wright and Co., of Tipton, of three large-sized Berryman patent water heaters for the Monkbridge Iron Company, Leeds. Each heater will be over 30ft. high, and they are to work in conjunction with Green's economiser in supplying thirty boilers with water at a guaranteed temperature of from 220 deg. to 240 deg. Forty-seven engines and steam hammers will exhaust their steam into the heaters, which are calculated to purify and heat 10,000 gallons of river water an hour. The Monkbridge Company expect by the use of these heaters to effect a saving in their consumption of coal of 6000 tons per annum. Messrs. Wright are now also negotiating for the setting up for another firm of the largest set of heaters ever contemplated."

The Electric Lighting Bill was discussed on the 20th inst. at considerable length by the Council of the Association of Municipal Corporations at their offices in Westminster. After a long and animated discussion, it resolved to memorialise the President of the Board of Trade for the adoption in his Bill of the following amendments suggested by the Council, viz.:—(1) No application for a licence or provisional order under this Act shall be made in respect of all or any part of any district of gas supply of a local authority without three months' notice to such local authority, who shall be entitled within that period to make application for a licence or provisional order; and until such application has been disposed of no other application shall be made or entertained. (2) No application for a licence or provisional order on the part of any company or person shall be made in respect of all or any part of the district of a local authority without three months' notice to such local authority, who shall within that period be entitled to make application for a licence or provisional order; and until such application has been disposed of no other application shall be made or entertained. (3) No powers of public lighting now vested in the local authority in relation to streets shall be interfered with or affected by any provisional order, except by agreement with the local authority. (4) That no electric lines or overhead works across or over streets be authorised by any provisional order without the consent of the local authority.

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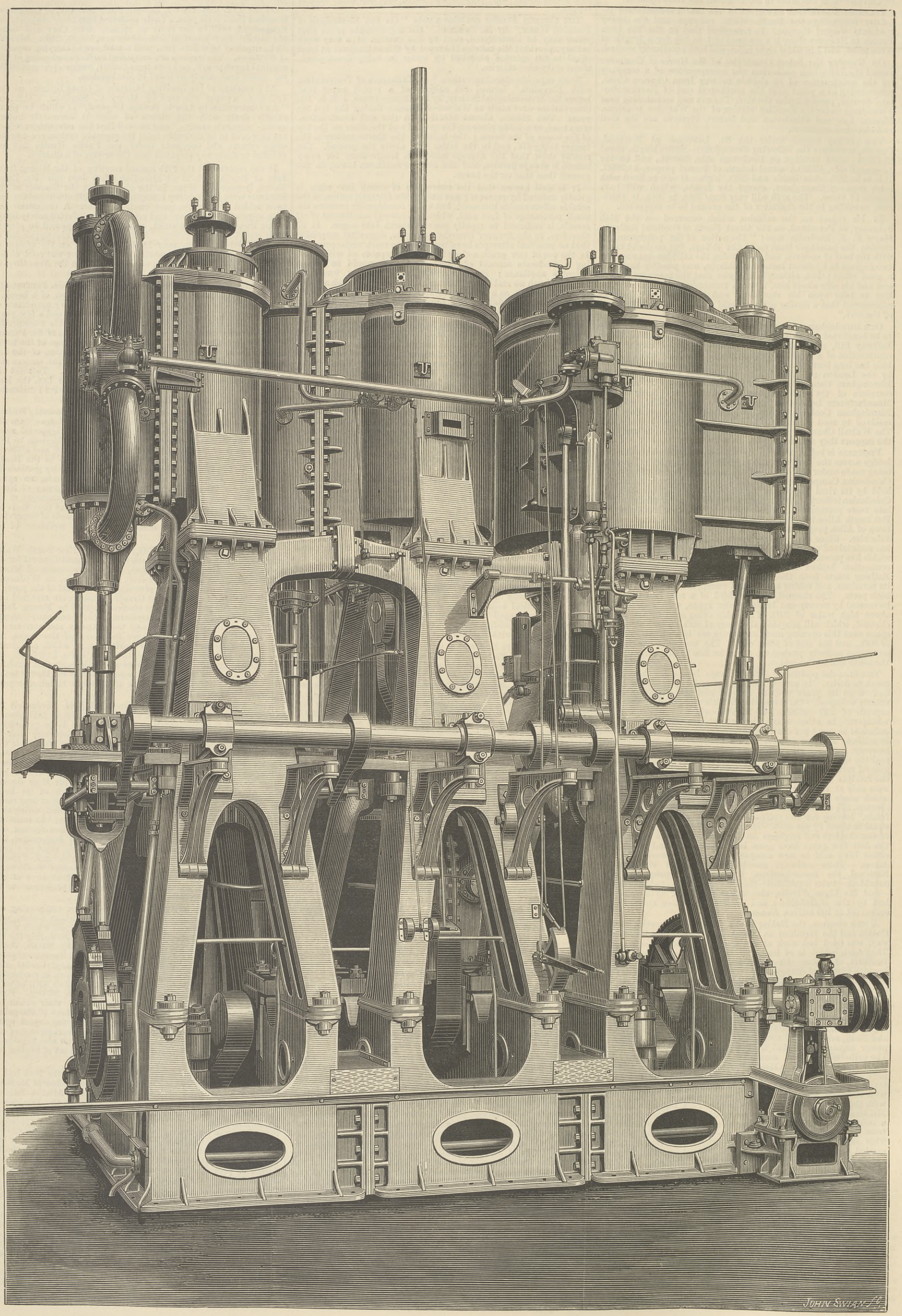

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TO CORRESPONDENTS.

*** *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.*

Stone Sawing (Aberdeen).—*Letters await the application of this correspondent.*

E. H.—*Apply to H. Monk,* 219, *Strand, London, and to the Model Dockyard, Fleet-street, London, E.C.*

R. N. (Water-street, Birmingham).—*We do not think your invention is new, and if it were, as it would add to the weight and cost of the bicycle, we do not think it would be adopted.*

G. P. C. (Dublin.).—*We really cannot see that your letter throws any light on the questions at issue, and for this reason we do not publish it. It is, in brief, an assertion that the statements we have made concerning the cost of electric lighting, based on the result of an experiment made at the Crystal Palace, are wrong. It would be impossible in the present state of affairs to put forward any estimate against which the same charge could not be brought. Our estimate was based on certain conclusions at which any engineer would arrive who knew the nature of the appliances with which he had to deal. The fact that at the present moment the Brush Electric Light Company charge high prices is quite beside the question. Messrs. Hammond ask £400 for a Brush machine; when made in quantities such machines will cost about £100 each. They charge £16 for a lamp, which can be made for £5. It would be most unfair to the electric light to saddle it with charges which are only legitimate until patentees have been reimbursed for their work, and the company has been paid for the risk it has run and the enormous charges incurred in introducing the light to the public. You do not advance a single argument to prove that we have said what is erroneous. The cost of an engine-house may be anything between £10 and £1000. The cost of coupling up lamps—64 lamps over five miles—means the cost of ten miles of wire, and a certain unknown quantity for labour. You will hardly argue that wire is worth £10 a mile, whatever may now be charged for it. We have estimated the cost of maintenance at a much higher figure than Messrs. Hammond, and we see no reason to alter our views. If you will prepare an estimate of the cost of the plant for 64 lamps of 1000 candles each, on a commercial basis, and eliminating royalties, we shall have much pleasure in publishing it. A comparison of such an estimate with the actual charges made by Messrs. Hammond, and other firms, would no doubt prove very instructive.*

Erratum.—*In our description given last week of Steam Steering Gear, Mr. Coulson Douglas was incorrectly referred to as Mr. Douglas Coulson.*

MACHINERY FOR MAKING WELDED COPPER TUBES.

(*To the Editor of The Engineer.*)

Sir,—Would any of your readers kindly inform me who can supply me with a machine for making copper welded tubes out of sheet copper, perfectly cylindrical? J. G. N.

Barcelona, April 20th.

GRAIN ELEVATORS.

(*To the Editor of The Engineer.*)

Sir,—I have an inquiry for several machines—grain elevators—to load and unload such goods as grain, and convey it from the stores to the ships, and *vice versâ*. May I ask the kindness of your readers to let me have the names of the makers of such appliances? A. C.

Paris, April 22nd.

MR. JOHN HOWARD KYAN.

(*To the Editor of The Engineer.*)

Sir,—Can any of your correspondents give me some biographical details of John Howard Kyan, the inventor of the process of preserving wood known as "kyanizing?" References to periodicals will be sufficient for my purpose, which is purely historical. I want the exact date and place of birth, and the same particulars relating to his death, if he is no longer living. Historicus.

CHILLED CAST WHEEL BOXES.

(*To the Editor of The Engineer.*)

Sir,—Having read "Foundry Manager's" letter in answer to "F. K.," it appears to me that "Foundry Manager" knows very little about the subject, and he is only acquainted with one particular shaped box, for it is a very common practice to cast bushes for cart wheels with a tapered hole. In the middle a chamber is formed so as to surround the axle; its object is to contain grease for lubrication. The cores used for these are cast iron pins turned and polished, and around the middle a thickness of sand is wrapped to form the grease chamber. This part is made of sand to allow the core pin to be driven out of the bush when cast. The bushes are cast vertically with the feathers at the bottom. Now if "F. K." will drill a hole in the centre of his core pins lengthways, and at the part where he fits his thickness of sand for the grease chamber drill several small holes radially to meet the one previously drilled lengthways, he will then easily get rid of his air and also over the difficulty.

Grays-inn-road, April 26th. Pattern Maker.

(*To the Editor of The Engineer.*)

Sir,—In reply to "Foundry Manager," we beg to enclose two rough sketches of cast bushes; they are the common kind used for wooden cart wheels. There are two kinds made, viz., those chambered all round, and those with three recesses. We have cut recesses in the chills for the latter kind, and then fitted cores made of fire-clay wash and sharp river sand into these recesses, and projecting the requisite depth beyond the face of the chill. You will see there is no way for the air to get off these cores except by drilling holes in the chill and leading to top or bottom, but this causes much trouble, as the holes get stopped up hard. We have tried oil sand, loam, clay wash and sand, and plumbago and sand, and the fire-clay wash and sand put on wet and dried on the chill has answered best, but none have answered without taking the air through the chill. We also find that where the metal comes in contact with the chill on first entering the mould, it burns into it, as there is a constant stream of hot metal impinging on one place until the mould is full. The tackle for these boxes is very expensive to get up, and they do not pay unless you can make certain that every one cast will be good. We should feel grateful for any information on the subject, as we are at great loss on account of blown castings and also burnt chills. R. and F. K.

Ireland, April 23rd.

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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.*

MEETINGS NEXT WEEK.

The Institution of Civil Engineers.—Tuesday, May 2nd, at 8 p.m.: Paper to be discussed, "Harbours and Estuaries on Sandy Coasts," by Mr. L. F. Vernon-Harcourt, M.A., M. Inst. C.E.

Society of Engineers. — Monday, May 1st, at 7.30 p.m.: "On the Utilisation of Tidal Energy," by Mr. Arthur Oates, the leading features of which are as follows:—The power and value of tidal energy, and the means of utilising it with a description of the tidal dam, its construction and action. Concluding with a statement of the conditions most likely to render tide utilising works successful.

Chemical Society.—Thursday, May 4th, at 8 p.m.: "Recent Developments of the Theory of Dissociation," by Professor J. Dewar, F.R.S.

Society of Arts.—Wednesday, May 3rd, at 8 p.m.: Twentieth ordinary meeting, "The Fire Risks Incidental to Electric Lighting," by Mr. Thomas Bolas, F.C.S. Mr. W. H. Preece, F.R.S., will preside. Friday, May 5th, at 8 p.m.: Indian Section, "Experiences of an European Zemindar—Landowner—in Behar," by Mr. James Mylne. Sir George Campbell, K.C.S.I., M.P., will preside.

DEATH.

On the 27th inst., at his residence, Kew, Henry Hooper, Esq., C.E., late of Her Majesty's Indian Service—third son of the late George Hooper, Esq., of Grove Lodge, Clapham Park—in his 54th year.

THE ENGINEER.

APRIL 28, 1882.

COOPER'S HILL COLLEGE.

On Friday, the 21st inst., Mr. Gibson moved in the House of Commons for the appointment of a Select Committee "to inquire into the working and expense of Cooper's Hill College, and report if it is desirable for the public service to retain the present system, or whether any, and if so, what, changes and modifications should be made." After a prolonged discussion the House was divided—for the motion 27, against it 78; so that Mr. Gibson was beaten by a majority of 51. This result was just that anticipated. It was to the last degree unlikely that the Government would permit themselves to be defeated concerning a College which was founded eleven years ago by the Duke of Argyll. But the question is really one concerning which the wishes of Parliament or of a Government can effect but little. All such establishments as that at Cooper's Hill stand or fall ultimately on their own merits, and the evidence is not wanting that Cooper's Hill College is practically doomed. It has ceased for some time to be what it once was—a school intended exclusively for the education of engineers for India. The Government will no longer guarantee employment for its trained students. Not one-third of the number it can accommodate can obtain berths in India, and an attempt is being made to keep the College books full by offering a very good but very expensive education to many men who have no intention of going to India. Costly as the education given is to parents and guardians, the College is far from being self-supporting. The expenditure on the Institution was in 1877-78, £20,427, while the receipts were only £18,254; in 1880-81 the expenditure was £19,812 and the receipts £15,125. During the past eleven years the enormous sum of £317,000 has been spent and £148,000 received in connection with Cooper's Hill College. It has been calculated that every student turned out has cost the Government £321. If the result had been satisfactory there might have been little to say on this subject. The price would not, perhaps, be too high to pay for securing the services of a trained engineer; but the results have been the very reverse of satisfactory, and they could not possibly be otherwise.

As the true point at issue was overlooked by the Marquis of Hartington and others who took part in the debate—we presume because, not being engineers, they knew next to nothing of what they were talking about in its most important aspect—we may be excused if we endeavour to summarise matters a little. In India we had numerous possessions. These were won with the sword and kept by the sword. The military power was practically the only power in Hindostan. As peace settled on the country it became apparent that the aid of the engineer must be called in. For the most part his work was of a very simple character. It consisted in making embankments, constructing irrigation canals, making a few roads, and doing a comparatively small quantity of railway work. Practically there were no civil engineers in the country; but there were plenty of military engineers, who had little to do. Nothing was more natural than that these gentlemen should be set to make roads and embankments. But by degrees the work augmented in quantity, magnitude, and importance, and it was found that not only were military engineers not competent to execute it, but not plentiful enough. So a few civil engineers were employed, and by degrees their number was augmented. At last a period came when the Indian Government found itself stranded. The supply of engineers was exhausted, that is to say, no more could be had at the price offered. Then Lord Stanley—the present Lord Derby—in order to obtain more engineers, established a system of competitive examinations in this country. A certain number of appointments was offered in India to candidates who liked to compete for them by examination and in this way very many good men were obtained. The "Stanley engineers" still enjoy a high reputation in India. But on the first inception of the scheme business was not very good in this country. Engineers were not busy, and plenty of candidates were secured. After a time however, trade got better, and engineers obtained employment from better pay-masters than the Indian Government. The supply of Stanley engineers dwindled down. The Indian Government was outbidden. At this crisis the Duke of Argyll, then Secretary of State for India, established Cooper's Hill College. He had a vast country to deal with requiring the aid of the engineer on every side to civilise and enrich it; but instead of availing himself of the talent and experience ready to his hand in this country, he sent half a hundred boys to school to learn engineering. Cooper's Hill has cost this country £169,000; what it has cost India will never be known. For £16,000 a year the services of sixteen trained and talented engineers could have been obtained. Can it be doubted that these men would have been infinitely more useful than the three or four hundred college students who went to India, ignorant of the very rudiments of the practical part of their profession? But the matter does not end here. These young gentlemen had to be paid while in India. If the sum thus expended had been added to the £16,000 a year above mentioned, it will be seen that a large sum would have been obtained out of which to pay a competent staff a proper price for its services. Under the circumstances, there never was, perhaps, a more fatuous scheme than that of the Duke of Argyll. It was begun and continued in direct opposition to the advice of every influential member of the profession. Colonel Chesney himself admitted that Cooper's Hill did not profess to turn out practical engineers. But the one thing wanted in India, then and now, is the practical engineer. In this country, a young man with a good theoretical knowledge of his business can always get assistance to pull him through in practice from foremen, but in India the young engineer is left on his own resources and comes to grief accordingly. Some of the stories told of the doings of Cooper's Hill men in India would be ludicrous were they not melancholy. Thus we hear of one young fellow who was sent some distance up the country to drive piles in a somewhat rapid stream. He knew from books all about piles. A whole week passed and his chief sent someone to find how he was getting on, but he was not getting on at all. He could have driven the piles well enough if only he could get them on end, but this he and his men were entirely unable to do. An English foreman could have had the whole lot driven in two days. Again we have the story of the man who made a bench mark on the bark of a tree in laying out a railway, and it was subsequently found that a bridge put upon this section of the line was all out of level. The ingenuous youth had forgotten that trees grow fast in India, and in the year which had elapsed since his levels were taken the tree had got up a foot or so. We have taken no small trouble to ascertain for ourselves from Government engineers of the highest grade employed in India what the Cooper's Hill man can do; and the answer has always been the same, "When he comes out he can do nothing." "Cooper's Hill men are gentlemen, and nice fellows; but they are not engineers." So notorious did this become at a comparatively early period, that a system was tacked on to the Cooper's Hill College scheme, by which the student got a few months' practical work in the office of some leading English engineer, to the infinite advantage of a student who knew how to avail himself of his opportunities.

The true cause of all the difficulties the Indian Government has had to encounter as regards engineers, is simply that the Government would not pay enough to obtain what is wanted. Payment again means something more than money. In the matter of pension and position, the military engineer has always been better off than the civil engineer. If the Indian Government thought proper to do what is right it could have to-morrow a large supply of competent men. Of course no such step will be taken. In writing as we do, we have no intention of disparaging Cooper's Hill students; they are in no way to blame. The education they obtain is in fault, not the men themselves. What would be thought of the students turned out of a hospital and in which they never saw an operation performed, and in which the highest practical instruction they got consisted in operating on a wax leg or arm? But this is precisely analogous to the education given at Cooper's Hill; the men there are taught one-half, and that, as regards India, the least important half of their profession.

Sir G. Campbell expressed on Friday night the popular impression when he said that "when Cooper's Hill College was established the state of the public works service was so unsatisfactory that it was undoubtedly necessary that something should be done to secure a supply of young men." This is the theory which has done so much mischief. India did not want young men; she wanted men in the prime of life, and in full possession of their powers—men practically as well as theoretically trained. There was not then, and there is not now, any lack of such engineers in this country; but they must be well paid. The Indian Government offered £400 and £500 a year to men who in this country could get the same sums, and much more. Bearing in mind the difference between the value of money in the two cases, it will be seen that the remuneration offered was quite inadequate. It is much to be regretted that this fact was not brought out as fully as it ought to have been during Friday night's debate. As for Cooper's Hill College, it will probably die of sheer inanition. The Marquis of Hartington stated, in reply to Mr. Gibson, that for many years to come India will not need more than ten engineers, or fifteen at the utmost, annually. This means, of course, that little money is available for public works. But the College has been established, and as it cannot be kept going by ten or a dozen pupils, it has been opened to the general public. When it has been found out that a most expensive education is imparted, which education is practically useless as a tool for earning money, the College will lose the small remnant of popularity which it now enjoys. It was a mistake from the beginning, and it is a still greater mistake to endeavour to perpetuate it after the object for which it was called into existence has ceased to exist. The sum which will be wasted on it could be better spent in paying the ten or fifteen well-trained and experienced engineers who are wanted in India each year.

DIVING.

It ought not, we think, to surprise anyone to discover that diving has now-a-days become a trade by itself, and that the manufacture of apparatus connected with the process is a speciality in which numerous firms are engaged. The complexity of modern civilisation has been

the cause and consequence of many inventions and of much activity of mind, the result of which has been the creation and separation of many distinct branches of investigation and trade, and the domain of knowledge and the field of engineering have become so great that it has been found necessary to allot different paths to the especial care of their own curators. That this state of things should have some inherent drawbacks is not surprising; but they are drawbacks which we fear are not easily to be remedied, nor, if they were, would it be our business here to inquire into them. What we desire to point out is that there are spheres of activity of so special a character that those not engaged in them know very little of the progress that is being made in them, and diving we hold to be one of these.

The late Naval and Submarine Exhibition at the Agricultural Hall at Islington has afforded a rare opportunity to those who have not had occasion to investigate the subject specially to observe the contrivances which have reduced the calling of the diver to one of reasonable safety, and actually to see the use made of these contrivances in the tank which was erected in the middle of the Hall. This tank was furnished with windows, through which the men under water could to some extent be watched by the public; and the conditions of actual practical diving were imitated as far as space would allow, though of course the depth and pressure were far short of what would occur in the generality of diving operations. The diving tank was certainly the most popular of all the exhibitions at the Hall; and we are not surprised at this, considering how special is the condition of the diver and how invisible his ordinary operations are. Round about the central tank were the seven exhibition stands of as many makers of diving machinery; but these seven stands only afforded examples of two really different systems of artificial diving which are much in vogue at the present time, for the diving bell may now be considered as quite obsolete for practical purposes. These two systems are—First, that in which air is pumped from above down to the diver, who is enclosed in a water-tight dress only open at the valves, through which the excess of air escapes; and, secondly, the later method, in which the diver takes down a supply of oxygen to fill the place of that which is absorbed by the lungs, and a suitable filter for extracting from the breath exhaled the carbonic acid; these two chemical operations really constituting the purification of air for breathing purposes, as the nitrogen can be used over and over again in the lungs.

The former system being the older and more established and easily understood among divers, finds a larger number of supporters than the second more recent and chemical method. Accordingly we find that six out of seven manufacturers supply apparatus founded on the first system, and two the oxygen apparatus; one enterprising firm, Messrs. Barnett and Foster, recognising the advantages of the two systems and manufacturing both kinds of apparatus; and undoubtedly each system has its advantages, some of which we will point out. The air pumping system is well understood by divers, and does not involve the machinery for making and compressing gas. There is no particular limit to the time a diver can be continuously under water. A diver under the new system might outstay under water his supply of oxygen. Under the old system, in case of accident, the diver can perform the operation called technically "blowing himself up," that is, he can close more or less the outlet valves, and allowing his dress to become inflated, bring himself to the surface. A diver, with the oxygen apparatus, can usually do this too; but towards the end of his supply he might find it inconvenient or impossible. On the other hand, the oxygen system has its special advantages. The diver is independent of anyone above the surface. The breathing apparatus being also independent of the diving dress, an accident might occur to the latter without producing serious evil. As there is no air tube connecting the diver with the surface, he can move about the more freely among the *débris* of a wreck. He can penetrate a long heading, where it would be impossible to drag an air-hose. In shallow water a flexible helmet can be substituted for the large copper one, which, however, is essential in deep water. The diving staff, too, is less numerous under this system. Altogether there is no doubt that Messrs. Fleuss, Duff, and Co., to whom the oxygen apparatus is due, have contrived to bring a scientific idea into a practical working form. Of course the diver will have to become accustomed to the use of the thing, and especially will he have to be careful to regulate the duration of his stay below by his depth. He takes down with him as much oxygen as would fill six cubic feet at the atmospheric pressure, but it has all been pumped into a volume of three-quarters of a cubic foot—*i.e.*, it has a pressure equal to eight atmospheres. The depth of water corresponding to this pressure is 264ft.; so that, if the diver were working at a depth of 132ft., it is obvious that the elasticity of the gas will be expended when half the original weight has been consumed. Whereas, if the diver is working close to the surface of the water, the elasticity of the gas will last till seven-eighths have been used. There is some reason for thinking that in respiration the important thing is the weight of oxygen taken into the lungs rather than the volume. For instance, more rapid breathing is necessary on an Alpine summit than on ordinary altitudes, and on the other hand, the breathing of divers is performed more slowly than when they are doing the same amount of work in the air. Still the rate of breathing, and therefore the absorption of oxygen, under pressure, is certainly greater than would be the case if absorption went on uniformly and independently of the compressed state of the gas.

The skilful use of the oxygen apparatus must therefore be a matter of experience in the diver; but there is no reason why a careful man should not be as perfectly safe in a dress of this sort as in one on the air-pumping system. Some few improvements may be at once suggested, and others may suggest themselves as experience increases. We certainly think that some gauge may be contrived which, read perhaps by the touch, may inform the diver of the difference of pressure in and outside of his oxygen reservoir. The tubes, too, between the filter and the mouth of the diver seem to us to be too weak, and in their position too exposed to be pulled away from the metallic junctions by accident. Externally the diver, equipped for descending, carries on his back a knapsack containing the reservoir of oxygen below and above the ebonite filter, and on his breast a flexible wind bag. The filter is divided into four vertical partitions, and the air passes up and down these through alternate layers of caustic soda and tow. Below there is a sink for any moisture which may be formed. The two ends of the filter are connected by flexible tubes with passages in the mask leading to the mouth of the diver, who breathes by means of his mouth alone. One of these tubes is for inhaling, and the other for exhaling, and they are furnished with beautiful metallic valves, opening, of course, so as to keep the current always in the same direction. The breast bag is in connection with this circuit, and rises and falls with respiration. It is also in connection with the reservoir through a screw valve, which is operated by the hand, and is opened periodically for a moment to charge the circuit with oxygen. Thus it will be seen that the breathing gear is entirely independent of the diving dress. A mask is necessary to enable the diver to use his eyes. For shallow water this may be flexible, but in deep water the mask must take the form of a rigid helmet to prevent pressure upon the face.

In all systems of diving the body is subjected to the pressure corresponding to the depth. This may be transmitted through the dress directly, the folds of which pressing locally may give the diver a good deal of pain. This can be removed by allowing the air or gas to fill the dress, in which case the pressure is transmitted uniformly by the air or gas, and gives no pain to the diver. But this inflation has its evil in rendering it hard for the diver to keep at the bottom. When necessary, however, it is performed in the air pumping gear by closing more or less the escape valves, and in the oxygen apparatus by opening the reservoir valve for an instant at the same time as the mouth, when the gas will escape directly into the dress.

It is of course very often an advantage to have artificial lights to assist operations under water. A variety of these have been invented. Of course there is the electric lamp. Messrs. Siebe, Gorman, and Co. exhibited at the Agricultural Hall a somewhat ponderous example, and Messrs. Applegarth and Denayrouze an oil lamp whose combustion is supported by air from the pumps, introducing yet another possible cause of entanglement in the shape of an additional connection with the surface. The makers of the oxygen apparatus sell a lamp in which oxygen in a compressed form supports the flame. This lamp is quite portable, and needs no attachment to the surface, but of course it would only be advantageous where the oxygen generating apparatus is present. One defective point in all systems of diving is the want of an expeditious means of communicating directly with the surface. The signals which can be given by pulling a rope are very few, and nothing unexpected, and at the same time important, can be communicated by this means. Telephones and speaking tubes have been tried and given up. In the air pumping apparatus the speaking tube in its simple form gave too free a vent to the air, but we cannot help thinking that speaking tubes with vibrating diaphragms might be attached to the tube supplying air; the motion of translation which the air in the tube has would have very little disturbing effect upon the vibrations on which the transmission of sound depends. At present, however, communication between the diver and the surface is carried on by means of a slate and cord. a mode which it is difficult to suppose does not admit of improvement.

We close this article by giving a list of the principal firms who manufacture diving apparatus, and who exhibited at the Naval and Submarine Exhibition. Makers of apparatus upon the system of pumping air to the diver: Messrs. Siebe, Gorman, and Co., Lambeth; Applegarth and Denayrouze, London and Paris; Routh, Davis, and Co., Westminster-chambers; Sadler and Co., Oak-lane, London; Lang and Son, Gerrard-street, Soho. Makers of the oxygen diving apparatus: Messrs. Fleuss, Duff, and Co., Cannon-street. Makers of both descriptions of diving gear: Messrs. Barnett and Foster, Forston-street, London.

A GREAT PLATE MILL.

The West Hartlepool Ironworks, recently purchased by Messrs. Gray and Gladstone, have been remodelled under the supervision of Mr. W. Prosser. The works, when previously going, were principally engaged in the iron rail trade; the works, as now designed, are the most complete ship-plate manufactory in the country. They comprise two puddling mill trains, for rolling 12in. to 20in. puddle bars; there are five 80 cwt. steam hammers, and ninety-six puddling furnaces in the forge. The finishing department contains three plate mills, a large 28in. train, capable of rolling plates up to 6ft. wide and 40ft. long. This mill has ten first-heating furnaces and four wash-heating furnaces, a separate blooming mill, the reversing gear of which is three bevelled wheels, 6ft. diameter, made by the Lilleshall Iron Company; a pair of single grooved rolls take in the pile, 16in. square, and draw it down in a few passes to a slab 5in. or 6in. thick. This mill has a steam reversing engine and a steam lift for the bloom; the furnaces are all fitted with charging cranes and steam drawing-out gear. The finishing mill is driven at a speed of 25 revolutions per minute by an engine going at the rate of 75. The heavy reversing wheels, weighing altogether 150 tons, were made by Messrs. Taylor and Farley, of West Bromwich, who also supplied the housing and rolls, which are equally massive. The output from this mill will be from 50 to 60 tons per shift of twelve hours, or 600 tons per week. The floor for this mill is 75ft. wide by 200ft. long, giving ample room for laying down the hot plates. The plates immediately they leave the rolls are drawn out on to this floor by steam machinery. The shearing shed is supplied with Buckton's 10ft. shears, and with a 7ft. Lilleshall shears, and a powerful scrap shears by De Bergue, all of the newest and strongest design. The second mill is a 6ft. by 24in. train, and has six mill furnaces; it is an ordinary pullover mill, but has a steam lift to the breaking-down rolls, which facilitates the work very much. The furnaces in this mill have steam charging and drawing-out gear. The output in this mill has exceeded 330 tons in one week. A third mill, 5ft. 6in. by 24in., with three mill furnaces for the lighter class of plates, with an output of 100 tons per week, completes the arrangement of the works, and gives them altogether a capacity of 1000 tons per week. We understand the firm have 40,000 tons of plates on their books for manufacture over the next twelve months.

THE EARNING POWER OF RAILWAYS.

Although it cannot be said to be an exact test, yet approximately the mileage receipts of railways affords the fairest test of their earning power; and an illustration or two may be of interest. Certainly the highest in this respect are the passenger lines. In one recent week each mile of the Metropolitan Railway earned £891—the highest amount reached in that week by any of our British railways, and more than fifty per cent. above that of its neighbour the Metropolitan District. The North London followed with an average mileage receipt of £727, and one or two other of the short passenger lines also earned large mileage receipts. Coming to the south-country lines we find the London and Brighton earned £116 per mile; the London, Chatham, and Dover, £157 per mile; and the South-Eastern, £124. The great lines do not show quite so well; the Great Western receipts averaging only £67 per mile for the week; the Midland's, however, were £110; whilst the North Eastern's were £87 only; and those of the Lancashire and Yorkshire stood in strong contrast thereto at £154, and the much-abused Manchester and Sheffield had a weekly mileage receipt of £113. It is evident, however, that the density of the districts served by the railways has much to do with the mileage receipts, and that the passenger traffic yields the best results. But it is worthy of the consideration of the directorates of railways whether they have done all in their power to cultivate business by giving full, speedy, and cheap facilities for traffic, and by making these understood. In the metropolis there is scarcely a resident who does not know rates, times, and routes of trains; but in the country districts this is far from being the case, and this ignorance and the scant service prevents travelling in some degree. Our railways might be made more lucrative in general if the directors would turn their thoughts more to the cultivation of cheap traffic by the regular trains, and if they would expedite their service.

A PHOTOGRAPHIC GUN.

In taking instantaneous photographs it is well known that some difficulty is experienced in bringing the object into the field of the camera. The process of taking aim at, for instance, a moving object such as a ship has sometimes to be repeated several times, and in the end the result is unsatisfactory. Mons. Marrey has, to get over this difficulty, designed a photographic gun. This is neither more nor less than a very large revolver, with a stock to put to the shoulder. The barrel is a telescope, that is to say it contains the lenses of a camera; there are sixteen apertures which take the place of the chambers. The photographer puts in a sensitised plate behind these apertures, and performing an operation analogous to cocking the weapon, he is ready for the field. On seeing a flying bird he takes aim and pulls the trigger, the chamber revolves once, and in one second he obtains sixteen little pictures of the bird in various positions. Hitherto Mr. Marrey has made use of his photographic gun for the purpose of investigating the flight of birds. In this case clearness of definition is of little consequence, so long as a dark image or silhouette the shape of the bird is obtained, so that it matters little whether the object aimed at be focussed or not; but it is obvious that in a multitude of other cases the image can be obtained perfectly in focus. Indeed it will be seen that the system of thus carrying a small camera to be steadied against the shoulder admits of extension, and may prove of the utmost service to the photographer.

LIFE-SAVING APPARATUS.

Mr. Barnett gave two prizes—one of one hundred guineas and the other of fifty guineas—in connection with the Naval and Submarine Engineering Exhibition; the first "for the best means of saving life in cases of shipwreck;" and the second for the "best invention of a humane character connected with seafaring." Admirals Boys and Hood, and Sir Digby Murray—Board of Trade—acted as judges. They report, "After a careful examination of all the exhibits brought to our notice, with the object in view, we award the one-hundred-guinea prize to Mr. R. Roper, Stand 82, for his bridge raft, as affording the readiest means seen by us in case of shipwreck of saving collectively a large number of persons and supporting them above water for a lengthened period. The fifty-guinea prize to Messrs. J. and A. W. Birt, Stand No. 309, for their contrivances of cork mattresses, hammocks, cushions, seats, &c., for supporting individually persons in the water till further assistance can be rendered." It now remains to be seen whether any action will be taken by the Board of Trade or shipowners to render useful, appliances which have been pronounced good by such eminent authorities as the judges named.

THE CRYSTAL PALACE ORGAN.

Messrs. Gray and Davison are now carrying out a work at the Crystal Palace which will be approved by all lovers of organ music; they are practically reconstructing the great Handel Festival organ, and introducing the most modern improvements. Hitherto it has been blown by nine men, the bellows being placed in one of those upper galleries, to which the public are never now admitted, for some not well understood reason. In future it will be blown by three of Joy's organ blowers, supplied by Messrs. Hathorn, Davey, and Co., of Leeds. The organ will be revoiced and fitted with pneumatic action, by which the touch will be made as light as that of a pianoforte. It will also be fitted with a carrillon of bells of considerable size. The renewal of the organ is an extensive work, and will hardly be completed before the middle of June.

THE SHIPWRIGHTS' COMPANY'S EXHIBITION OF SHIPBUILDING MODELS.

This Exhibition, which will be held in the Fishmongers' Company's Hall, London Bridge, is to be opened on the 3rd of May, and promises to be the largest and most interesting Exhibition of naval models that has ever yet been got up in this country. The Shipwrights' Company, the promoter of the Exhibition, has endeavoured, with commendable zeal, to make it of an international character, and has invited foreign nations to exhibit models of their vessels, in addition to the Admiralty and our own shipbuilders and shipowners. The Governments as well as private shipbuilders of several countries have

cordially responded, and the great naval Powers, including France, Holland, and Sweden and Norway, have taken an active interest in the enterprise, and many models, some of exceptional merit, are included in the collection. Notably, among many others of the foreign models which have been contributed, is one of a vessel that belonged to one of the ancient Vikings of Scandinavia. This is a remarkable specimen of naval architecture, and is not only valuable from an historical point of view, but also as indicating the ingenuity with which the ships of the early period to which this vessel belonged were constructed, and the mechanical ability of the men who built them.

The models to be exhibited by Holland, like those of Norway, represent a great variety of vessels, from the old galleon down to the modern ironclad ship of war. The French Government have sent some magnificent models of war vessels, including those of their largest ironclads, and one of the heavily-armoured turret vessels for coast defence. The models of the French ironclads will doubtless attract considerable attention at the present time, when the strength of our Navy, and especially as regards the thickness of the armour protection of some of our later vessels has lately been the subject of so much controversy in and out of Parliament.

The exhibits sent by British shipbuilders and shipowners are the most numerous that have ever been brought together, and include many most beautiful specimens of naval architecture, and embrace representations of all the largest passenger steamers which have lately been added to the mercantile marine for the Atlantic, South African, and East Indian services. Cargo carrying vessels are also well represented, and, indeed, the collection of merchant sea-going steamers is, we think, as complete as it well could be. The Exhibition is, however, not confined to war ships and ocean passenger and cargo steamers. Models of sailing ships of various sizes will be shown, sailing and steam yachts, fishing vessels, and river craft and lifeboats, will be included in the collection.

It will be remembered that the Shipwrights' Company held an exhibition at the Fishmongers' Hall about five years ago, which included models of steamers and sailing ships, yachts, and small craft. That exhibition was to a great extent competitive, and prizes were offered for the best models of vessels of various types. It was not to be expected that the most eminent shipbuilders in the country would compete for the prizes advertised; and, consequently, the exhibition, as a competitive one, was not fully representative, and did not completely illustrate the advancement which had then been made in naval architecture. Builders, for instance, of the most improved Atlantic liners, embodying as these do all the scientific knowledge and experience of the designers of ship and engines, would not, we should suppose, feel any keen desire to submit their vessels to adjudication with a view to being awarded a modest prize.

The present Exhibition is to be only partly competitive, in consequence of this known feeling of some of the foremost shipbuilders in the kingdom, and the result is that many shipbuilders and shipowners who would not otherwise be exhibitors have readily lent models of the most magnificent vessels that are afloat, in order to assist in making the Exhibition completely representative; the models themselves being elegant specimens of model work. The prizes offered for the best designs in the different sections included in the list include first and second-class medals, and in some instances these will, we believe, be supplemented by substantial money prizes, presented by members of the Shipwrights' Company. The competition is open to models of vessels built not more than five years, in addition to designs that may not have been built; and a very sensible condition has been imposed which provides that no exhibitor may compete in more than two classes. We have been furnished with a list of the judges who are selected to decide upon the rival merits of the exhibits intended for competition in the separate classes, and we think the selection is creditable to the Company, including, as it does, men of well-known ability and high standing in the profession of naval construction. The decisions, therefore, of the Adjudicating Council may, we think, be expected to give general satisfaction.

The exhibits will be divided into twelve sections arranged in alphabetical order, and each section will be subdivided into two or more classes. We will briefly allude to these, so as to set out more distinctly the scope of the Exhibition. Section A illustrates vessels of war, and comprises five classes, viz.: (1) First-class sea-going ironclads carrying heavy guns, and ironclad rams; (2) ironclads for coast or harbour defence; (3) steel or iron corvettes; (4) torpedo boats; (5) models of the Royal Sovereign built in 1635, and of the Royal George and others, lent by the Lords Commissioners of the Admiralty. Section B includes mercantile steamers, and these also are divided into four classes for competitive purposes: (1) The best mail steamer for the American trade to Great Britain, or France, or Hamburgh; (2) mail steamer for direct service between England and Australia, say in thirty-two days; (3) steamer of largest class between England and the East, viâ Suez Canal; (4) Atlantic steamer for cattle and grain trades. Section C comprises steamers for short sea passages and of limited draught, say 9ft., and Thames, Mersey, and Clyde passenger steamers. Section D is devoted to sailing ships in two groups: (1) Vessels not exceeding 2000 tons; and (2) vessels not over 1100 tons. Section E includes sailing and steam yachts. Section F furnishes models of fishing smacks and steam trawlers, and for the best specimen in this section a prize of 25 guineas is offered in addition to the medals in the two classes In Section G will be found three classes of tugs—namely, those for sea-going service, screw river tugs, and shallow vessels of not over 4ft. draught, which may be either paddle or screw vessels. Section H is for sailing barges in two classes, (1) for 100 tons and above, and (2) for vessels of smaller size. Sections J and K include boats in three classes, and steam launches, and Section L comprises the important collection of models which have been lent for exhibition but not intended for competition. In this last section will be found the beautiful models of the large Atlantic steamers that have recently been built for the leading passenger lines engaged in crossing the Atlantic, also models of the latest additions that have been made to the splendid fleets of the Peninsula and Oriental Company, the British India Steam Navigation Company, the Union Steamship Company, and Orient Company. In Section A, Class 1, the French Government are the exhibitors of three models; our Admiralty exhibit models of the turret ironclads, Monarch and Devastation, and Messrs. Samuda Brothers, of Poplar, send a model of the Argentine Government twin-screw armour-clad corvette, Almirante Brown, of 4200 tons displacement and 4500 indicated horse-power, speed 14 knots.

The first of the French vessels included in this section is the Admiral Duperré, which is the largest and most heavily-armed ironclad in the French Navy, and in fact one of the most powerful ironclads in the world. We will give a brief description of this vessel for the information of those of our readers who may desire to give special attention to this interesting and important section of the Exhibition. The Admiral Duperré is 319ft. in length between perpendiculars, 67ft. broad, her mean draught of water is 25ft. 9in., and her load displacement is 10,322 tons. She is a full-rigged broadside vessel, carrying fourteen guns in a central battery under the upper deck, besides four 13½in. 48-ton guns placed *en barbette*, in four fixed turrets on the upper deck. These turrets are all heavily armoured with plates 12in. in thickness. The two forward turrets are abreast each other, and project beyond the sides of the ship. The guns in these can be fired straight ahead parallel to the keel, and can sweep through an angle of about 150 deg. The guns in the after turret can be fired right aft and also at an angle on either side considerably forward of the beam, and the midship turret gun sweeps through a large angle on each side, so that the turret guns taken together can sweep the sea in all directions. The gunners are protected from downward fire by shelter decks. The sides at the water line all fore and aft are protected by armour 21½in. thick and 8ft. in depth, and on top of this, at about 2ft. 6in. above water, an armour deck is placed, extending from stem to stern. Thus the midship battery is left without armour. The Admiral Duperré is a twin-screw vessel, and has high-pressure compound vertical engines of the three-cylinder type. The high-pressure cylinders are 61in. in diameter, and the low-pressure 78½in., and the stroke is 39·4in. The engines are capable of working up to about 7400 indicated horse-power, which would give the vessel a speed of about 14½ knots per hour. We have already mentioned that the turret guns can sweep the sea all round; and another advantage they possess is their great height above the water, which permits of downward fire on an enemy's deck when fighting at close quarters. The slight and only partial protection which is afforded by the hurricane deck or shelter involves a great disadvantage, on account of the exposure of the guns and gunners to well-directed fire, as from forts. The weight of the fixed turrets, too, would be a possible source of danger, on account of their height, in case of the vessel becoming pierced below the armour in any one compartment injuriously affecting the consequently reduced stability. As regards weight of armament and thickness of armour, the Admiral Duperré compares favourably with the Alexandra, which has an armour belt 12in. thick along the water line, as against 21½in. in the Admiral Duperré, and the armour on the batteries is only 8in. on the main battery reduced to 6in. at the top battery, whereas the turrets in the French vessel are covered with 12in. armour. The Alexandra carries two 25-ton guns and ten of 18 tons, while in the Admiral Duperré there are, in addition to fourteen broadside guns, the four 48-ton turret guns.

The remaining ironclads exhibited in the first section are the Dévastation and Redoubtable. The former is a full-rigged vessel, carrying four 12¾in. guns in a central battery, and four 10½in. guns in half turrets on the upper deck, and in addition six 5½in. guns on the upper deck. Her armour belt has a maximum thickness of 15in. The Redoubtable is a full-rigged ship, and carries eight 10½in. guns similarly arranged to those in the Dévastation, besides six smaller ones along the broadside. Her maximum thickness of armour is 14in.

We must defer any further notice of these interesting war models at present. In calling the attention of our readers to this Exhibition, we add that we think great credit is due to the Shipwrights' Company for collecting the models it has succeeded in obtaining. They illustrate in a forcible manner the progress which has been made of late years in the development of war as well as merchant vessels, and will be interesting and instructive to the general public as well as those more particularly acquainted with shipbuilding and engineering, and we heartily wish the project to be completely successful.

HENRI GIFFARD.

In our last impression we briefly announced the death of M. Henri Giffard, the inventor of the injector. Although M. Giffard was a voluminous writer, and has left a vast mass of manuscripts behind him, he appears to have been reticent in social intercourse, and retiring in disposition, so that as yet but little is known concerning his life. He was buried on the 19th of April, and the addresses usual in France when a great man dies were pronounced over his grave by M. Hervé Mangon, Member of the Institute; M. Legrand, Under-Secretary of la Société des Amis des Sciences; M. Gaston Tissandier, President de la Société de Navigation Aérienne; M. Perron, President of l'Academie d'Aérostation; and by M. Ch. Comberousse, Professor de Méchanique à l'Ecole Centrale. From these discourses we gather the following facts:—M. Giffard was born in Paris on the 8th January, 1825. He was educated at the College Bourbon, and very early in life he manifested a strong bent for mechanics. In 1839 or 1840 he used to run away from school to see the locomotives on the Saint Germain Railway. Two years afterwards he got employment in the workshops of the same line. At the age of eighteen he began to turn his attention to the construction of a navigable balloon, and after overcoming numerous obstacles, he, in 1852, constructed a balloon 44 metres long and 12 metres in diameter; it was fitted with a large screw propeller and a steam engine of 3-horse power. With this he made an ascent on the 24th September, 1852, on a calm day, and succeeded beyond his expectations in guiding and propelling the machine. In 1853 he ascended in another and not less remarkable balloon; but on this occasion there was a wind, and he effected nothing. These trials exhausted his resources, and giving up ballooning for a time, he turned his attention to the production of a high-speed locomotive, and during this period he invented the injector. Precisely how he did this is not yet fully known; many thousands of injectors were at work before its theory had been satisfactorily stated by mathematicians. The apparatus is one which had on its first introduction the appearance of an anomaly, but on more careful consideration of physical laws, it was seen to be a real and scientific discovery on the part of its intelligent inventor. This apparatus has, in fact, worked a complete revolution in the mode of supplying locomotive and other steam boilers with water, not only in this country, but throughout the civilised world, and was so remarkable in an early application of it to the boiler of a Mediterranean steamer, as at once to attract the observation of Mr. C. P. Stewart, of the firm of Sharp, Stewart, and Co., Manchester, and to induce him, in the year 1859, to open negotiations in Paris with M. Giffard for the development of the invention in Great Britain. Thanks to the assistance of Mr. Henry Chapman, their correspondent in that city, arrangements were completed between the inventor and Messrs. Sharp, Stewart, and Co., not only for Great Britain, but also for the United States, Canada, and some parts of the European Continent, which resulted, after persevering efforts against the preconceived notions of engineers, both scientific and practical, in the complete success of the invention, not only as applied to steam boilers, but also for raising water by exhaustion. This success had led to many imitations and extensions of the invention, but it seems to us that neither as to first principles nor as to practical applications has there been any very important advance on the ideas which had been so definitely fixed in the inventor's mind as to lead him—as shown in his drawings still extant—to contemplate almost every one of the applications sought to be introduced by engineers who have followed him. The result of its invention was that M. Giffard became very rich, and he then returned to his old love, aërial navigation. He constructed the first captive balloon, properly so called, and exhibited it in Paris during the exhibition of 1867. The following year it appeared in Cremorne Gardens here. It cost 700,000 francs, which were entirely lost. In 1878 he made the great captive balloon, which attracted so much attention in 1878 at Paris. This monster had a capacity of 25,000 cubic metres, it raised forty persons at one time, and during the exhibition more than 30,000 persons made the ascent. He next commenced the project of constructing a balloon with a capacity of 50,000 cubic metres, or nearly 1,500,000 cubic feet, fitted with a surface condensing steam engine. All the plans, drawings, and calculations for the machine were prepared, and a million of francs were lodged with his bankers to pay for it, when his health gave way. Soon he could no longer read or write. He sought solitude, retired from the world, and finally expired at the comparatively early age of fifty-seven.

The Academy of Sciences presented Giffard, in 1859 with the Montyon prize, which had been awarded in 1825 to Poncelet; to Girard, the great hydraulic engineer, in 1843; to Triger, the inventor of sinking foundations by the aid of compressed air, in 1852; and to M. Lavalley, the engineer-in-chief of the Suez Canal, in 1868.

Giffard was in figure slight, in temperament nervous, he was bodily active, and remarkably handy; we cannot find a more expressive word. He knew how to do everything, to make everything himself. In his charities he was profuse, in his manner of life simple and unostentatious—in all respects a remarkable man, and one who can be badly spared, and whose name will remain as imperishable as the fame of the steam engine.

TRIPLE EXPANSION ENGINES OF THE STEAMSHIP ABERDEEN.

We illustrate this week, on page 306, the engines of the steamship Aberdeen, built by Messrs. R. Napier and Sons, for Messrs. George Thompson and Co. These engines were briefly described by Mr. Kirk, of the firm of Messrs. Napier, in his paper read before the Institution of Naval Architects, and reprinted in our impression for March 31st.

The engines have three cylinders, 30in., 45in., and 70in. in diameter, by 4ft. 6in. stroke. There are two boilers with Fox's corrugated flues, to stand 125 lb. per square inch. The high-pressure cylinder is not jacketted. The second is jacketted with steam of 50 lb., and the third with steam of 15 lb. pressure per square inch. The ship is 350ft. long by 44ft. by 33ft.

The engines are clearly shown by our engraving, which is copied from a photograph courteously placed at our disposal by Mr. Kirk.

THE IRON AND STEEL INSTITUTE.

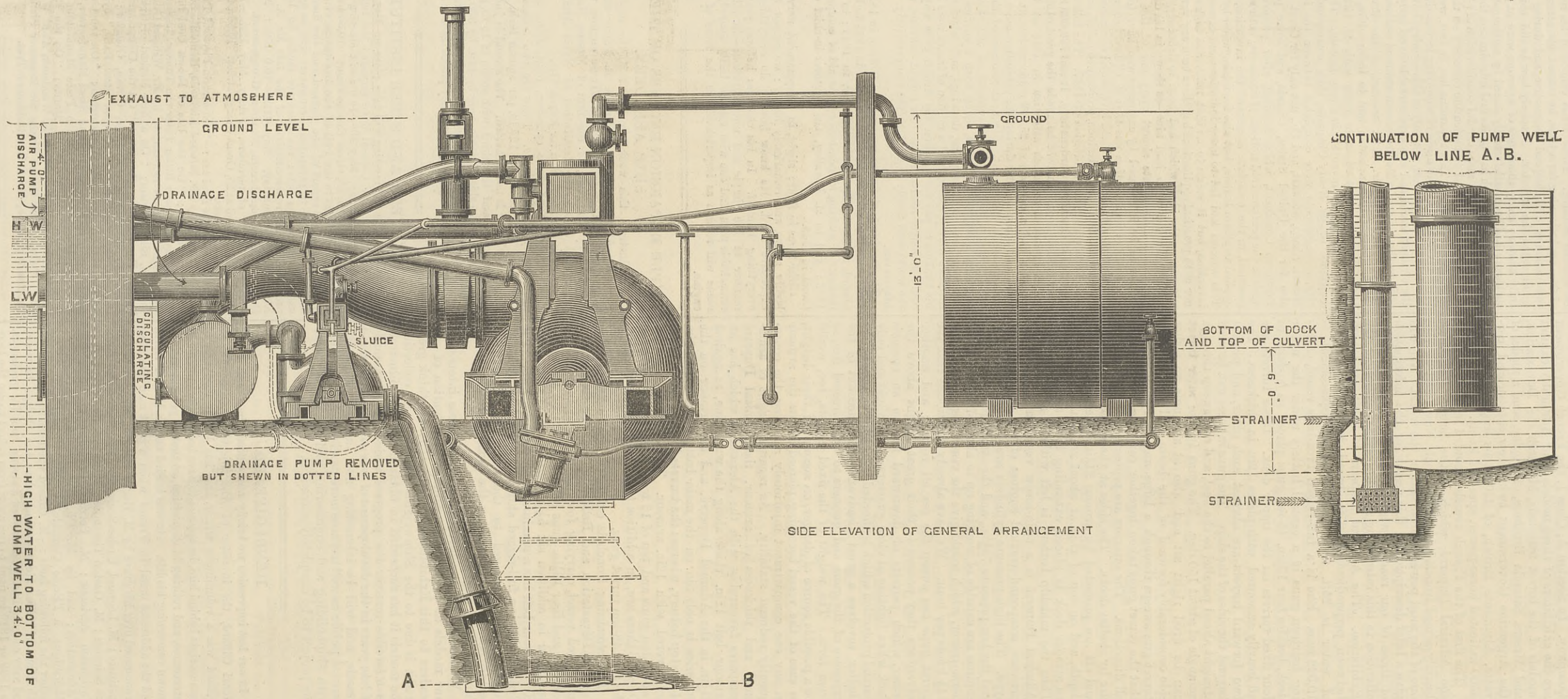
The annual general meeting will take place on May 10th, 11th, and 12th, 1882. The Council have arranged the following programme:—Wednesday, May 10.—10.0 a.m.: Meeting of Council in the Council-room, 25, Great George-street. 10.30 a.m.: General meeting of members in the hall of the Institution of Civil Engineers; the annual report of the Council and the financial statement for 1881 will be presented; scrutineers will be appointed to examine the voting lists; the Bessemer medal for 1882 will be presented to the representatives of the late Mr. A. L. Holley, New York. Thursday, May 11th.—10.0 a.m.: Meeting of Council at the Council-room, 25, Great George-street. 10.30 a.m.: General meeting of members. Friday, May 12th.—10.15 a.m.: Meeting of Council at 25, Great George-street. 10.30 a.m.: General meeting of members.

The papers to be read are:—"On certain Physical Properties of Iron and Steel," by Mr. Edward Richards, Hematite Steel Works, Barrow-in-Furness; "On the Use of Brown Coal in the Blast Furnace," by Professor Ritter Peter von Tunner, Leoben, Austria; "On the Bilbao Iron Ore District," by Mr. William Gill, M.I.C.E., Luchana, Bilbao, Spain; "On a New Method of Getting Coal," by Mr. Paget Mosley, London; "On the Compression of Fluid Steel," by Mr. William Annable, Govan, Glasgow; "On the Chemical Composition and Testing of Steel Rails," by Mr. G. J. Snelus, F.C.S., A.R.S.M., Workington; "On the Consumption and Economy of Fuel in Iron and Steel Manufacture," by Mr. J. S. Jeans, London; "On the Tin Plate Manufacture," by Mr. Ernest Trubshaw and Mr. E. S. Morris; "On the Relations of Carbon and Iron," by Mr. Geo. E. Woodcock, Atlas Works, Sheffield; "On a New Centre Crane for Bessemer Plant," by Mr. Thomas Wrightson, M.I.C.E., Stockton-on-Tees.

At a recent Ministerial Council held in Paris M. de Freycinet brought forward another project for creating an inland sea in the Algerian Sahara by cutting through a small isthmus at Gabes. A Committee of Inquiry was appointed to consider it. The cost is estimated at sixty millions of francs.

PUMPING MACHINERY AT THE NEW GRAVING DOCK, RIO DE JANEIRO.

MESSRS. LAWRENCE AND PORTER, WESTMINSTER, ENGINEERS.



SIDE ELEVATION OF GENERAL ARRANGEMENT

We lay before our readers this week the remaining illustrations and a description of pumping machinery supplied by Messrs. Lawrence and Porter, London, for the Ponta da Sande Graving Dock, Rio de Janeiro. Last week we illustrated the general arrangement. The machinery consists of a pair of direct-acting inverted cylinder surface condensing centrifugal pumping engines, also a pair of drainage and circulating engines, with boilers, sluices, feed engine, piping, &c.; the whole complete ready for fixing and setting to work. The main engines are combined with the pumps on the same bed-plate, and are arranged to work together or separately, or either engine can work its own or the opposite pump. The cylinders are 24in. in diameter by 20in. stroke, and steam jacketted, the jackets being formed by inserting a loose liner having an internal flange bolted to the cylinder bottom. The cylinders are fitted with variable expansion valves, working on the back of the main slides. The expansion valves are adjustable by a right and left-hand screw, arranged to cut off from two-tenths to three-fourths. The valve chests are on the outside of the cylinders, and the latter are fitted with escape valves at each end. The main engines are arranged to exhaust to atmosphere if necessary; for this purpose each of the eduction branches is fitted with a neatly contrived box, arranged with a single spindle double valve, which if raised or lowered admits the exhaust to condenser or atmosphere. The pistons are fitted with patent compensating metallic packing. The piston rods are of steel, $3\frac{3}{4}$in. in diameter, and in one solid piece with head and guide. The guides are fitted with a gun-metal shoe, having a surface of 120 square inches. The crosshead pins are 5in. in diameter by $7\frac{1}{2}$in. long, and the brasses are adjustable, having bolts and wrought iron caps. The connecting rods are of wrought iron, 5ft. long and $4\frac{1}{4}$in. in diameter, and in one solid piece to the centre of crank pin journal, and coupled to the journals with brasses, wrought iron caps, and bolts. The valve spindles are of steel, $2\frac{1}{4}$in. in diameter, working in stuffing boxes on top of casing. The excentric rods are of wrought iron and the straps are of gun-metal, with the bolts close to excentric. The crank shafts are of Vickers steel, having four bearings $6\frac{1}{2}$in. in diameter by 11in. long; the crank pins are $6\frac{1}{2}$in. in diameter by $7\frac{1}{2}$in. long, and the cranks are fitted with balance weights secured by wrought iron strap bolts; each end of shaft has a solid collar to couple to the pump spindle.

The condenser is distinct from the engines, and is of a circular section and horizontal, containing 864 tubes $\frac{3}{4}$in. diameter arranged in two groups, the circulating water traversing the length of condenser twice. The tube packing is of cotton arranged with screwed glands. There are two air pumps, single-acting, each bolted at an angle to the framing of crank shaft outer bearing. The air pumps are 11in. in diameter by 7in. stroke; the foot valve seating is bolted to the bottom of barrel, and the discharge valve on top; each air pump is worked by an excentric on the outer end of the crank shaft. The centrifugal pumps have suction and discharge pipes 42in. in diameter; each pump has flanged feet cast on one side to bolt to engine bed, and the pumps are tied to each other through the engine diagonals. The pump spindles are of steel, $5\frac{3}{4}$in. in diameter, and cased with gun-metal at the stuffing-boxes, and have solid collars for coupling to engine shaft; the outer end of each spindle is carried in a bearing close to fly-wheel. The main sluices have solid casings, and the valves are worked by hydraulic pressure, and are kept open by a neat arrangement of locking gear, acted on by a right and left-hand screw. There are two feed pumps worked from the outer end of the pump spindles. The drainage and circulating pumping engines are non-condensing, and of the same design as the main engines. The drainage pump has 12in. pipes discharging 1800 gallons per minute 35ft. high; cylinder 10in. in diameter by 8in. stroke. The circulating pump has 8in. pumps discharging 900 gallons per minute 30ft high; cylinder 10in. in diameter by $5\frac{1}{2}$in. stroke. The feed engine is vertical and arranged to work by hand, having two double-acting feed pumps, and is also fitted with an air pump for charging all the centrifugal pumps, and an hydraulic pump for working the large sluices. The engines are supplied with steam by two cylindrical multitubular boilers, each 10ft. diameter by 10ft. long, having two furnaces 2ft. 9in. in diameter, communicating with a combustion chamber, from which the tubes lead into the smoke-box; each boiler contains 100 tubes $3\frac{1}{4}$in. in external diameter. The heating surface is equal to 840 square feet, and grate area 32 square feet. The boilers are seated on bearers, consequently no brickwork setting is required. There are three boilers, one being held in reserve. During the early trials of the machinery the pressure of steam in the boilers was from 55 lb. to 60 lb.; now the boilers are lagged with silicate and covered with canvas the boiler pressure is 72 lb. From the illustrations given in our last impression and herewith, the general arrangement of the whole of the machinery may be clearly seen.

The pumping machinery is now working and giving the greatest satisfaction, the main pumping engines doing much more duty than guaranteed by specification. The official information received states that the dock is not at present made to its intended length, 520ft., but that vessels can be taken in 300ft. long. The dock now contains 650,000 cubic feet of water, and this quantity is pumped out without forcing in seventy-five minutes, or a mean of 54,000 gallons per minute during the operation. The depth of water to be pumped out of dock is 29ft., and the rise and fall of tide is 4ft. The resident partner states that the pumping machinery has not its equal in a dock in the world, and "that it reflects the greatest credit on the engineers."

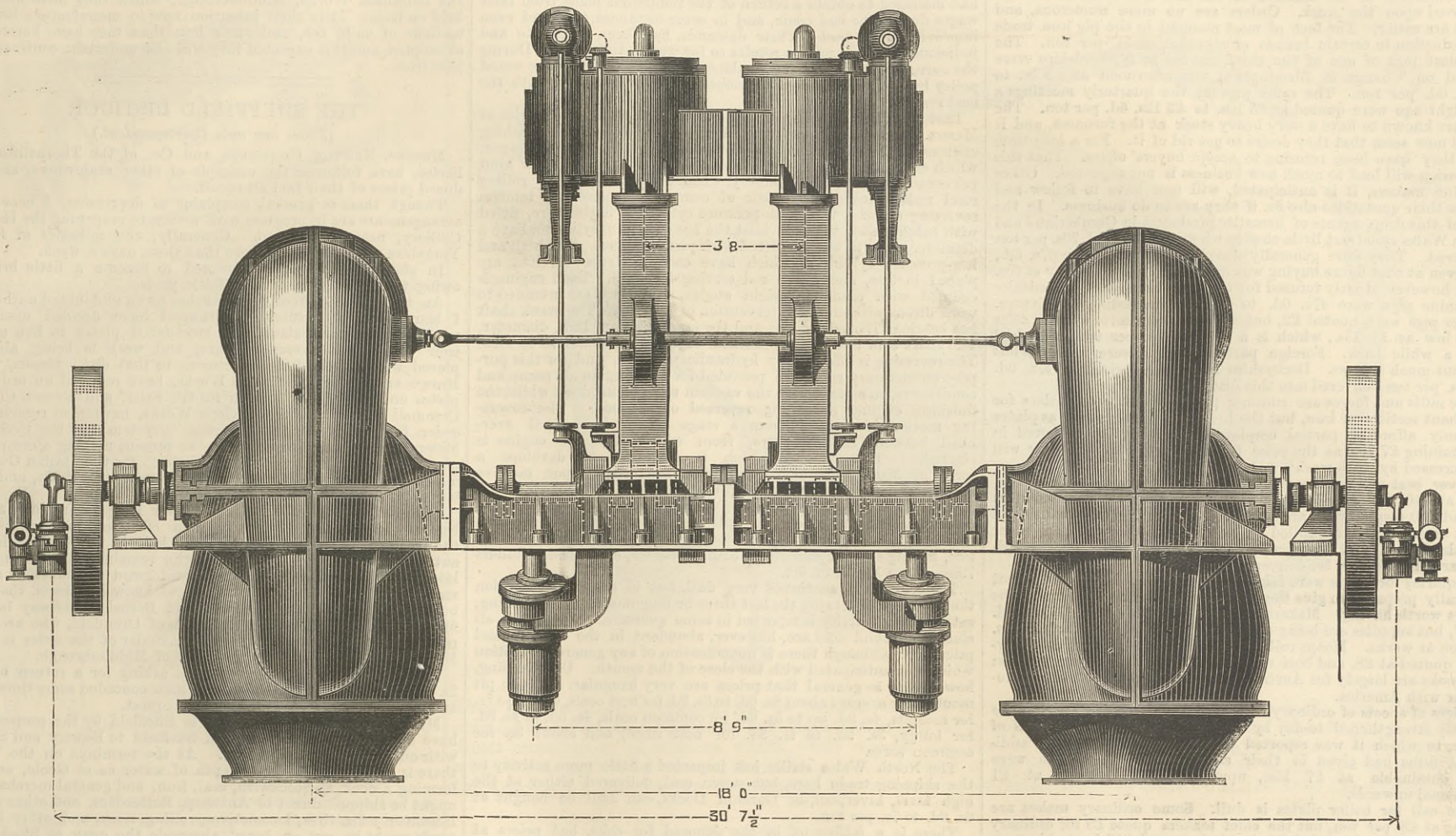
The entire contract was executed by Messrs. Lawrence and Porter, to the order of Messrs. Knowles and Foster, Moorgate-street, London, who speak in the highest terms respecting the satisfactory working of the machinery, which was inspected while in progress by Mr. John Findlay, managing engineer of the graving dock and engineering works.

The graving dock when completed will admit vessels 510ft. long and 70ft. beam, depth of water over cill 25ft., width of dock at floor 70ft., width at top 90ft. At present vessels can be docked 300ft. in length. The dock is finished with an iron caisson gate, made by the Thames Iron and Shipbuilding Company. The cofferdam, inside of which the sea wall and dock entrance has been built, is 600ft. long, forming two sides of a square. The engineering works, which are within 50ft. of the dock side, consist of three buildings each 200ft. long, and joined together,-the centre one being 60ft. wide, and the two outside, each 45ft. wide, and they comprise machine shops, also boiler-makers' foundry, blacksmiths' pattern shops, &c.; in all these shops will be found the most improved and modern machinery, including hydraulic rivetters. This new enterprise is described as the largest engineering and dock works in South America. For these increased facilities Rio de Janeiro is indebted to Mr. W. F. Kemp, the resident partner of the old-established firm of Messrs. Finnie, Brothers, and Co. The civil engineering part of the work has been in charge of Mr. Paul Taves, and the mechanical part in that of Mr. John Findlay, both old residents in Rio de Janeiro, and known as thoroughly practical men.

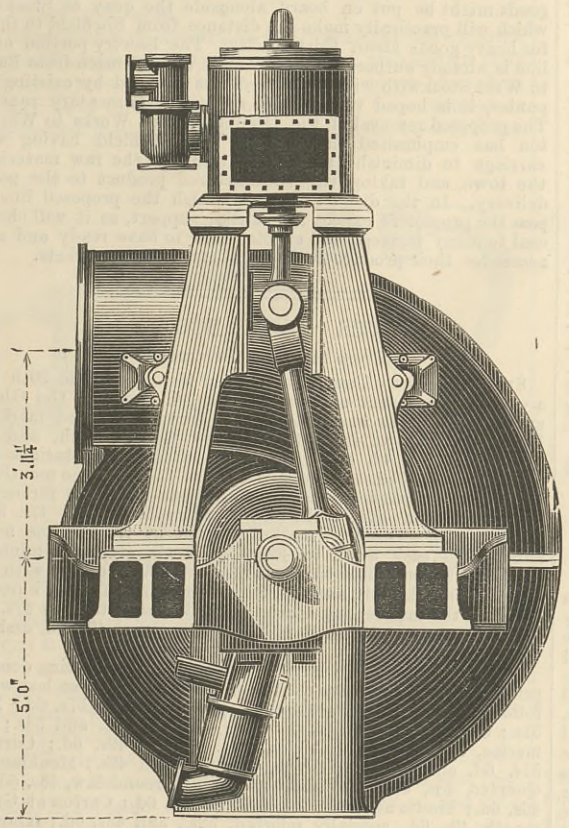
PUMPING MACHINERY AT THE NEW GRAVING DOCK, RIO DE JANEIRO.

MESSRS. LAWRENCE AND PORTER, WESTMINSTER, ENGINEERS.

(*For description see page* 310.)



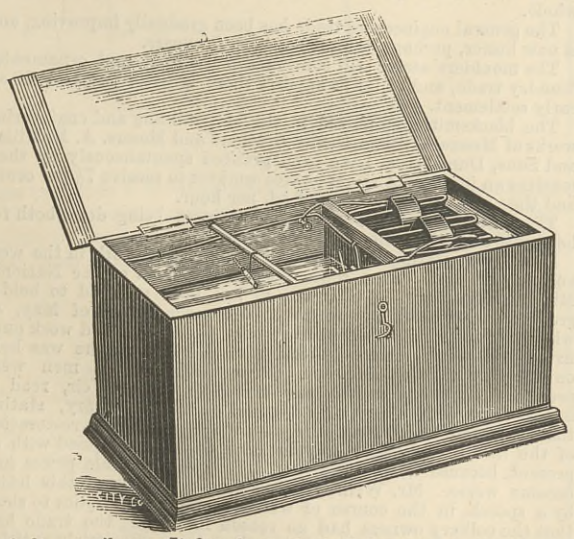
HALF PLAN



END ELEVATION

CHASTER'S ELECTRO-PLATING APPARATUS.

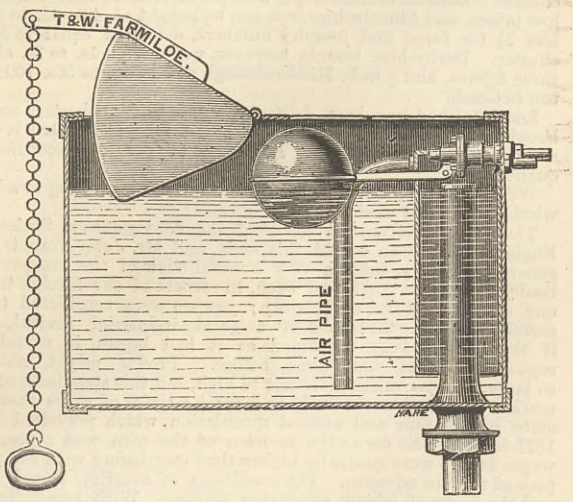
Amongst the articles useful to engineers exhibited in the Electrical Exhibition is a new apparatus for plating either nickel,



cobalt, or silver. It has been devised by Mr. J. E. Chaster, Manchester, for metal-work manufacturers who desire to put a superior finish on their work. There are many small articles which appear too trifling to send to a professional plater, and to those dealing or working in such this apparatus will no doubt be of great value. It is well adapted to the requirements of colleges for class demonstration, and for the use of amateurs in the interesting occupation of electro-plating. It is used in the plating of boiler fittings, both for land and marine engines, by some well-known firms in the country, and can be used with advantage by all makers of machinery who desire to put a finish on their work. The construction of the apparatus forms one of its several merits, bath and battery being in the same mahogany case. The electromotive force is under four volts, and the plates of the battery having great surface, a considerable quantity of current is obtained. In many cases nickel-plating is done with too much electromotive force, the result being that the nickel is very easily chipped off. No acids are used in the battery, the zincs do not require amalgamation, and the battery is very constant. The apparatus are made in sizes of from 1 to 10 gallons, and are to be seen at the Crystal Palace Exhibition on the stands of Messrs. Orme and Co. and of Messrs. Dale and Co.

VALVELESS WASTE-WATER PREVENTER CISTERNS.

In our account of the recent Building Exhibition reference was made to a valveless waste-water preventer cistern by Messrs. T. and W. Farmiloe. This is shown in the annexed engraving, from which it will be seen that upon pulling the chain and forcing the displacement float into the water, the level of the latter is raised, and flow commences down the bell-covered syphon, and continues until the water has fallen to the bottom of the bell. Air then enters the bell and stops the syphon action, and the ball valve lever having fallen, the water



commences to refill the cistern. To cause the syphon action to commence, it is necessary to hold the displacement float down a short time.

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

(From our own Correspondent.)

The condition of the finished or the raw iron trades have not improved upon the week. Orders are no more numerous, and prices are easier. The fact of most moment in the pig iron trade is a reduction in certain brands of all-mine of 5s. per ton. The hot blast pigs of one of the chief makers in Staffordshire were offered on 'Change in Birmingham this afternoon at £3 5s. to £3 7s. 6d. per ton. The same pigs at the quarterly meetings a fortnight ago were quoted at £3 10s. to £3 12s. 6d. per ton. The firm are known to have a very heavy stock at the furnaces, and it would now seem that they desire to get rid of it. For a long time past they have been refusing to accept buyers' offers. That this concession will lead to much new business is not expected. Other all-mine makers, it is anticipated, will now have to follow and reduce their quotations also 5s. if they are to do business. In the face of this drop, agents of hematite producers in Cumberland and South Wales stood but little chance when they quoted 70s. per ton delivered. They were generally unable to get more than 67s. 6d., and even at that figure buying was not brisk. Offers to buy at 65s. were, however, stoutly refused for the best brands. Staffordshire part-mine pigs were 47s. 6d. to 52s. 6d., according to mixture. Cinder pigs were quoted £2, but some common sorts were on offer at as low as £1 15s., which is a drop of 5s. per ton, compared with a while back. Foreign part-mine pigs were pressed, but without much success. Derbyshire sorts were priced at 47s. 6d. to 50s. per ton delivered into this district.

The mills and forges are running pretty steadily on orders for merchant sections of iron, but the heavy descriptions such as plates are only affording partial employment. Difficulty is found in maintaining £7 10s. as the price for bars, and this difficulty will be increased by this week's reduction in pigs. For the present, however, best marked bars continue at £9 per ton, and double best ditto at £10. Best and double best scrap bars likewise stand at £9 and £10 respectively, and so also do the two same qualities of chain bars. Good bars rolled by other than the best houses are abundant at £7, and common bars are easy at £6 7s. 6d. Welsh bars are priced at £6 5s. delivered.

Enquiries for hoops were fairly numerous, but buyers were not generally prepared to give the prices which alone will make the orders worth having. Makers of ordinary sorts quote £6 17s. 6d. to £7, but supplies are being obtained from some firms at £6 15s. per ton at works. Hoops rolled by the marked houses are, however, quoted at £8, and best sorts at £9 10s. The orders now on the books are largely for Australia, Germany, Italy and Spain, together with America.

Prices of sheets of ordinary merchant and galvanising sorts were slightly strengthened to-day by the arrangement for restriction of make, to which it was reported that since last week some additional firms had given in their adherence. Yet singles were still obtainable at £7 15s., upwards, and doubles at £1 additional upwards.

The call for boiler plates is dull. Some ordinary makes are selling at £8 per ton, but the chief makers quote £9 for ordinary qualities, £10 for best, £11 for double best, and £12 for treble best.

Merchants reported that this week's Australian mail had brought some fair orders for tin-plates, bars, and plates, and some of these orders were placed to-day. The advices spoke of prices in Melbourne being, on the whole, pretty well sustained.

To-day the Mill and Forge Wages Board met in Birmingham. The men asked for a new scale upon the basis of 8s. for puddling when bars were £7. The masters stated the basis was excessive, they offered to continue the present wages—namely, 8s. per ton—for a month, until an arbitrator could be selected. The men accepted the proposition, and it was resolved to ask Mr. Richard Chamberlain to again arbitrate.

Messrs. Joseph Wright and Co., of Tipton, have just completed a contract for the Italian Government for six of Martin's patent self-canting anchors, each weighing 6½ tons, and they are for use in connection with the 15,000-ton ironclad which is now being built to carry the 100-ton guns which the Italian Government have adopted. No firm in the district is busier at the present time than that of Messrs. Noah Hingley and Sons, of Netherton, who are well on with foreign cable and anchor work.

At the last meeting of the Wolverhampton Chamber of Commerce a communication was received from the Board of Trade stating that the department was disposed to recommend that a standard wire gauge, a copy of which accompanied the communication, should be verified in the Weights and Measures Act, 1878. The gauge was examined by the Chamber, and it was found that it was identical with the standard gauge proposed by the Wire Gauge Committee of the Associated Chambers. The secretary was instructed to reply that the council thoroughly agreed with the proposal of the department.

On 'Change this afternoon, as also in Wolverhampton yesterday, a petition promoted by the Ironmasters' Association received numerous signatures for presentation to the Parliamentary Committee now sitting upon the question of railways and canals. The objects sought by the petition are to extend the enquiry of the committee into (1) The comparative cost of transport by railway and transport by canal; (2) The comparative causes which are restricting and destroying canal navigation in the United Kingdom, and developing and extending it in other countries; (3) The expediency of the purchase of the canals by the State, and their maintenance as highways by tolls; and also as to the comparative working of the railways and canals of the United Kingdom administered and managed by private companies and those of foreign countries."

NOTES FROM LANCASHIRE.

(From our own Correspondent.)

Manchester.—There was a very quiet market at Manchester on Tuesday, and the basis upon which business has been done has been about 46s. to 46s. 6d., less 2½, for delivery equal to Manchester. District brands of pig iron continue to be offered here at low prices, and Lincolnshire iron can be bought at 46s. 6d. to 47s., less 2½ for forge and foundry numbers, delivered equal to Manchester. Derbyshire brands, however, are quoted 1s. to 2s. above these figures, and g.m.b. Middlesbrough at 50s. 4d. to 50s. 10d. per ton net cash.

Local finished iron bars, delivered equal to Manchester, can be bought at £6 10s. to £6 15s., and hoops, for which there is only a very poor inquiry, at from £6 10s. to £7 per ton, according to quality.

With regard to the engineering trades, there is nothing to add to what I wrote last week.

The thirty-first annual report of the Amalgamated Society of Engineers has been issued this week, and Mr. John Burnett, the general secretary, takes a very hopeful view of the prospects of trade. The year 1881 had been, in respect of our foreign trade, one of the best in our history; yet we were considered to be merely on the threshold of a great industrial revival, and if the present year continued as it had begun, it would far exceed all that had gone before. Profits might not be so large, because values were not so high, but this steadiness of the market was much more likely to last for a series of years than the state of inflation and excited speculation which prevailed from 1871 to 1874. So far as the position of the men was concerned, wages to-day were generally higher than ever before with the prospect of further advance. The conditions of overtime were better, and the hours of labour altogether shorter. With regard to the position of the society, the number of branches had increased during the year from 405 to 412, and the number of members from 44,692 to 46,101. The distribution of the branches was now as follows:—England, 295; Scotland, 42; Ireland, 14; Australia, 9; Canada, 6; New Zealand, 4; Queensland, 1; India, 1; United States, 36; Malta, 1; Turkey, 2; and France, 1. The total income for the year had been £132,506, and the total expenditure £116,623, showing an excess of income over expenditure of £15,883, and bringing the society's balance up to £145,957 which was equal to a value of £3 3s. 3¾d. per member. The prospects of their trade were never brighter. Already many of their districts had managed to obtain a return of the reductions made from their wages during the bad trade, and in some instances they had even improved upon that. Their demands had been moderate and judiciously made, and the results so far were satisfactory. During the current year a quiet but vigilant observance of the same sound policy by their districts and branches might be attended with the best results.

Last week I had an opportunity of inspecting, at the works of Messrs. W. and J. Galloway and Sons, a pair of rail mill finishing engines for the St. Nazaire Iron Company, Limited, Nantes, France, which are probably the most massive and powerful of their kind yet constructed. The machinery, which is constructed for rolling steel rails, consists of a pair of compound horizontal tandem reversing engines, with high-pressure cylinders, 33½in. bore, fitted with balance slide valves, whilst the low-pressure cylinders have a diameter of 59in. and are fitted with piston valves. The high and low-pressure cylinders, which have each a stroke of 4ft., are placed in line, one piston rod serving for both. Each engine is coupled with cranks at right angles, and they are intended to work direct without the intervention of gearing. The crank shaft has bearings 17in. diameter, and the crank pins are 18in. diameter. The shaft is in two pieces, welded together, and weighs 13 tons. The reversing is effected by hydraulic pressure, and for this purpose an auxiliary engine is provided for working an air pump and condensers, so as to enable the vacuum to be maintained whilst the finishing engines are being reversed or stopped. The reversing motion is worked from a stage which is erected overhead between the cylinders, from which also the engine is started. The engine, which is intended to develope a force of 3000 indicated horse-power, is fitted upon massive bed-plates of the box pattern, and the total weight is about 225 tons. For the same firm in France, Messrs. Galloway are also constructing a pair of cogging mill engines of similar dimensions and on the same principle, and compound blowing engines of large size, having steam cylinders of 32in. diameter, and blast cylinders 79in. with a stroke of 5ft.

The coal trade continues very dull, but in no worse condition than it has been during the last three or four months; if anything, rather more activity is reported in some quarters. Supplies of all classes of round coal are, however, abundant in the market, and prices low, although there is no indication of any general reduction which was anticipated with the close of the month. Underselling, however, is so general that prices are very irregular. At the pit mouth they average about 8s. 6d. to 8s. 9d. for best coals, 6s. 6d. to 7s. for seconds, 4s. 9d. up to 5s. 6d. for common coals, 4s. 6d. to 4s. 9d. for burgy, 3s. 9d. to 4s. 3d. for best slack, and about 3s. for common sorts.

The North Wales strike has imparted a little more activity to the shipping trade here, but steam coal, delivered either at the high level, Liverpool, or Garston Docks, can still be bought at 6s. 6d. to 7s. per ton.

There is a falling off in the demand for coke, but prices at present remain at about 9s. to 10s. for common up to 12s. and 13s. per ton for the best sorts at the ovens.

Barrow.—The tone of business in the hematite iron market has for the past few days been characterised by a state of inactivity, and I am disposed to think that there will not be any considerable change for the better for some time to come. The inquiry for the iron is chiefly amongst buyers who are wanting parcels for early delivery, but owing to the small and unremunerative prices now ruling both in Bessemer and forge qualities of iron, makers are refraining from selling in many cases. Prices are still being reduced, and I notice the figures to-day: No. 1, 54s. 6d.; No. 2, 53s. 6d.; No. 3s, 52s. 6d. net, per ton, f.o.b. west coast ports, with delivery extending to three months. Though the demand for steel rails is not very great, the works in the district have good employment, and orders are largely held for the rails, plates, and merchant qualities of steel, which makes all the works pretty active. I notice a steady employment in the iron shipbuilding trade, and new keels of large merchant steamers are rapidly filling up the vacancies caused by the launches which have recently taken place. There is a fair sale of iron ore at from 13s. 6d. to 15s. per ton at mines. There is also a good amount of work in the engineering trades, and I think this is more especially marked in the marine department.

There is a fair demand for coal and coke, and shipping is taking a more active turn than of late.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

The iron market held at Middlesbrough on Tuesday last was well attended, and had even an animated appearance; but very few genuine sales were reported. Consumers of pig iron hesitate about buying forward, even at the comparatively low price quoted by the "bears," and merchant buyers will not give makers' prices. The ironmasters had their usual meeting before 'Change, and decided to remain firm to 43s. 6d. for No. 3 g.m.b. f.o.b. Middlesbrough. It was stated that merchants had offered quantities up to 5000 tons for delivery after June 30th, and over the remainder of the year at 42s. delivered, to several consumers last week. This was for payment by cash 10th of the month for previous months' deliveries. Notwithstanding the tempting nature of such offers, they were not in any case accepted. Smelters refused to sell for forward delivery at any price. Merchants offered small quantities for prompt delivery at 43s. 3d., and sold some small quantities at that figure. The object of this was no doubt to establish a market price. In no case, however, would they sell large quantities for prompt delivery; no doubt because of the difficulty of obtaining the iron. Indeed it is long since there has been such a scarcity. Warrants were offered and changed hands at 42s. 3d., and by the purchase of these alone were the "bears" enabled to obtain iron in completion of their contracts. The stock in Connal's stores has gone down during the week 3489 tons, and only 148,942 tons are now in stock, or a diminution of 40,000 tons during the last few months.

The finished iron trade remains quiet and steady; there is no change in prices, £7 5s. f.o.t. Middlesbrough being quoted for plates, and £6 10s. for angles and bars, in all cases subject to 2½ per cent. discount for cash.

It is expected that Mr. J. W. Pease will give his award upon the ironworkers' wages during the present week, but what that award will be can only be guessed at. It is certain that it will be a heavy blow to the manufactured iron trade if he awards an advance. The Iron Manufacturers' Association, or, in other words, the union of the masters connected with the manufactured iron trade, is being resuscitated and strengthened. The association has existed since 1864, but since the Board of Arbitration has regulated the wages of the district it has rather fallen into disuse. The employers, however, find that this is not regarded by the workmen as any reason for neglecting their union, and as they have several times resisted the decisions of the board it is deemed advisable and even necessary that the employers' union should be made as strong a force on one side of the Board of Arbitration as the men's union is on the other side. It is needless to say, however, that the renovated association will not act in contravention in any way of the Board of Arbitration, and it will never use its coercive power, except to enforce obedience to the decisions of the board. A full meeting of the Board of Arbitration will be held at Darlington on Friday, in order to receive the report of the committee of the employers and operatives recently charged with drawing up an uniform scale of puddlers' extras. It is understood that the report of that committee recommends adherence to the existing custom as regards daily prize money and level-hand money, but recommends certain alterations as to Sunday fettling and Monday working money, which will have the effect of giving the men greater inducements to work regularly throughout the week.

It is reported that Messrs. Dorman, Long, and Co., have now arranged with Mr. B. Samuelson, M.P., for the purchase of the Britannia Works, Middlesbrough, which they have hitherto held on lease. It is their intention now to manufacture heavier sections of bulb, tee, and angle iron than they have heretofore attempted, and it is expected they will also undertake contracts for joist iron.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

Messrs. Newton, Chambers, and Co., of the Thorncliffe Collieries, have followed the example of other coalowners, and reduced prices of their fuel all round.

Though there is general complaint of depression, I hear that arrangements are in progress with a view to reopening the Holmes Colliery, near Rotherham. Generally, the collieries of South Yorkshire are not making more than three days a week.

In steam fuel trade is expected to become a little brisker, owing to the opening of the Baltic ports.

An important item of news reaches us on undoubted authority. I learn that the Dutch Government have decided upon re-armouring their ironclads with steel-faced plates in lieu of the iron coating at present in use, and work is being already placed with Sheffield manufacturers to that end. Messrs. John Brown and Co., of the Atlas Works, have received an order for plates on the "Ellis" system for the Stier, and Messrs. Charles Cammell and Co., of the Cyclops Works, have also received an order for plates on the "Wilson" system for the Cerberus. Messrs. John Brown and Co. are at present making a compound plate 19in. thick, on the "Ellis" system, for the Italian Government. It is intended for their new warship the Italia, and is to be tested by the 100-ton gun at Spezzia.

According to the *Essen Gazette*, Herr Krupp bargained as far back as the beginning of 1881 to make 8000 tons of steel rails for the Hull and Barnsley Railway, the half to be delivered in the autumn of the current year, and the remainder a twelvemonth later. On the other hand, we are informed this week by a rail manufacturer, who is in a position to know the facts, that the bulk of the order for the Hull and Barnsley Railway is with Messrs. Wilson, Cammell, and Co., of Dronfield, who are now rolling these rails, and that the remainder of the order is with Messrs. Bolckow, Vaughan, and Co., of Middlesbrough.

The ironworkers at Thorncliffe are asking for a return of the 2s. reduction in wages which the men conceded some time ago, and the proprietors are opposing the request.

Much interest is being excited in Sheffield by the proposal to have a double line of rails from Sheffield to Bawtry and Stockwith-on-Trent, *vid* Rotherham. At the terminus on the Trent there is said to be the same depth of water as at Goole, and by forming a dock at Stockwith, coal, iron, and general merchandise might be shipped direct to Antwerp, Rotterdam, and other ports. Bessemer rails, tires, locomotives, rolling stock, and other heavy goods might be put on board alongside the quay at Stockwith, which will practically make the distance from Sheffield to the sea for heavy goods about thirty miles. The Bawtry portion of the line is already authorised, and, though the extension from Bawtry to West Stockwith will undoubtedly be opposed by existing companies, it is hoped that it will receive parliamentary sanction. The proposed removal of the Dronfield Steel Works to Workington has emphasised the necessity for Sheffield having water carriage to diminish the cost of bringing the raw material to the town, and taking the manufactured product to the port of delivery. In the district through which the proposed line will pass the promoters expect substantial support, as it will cheapen coal to many farmers, and enable them to have ready and cheap access for their produce to Sheffield and district markets.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

Since the price of warrants touched 46s. 8d., on the 20th inst., a very large amount of iron has changed hands in the Glasgow market. Business was done in the Glasgow warrant market on Friday morning at from 46s. 11d. to 47s. 2d. cash, and from 47s. 2d. to 47s. 4d. one month, the afternoon quotations being 47s. 1d. to 47s. 3½d. cash, and 47s. 3d. to 47s. 5½d. one month. On Monday the market was steady, with business in the forenoon at 47s. 3d. to 47s. 1½d. cash, and in the afternoon at 47s. 3d. to 47s. 2d. cash. Tuesday's market was flat at 47s. 5d. one month, and 47s. ½d. cash down to 46s. 10½d. cash, closing nominally at the latter figure. The tone was firmer on Wednesday, with business at 47s. 2d. cash, and 47s. 3d. one month. This—Thursday—morning the firm feeling continues, with transactions at 47s. 6½d.; but the market was quiet in the afternoon at 47s. 2d. cash, and 47s. 4d. one month.

Notwithstanding the large amount of business being done, the prices of makers' iron are quoted at about 6d. less than last week as follows:—Gartsherrie, at Glasgow, per ton, No. 1, 57s. 6d.; No. 3, 51s.; Coltness, 57s. 6d. and 54s.; Langloan, 58s. and 54s.; Summerlee, 57s. and 49s.; Calder, 56s. 6d. and 49s. 6d.; Carnbroe, 51s. 6d. and 47s. 6d.; Clyde, 51s. 6d. and 49s.; Monkland and Quarter, 48s. and 46s. each; Govan at Broomielaw, 48s. 6d. and 46s. 6d.; Shotts at Leith, 58s. 6d. and 54s. 6d.; Carron at Grangemouth, 49s. 6d., specially selected, 52s., and 48s. 6d.; Kinneil at Bo'ness, 47s. 6d. and 46s.; Glengarnock at Ardrossan, 51s. 6d. and 48s.; Eglinton, 48s. and 46s.; Dalmellington, 48s. and 46s. The shipments of Scotch pig iron to date amount to 183,803 tons, as compared with 157,184 at the corresponding date last year, while the stock in Connal's stores stands at 631,905, as compared with 548,798 tons. Up to date there is a total decrease of 6115 tons in the imports of Cleveland iron into Scotland.

The malleable iron trade continues still well employed on the whole.

The general engineering trade has been gradually improving, and is now busier, perhaps, than it has been for years.

The moulders' strike still continues in the light and ornamental foundry trade, and so far as appears there is little prospect of an early settlement.

The blacksmiths employed in the shipbuilding and engineering works of Messrs. William Denny Brothers and Messrs. A. McMillan and Sons, Dunbarton, have been granted spontaneously by their masters an increase of wages—piece workers to receive 7½ per cent., and time workers an increase of ½d. per hour.

The coal trade is active, a large business being done both for home use and shipment.

Important meetings of miners have been held both in the west and in the east. At a conference of delegates of the National Miners' Association in Glasgow, it has been resolved to hold a great demonstration of miners in the second week of May, at which the men will be asked to restrict the output and work only five days a week. A mass meeting of the Fife miners was held on Monday at Cowdenheath. About a thousand men were present. The secretary of the association, Mr. Weir, read a letter from Mr. Connal, the mine owners' secretary, stating that he had no hope that the request of the men for the restoration of the late reduction of 12½ per cent. could be complied with at present, because during the past three weeks the sale prices had become worse. Mr. Weir followed up the reading of this letter by a speech, in the course of which he quoted statistics to show that the colliery owners had no reason for saying the trade had become worse, and he argued that the miners were fairly entitled to receive back the last reduction. It was resolved to work only five days per week, and rigidly adhere to the eight hours' system.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

The new Cyfarthfa lease has been signed, and an early re-start may be expected.

The iron trade appears to be looking up once more, and there is a probability of a re-start at some other works that have long been standing.

In the Llanelly district the tin-plate trade is dull again, and stocks are increasing, but makers so far are resolute in fighting against a reduction of quotations, and I hear of even 3d. a box reduction being rejected.

The coal trade is improving as regards quantity, but no change has taken place in price.

The Hendrefargan Anthracite Colliery is in the market, and will be sold by auction the first week in May. I note that Ynyscedwin Works will be started by a new company, the South Wales Iron and Steel Company, Limited. The plant of the New Lodge Collieries, Swansea, is to be sold.

The house coal collieries are going on well, and the threatened stoppage has been averted. It is decided to continue working to the end of the term arranged by the men with the coal-owners, and when that is ended then to agitate for a new sliding scale arrangement.

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 the 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.

18th April, 1882.

1833. Lixivating Materials, C. Heckmann and E. Hausbrand, Berlin.
1834. Ice, W. W. Nightingale, Southport.
1835. Protector for India-rubber, A. Schroll.—(*F. Froescheis, Nurnberg.*)
1836. Artificial Stone, W. Walker, London.
1837. Steam Boilers, J. Imray.—(*J. P. Bordone, Paris.*)
1838. Packing, J. Bell, Liverpool, & R. Harper, London.
1839. Driving Gear, S. J. Collier, Manchester.
1840. Umbrellas, W. Grant.—(*J. W. Watson, U.S.*)
1841. Stretchers, T. H. Harris London.
1842. Preserving Eggs, H. H. Doty, London.
1843. Pocket Knives, W. Brierley.—(*H. Buettner, Neustad, near Stolpen, Germany.*)
1844. Rolling Mills, W. Deighton, Workington.
1845. Mains, W. T. Whiteman.—(*The American Heating and Power Company, New York.*)
1846. Plaistic Compounds, H. J. Haddan.—(*G. S. Evans, New York.*)
1847. Printing, J. F. Haskins, London.
1848. Grape Sugar, W. R. Lake.—(*A. Behr, New York.*)
1849. Printing, W. Lake.—(*P. Reid & J. Eastwood, U.S.*)
1850. Telephone Lines, R. D. Smillie, Glasgow.
1851. Insulated Supports, C. Curtoys, London.
1852. Preserving Meat, E. G. Brewer.—(*A. Lee, J. A. Wallace, and R. W. Knox, Melbourne.*)
1853. Transmitting Apparatus, &c., W. J. Burnside, Norwood.
1854. Lifts, J. S. Stevens and C. G. Major, London.
1855. Brakes, F. C. Glaser.—(*A. Klose, Switzerland.*)
1856. Seats, H. J. Mohan and E. A. Girvin, U.S.
1857. Bricks, W. Blyth, Barton-upon-Humber.
1858. Lamps, A. Leefe, London.
1859. Velocipedes, H. Newton.—(*A. Winkler, Paris.*)
1866. Drying Piece Goods, J. Worrall, Salford, and J. Kershaw, Wadsworth, Halifax.
1861. Picking Arms, &c., W. B. Birkby, Liversedge.
1862. Electrical Railways, T. J. Handford.—(*T. A. Edison, Menlo Park, U.S.*)
1863. Pocket Filter, A. M. Clark.—(*L. L. T. F. d'Autemarche, Paris.*)
1864. Transmitting Motion, A. M. Clark.—(*A. Samper, Paris.*)
1865. Printing, &c., W. R. Lake.—(*H. P. Feister, U.S.*)

19th April, 1882.

1866. Refining Spirits, F. M. Lyte, London.
1867. Electric Arc Lamps, A. B. Brown, Edinburgh.
1868. Gas Engines, H. A. Dufrené.—(*Messrs. L. Bénier, and A. Lamart, Beaumetz, France.*)
1869. Steam Boilers, J. Fox, Staincliffe, Dewsbury.
1870. Locks, W. S. Frost, London.
1871. Penholders, H. Haddan.—(*H. Burckas, Leipzig.*)
1872. Slide-valves, &c., E. Edwards.—(*E. Sonntag, Lauban, Germany.*)
1873. Sweeping Chimneys, H. Fokes, London.
1874. Gas, W. C. Brown, Sheffield.
1875. Secondary Batteries, D. G. FitzGerald, C. H. W. Biggs, and W. W. Beaumont, London.
1876. Stereotype Plates, W. R. Lake.—(*J. A. Heuse and G. Jouanny, Paris.*)
1877. Rolls for Grinding Mills, W. P. Thomson.—(*R. Birkholz, and E. P. Allis, Milwaukee, U.S.*)
1878. Dynamo-electric Machines, J. H. Johnson.—(*J. M. A. Gerard-Lescuyer, Paris.*)
1879. Saccharine Compounds, W. R. Lake.—(*E. Wilhelm, Buffalo, New York.*)
1880. Transmitting, &c., Motion, P. Pfleiderer.—(*W. Kankelwitz, Stuttgart, Germany.*)
1881. Breech-loading Small-arms, W. Tranter, Birmingham.
1882. Straining, &c., Wire Mattresses, E. Hoskins, Birmingham.
1883. Printing, W. Conquest.—(*Messrs. R. Hoe and Co., New York.*)
1884. Separating Metals, W. R. Lake.—(*E. Marchese, Turin, Italy.*)

20th April, 1882.

1885. Velocipedes, A. H. Griffiths, Birmingham.
1886. Advertising, &c., C. W. Morley, London.
1887. Steam Engines, J. W. Richardson, Neptune Works, near Newcastle-upon-Tyne.
1888. Engines, J. F. and M. Rankin, Greenock.
1889. Cask Tilters, B. Fowell, Romiley, and W. Clancey and J. C. Walker, Manchester.
1890. Holding Stair Rods, F. Kingston, Deptford.
1891. Milling, A. J. Boult—(*R. L. Downton, U.S.*)
1892. Steam Traps, J. Shaw, Lockwood.
1893. Cultivating Land, M. R. Pryor, Stevening.
1894. Spinning, W. R. Lake.—(*Messrs. Lewis Martin and Co., Lyons, France.*)
1895. Electric Lighting, P. Justice.—(*A Cruto, Italy.*)
1896. Signalling, A. Brown and H. Saunders, London.
1897. Pump, A. Browne.—(*C. F. Osborne, Cape Town.*)

21st April, 1882.

1898. Stoppers, J. Ballard, Nottingham.
1899. Screw Propellers, T. Lambert, Plymouth.
1900. Hoops, T. Nash and G. H. Hunt, Sheffield.
1901. Voltaic Batteries, A. R. Bennett, Glasgow.
1902. Ash-guards, W. Selley, Manchester.
1903. Depositing Manure, T. Reid, Ayr.
1904. Calendering, C. Abel.—(*C. Söhne, Vienna.*)
1905. Colouring Matters, J. A. Dixon.—(*C. Rumpff, Aprath, Germany.*)
1906. Sewing-machines, H. Simon.—(*F. B. Köhler, Chemnitz, Saxony.*)
1907. Fire-escapes, T. H. Pinder, Exeter.
1908. Strainers, G. Tidcombe, jun., Watford.
1909. Extract of Malt, T. Dence & J. Mason, London.
1910. Engines, S. Skinner, Eastbourne.
1911. Tricycles, J. G. Harrison, Birmingham.
1912. Springs, W. Buckley, Sheffield.
1913. Treating Ores, A. Clark.—(*A. Sébillot, Paris.*)
1914. Funeral Cars, J. Whitehead, London.

22nd April, 1882.

1915. Electric Lamps, W. T. Whiteman.—(*M. Bauer, Paris.*)
1916. Bricks, &c., T. A. Riggs, Aldeburgh.
1917. Tires, G. W. Knox, Sheffield.
1918. Water-gas, J. C. Mewburn.—(*G. Dwight, U.S.*)
1919. Electric Arc Lamps, J. Lea, London.
1920. Boilers, J. Keith, Edinburgh.
1921. Mordant, S. Musgrave, Leeds.
1922. Turf-trimming, A. Ridgway, Sutton.
1923. Pencil-cases, J. Spear, London.
1924. Cable Rails, W. P. Thompson.—(*W. Haddock and J. Frank, Cincinnati, U.S.*)
1925. Lace Fabrics, J. Tuffnell, Manchester.
1926. Paper-cutting, W. Crosland, Lancaster.
1927. Applying Colours, J. Mugnier, Lyons.
1928. Treating Oils, E. de Pass.—(*P. Labouret, Paris.*)
1929. Socket-slides, W. Randle, Birmingham.
1930. Exhibiting Advertisements, F. H. F. Engel. - (*G. Richter, Altona, Germany.*)
1931. Hoes, R. P. Yates, Birmingham.
1932. Self-Levelling Ships' Berths, A. Y. Young, Boston, U.S.
1933. Life-preserving Mattresses, A. Young, Boston, U.S.
1934. Bushing Material, W. Lake.—(*G. Senter, U.S.*)

24th April, 1882.

1935. Plumbers' Furnaces, W. S. Cooper, Liverpool.
1936. Hutches, J. McCulloch and W. Cook, Glasgow.
1937. Drawing Pens, C. D. Abel. — (*Messrs. E. O. Richter and Co., Chemnitz, Germany.*)
1938. Centrifugal Separating Machines, F. H. F. Engel.—(*H. Petersen, Hamburg, Germany.*)
1939. Metal Rollers, D. Davies, Crumlin.
1940. Electric Batteries, W. R. Lake.—(*L. Maiche, Paris.*)
1941. Crystallised Hydro-chlorate of Alumina, W. R. Lake.—(*T. Gladysz, Marseilles, France.*)
1942. Fastening Gloves, W. Bown, Birmingham.
1943. Taps, E C. Sutcliffe, Halifax.
1944. Raising Ships, W. Wise.—(*J. Westerman, Genoa.*)

Inventions Protected for Six Months on Deposit of Complete Specifications.

1817. Obtaining Sugar J. H. Johnson, London.—A communication from A. Wernicke, Halle-on-the-Saale, Prussia.—17*th April*, 1882.
1840. Umbrellas, W. Grant, New York.—A communication from J. W. Watson, New York.—18*th April*, 1882.
1844. Rolling Mills, W. Deighton, Workington.—18*th April*, 1882.
1848. Grape Sugar, W. R. Lake, London.—A communication from A. Behr, New Jersey. —18*th April*, 1882.
1852. Preserving Meat, E. G. Brewer, London.—A communication from A. Lee, Fitzroy, and J. A. Wallace and R. W. Knox, Melbourne.—18*th April*, 1882.
1865. Printing, &c., Machinery, W. R. Lake.—A communication from H. P. Feister, Philadelphia, U.S.—18*th April*, 1882.
1891. Milling, A. J. Boult, London.—A communication from R. L. Downton, St. Louis, U.S.—20*th April*, 1882.

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

1520. Fastening Windows, R. Adams, London.—18*th April*, 1879.
1580. Ships' Fog-signals, J. W. Fowle, Boston, U.S. —22*nd April*, 1879.
1541. Preventing Jerks, M. Jones, London.—19*th April*, 1879.
1601. Refrigerating Apparatus, W. R. Lake, London.—23*rd April*, 1879.
1611. Casting Type, W. T. Smith, London.—24*th April*, 1879.
1783. Sugar, F. C. Glaser, Berlin, Prussia.—6*th May*, 1879.
1515. Transparent Block Ice, R. Skene, London.—18*th April*, 1879.
1531. Telephonic Apparatus, J. W. T. Cadett, London.—18*th April*, 1879.
1532. Preparing Cotton, R. Tatham, Rochdale.—18*th April*, 1879.
1553. Taps, C. J. Waddell, Manchester.—19*th April*, 1879.
1556. Sewing-machine, C. Necker and R. Horstmann, Berlin.—19*th April*, 1879.
1575. Surfacing Lathes, H. F. Smith, Salford.—22*nd April*, 1879.
1632. Heating, &c., L. W. Leeds, London.—25*th April*, 1879.
1646. Heating, L. W. Leeds, London.—26*th April*, 1879.
1559. Attaching Knobs, E. Taylor, Burslem.—19*th April*, 1879.
1756. Ruling Paper, H. E. Newton, London.—3*rd May*, 1879.
1716. Tubes, C. E. Smith, Wednesbury.—30*th April*, 1879.
1577. Eliminating Phosphorus, F. T. Reade, London. —22*nd April*, 1879.
1598. Stamping Sheet Metal, W. R. Lake, London. —23*rd April*, 1879.
1659. Treating Porcelain, S. Ranford and J. Callowhill, Worcester.—28*th April*, 1879.
1589. Horse-rakes, E. H. Tooley, Holwell.—22*nd April*, 1879.
1603. Turntables, H. Bridgewater, Watford.—23*rd April*, 1879.
1610. Fare-registers, H. J. Haddan, London.—24*th April*, 1879.
1628. Irons for Smoothing, &c , R. Reid, Glasgow.—25*th April*, 1879.
1690. Endless Bands, W. R. Lake, London.—29*th April*, 1879.
1699. Buttons, G. L. Aston and A. Hames, Birmingham.—30*th April*, 1879.
1829. Sewer Connections, H. J. Haddan, London.—8*th May*, 1879.

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

1429. Grinding Seed, C. Lucop, Southwark.—20*th April*, 1875.
1562. Metal Tubes, T. P. Allen, West Bromwich.—28*th April*, 1875.
1566. Cgmposing, &c., Type, R. Hattersley, Manchester.—29*th April*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition 12*th May*, 1882.

4780. Insulating Conductors, A. T. Woodward, New York, U.S.—1*st November*, 1881.
5403. Artificial Flowers, P. K. Klein, London.—A com. from G. Bittner.—10*th December*, 1881.
5495. Transparent, &c., Opaque Sheets, E. V. Emery, Canonbury.—15*th December*, 1881.
5505. Securing Ends on Metal Cans, W. R. Lake, London.—Com. from J. Clark —16*th December*, 1881.
5517. Smoking Chair, J. Sothcott, Bayswater.—16*th December*, 1881.
5519. Pens, &c., J. H. Johnson, London.—A communication from I. Henestrosa.—16*th December*, 1881.
5521. Secondary Batteries, G. Grout and W. Jones, London.—17*th December*, 1881.
5522. Obtaining Vitrifiable Monochrome Photographs, H. A. Bonneville, London.—A communication from M. G. Wolff.—17*th December*, 1881.
5529. Raising Sunken Vessels, R. Hodgson, London. —17*th December*, 1881.
5434. Gas Locomotor, W. H. Beck, London.—A communication from M. Montclar.—17*th December*, 1881.
5558. Crank Shafts, J. Dickinson, Sunderland.—19*th December*, 1881.
5585. Regulating Transmission of Motive Power, H. J. Haddan, London.—A communication from B. Reussille.—21*st December*, 1881.
5638. Exhibiting Magic Lantern Pictures, E. Webster & T. Williams, London.—23*rd December*, 1881.
5649. Gas-burners, W. T. Sugg, London.—24*th December*, 1881.
5715. Cocks, W. R. Lake, London.—A communication from J. Aymonnet.—29*th December*, 1881.
34. Flying Engine, J. K. Smythies, London.—3*rd January*, 1882.
96. Lock Spindle, S. Collett, Willenhall.—7*th January*, 1882.
206. Wire Net, F. Wirth, Germany.—A communication from G. Pickhardt.—14*th January*, 1882.
220. Artificial Ivory, F. W. Cottrell, London.—16*th January*, 1882.
462. Stopping Tubes, J. Turner, Plaistow.—30*th January*, 1882.
526. Weighing Machinery, F. Wheeler, East Cowes. —3*rd February*, 1882.
964. Steering Ships, T. F. Walker, Birmingham.—A com. from J. C. Robinson.—28*th February*, 1882.
1056. Folding Boats, J. P. Wright, Redhill.—4*th March*, 1882.
1227. Paste, E. L. Loxton, Wakefield.—14*th March*, 1882.
1281. Effecting Compression in Moulds, E. Harding and W. Watkins, Sunderland.—16*th March*, 1882.
1370. Spinning, J. M. Howson, Bradford.—21*st March*, 1882.
1378. Waterproof Capes, G. Mandleberg, H. L. Rothband, and S. Mandleberg, Manchester.—22*nd March*, 1882.
1840. Self-opening Umbrellas, W. Grant, New York. —A com. from J. Watson.—18*th April*, 1882.
1844. Rolling Mills, W. Deighton, Workington.—18*th April*, 1882.

Last day for filing opposition, 16*th May*, 1882.

5434. Life-preserving Mattresses, G. G. de L. Byron, Brighton.—13*th December*, 1881.
5548. Vacuum Pumps, L. A. Groth, London.—A communication from H. Goebel and J. W. Kulenkamp. —19*th December*, 1881.
5554. Fastening, &c., Window Sashes, B. C. Cross, Dewsbury.—19*th December*, 1881.
5576. Heads and Gratings for Air Inlets, &c., H. S. Cregeen, Bromley.—20*th December*, 1881.
5591. Clarifying Liquids, C. H. Roeckner, Newcastle-on-Tyne.—21*st December*, 1881.
5592. Endless or Band Saws, J. H. Johnson, London. —Com from H. Tuyssuzian.—21*st December*, 1881.
5604. Galvanic Batteries, E. B. Burr, Walthamstowe, and W. T. Scott, Stratford.—22*nd December*, 1881.
5605. Ambulance Stretchers, A. K. Irvine, Glasgow. —22*nd December*, 1881.
5613. Fire-arms, B. J. B. Mills, London.—A communication from J. H. McLean.—22*nd December*, 1881.
5620. Lifting the Safety-valve of Boilers, T. Rogers, Smethwick.—23*rd December*, 1881.
5630. Reeds for Musical Instruments, J. B. Hamilton, Greenwich.—23*rd December*, 1881.
5639. Electrical Alarm Apparatus, D. S. Garau, London.—23*rd December*, 1881.
5641. Rotary Mills, B J. B. Mills, London.—A communication from P. D. Orto.—23*rd December*, 1881.
5647. Steamships, W. P. Thompson, London.—Com-from G. A. Cochrane.—24*th December*, 1881.
5658. Pickers for Looms, E. Hollingworth, Dobcross. —24*th December*, 1881.
5669. Destroying Insects, H. H. Lake, London.—A communication from La Société La Reconstitution Viticole.—26*th December*, 1881.
5699. Feeding Apparatus for Grain Mills, &c., J. Hurt and A. M. Streathern, Glasgow.—28*th December*, 1881.
5702. Sockets for Electric Lamps, J. W. Swan, Newcastle-on-Tyne.—28*th December*, 1881.
5705. Ships' Stern-posts, W. Cook and D. Mylchreest, Liverpool.—29*th December*, 1881.
5741. Steam Boilers, G. H. Lloyd, Birmingham.—31*st December*, 1881.
5742. Heating, &c., Metals, J. S. Williams, London. —31*st December*, 1881.
5749. Alloying, &c., Metals, P. de Villiers, Silver Hill, St. Leonard's-on-Sea.—31*st December*, 1881.
5750. Alloying, &c., Metals, P. de Villiers, Silver Hill, St. Leonard's-on-Sea.—31*st December*, 1881.
65. Bridges, H. H. Lake, London.—A communication from G. Eiffel.—5*th January*, 1882.
149. Umbrellas, &c., J. H. Bayzand and G. Boyle, London.—11*th January*, 1882.
421. Felloes and Tires, G. Perks, Perry Barr. -27*th January*, 1882.
486. Hot-blast Stoves, E. A. Cowper, London.—31*st January*, 1882.
635. Steam Boilers, W. Arnold, Barnsley.—9*th February*, 1882.
858. Preventing, &c., Fires, K. and J. McLennan and R. Owen, London.—22*nd February*, 1882.
948. Lamps, &c., P. Molloy, Limerick.—27*th February*, 1882.
1066. Lubricating, &c., Spindles, T. Watson, Paisley. —6*th March*, 1882.
1262. Knitted Fabrics, R. Mackie, Stewarton, and W. Start and H. Scattergood, Nottingham.—15*th March*, 1882.
1404. Manure, E. Fisher, Beverley.—23*rd March*, 1882.
1437. Electric Accumulator, S. Cohné, London.—25*th March*, 1882.
1439. Suspending Portable Machines, J. Fielding, Gloucester.—25*th March*, 1882.
1472. Governors, W. Lyon, Sheffield.—27*th March*, 1882.
1476. Ornamenting China, H. Doulton, London, and J. Slater, Burslem.—27*th March*, 1882.
1478. Sugar, J. H. Johnson, London.—A communication from M. Weinrich.—27*th March*, 1882.
1484. Tin-plates, C. S. B. Gardner, Neath.—28*th March*, 1882.
1490. Engines, A. Morton, Glasgow.—28*th March*, 1882.
1790. Locomotives, W. R. Lake, London.—Com. from Messrs. Debarnot and Jacquot.—14*th April*, 1882.
1848. Grape-sugar, W. R. Lake, London.—A communication from A. Behr.—18*th April*, 1882.
1865. Printing, &c., Machinery, W. R. Lake, London.—Com. from H. P. Feister.—18*th April*, 1882.
1891. Milling, A. J. Boult, London.—A communication from R. L Downton.—20*th April*, 1882.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 21st April*, 1882.)

4102. Window-sashes, A. Bedborough, London.—23*rd September*, 1881.
4516. Bottles, &c., B. Azulay, London.—17*th October*, 1881.
4626. Crushing Ores, C. J. Appleby, London.—22*nd October*, 1881.
4628. Treating Peat, A. Wilkinson, Marylebone.—22*nd October*, 1881.
4637. Rotary Apparatus, A. J. Boult, London.—22*nd October*, 1881.
4654. Electric Incandescent Lamps, G. G. Andre, Dorking.—24*th October*, 1881.
4659. Glass Tiles, T. H. Rees, Lambeth.—25*th October*, 1881.
4670. Metallic Pillars, R. B. Lee, Manchester.—25*th October*, 1881.
4684. Balloons, F. C. Kinnear, London.—26*th October*, 1881.
4853. Shaping Metals, J. Whitehouse and S. Peacock, Birmingham.—5*th November*, 1881.
4898. Balanced Slide-valve, A. M. Clark, London. —8*th November*, 1881.
302. Voltaic Batteries, A. R. Bennett, Glasgow.—21*st January*, 1882.

(*List of Letters Patent which passed the Great Seal on the 25th April*, 1882.)

4668. Stoves, A. H. Hearington, London.—25*th October*, 1881.
4677. Screw Nuts, W. H. Lewis and W. R. Clark, London.—25*th October*, 1881.
4685. Horseshoes, H. Dyer, London.—26*th October*, 1881.
4691. Cutting, &c., Corks, H. Gardner, London.—26*th October*, 1881.
4699. Mashing Maize, &c., W. H. Apthorpe, Cambridge.—27*th October*, 1881.
4700. Steam Engines, S. Geoghegan, Dublin, and J. Sturgeon, London.—27*th October*, 1881.
4703. Axle-boxes, R. McIntosh, Dundee, and J. Wright, Kingston-upon-Hull.—27*th October*, 1881.
4704. Chandeliers, G. W. von Nawrocki, Berlin.—27*th October*, 1881.
4706. Knife-boards, H. C. de Berenger, London.—27*th October*, 1881.
4712. Ash-pans, C. Ezard, Bradford.—27*th October*, 1881.
4717. Pills, &c., W. R. Lake, London.—27*th October*, 1881.
4719. Treating Malt, A. and M. Conroy, Liverpool.—28*th October*, 1881.
4722. Velocipedes, F. W. Jones, Exeter.—28*th October*, 1881.
4723. Separating Solid Bodies, H. J. Smith, Glasgow.—28*th October*, 1881.
4725. Flushing Water-closets, H. Skerrett, Birmingham.—28*th October*, 1881.
4731. Treating Stone, &c., J. H. Johnson, London.—28*th October*, 1881.
4741. Chimney-pieces, J. Thomas, Bangor.—29*th October*, 1881.
4745. Heating Water, &c., R. T. Gillibrand, Darwen. —29*th October*, 1881.
4748. Galvanic Batteries, W. R. Lake, London.—29*th October*, 1881.
4752. Weaving, &c., Hollow Articles, M. Bauer, Paris.—31*st October*, 1881.
4753. Self-acting Reversing Gear, M. Bauer, Paris. —31*st October*, 1881.
4763. Folding Paper, W. Conquest, London.—31*st October*, 1881.
4770. Apparatus for Playing a New Game of Chance, C. A. Glazbrook, W. H. O. Taylor, and W. P. B. Trench, London.—1*st November*, 1881.
4773. Steering Apparatus, A. W. Cooper, Dundee.—1*st November*, 1881.
4775. Electric Lamps, H. A. Bonneville, London.—1*st November*, 1881.
4787. Stoves and Heaters, J. Dunnachie, Lanark, N.B.—2*nd November*, 1881.
4790. Vaccinating Apparatus, T. Smith, London.—2*nd November*, 1881.
4799. Self-governing Gas-burners, J. B. Fenby, Sutton Coldfield.—2*nd November*, 1881.
4829. Tricycles, A. Archer, Birmingham.—3*rd November*, 1881.
4864. Steam Generators, C. D. Abel, London.—7*th November*, 1881.
4891. Preparing Grain, &c., J. Fordred, London.—8*th November*, 1881.
4902. Bridges, &c., J. F. Smith, Leicester.—9*th November*, 1881.
4903. Boots and Shoes, H. Dickson, Leicester.—9*th November*, 1881.
4987. Spring Hinges, &c., F. R. Baker, Birmingham. —10*th November*, 1881.
4992. Centrifugal Drying Machines, A. Fryer, Wilmslow, and J. B. Alliott, Nottingham.—15*th November*, 1881.
5025. Elevators, &c., H. Garland, Liverpool.—16*th November*, 1881.
5169. Regulating the Speed of Engines, W. W. Girdwood, London.—26*th November*, 1881.
5172. Water-closets, C. Pieper, Berlin.—26*th November*, 1881.
5357. Grinding Corn, &c., W. L. Wise, London.—7*th December*, 1881.
5393. Hollow Projectiles, R. H. Brandon, Paris.—9*th December*, 1881.
5435. Breech-loading Cannon, R. H. Brandon, Paris. —13*th December*, 1881.
5467. Barrels or Casks, J. Campbell and J. T. Swainston, London.—14*th December*, 1881.
5654. Rifling Gun, &c., Barrels, P. Mauser, Germany.—24*th December*, 1881.
35. Two-wheeled Carriages, J. Marston, Birmingham.—3*rd January*, 1882.
120. Storing Electrical Energy, J. E. Liardet, Brockley, and T. Donnithorne, London.—9*th January*, 1882.
211. Fireproof Paint, C. J. Mountford, Birmingham. —16*th January*, 1882.
379. Flush Cisterns, W. Wright, Plymouth—25*th January*, 1882.
423. Embroidery, C. A. Barlow, Manchester.—27*th January*, 1882.
451. Colouring Matters, J. A. Dixon, Glasgow.—30*th January*, 1882.
476. Circular Slide, &c., Valve, W. C. Church, London.—31*st January*, 1882.
485. Taps, W. Rose, Halesowen.—31*st January*, 1882.
547. Illumination Lamps, J. Pain and W. H. Gritton, London.—4*th February*, 1882.
563. Electric Lamps, A. J. Jarman, London.—6*th February*, 1882.
608. Tricycles, J. Beeston, Lymington.—8*th February*, 1882.
611. Ornamental, &c., Capsules, E. Belmer, London. —8*th February*, 1882.
627. Colouring Matters, J. A. Dixon, Glasgow.—9*th February*, 1882.
648. Musical Instruments, H. J. Haddan, London.—10*th February*, 1882.
649. Spring, &c., Wagons, J. Watling and E. Chaston, London.—10*th February*, 1882.
670. Shirts, C. Tighe, London.—11*th February*, 1882.
721. Catching, &c., Vermin, W. Burgess, Malvern Wells.—14*th February*, 1882.
839. Ratchet-braces, S. Gardner, Adderbury.—21*st February*, 1882.
931. Dynamo-electric Machines, A. M. Clark, London.—25*th February*, 1882.

List of Specifications published during the week ending April 22nd, 1882.

932, 6d.; 2974, 6d.; 2991, 6d.; 3543, 6d.; 3559, 6d.; 3604, 6d.; 3687, 4d.; 3744, 8d.; 3770, 8d.; 3776, 6d.; 3782, 8d.; 3786, 1s.; 3790, 6d.; 3792, 6d.; 3795, 6d.; 3801, 6d.; 3807, 6d.; 3845, 8d.; 3848, 6d.; 3852, 6d.; 3856, 6d.; 3858, 8d.; 3859, 6d.; 3860, 6d.; 3862, 8d.; 3878, 6d.; 3880, 10d.; 3881, 6d.; 3882, 6d ; 3883, 6d.; 3886, 8d.; 3888, 6d.; 3891, 6d.; 3892, 6d.; 3893, 8d.; 3895, 6d.; 3897, 6d.; 3904, 6d.; 3907, 6d.; 3908, 6d.; 3911, 8d.; 3912, 1s. 2d.; 3913, 6d.; 3914, 6d.; 3917, 6d.; 3918, 6d.; 3920, 10d.; 3921, 6d.; 3922, 6d.; 3924, 2d.; 3926, 6d.; 3927, 6d.; 3929, 10d.; 3932, 6d.; 3933, 4d.; 3934, 10d.; 3935, 6d.; 3936, 6d.; 3937, 6d.; 3938, 6d.; 3940, 4d.; 3949, 8d.; 3950, 8d.; 3954, 6d.; 3955, 8d.; 3957, 10d.; 3960, 4d.; 3962, 8d.; 3065, 6d.; 3967, 6d.; 3968, 8d.; 3960, 6d.; 3972, 6d.; 3975, 6d.; 3979, 6d.; 3980, 6d.; 3981, 6d.; 3986, 6d.; 3987, 6d.; 3988, 2d.; 3989, 6d.; 3990, 6d.; 3992, 6d.; 3996, 6d.; 4003, 6d.; 4006, 6d.; 4010, 6d.; 4012, 6d.; 4016, 2d.; 4021, 6d.; 4022, 6d.; 4026, 2d.; 4028, 6d.; 4034, 6d.; 4037, 6d.; 4039, 6d.; 4041, 6d.; 4043, 6d.; 4044, 2d.; 4047, 2d.; 4050, 2d.; 4051, 4d.; 4052, 1s.; 4053, 6d.; 4054, 2d.; 4056, 6d.; 4057, 6d.; 4059, 4d.; 4060, 6d.; 4061, 4d.; 4062, 6d.; 4063, 4d.; 4064, 2d.; 4066, 2d.; 4068, 2d.; 4969, 6d.; 4070, 6d.; 4071, 2d.; 4072, 2d.; 4073, 2d.;

4074, 2d.; 4076, 2d.; 4977, 2d.; 4072, 2d.: 4080, 2d.; 4082, 6d.; 4086, 8d.; 4088, 4d.; 4089, 2d.; 4090, 2d.; 4092, 6d.; 4093, 2d. 4095, 6d.; 4096, 2d.; 4103, 4d.; 4104, 6d.; 4108, 2d.; 4109, 2d.; 4119, 2d.; 4122, 2d.; 4123, 2d.; 4125, 6d.; 412^6, 6d.: 4127, 2d.; 4130, 2d.; 4131, 2d.; 4135, 2d.; 4137. 6d ; 4142, 2d.; 4145, 2d.; 4148, 4d.; 4149, 2d.; 4158, 6d.; 4163, 4d.; 4178, 6d.; 4342, 2d.; 4381, 2d.; 4449, 6d.; 4686, 4d.; 5438, 6d.; 5543, 6d.; 19, 4d.; 223, 8d.; 226, 4d.; 266, 6d.; 270, 6d.; 335, 4d.

*** 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.*

2974. Storing, Carrying, and Preserving Fruit, &c., *G. A. Cochrane, Montreal.—7th July*, 1881. 6*d.*

This consists, First, in forming the cases with projecting knobs or bars on every side, so that no two cases can come close up together; Secondly, in making the cases thoroughly perforated on top, bottom, and every side, for the free passage of air.

2991. Hat-shaping Machine, *J. R. Kelsey, Bristol.—7th July*, 1881. 6*d.*

The two features of novelty are two pressers brought into position by means of levers acted upon by a treadle, and back and front clamps acting in conjunction with the side boxes.

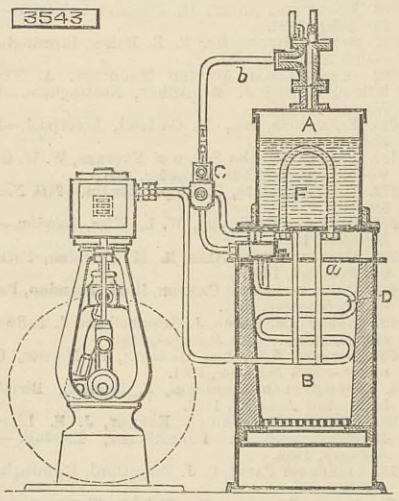
3509. Improvements in Electrical Interrupters, *P. Ullathorne, London.—12th August*, 1881. 6*d.*

The instrument consists of three stretched wires nearly parallel but not in the same plane. The contact or anvil wire is platinised at its contact point, and is insulated from the other two which are attached to the ends of a soft iron armature, lying in a plane between the contact wire and the other two external wiress; the part of the armature making contact is also platinised. The wires are stretched over bridges, so that the armature bisects the vibrating portion of the wires to which it is attached, and these are equally stretched and equal in other respects. The contact wire is also stretched on bridges, one of which is near the armature. An electro-magnet is placed on that side of the armature furthest from the contact wire. Supposing the current to enter the electro-magnet, it passes to the ends of the armature wire and into the armature; from here it goes to the contact wire, and exits from one or both ends of the vibrating part of the contact wire. Modifications of this mode of construction are also described and the instruments illustrated.

3543. Steam Engines Operating with Regenerated Steam, *E. A. Brydges, Berlin.—16th August*, 1881. —(*A communication from H. de Grousilliers, Berlin.*) 6*d.*

This consists in regenerating steam by means of an arrangement for reducing the superheated exhaust steam to the temperature of the steam in the boiler, previous to the entrance of the said exhaust steam into the compression cylinder, which is effected by the cooler F, which said cooler is surrounded by water of similar temperature to the steam in the boiler. Steam

3543



is generated in the tubes *a* located in the fire-box of the furnace B. Saturated steam passes from the boiler A through a tube or pipe *b*, to the regulator or cut-off C, from whence it passes through a suitable tube or pipe to the superheater D, and from thence through a suitable pipe or tube to the slide valve box, where the said superheated steam is caused to operate on the upper or lower surface of the piston, according to the position of the slide or valve.

3559. Improvements in Electric Lighting and in the Means or Apparatus Employed Therein, *C. W. Harrison, London.—16th August*, 1881. 6*d.*

The inventor makes use of a reflector of solid roc-stone in slabs, or uses it as a base, and mixes therewith gypsum and oolite, bringing the whole into a fluid state by a solution of potash; the mixture is then dried in blocks at a low heat, and subsequently hrydraulicly pressed into a hard mass. The inventor varies the colour of the light given by the arc by adding liquid sulphates of various bodies to this reflecting material, according to the tint required.

3604. Manufacture of Brushes, *S. Abraham, Manchester.—19th August*, 1881. 6*d.*

This consists in the combination of a central stock, a projecting device for the attachment of a rod or handle, an assemblage of wires or their equivalent, and a backing of material such as cloth, leather, or sheet rubber for securing the said wires or their equivalent.

3659. Locomotive Engines, *W. Morgan-Brown, London.—23rd August*, 1881.—(*A communication from M. Stevens and J. H. Pearson, New Hampshire, U.S.*) 10*d.*

This relates to an arrangement of parts so that the engine is situated between the water tank and boiler, the whole being supported on one frame, by which means the adhesion of the wheels is increased, and the engineer's cab can be placed in front of the boiler and smoke pipe, where the engineer has a clear view of the track, and has all the valve mechanism under his inspection and control. The invention also relates to the valve mechanism employed.

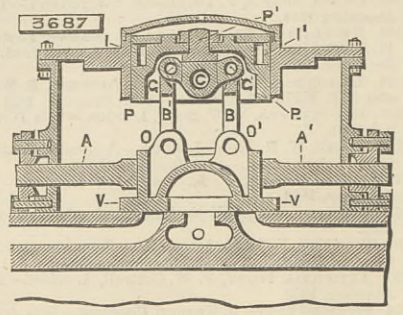
3668. Improvements in Electric Lighting Apparatus, *W. R. Lake, London.—23rd August*, 1881.—(*A communication from T. A. Connolly, Washington, U.S.*) 6*d.*

This consists in the employment of an automatic switch in connection with the electro-magnet, through which the upper carbon is fed, by means of which, should the arc become defective from any cause, the current will be diverted through the lamp frame, and out at the same terminal as when the arc was established, so that the other lamps in circuit would not be affected. The feeding of the carbons is accomplished by clamps attached to the armatures of electro-magnets.

3687. Slide Valves, *C. de Lucia, Naples.—24th August*, 1881. 4*d.*

In the drawing V is a slide valve which differs from those frequently used for locomotives, by the addition of four eyes O O^1 at the back. A A^1 is the valve rod, P is the piston for balancing the slide valve. It is movable in the cylinder formed in the cover of the valve chest, and provided with an ordinary metallic packing

3687



ring I I^1. The back of the slide valve is connected with the piston by two rods B B^1, pivotted at one end to the four eyes O O^1, and at the other end to the beam G G^1. The latter is secured at C to the eyebolt P^1 passing through the bottom of the piston.

3696. Improvements in Electro-magnetic Clocks and Batteries for the same and other Purposes, *C. Shepherd, South Hampstead.—24th August*, 1881. 6*d.*

The inventor drives the clockwork by the reciprocating motion of the poles of a permanent magnet and electro-magnetic coils, or of electro-magnetic coils near the poles of a fixed permanent magnet, also communicating thereby continuous rotary motion to a fly-wheel or weights, so that the same shall revolve in equilibrium, the magnet or coils being suspended by a cord, spring, or knife edge. The improvements in batteries consist in the use in combination with a zinc element and a liquid element of porous material, such as burnt cinders, so arranged as to raise the liquid element by capillary attraction, and expose it to extended contact with air to prevent polarisation.

3734. Fishing and other Nets, &c., *R. Balderstone, Paisley.—26th August*, 1881.—(*A communication from A. Bonamy, France.*) 1s. 2d.

This relates to machines for manufacturing nets in which the knots and meshes resemble those made on the Scotch machine, or by hand, and it consists in forming the needles in two parts rivetted together and fixed in regularly divided bars; the hooks rivetted to small plates fixed in regularly divided bars; the position and construction of the sinkers, which are in two parts, viz., the sinker proper and the sinker hook, rivetted at right angles thereto; the stop motion for the cam shaft; the forming of the body of the net with one thread only; means for automatically picking up and drawing the thread from the bobbin through the needles and sinkers to the opposite side of the machine; the automatic take-up, which may be regulated to suit any mesh; the employment of auxiliary threads for making the selvedges with the auxiliary threads, and of placing them on the hooks; means for cutting the thread at each end of the machine; a method for removing the end of the threads which remain hanging to the shuttle; safety mechanism for temporarily preventing the movement of the cam shaft; the arrangement of the slur levers; and the arrangement for altering the motion of the hook bar to make slip meshes—that is to say, without knots.

3744. Bicycles, &c., *E. C. F. Otto, Peckham.—27th August*, 1881. 8*d.*

This relates to improvements on patent No. 1673, A.D. 1880, and relates more particularly to the means for altering the tension of the driving bands for the purpose of the steerage of the machine, to a more efficient brake arrangement, to an improved arrangement of the seat, and to the equalisation of the power of the crank during the whole course of its revolution.

3770. Mechanism for Issuing and Recording Number and Prices of Tickets, *J. P. Power, London.—30th August*, 1881. 6*d.*

This consists, First, in the arrangement of mechanism for simultaneously stamping on tickets the date of issue, the stage or section of the journey, the number of the journey, and the amount of the fare paid; Secondly, in the combination of the apparatus, the receptacle for tickets, and the method of feeding them to the apparatus.

3776. Horseshoe Nail Blank Forging Machines, *S. Pitt, Sutton.—30th August*, 1881.—(*A communication from C. W. Woodford, Essex, U.S.A.*) 6*d.*

This consists, First, in the means whereby the pitman which receives motion from the roller shaft is connected with the hammer which it operates, so as to make the parts self-adjusting when put together, and obviates the difficulties caused by loosening from wear; Secondly, in so constructing and arranging the gauge for regulating the length of nail to be cut as to secure its easy adjustment, certain operation, and non-liability to become choked; Thirdly, in improvements connected with the carriage on which the nail rod is placed, by which it is maintained in a perfectly horizontal position; and Fourthly, in the construction of the cutter stock in such a way that the wear of the cutter or of the operating mechanism can be easily compensated for, and the length of the head of the nail altered at will.

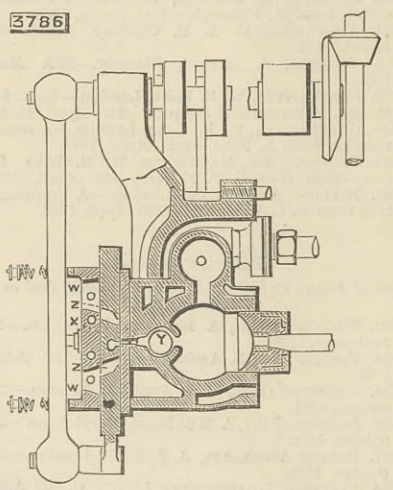
3782. Velocipedes, *J. White, Earlsdon, near Coventry, and J. Asbury, Coventry.—30th August*, 1881. 8*d.*

This relates to the construction of velocipedes whereby they may be contracted in width to any desired extent to facilitate their passage through narrow entries.

3786. Gas Motor Engines, &c., *J. J. Butcher, Gateshead.—31st August*, 1881. 1s.

To ignite the gaseous charge the induction and

3786

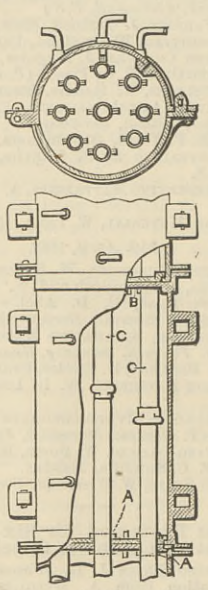


ignition slide valve is caused to make one backward and forward traverse for every two revolutions of the engine. X is the induction port, which in its central position communicates with the cylinder port Y, which also serves for ignition, by means of the flame pockets Z; the passages W allow of the escape of the products of combustion, and through which pass the pipes to convey the compressed charges of gas and air to the cylinder, so that their contents are heated. To govern the speed of the engine a governor is caused to alter the position of the piston travel where the cylinder acts as an air pump at one end and a motor cylinder at the other. A current of air is used to cool the cylinder.

3790. Improvements in and Relating to the Covering, Protection, and Insulation of Electrical Conductors or Cables for Telegraphic, Telephonic, and other Purposes, *W. R. Lake, London.—(A communication from S. D. Strohm, Philadelphia, U.S.)—31st August*, 1881. 6*d.*

The figure shows a section and a plan partly in section of the invention. The exterior casing is in two sections with external flanges, by which they are bolted together. The top section forms a movable cap, which facilitates inspection of the interior. Each cylinder has discs B B, either forming a complete

3790

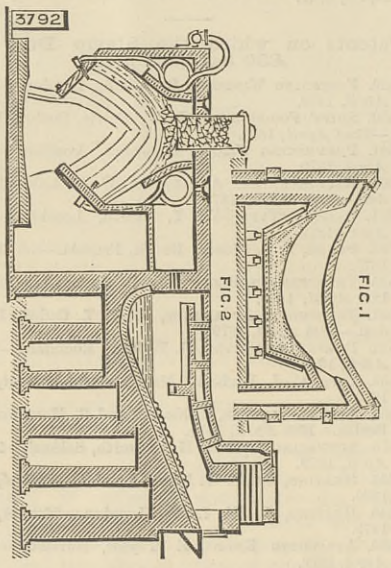


circle, or in sections as A A. These discs have annular grooves, into which the flanges of the sections of discs fit. They also have numerous openings for the passage of the tubes holding the wires. These tubes C C are formed in sections, and so constructed as to fit into one another; they are lined with insulating material and the wires laid inside. Modifications of this plan are also described by the inventor, whereby the joints are protected from moisture, &c., by india-rubber rings, and fluid shellac is injected into the tubes and allowed to harden.

3792. Manufacture of Steel, &c., *C. W. Siemens, London.—31st August*, 1881. 6*d.*

This consists, First, in the manufacture of steel, of heating in an open hearth furnace iron oxide with scrap metal and puddled ball, and pouring thereon fluid cast iron, so as to form a mixture for subsequent treatment in an ordinary way for the production of

3792



steel; Secondly, in adding to the liquid stream of steel metal as it runs from the furnace heated ferro-manganese in small pieces; Thirdly, in the construction of a furnace for steel manufacture with cooling water pipes as shown in Fig. 1; Fourthly, the construction of furnace as shown in Fig. 2. Other improvements are described.

3795. Manufacture of Brushes, &c., *B. J. B. Mills, London.—31st August*, 1881.—(*A communication from J. J. C. Smith and H. Gelpcke, College Point, U.S.*) 6*d.*

This relates to improvements on patent No. 3793, dated 31st August, 1881, for improvements in the manufacture of articles of india-rubber or other vulcanised gum, and in means or apparatus employed therein. The tufts of bristles, after being inserted so as to project within the hollow brush back or body, are then secured by pouring cement, so as to fill or partially fill the cavity, which cement on cooling or drying, as the case may be, fixes the tufts or bunches of bristles securely in position.

3801. Mules for Spinning, *J. Chisholm and J. Clegg, Oldham.—1st September*, 1881. 6*d.*

This consists, First, in the method of reversing the motion of the front roller so as to lay hold of the twisted part of the yarn while the twisting is proceeding; Secondly, in an improved method of latching the long lever to prevent its return to the original position before being depressed, and consists in placing a link between the long lever and a retaining lever, to which a spiral spring is attached.

3804. Improvements in Commutators for Dynamo or Magneto Electric Machines and Electric Motors, &c., *P. Jensen, London.—1st September*, 1881.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 4*d.*

The inventor makes his commutator bars and brushes of copper, and amalgamates their surfaces directly with mercury; or they are faced with silver and afterwards amalgamated; this reduces sparks.

3807. Drying Rice, &c., *A. W. Gillman and S. Spencer, Southwark.—1st September*, 1881. 6*d.*

This consists in the employment, in combination with a series of endless aprons enclosed in a drying chamber, of a furnace, the heat and products of combustion from which are caused to travel along the said chamber, and between and amongst the said endless aprons in directions contrary to that of the rice or other grain or malt to be dried.

3809. Improvements in Apparatus for and Arrangement of Telephonic Exchanges, *C. D. Abel, London.—1st September*, 1881.—(*A communication from La Société Générale des Téléphones, Paris.*) 6*d.*

According to the arrangements included in this invention there are two wires to each circuit, and seven sets of these double wires are grouped in cables, thus one cable serves for seven subscribers. The cables are led into the building through a metal plate attached to the wall, which has as many separate holes as there are cables. From this plate the cables are led along channels to the "rosace" or apparatus by which the connections are established between the conducting wires and the exchange apparatus, one-half being led to the top and the other to the bottom. The ends of the cables are then spread out and each attached to a stud, whence the seven pairs of wires are spread out, the different pairs of wires are then separated and attached to a disc with the name, &c., of the subscriber. The other connections are then made in such a way that it is easy to group the cables on the rosaces, so that at the commutators the subscriber that communicates most often with each other have their "jack-knives" nearest to each other. Other improvements are also described.

3845. Moulding Bottles, *A. M. Clark, London.—3rd September*, 1881.—(*A communication from H. Aupècle and Co., Chalon-sur-Saone, France*) 8*d.*

This consists, First, in a rotary bottle mould in the employment of a ribbed metal rotary bottom turning in the opposite direction to the body of the mould; Secondly, in the combination with a rotary bottle mould of treadle-operated mechanism acting at two distinct times, whereby the mechanism by which the mould and mould bottom are rotated in opposite directions is first put into gear, and secondly, whereby the mould is closed after it has made a few revolutions; Thirdly, in the combination of the plunger and the rotary mould bottom in such a manner as to permit an up-and-down motion of the plunger.

3848. Steam Generators, *J. Blake, Manchester.—5th September*, 1881. 6*d.*

This relates partly to improvements on patent No. 1207, dated 3rd April, 1875. The fire-box is made of spherically moulded plates or of a conical form, the axis being inclined, so that in some cases the front side is vertical, the outer enclosing shell being of cylindrical formation. The narrow end of the box opens into a combustion chamber, which in some cases is formed by recessing the outer shell.

3852. Making Heels for Boots and Shoes, &c., *F. Cutlan, Cardiff.—5th September*, 1881. 6*d.*

This relates to the appliances for making the heels for boots and shoes, also applicable for other purposes, by the use of heel mould and rivet container and necessary parts connected therewith.

3856. Manufacture of Artificial Fuel from Slack, Small Coal, &c., *W. P. Thompson, Liverpool.—5th September*, 1881.—(*A communication from M. Neuhaus and O. Henniges, Berlin.*) 6*d.*

This relates to the process for the more effectual and more rapid drying of combustibles in closed, heated containing vessels, consisting in condensing the vapour developed in a condenser separate from the containing vessel, and drawing off the condensed liquid by means of an air pump.

3858. Apparatus for Diffusing Light, *J. Wetter, New Wandsworth.—5th September*, 1881.—(*A communication from W. Wheeler, Massachusetts.*) 8*d.*

This consists partly in a prolate ellipsoidal reflector or holophose, whose reflecting surface is approximately such as would be generated by the revolution about its major axis of that part of an elliptic curve included between the latus rectum and the minor axis, the light source being placed in a focus of the reflector.

3859. Apparatus for Self-massage, *C. A. Angström, Stockholm.—5th September*, 1881. 6*d.*

This consists in the use for self or hand massage of one or more rollers provided with hafts or handles, such rollers and hafts or handles being constructed with forms adapted to the particular muscles or groups of muscles to be treated.

3860. Pianofortes, *W. H. Squire, London.—5th September*, 1881. 6*d.*

This consists in the general construction and arrangement of pianos in which the strings are strung horizontally, or nearly so, on both sides of the framework to which they are attached, whereby the framework carrying the strings may be extended beyond the length of the keyboard.

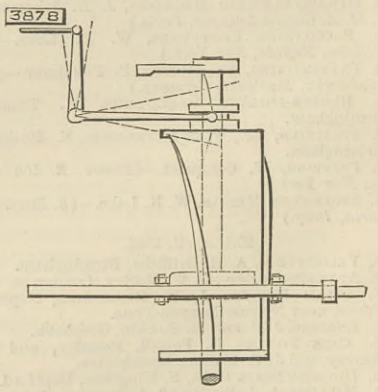
3862. Regenerative Kilns for Burning Fire-bricks, &c., *J. Dunnachie, Lanark, N.B.—6th September*, 1881. 8*d.*

This consists in constructing in the walls of adjacent kilns duplex hollow spaces or flues, the alternating portions of the opposite sides of which have slits or perforations formed therein, so as to enable the heated products of combustion to be passed or discharged from the lowest part of one kiln into the lowest part of the next kiln, that is to say, the kiln which is being heated preparatory to being fired. These flue spaces are provided with vertical or horizontal dampers, so as to shut off the communication between the kilns, the slits or perforations in the flue spaces effecting the improved diffusion.

3878. Steam Engines, *C. Bedford, Birstall.—7th September*, 1881. 6*d.*

This has reference to apparatus employed in opening and closing the port of steam valves for admitting and shutting off the steam in connection with steam engine cylinders. The mechanism consists of two cams or tappets fixed to or formed on a boss keyed on a revolving shaft. One of the said cams or tappets is for opening the ports of the steam valves, and the other cam or tappet is for closing the said ports.

3878



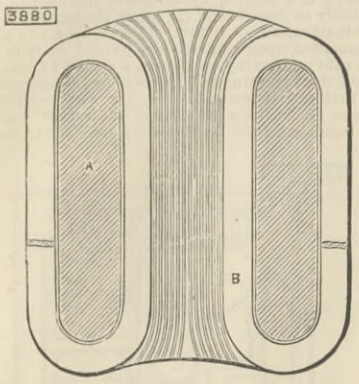
The opening cam is placed on a boss so as to be parallel with the axis of the shaft, but the closing cam which is formed taper or cone-shaped, is placed spirally around the said boss. In connection with the slide valve rod is a ring or yoke in which the said cams revolve, so that at each revolution thereof the said slide valve rod is pushed backward and forward, by which means the ports of the steam valves are opened and closed.

3880. Improvements in the Manufacture of Revolving Armatures and other Parts of Electrical Apparatus and in Machinery therefor, *W. R. Lake, London.—7th September*, 1881.—(*A communication from C. Dion, New York.*) 10*d.*

The figure shows the method of constructing the armature. The wire is ribbon shaped and is placed

in parallel coils around the walls of the armature in the following way, viz: The outer portion of each coil is placed edgewise upon the outer surface of the core, the inner portion being arranged in the same way on the inner surface. The coils are insulated by being coated with gelatine treated with bichromate of potash, after which they are exposed to the light, whereby an insoluble film is produced. A is the core and B the wire. The core is made in two halves, upon which the wire, having been previously bent to the shape required to fit the coils by a special machine described in this specification and also the subject of this patent, is slipped, and the two halves are subse-

3880



quently bolted together. The inventor claims that his system dispenses with commutators, as brushes can be applied direct to the conducting coils, one brush at the outside of the coils and the other on a collecter fitted on the axle of the armature. The coils also offer a small resistance as they have a large surface, and the risks of heating are reduced owing to the large cooling surface.

3881. APPARATUS FOR THE GELATINISATION OR CONVERSION OF UNMALTED GRAIN, *E. Luck, London.—7th September*, 1881. 6*d*.

The rousers are provided with chambers so perforated and placed that the steam employed in the treatment is caused to issue or be ejected backwards and downwards into the vat.

3882. OBTAINING PRODUCTS FROM THE DISTILLATION OF SMALL WOOD, &c., *R. Haldane and J. Telfer, Glasgow.—7th September*, 1881. 6*d*.

The small wood is passed through a retort to be distilled by subjecting it to heat, the retort consisting of tubes in communication with end chambers, so that by endless chains and scrapers the wood may be traversed in one direction along one tube, and then in the opposite direction along the other tube. The space between the tubes is filled in so that the flame of the furnace does not impinge on the underside of the top tube, the object being to subject the wood when fed into the top tube to a gentle heat, which increases as the wood passes towards the outlet, where it is discharged by a recessed wheel, which delivers it to a similarly constructed cooling apparatus, round the tubes of which air or water circulates. The gases pass from the cooler to a condensing apparatus, the wood passing down through an inclined perforated rotating cylinder, in which the dust is separated from the charcoal.

3883. ACETIFYING ALCOHOLIC WASH AND MATURING SPIRITS, *E. Luck, Blackfriars-road.—7th September*, 1881. 6*d*.

This relates to apparatus for acetifying alcoholic wash in the manufacture of vinegar, and consists in substituting for the basket work or birch usually employed two sets of bars of wood, arranged one at the upper part of the acetifier and the other below, such bars being placed at a suitable distance apart, and each provided with a longitudinal groove with cross grooves extending therefrom for the reception of endless strings. The wash is introduced into the longitudinal grooves and passes into the cross grooves in both directions, whence it descends along the strings, whilst the current of air circulates in the usual manner.

3886. PRODUCTION OF HOLLOW MOULDED FORMS IN METAL, *E. Hoskins and C. Harvey, Birmingham.—8th September*, 1881. 8*d*.

The machinery consists of a frame similar to a lathe, carrying spindles and driving pulleys, and upon the upper ends of two such spindles are fixed rolls, whose peripheries are cut to the section of the articles to be formed. In one machine two such rolls are used, a large one and a small one, and the metal blank, stamped to a conical form with straight tapered sides, is placed over the small roll, which is then advanced by a slide up to the larger one, and both rolls are driven in the same direction, whereby the conical shell is forced into the forms on the rolls, and thereby moulded.

3888. BICYCLES, *H. Haes, Wednesbury.—8th September*, 1881. 6*d*.

This relates to means for enabling the bicycle to stand upright when stationary, and consists in the use of rods, which may be lowered so as to bring them in contact with the ground when required.

3891. MECHANICAL ARRANGEMENTS APPLICABLE TO STEAM WINCHES, HOISTING APPARATUS, &c., *T. Archer, jun., Durham.—8th September*, 1881. 6*d*.

This relates, First, to an improved method of coupling a piston and connecting rod, whereby, with the same length of connecting rod as usually coupled, the cylinder and crank may be brought nearer together; Secondly, to a method of operating clutch gear, whereby great leverage, facility, and rapidity of movement is obtained; Thirdly, to a combination of the clutch and brake gear so as to be operated by one handle and one movement; Fourthly, to an arrangement of mechanism for operating high-speed whipping drums; and Fifthly, the combination with whipping drums or winches of rapid weighing apparatus.

3892. ORNAMENTING LINOLEUM, &c., *J. H. Allin, Edgware-road.—8th September*, 1881. 6*d*.

This consists in punching the required design or pattern on the linoleum or other floorcloth, and then filling in the recesses with paint or other suitable fluid or plastic composition of the required colour.

3895. HORSESHOES, *T. Brown, Sheffield.—8th September*, 1881. 6*d*.

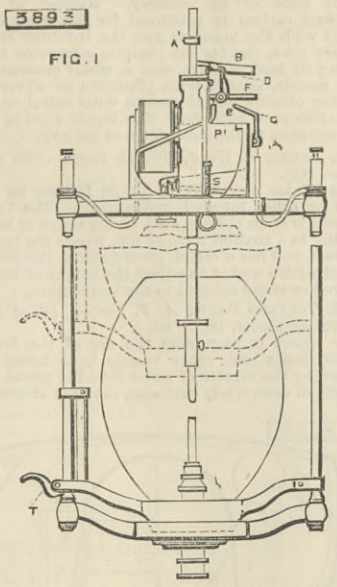
The shoes are formed from bars or plates of iron or steel rolled with one face flat, the other face having a continuous series of narrow and deep transverse corrugations across it, and, if desired, also longitudinal grooves rolled along it. The bar is heated and bent to the shape of the shoe, so that the plane side forms the part to fit the hoof, while the corrugated surface forms the underside of the shoe.

3893. IMPROVEMENTS IN ELECTRIC LIGHTING APPARATUS, *W. R. Lake, London.—8th September*, 1881. —(*A communication from W. S. Hill, Boston, U.S.*) 8*d*.

This invention relates to improvements whereby a lamp may be automatically extinguished when the carbons are burnt low enough without affecting the other lamps in circuit; also to a means for lifting the glass globe, so that the carbons may be replenished from beneath without removing the globe. The figure shows the improvements as adapted to a Weston lamp, though they are applicable to other kinds of lamps. Supposing the arc to be formed the collar A1, Fig. 1, is placed at such a point that when the carbons have burned as low as desired it will strike and depress inner end of lever B, causing it to release plate D, when the action of spring S moves the switch bar F to position shown in Fig. 2, or into closed contact with plate G, thereby offering a more direct passage for the current and diverting it from the regulating mechanism and carbons. The lamp having been supplied with new carbons it can be put in action by drawing down rod P1. To replenish the carbons

3893

FIG. 1



the globe is raised by sliding its holder up the side rods, the cam lever T by bearing against the left hand

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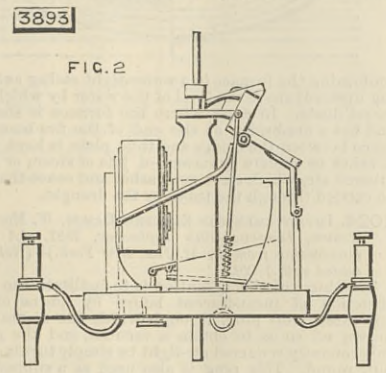
FIG. 2



rod, holding it securely where desired. Another part of the patent refers to a means for automatically lighting the second of a double set of carbons when the first are consumed.

3897. MOTIVE POWER ENGINES, *H. G. Hosmer, Rome, —8th September*, 1881. 6*d*.

The invention is based upon the principle that by shifting a weight to the highest or upward side of a swinging pendulum, the pendulum will be caused on each return stroke to swing to the fullest extent, and it consists in the application of such principle to the production of motive power.

3904. BONE BOILING, &c., *G. W. von Nawrocki, Berlin. —8th September*, 1881.—(*A communication from A. Leuner, Bavaria.*) 6*d*.

This relates to means for depriving bones of all their greasy parts by means of lower pressure vapour or steam of the known fat solvents, and it consists in subjecting the bones to a previous steaming of water steam before removing the fat, by which means the air is driven out of the pores of the bones and the fat rendered more soluble. Further, the bones during the removal of the fat, while exposed to the action of the solvent in the form of steam, are also acted on by water steam so as to materially assist the dissolving action of the solvent steam.

3907. PRODUCING ROTARY MOTION, *J. J. Read, Dublin. —9th September*, 1881. 6*d*.

On a frame are mounted two parallel shafts, one carrying two ratchet wheels at a distance apart, and outside which are arranged two hollow drums mounted loosely on the shaft, and within each of which is a pawl gearing with the ratchet wheel. Round a flange on the face of the drums is coiled a belt, the free ends of which are connected with the grooved peripheries of two pulleys keyed on the second shaft. These pulleys are of the some diameter as the drums on the first shaft are placed at the same distance apart, and the belts connecting them with such drums are wound in different directions. Around the circumference of each drum is arranged one or more coils of belt or chain, the free ends of which may be acted upon by treadles or other means.

3908. COUPLING AND UNCOUPLING RAILWAY VEHICLES, &c., *B. Askew, Edinburgh.—9th September*, 1881 6*d*.

The object is to enable carriages to be coupled and uncoupled without it being necessary to get between the vehicles. The apparatus consists of a tube with a hook at one end, and near the other end inside is placed a spiral spring, one end connected to a rod projecting from the tube. The rod is actuated by a lever and causes the coupling to be held firmly in the hook, when it can be lifted into the desired position.

3911. REFLECTORS, *J. Wetter, New Wandsworth.—9th September*, 1881.—(*A communication from W. Wheeler, Mass., U.S.*) 8*d*.

This relates to means for directing and dispersing light from any source, so that its full illuminating power may be utilised in the direction and within the limits of the space to be lighted; and it consists in the employment of a reflector with a continuous reflecting surface, such as would be generated by the partial revolution of a conic-sectional curve on its *latus rectum*, and by the partial revolution of such curve on its prolate axis at one or each terminus of the partial revolution of the *latus rectum*, the axes of revolution intersecting each other in the focus of the curve.

3912. RAILWAYS OR TRAMROADS, &c., *F. Devoght, Antwerp.—9th September*, 1881. 1*s*. 2*d*.

This relates to the method of drawing carriages along the rails, and consists in the use of a continuously moving endless cable sliding on antifriction wheels placed at the bottom of a horizontal tube laying between the rails, such tube having on the upper side a longitudinal cleft for the sliding of two hooks placed on each carriage

3913. FIRE-ARMS, *M. Kaufmann, Strand.—9th September*, 1881. 6*d*.

This relates to solid frame or rod-extracting revolving fire-arms, in which the lock is provided with a rebounding hammer, and the object is to provide the lock with a stop which locks the cylinder after each rotation and keeps it securely in place when not in use, an essential feature being the utilisation of the movable covering plate for the purpose of freeing the cylinder from such stop, so that it may rotate freely when loading the fire-arm.

3914. PREPARING COTTON AND OTHER FIBRE, *W. and W. Lord, Todmorden.—9th September*, 1881. 6*d*.

The object is to remove dirt and other impurities from the cotton, and it consists in holding the fibre by feed rollers, just beyond which is fitted a porcupine roller driven at any desired speed. Beneath the latter is a grid, and in connection with it a number of horizontal or inclined cleaning boxes with grids and doors below are arranged, such boxes communicating with the vertical cylinder or beater of a Crighton opener. The fibre is blown from the porcupine and through the boxes into the opener, from which it is taken and formed into a lap or delivered in an open state.

3917. HOT FORGINGS AND STEEL DIES, &c., *A. Storer, Clapham Park.—9th September*, 1881. 6*d*.

In making steel dies the steel block on which the impression is to be made is placed in an iron case lined with fire-clay, or in plumbago crucibles bound with iron bands. The case is placed in a retort heated on all sides except the front, and the block is brought to the desired heat, while in order to prevent a scale forming on its face pipes convey carbonic acid gas to the retort so as to neutralise any free oxygen therein. While treating the block under the hammer, pipes are caused to supply gas and surround the block with an atmosphere of neutral gas when it is in position to receive the impression of the hammer with the matrix attached.

3918. CASE FOR THE RECEPTION OF EMBROIDERED AND OTHER TRIMMINGS, &c., *E. J. V. Earle, Oxford-street.—9th September*, 1881. 6*d*.

The trimming is wound on a flanged roller and inserted in a rectangular case of corresponding size, the top of which has a central longitudinal opening, and the ends of which form bearings on which the roller can turn.

3920. ROTARY ENGINES, *R. Hodson, St. John's Wood.— 9th September*, 1881. 10*d*.

This relates to improvements on patents No. 4458, A.D. 1875, and No. 3224, A.D. 1877, the object being to make rotary engines reversible without the use of bevel or other gearing, and it consists in providing each compartment of the cylinder with a pair of abutment valves, and a double set of steam induction passages controlled by an oscillating valve capable of an endway motion on its seat, so that when the reversing takes place the passages are brought alternately into communication with the exhaust passage by means of a plug cock actuated by the reversing gear. In combination with the reversing valve a second oscillating valve is employed, and forms the seat for the reversing valve, and controls the steam ports for the purpose of cutting off the steam at any required part of the stroke.

3921. BUTTON-HOLE STITCHING APPARATUS, *W. R. Lake, London.—9th September*, 1881.—(*A communication from J. Gutmann, Berlin.*) 6*d*.

The object is to provide a button-hole stitching apparatus which can be attached to any sewing machine in which the shuttle moves transversely to the feed motion. In the needle bar head a slide is provided, the adjustment of which is automatically effected by the machine in such a manner that before each stitch is made the slide is stitch by stitch alternately brought into one or the other of two determined positions, by which means the stitches for the edge of a button-hole can be produced with a single needle in a shuttle sewing

3922. UMBRELLAS AND SUNSHADES, *A. M. Clark, London.—9th September*, 1881.—(*A communication from F. M. C. Farradesche, Paris.*) 6*d*.

This relates to improved spring joints for the ribs and stretchers, and the stretchers and runners of umbrellas and sunshades, whereby they are more easily opened and closed completely.

3924. KEEPING TOBACCO MOIST, &c., *J. B. Davies, Bilbao.—10th September*, 1881.—(*Provisional protection not allowed.*) 2*d*.

A mould of plaster of Paris is used to form the lining of the tobacco-box or receptacle, and when the tobacco is too dry the mould is immersed in water, some of which it absorbs, and when the tobacco is placed therein it takes up the superfluous moisture from the mould.

3927. MANUFACTURE AND TREATMENT OF SUGAR, &c., *J. Duncan and B. E. R. Newlands, London.—10th September*, 1881. 6*d*.

This relates to the process of manufacturing sugar into sticks by casting it in a mould open at the bottom, but closed during the filling operation by being placed upon or over a bed-plate formed of or covered with a yielding material.

3932. IMPROVEMENTS IN DYNAMO AND MAGNETO-ELECTRIC MACHINES, *P. Jensen, London.—10th September*, 1881.—(*A communication from T. A. Edison, Menlo Park, N.J.*) 6*d*.

This relates to improvements on patent No. 1240, dated March 21st, 1881, which consists in the method of connecting copper bars B B1 with discs by means of ears A. The ears being now widened so as to close up the spaces between them. Bars B also extend straight to ears A, whilst B1 are curved over the first line of ears to ears H of the second line. The contacts between the ears and the bars are plated with gold and silver. For commutator connections, rods having nearly the same conducting area as the bars,

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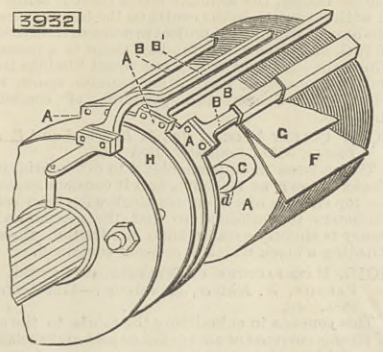

are used; these contacts are also plated. To place the copper discs outside the field of force, the thimbles C separate them from the core as shown. The copper discs have double bevelled edges forming angular spaces into which the projecting edges of the paper sheets used to insulate the copper discs are pressed to prevent electrical creeping between their edges. The copper bars are insulated by F parchment paper and G mica. An apparatus for driving a constant current of air through the armature is also described.

3933. FLOWER-POTS AND FLOWER-POT COVERS, *A. Booty, Harrogate.—10th September*, 1881. 4*d*.

Round the exterior, and at intervals above each other, are fixed or applied troughs of any desired shape.

3934. TRANSMITTING MOTION, *A. M. Clark, London.— 10th September*, 1881.—(*A communication from A. Samper, Paris.*) 10*d*.

This relates to improvements on patents Nos. 2906 and 3323, April, 1879. The spirals or turns of the round belt or cord upon the pulley are not separated one from the other, and form, so to speak, but one spiral; the belts or cords are regulated in their action, and put in tension without the aid of guide rollers.

3935. SPINNING AND DOUBLING COTTON, &c., *I. Buckley and E. Crossley, Dukinfield.—12th September*, 1881. 6*d*.

The carrier is slit to spring, and formed with a shoulder in connection with a bolster formed with a shoulder.

3936. HARVESTING APPARATUS, *H. K. Stone, Hull.— 12th September*, 1881. 6*d*.

This consists in combining with a reaping machine a set of cutters acting in advance of the ordinary cutters, and at an adjustable height above them, so as first to cut off the ears from the stalks or straw, and then to cut the stalks or straw off the ground. Secondly, in combination with the upper cutters of a travelling sheet or set of travelling bars to conduct the cut-off ears to the hinder part of the machine.

3937. DIRECT-ACTING STEAM PUMPS, &c., *G. Heywood and S. Spencer, Lancaster.—12th September*, 1881. 6*d*.

This relates to means for controlling the admission and omission of steam to and from the cylinder of pumping engines, and it consists in the use of a small cylinder A formed with a partition F so as to form two compartments having inlet and outlet ports D and E for live and exhaust steam. Within the cylinder work pistons G, the rods of which are carried by the frame P. With cylinder A is cast the flat slide valve J, moving over the valve face L, in which works piston M, the cylinder A and slide valve I being actuated to open and close the ports N and O by the frame P fitted loosely round the slide. To this frame is connected a rod Q working through a stuffing-box in the valve casing, and connected by a link to a pallet mounted on

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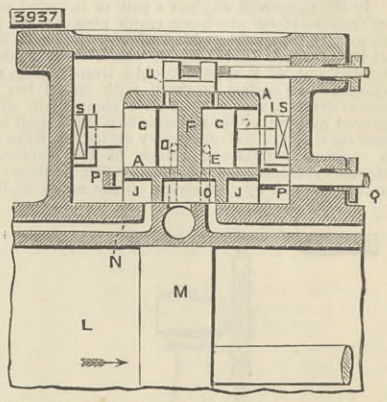


a stud and carried by a bracket bolted to the engine bed. A stud on the piston rod engages at each stroke of the piston with one of the arms of the pallet and reciprocates the frame, and thereby the cylinder A and valve J, so as to establish communication for the flow of steam to the cylinder L. The piston rods of pistons G carry blocks S fitted in slides I, so as to allow the cylinder A to bring down with it the pistons G when the valve face is worn. When piston M has completed its stroke the slide J opens a port, and steam flows into one of the compartments of cylinder A and effects the backward or forward stroke of the engine. In some cases an auxiliary valve U is employed.

3938. FRAMES FOR WASHING MACHINES, *A. Shaw, Lockwood, near Huddersfield.—12th September*, 1881. 6*d*.

This consists in the employment of metal tubing in the construction of washing and wringing machine frames.

3940. REMOVING CALCAREOUS AND OTHER IMPURITIES FROM WATER, *A. W. L. Reddie, London.—12th September*, 1881.—(*A communication from Baron N. de Derschau.*) 6*d*.

This relates to the purification of water charged with calcareous salts, such as the bicarbonates of lime and magnesia, or sulphate of lime, by passing it in contact with a filtering powder prepared from magnesia and sawdust, or its equivalent.

3949. OILING THE SHAFTING, SPINDLES, AND OTHER MOVING PARTS OF SPINNING, ROVING, AND OTHER MACHINERY, *W. Currie, Belfast.—13th September*, 1881. 8*d*.

This relates to apparatus consisting of a combination of oil vessels, their communications, and adjuncts, whereby the flow of oil in the apparatus and its exit at the points of discharge may be maintained, limited, regulated, or suspended, and whereby the apparatus between the main and distributing vessels may be kept wholly or partially filled with oil at will, notwithstanding that the discharge orifices remain open to the atmosphere.

3950. PREPARING HEELS OR HEEL-BLANKS FOR BOOTS AND SHOES, *W. Morgan-Brown, London.— 13th September*, 1881.—(*A communication from J. W. Brooks, Boston, U.S.*) 8*d*.

This relates to compressing and punching mechanism adapted to compress and condense the heels laterally by movable side pressers or dies, and also vertically by pressure applied at the top and bottom of the heel-blank.

3954. COUPLINGS FOR BROKEN SHAFTS, *A. Thompson, Southampton.—13th September*, 1881. 6*d*.

This consists in constructing the couplings for broken shafts in three segments.

3955. OIL LAMPS, &c., *J. Whitehead, Ashton-under-Lyne.—13th September*, 1881. 8*d*.

This relates partly to the manufacture of lamps for burning petroleum, paraffine, or other oils or spirits, constructed with the air chamber of not greater breadth than the dome or cone of the burner, and without a flange or ring projecting beyond the cone or dome, so as to cast little or no shadow downwards.

3957. GAS REGULATORS, &c., *W. T. Sugg, Westminster.—13th September*, 1881. 10*d*.

This consists, First, in a novel construction of apparatus for regulating the quantity of gas to be supplied to gas stoves, gaseliers, and in other places where the quantity of gas consumed and the pressure of the gas varies within considerable limits, and where it is impossible or undesirable to apply a regulator to each jet or burner; and Secondly, in the application of such apparatus or any other suitable gas regulator to gaseliers.

3960. MECHANISM FOR PIANOS, *F. Wirth, Frankfort.—13th September*, 1881.—(*A communication from G. Philipp, Forst-in-der-Lausitz, Germany.—(Not proceeded with.*) 4*d*.

This consists, First, in a combined check and repeater device; Secondly, in means for regulating and actuating the damper from the front by means of a jack; also in the arrangement of an independent forte stop placed in front of the action of an upright piano.

3962. PRODUCING OPEN FABRICS AND EMBROIDERED CLOSE AND OPEN FABRICS, *T. Coltman, Leicester.— —14th September*, 1881. 8*d*.

This consists of a rocking axle shaft carried by a bearing at each end, and also intermediate bearings where required. The rocking of the axle is effected by connecting links and levers operated by one or more cams on the main cam shaft of the machine to which the apparatus is applied.

3965. LAMP BURNERS AND WICKS, *J. S. Fairfax, London.—14th September*, 1881.—(*A communication from W. Painter, Baltimore, U.S.*) 6*d*.

This consists in a burner with a wick tube adapted to receive a double thickness of the wick and project it in the form of an abrupt loop to a fixed and definite distance above the tube in combination with a wick-moving mechanism, suitable mechanism being provided to move and support the loop.

3967. LAMPS AND BURNERS FOR CARRIAGES, &c., *J. G. Ellis, Earl's Court.—14th September*, 1881. 6*d*.

This relates to improvements in "gazine" lamps and burners, and has for its object to increase their illuminating power, and to afford greater safety in burning essential and volatile oils. A metal tube is screwed into the top of the reservoir and packed tight with cotton, wire, or porous clay, and round the top perforations are formed for the emission of the gas generated. The roof of the lamp is dome-shaped, and through its centre passes a funnel perforated at its

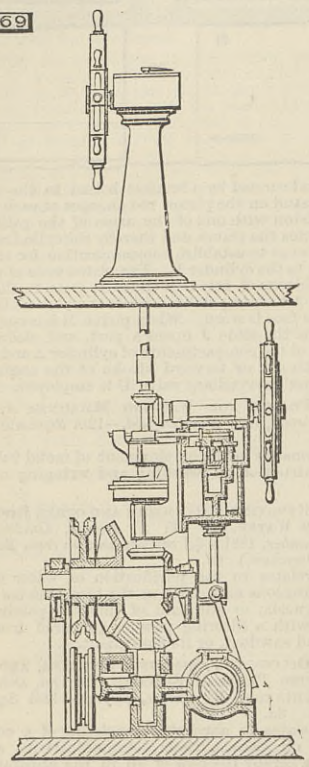
junction with the roof. Within this funnel is fixed a second funnel joined to the base of the first, but smaller in diameter at top, and not so high. The outer funnel is perforated at top above the dome, and is surrounded by a band surmounted by a cap. Louvres and slots are formed in the roof for the purpose of ventilation.

3968. Heating Water for Domestic Purposes, &c., *F. T. Bond, Gloucester.*—14*th September*, 1881. 8*d*.

The water vessel consists of a hollow metal cylinder fitted with a lid at one end having a hole through the centre, and inside the other end is fixed a hollow truncated cone with its edge secured to the edge of the cylinder. The upper edge of the cone has angular pieces cut out, and the space between it and the cylinder can be filled up to the bottom of such slits. Over the cone is mounted a series of trays with apertures for the passage of water from one to the other. The burner employed consumes a mixture of coal gas and atmospheric air.

3969. Steam Steering Engines, *H. Muir and J. Caldwell, Glasgow.*—14*th September*, 1881. 6*d*.

In the improved engines a pair of inverted vertical cylinders act on overhung crank pins at right angles to each other on the ends of a horizontal shaft, having at its middle a screw worm which is by preference turned out of a solid wrought iron forging, and is enclosed in a casing provided with an oil box. The worm drives a worm wheel on a short shaft, which is geared by bevel or spur wheels to a third shaft having fast on it either a chain pulley or barrel, from which a chain transmits the action to the rudder. The steam cylinders are provided with ordinary slide valves worked by excentrics on the worm shaft, and



the action of the engines is controlled by a third valve constructed like an ordinary slide valve and working upon a port face having ports communicating with the cylinder valve casing or casings and exhaust passages, and also having a port communicating with the exhaust pipe, the steam being admitted to the casing in which the third valve works, and the pressure keeping the valve tightly on its port face. The engines work in one direction or the other accordingly as the third slide valve is moved to uncover one or other of its ports.

3972. Stoves or Heating Apparatus, *S. C. Davidson, Belfast, Antrim.*—14*th September*, 1881. 6*d*.

This consists of an arrangement of stove wherein the products of combustion from a coke or charcoal fire burnt therein are mixed with a regulated amount of air to bring it to a suitable temperature, and the mixture drawn direct through a drying chamber, and through the substance spread therein, and the drying of which is thereby effected.

3975. A New or Improved Mode of and Appliances for Carrying or Laying Electric Wires, *J. W. Smith, Edinburgh.*—14*th September*, 1881. 6*d*.

This invention consists in making the curb stones and causeway blocks of streets hollow, so that the wires can be carried therein, provision being made for them to enter in or pass out where required.

3979. Covering the Outside of Tram-cars or Omnibuses to Protect Passengers, *E. H. Grey, Islington.*—15*th September*, 1881. 6*d*.

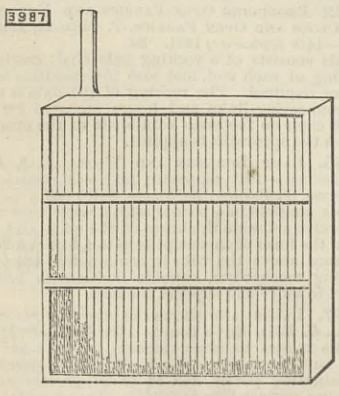
This relates to a waterproof covering which can be drawn up out of the way by means of cords when not required, a suitable frame being provided to hold it in position when lowered for use.

3980. Mechanical Game or Parlour Racecourse, *J. Maxfield, Islington.*—15*th September*, 1881. 6*d*.

This relates to a series of figures mounted on rods continued below the table of the racecourse, in which circular grooves are formed, the rods being each separately actuated by suitable gearing from a crank handle placed at different points round the course.

3987. Secondary Batteries or Magazines of Electricity, *J. S. Sellon, Hatton Garden.*—15*th September*, 1881. 6*d*.

The claims are, First, the use of supports to carry the spongy lead or other material, composed of alloys



of lead with antimony; Secondly, the use of plates composed of perforated strips, tubes, pieces, or woven fabrics of lead or the alloy supported by lead, carbon, or other suitable material. One form is shown in the figure.

3881. Abdominal Belts, &c., *H. Willington, Earl's Court-road.*—15*th September*, 1881. 6*d*.

This relates to forming belts so as to more effectually support the part to which it is applied and yet allow of the free movements of the body, and it consists in constructing the belt of a metallic or wirework skeleton frame shaped to fit the part to which it is applied.

3986. Safety Devices or Protectors for Watches, &c., *A. H. Turner, commonly called A. H. Firman.*—15*th September*, 1881. 6*d*.

A frame is secured inside the pocket, and is fitted with a pivotted lever, which is inserted through the watch ring and then turned, so as to secure the watch to the frame.

3988. Colouring Matter, *F. Wirth, Frankfort-on-the-Main.*—15*th September*, 1881.—(*A communication from Kalle and Co., Biebrich, Germany.*)—(*Not proceeded with.*) 2*d*.

This relates to an improved process for the production of various sulpho acids of rosaniline.

3989. Producing Cold Air, *E. Hesketh, Dartford.*—15*th September*, 1881. 6*d*.

This relates to machines for producing cold in which air, after being compressed, is expanded in a cylinder to atmospheric pressure, and it consists in preventing the accumulation of snow in the cylinder by placing the delivery valves at the end of the cylinder, which is made to converge towards the valves, so that when they are opened to deliver the expanded air all snow deposited in the cylinder is swept along and discharged. To clear the air discharged from snow it is conducted to a snow-box of any convenient form.

3990. Fire-extinguishing Apparatus, *A. M. Clark, London.*—15*th September*, 1881.—(*A communication from P. Oriolle, Nantes.*) 6*d*.

This relates to a set of pipes containing water under pressure, such pipes being kept closed by a device partly made of fusible metal, which, when exposed to a slightly elevated temperature, gives way and uncloses the pipe, thus allowing a constant stream of water to play on the fire.

3992. Beetling Machines, *C. Edmeston, Salford, and S. Smith, Manchester.*—16*th September*, 1881. 6*d*.

This consists in making the "fallers" of metal of rectangular cross section, with an eye formed to receive a wood "tappet" for the "wipers" to act upon.

3996. Twisting, Doubling, or like Manipulation of Cotton or other Fibrous Material, &c., *A. Yates. Derby.*—16*th September*, 1881. 6*d*.

This relates more particularly to "doubling," and its object is to dispense with the drawing rollers, and consists in a method of regulating the yarn in the creel itself, whereby all "roller laps" and like waste are avoided, and a better and more even drag maintained during the twisting. For this purpose a number of bobbins are mounted round a drum, their axes being capable of gravitating down rigid slides inclined, so that the bobbins pressing with part of their weight on the drum are driven by frictional contact therewith. The threads are guided through the wetting trough under and over rollers mounted on counterweighted dipping levers.

4003. Iron and Steel Wheels for Railway and other Carriages, &c., *W. Somers, Halesowen, Worcester.*—16*th September*, 1881. 6*d*.

A mass of iron or steel to form the wheel is raised to a bright red heat and placed in a die having the figure of a short hollow cylinder closed at bottom and having a central hole in the bottom, such die being supported on a firm base on which it can turn. Over the mould is a steam hammer with an acting face equal to the diameter of the interior of the mould, and by its action, combined with the slow rotary motion imparted to the mould, the heated iron or steel is spread out from the centre to the marginal portions of the mould.

4006. Sawing Machinery, *F. Myers, New York.*—16*th September*, 1881. 6*d*.

This relates chiefly to sawing planks for making packing cases, and consists in means to guide the boards so that the pieces cut by the saws will be truly rectangular. Two independent saws are employed, one serving as a cross-cutting saw, and the other as a ripping saw, and the wood is presented first to the former by a transversely moving guide, and then to the latter by a longitudinal adjustable guide.

4009. Screw Propellers for Ships, *R. M. Steele, Hampstead.*—17*th September*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to a propeller rim, and consists of a fixed structure or rim in axial line with the propeller, and of approximately similar diameter to its boss at the points of proximity.

4010. Cooking Stove, *J. Imray, London.*—17*th September*, 1881.—(*A communication from La Société des Specialités Mecaniques Reunies, Paris.*) 6*d*.

On a wooden base resting on an iron rim is fixed a double casing, the annular space therein being filled in with sawdust. In the centre on the base is placed the fire-box, in which bars project upward to receive blocks of fuel, and under the fire-box there is a passage to admit air. A boiler or cooking vessel fits into the top end of the casing, leaving an annular space, round which the flames and products of combustion circulate.

4012. Pulley Blocks, &c., *T. H. Ward and E. Howl, Tipton.*—17*th September*, 1881. 6*d*.

This relates more particularly to differential pulley blocks known as Weston's, and it consists in making the top sheaves of a Weston's block with their relative diameters proportioned so that the mechanical efficiency is slightly greater than the friction, thus constituting a block which is non-self-sustained.

4015. Manufacture of Velvets and other Pile Fabrics, *W. Mather, Manchester.*—17*th September*, 1881. 4*d*.

This consists in submitting the fabric to the action of strong currents of air heated or cold and moistened, if requisite, after the colouring matters have been applied to the fabrics in the usual manner, thereby obviating the necessity of hanging the velvet or other pile fabric, and allowing it to remain for a long time in a large stove or drying room.

4016. Pocket Knives, *W. A. Barlow, London.*—17*th September*, 1881.—(*A communication from Bierhoff and Wever.*—(*Not proceeded with.*) 2*d*.

This relates to knives which combine certain useful articles, such as a corkscrew and champagne knife, in addition to the blades.

4017. Improvements in Electric Lamps, &c., *S. Hallett, London.*—17*th September*, 1881. 4*d*.

This relates to incandescent lamps. The inventor supports his filaments in a foundation of lime, mounted between two platinised carbon discs, and covers the incandescent portion by a shell of silicon, thereby providing an impervious coating against the action of atmospheric gases, or he places the silicon inside a cylinder of lime. The glass globes surrounding the whole are of the usual shape, and exhausted in the ordinary manner.

4018. Covering or Shading Devices for Increasing Illuminating Effect of Gas Flames, *F. Wirth, Frankfort.*—17*th September*, 1881.—(*A communication from A. Gruis, Heilbronn.*)—(*Not proceeded with.*) 4*d*.

The apparatus is so constructed as to cause the air for supporting the combustion of the gas to be heated before it reaches the flame.

4019. Improvements in Generating Dynamic Electricity, *G. E. Dering, Lockleys, near Welwyn, Herts.*—17*th September*, 1881. 6*d*.

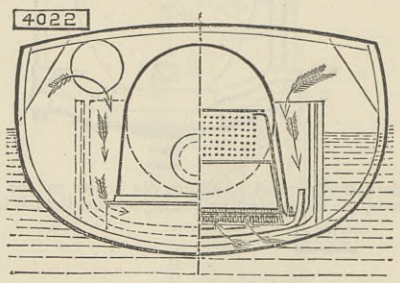
This invention consists in improvements in the Grove gas battery whereby the inventor converts it into a cheap and powerful generator of electricity. He substitutes atmospheric air for the oxygen gas usually employed as the negative element, and for the positive certain inexpensive oxidisable gases, such as common coal gas, &c. The inventor stores his gases in large reservoirs, from which pipes lead to the various cells of the battery. Instead of using platinised carbon or platinum for the conductor in contact with the negative gas, the inventor employs ordinary coke, and for the positive conductor he uses an alloy of lead and tin and a small percentage of other metals, coated with platinum or silver. The inventor obtains better results with spiral or coiled conductors than with flat. The liquid used is acidulated water as in the usual form of battery.

4021. Lamps, *T. Ward, Kentish Town.*—19*th September*, 1881. 6*d*.

This relates especially to lamps for use on pianofortes or other musical instruments. The body or reservoir is of an oblong, oval, or egg shape at bottom, tapering to a circular form at top, where the burner is attached, and has a metal piece fixed to the back and formed with a socket to adjust the height of the lamp on a rod or stand secured to the instrument.

4022. Torpedo Boats, *A. F. Yarrow, Isle of Dogs.*—19*th September*, 1881. 6*d*.

The object is to protect the fire of the boiler in torpedo boats and other vessels from being extinguished by the ingress of water into the vessel, and it consists in completely enclosing the part of the boiler



containing the furnace in a water-tight casing extending upwards above the level of the water by which the vessel floats. In cases where the furnace is shallow and has a fire-bridge at the end of the fire-bars, the space between the bridge and tube plate is kept clear of ashes or cinders by means of jets of steam or compressed air, which eject such ashes and cause them to be carried through the tubes by the draught.

4024. Improvements in Electric Lamps, *W. Morgan-Brown, London.*—19*th September*, 1881.—(*A communication from E. M. Fox, New York.*)—(*Not proceeded with.*) 2*d*.

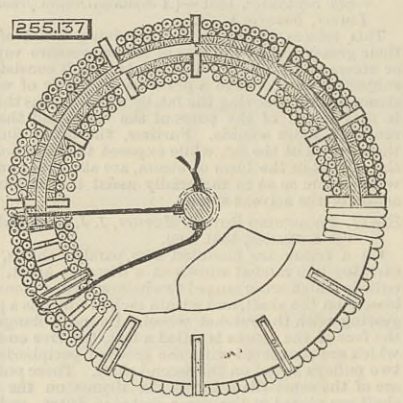
The object of this invention is to facilitate the construction of incandescent lamps by means of an apertured stop plug, through which the air can be drawn off so as to obtain a vacuum, and the globe subsequently rendered air-tight by simply turning the plug round. This plug is also used as a support for the conducting wires and carbons.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

255,137. Armature for Dynamo-electric Machines, *George H. Brown, New York, N.Y., assignor to Charles A. Cheever, same place.*—*Filed November* 14*th*, 1881.

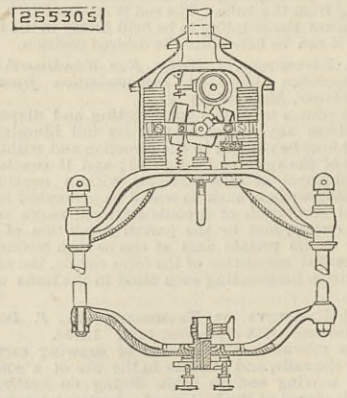
Brief.—The core of the armature has a section cut out, leaving a space, through which the separately-wound bobbins may be slipped to place them on said



core. The ends of the core are dovetailed, and a section correspondingly dovetailed completes the ring. Before placing this section in place a bobbin is slipped thereon to complete the annular series of bobbins.

255,305. Electric Lamp, *Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y.*—*Filed August* 4*th*, 1881.

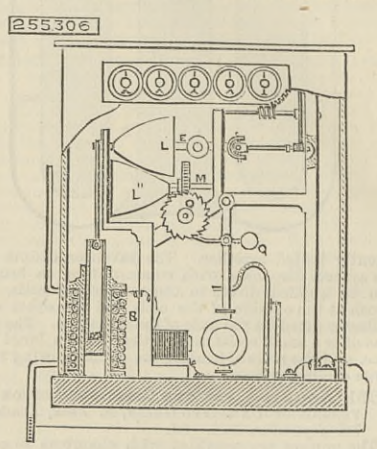
Claim.—In an electric lamp, a frame of magnetic metal supporting the feed-regulating mechanism, the sides of said frame being provided with pole pieces and wound with an insulated conductor forming part



of the lamp circuit, substantially in the manner set forth, to form the feed regulating magnets. The combination, in an electric lamp, of parallel cores, having consequent poles A^1 A^2 and coils C C^1 included in the main or arc circuit, armature E, pivotted between the said poles and having coils F, forming part of a shunt about the lamp carbon holding rod K, and mechanism connected with the pivotted armature and adapted to control the descent of the carbon holder, as set forth. The combination of pivotted armature E, link, and frame G, having shafts carrying friction wheels journalled therein, which are adapted to engage with the carbon holder K, one of said shafts being provided with a friction disc H, whose rotation is controlled by a detent carried by the armature E, substantially as set forth. The combination, in an electric lamp, with a carbon holding rod, of a cut-out or switch consisting of a pivotted contact lever V, insulated terminals T T^1, and a spiral spring connected to the lever at a point directly above the fulcrum, as and for the purpose set forth.

255,306. Electric Meter, *Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y.*—*Filed July* 20*th*, 1881.

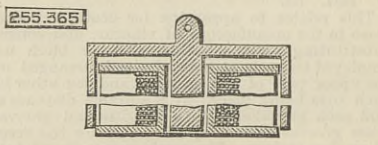
Claim.—(1) In an electric meter, the combination with the axially-movable core of the magnet B, of the universally jointed shaft E, connected thereto by an intermediate link, and also connected by intermediate gears with a registering apparatus, and carrying the conoid L^1, arranged to rock longitudinally upon the conoid L^2, mounted upon a shaft journalled in fixed bearings and rotated by armature mechanism, substantially as described. (2) In an electric meter, the combination, with a registering apparatus, of a conoid L^1, mounted upon a universally-jointed shaft in gear with said registering apparatus, a conoid L^2, mounted upon a shaft rotating in fixed bearings and supporting the first-named conoid upon its surface, suitable devices for varying the point of contact between said conoids by the influence of an electric current



over the main line, and automatic mechanism for rotating said conoid L^2 under the influence of a current derived from said main line, substantially as described. (3) The combination, with the registering apparatus and the electro-magnet B, arranged for connection with a main line, and provided with an axially movable armature, of the universaliy jointed oscillating shaft E, in connection with said apparatus and carrying the conoid L^1, a link connecting said shaft with said armature, the conoid L^2, mounted upon shaft M, carrying a worm wheel, the ratchet wheel O, fixed upon a shaft carrying a worm meshing with said wheel, an electro-magnet in a circuit derived from the main line, a pendulum adapted to be oscillated thereby and provided with a pawl, substantially as described.

255,365. Electro-magnet, *Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y.*—*Filed August* 10*th*, 1881.

Claim.—(1) The combination, with a hollow helix of insulated wire, of a movable armature composed of a central core extending entirely through the helix, and an inclosing shell, of iron, of equal length therewith, substantially as set forth. (2) The com-



bination, in an electric lamp, with the swinging lever or frame supporting the feed-regulating mechanism, of a hollow stationary helix composed of one or more coils of insulated wire, as described, and a movable armature consisting of a central core capable of extending entirely through the helix, and an inclosing shell, of iron, of equal length therewith, substantially as shown and described.

CONTENTS.

The Engineer, April 28th, 1882.

Wood enclosed in a close chamber, and submitted to the action of steam for a limited time, will be rendered so pliant that it may be bent in almost any direction. The same process will also eliminate the sap from the wood, and promote rapid seasoning.