KRUPP'S MEPPEN EXPERIMENTS FOR 1882.
No. II.

Resuming our account of these experiments, we go on to consider the

21 *cm. Mortar.*—In conformity with its small charges, the 21 cm. mortar (8·27in.) has but little length — 1·33 m. (4ft. 4·4in.) 6·35 calibres its total length, and 1·05 m. (3ft. 5in.) 5 calibres length of bore. It only weighs 1165 kg. (nearly 1 ton 3 cwt.), not even thirteen times the weight of its own projectile. It has the Krupp breech-closing arrangement, with axial vent, &c. The mortar—see Fig. 8—is on a carriage with iron brackets with a rack and pinion elevating arrangement, giving angles of elevation from 25 to 60 deg. The carriage rests on a bed of wood; it pivots so as to be able to fire 30 deg. to either side of the direct line. This mortar being a siege piece, is rendered portable by means of an axletree and wheels fitting beneath the bed. The weights are as follows:—Gun, 1165 kg. (1 ton 2 cwt. 3 qr. 2 lb.); carriage, 950 kg. (18 cwt. 2 qr. 22 lb); platform, 1670 kg. (3 cwt. 1 qr. 4 lb.); parts for transport purposes 603 kg. (11 cwt. 3 qr. 13 lb.); total weight, 4388 kg. (4 tons 6 cwt. 1½ qr.); limber, 412 kg. (8 cwt.); total, 4800 kg. (nearly 4 tons 14 cwt. 2 qr.) In its total weight the 21 cm. mortar lies between the 21 and 15 cm. siege guns. For special purposes the piece and its carriage can be mounted and transported separately.

Projectiles.—The object of a mortar is so different to that of a gun that the projectiles ought to be affected by it. Speaking generally, the walls of mortar shells are thinner than those of guns, because the pressure of gas is much less—perhaps in the proportion of 1 to 2. A mortar is exclusively intended to fire at high angles of elevation. It may be required, first, to demolish earthworks; secondly, to fire on troops under cover; thirdly, to force in the roofs of covered earthworks. To demolish earthworks it is necessary to have shells which penetrate well before bursting, which contain a large bursting charge, and which are sufficiently strong for the powder to be as completely burnt as possible before the commencement of the mining action. High angles of elevation should be employed and percussion fuses with slow action. Cast iron shells are less effective, because they require thick walls, and consequently contain comparatively small bursting charges and because they offer but slight resistance to the action of the bursting charge, so that explosion takes place before the powder is all burnt. Steel common shell are much better. If fixed charges be adopted, the thickness of steel shell may be brought very low; then to get the normal weight for the shell the length may be increased. Thus shells may be obtained with very great bursting charges up to the shells termed "torpedo shells." The mortar throws, then, three kinds of shell—common cast iron shells, common steel shells, and torpedo shells of steel. The details of these are given in the table on the next page. For the second purpose of a mortar—firing at troops under cover—the common shell is less suitable than the shrapnel with time fuse. Sufficient strength for this projectile may be obtained by cast iron, but the thick sides diminish the number of balls. On the other hand, it is necessary to increase the velocity of the balls by means of a charge placed in the bottom of the shell to give them sufficient penetration. This charge only has the desired effect if the material enclosing it offers sufficient resistance to cause the shrapnel shell itself to act like a mortar.* The steel shrapnel alone satisfies these conditions. The effects of it not the cast iron shell, therefore, are here noticed. The mean weight of the 21 cm. shrapnel is the same as that of the common shell, 91 kg. (200·6 lb.) It contains 1680 to 1700 balls of 26 gm. (14·6 drams av.), or from 730 to 735 balls of 60 gm. (2·1 oz. av.) The bursting charge is 1 kg. (2·2 lb.), but it can be increased if desirable. The time fuses have a maximum length of 28 seconds. They have also a percussion arrangement which acts on impact. Fuses for special angles of elevation and times of flight will be made of 40 seconds time of burning. The third object of mortar fire, the forcing in of roofs formed of arches, or of railway iron, &c., should be performed by common shell. While in the demolition of earthworks the action of the fuse must be delayed to obtain a sufficient depth of penetration, here the shell should explode immediately at the end of its descent, otherwise power may be lost by the shell exploding as it is rising after graze. It is well known that this difficulty has not been hitherto remedied by even the quickest action fuses. The explosion must be quickened as far as possible, however. For service purposes one kind of powder should be used in all cases with this piece. Three kinds were here tried: (1) large grains of from 6 to 10 mm.; ditto, from 10 to 13 mm.; and prismatic powder with seven channels "C/68." The maximum charge gave the highest initial velocity tried with the 91 kg. shell, namely, 200 m. (656·2ft.)

Results.—305 rounds were fired without showing the least traces of erosion in the bore of the piece. The powder of large grains, 6 to 10 mm., in a charge of 3·7 kg. (8·16 lb.) gave a velocity of 203·5 m. (666ft.) with a pressure of 1485 atmospheres (9·75 tons), 3·6 kg. (7·9 lb.) of this powder gave an initial velocity of 200 m. (656·2ft.) with a pressure of gas of 1420 atmospheres (9·3 tons).

Accuracy.—Prismatic powder gave the best results with the maximum charge, but the 6 to 10 mm. was better for smaller charges, and was recommended for all cases except perhaps special cases where a mortar was mounted where it would habitually fire its maximum charge, as might be the case on the coast. The firing of this rifled mortar is very much more powerful and accurate than that of smooth bores. To compare them together, the 50 lb. mortar, weighing 980 kg. (216·1 lb.) carriage without platform 975 kg. (215·0 lb.), threw shells of 56 kg. weight (123·5 lb.) up to a range of 1600 m. (1749 yards). The 21 cm. rifled mortar, with a weight of 1165 kg. (1 ton 3 cwt. nearly) carriage without platform 950 kg. (2094 lb.), throws shells of 91 kg. (200·6 lb.) up to 3600 m. (3937 yards). Thus with a total weight of only 8 per cent. increase, a projectile 62 per cent. heavier is thrown up to a range 125 per cent. greater. With 30 deg. elevation, the 50 lb. mortar, with charge 1·4 kg. (3·1 lb.) gave a range of 1047 m. (1145 yards) with a rectangle of 19 m. (20·8 yards) long and 10·8 m. (11·8 yards) wide. The 21 cm. mortar, with a charge of 1·45 kg. (3·2 lb.), at 30 deg. elevation, had a range of 1118 m., and threw

* The 10·5 cm. steel shrapnel bursting charge alone imparts to its balls a velocity of 120 m. (393·7ft.)

FIG. 8

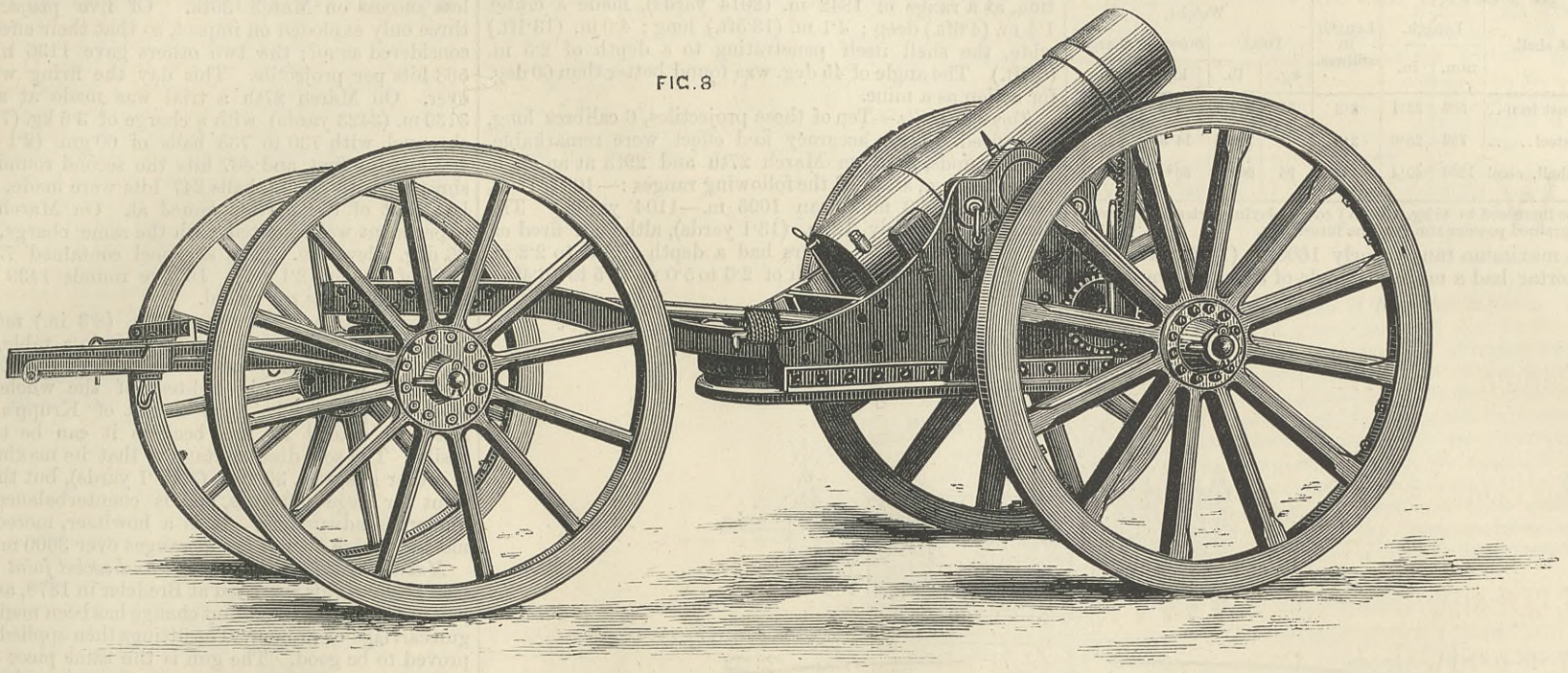


FIG. 9

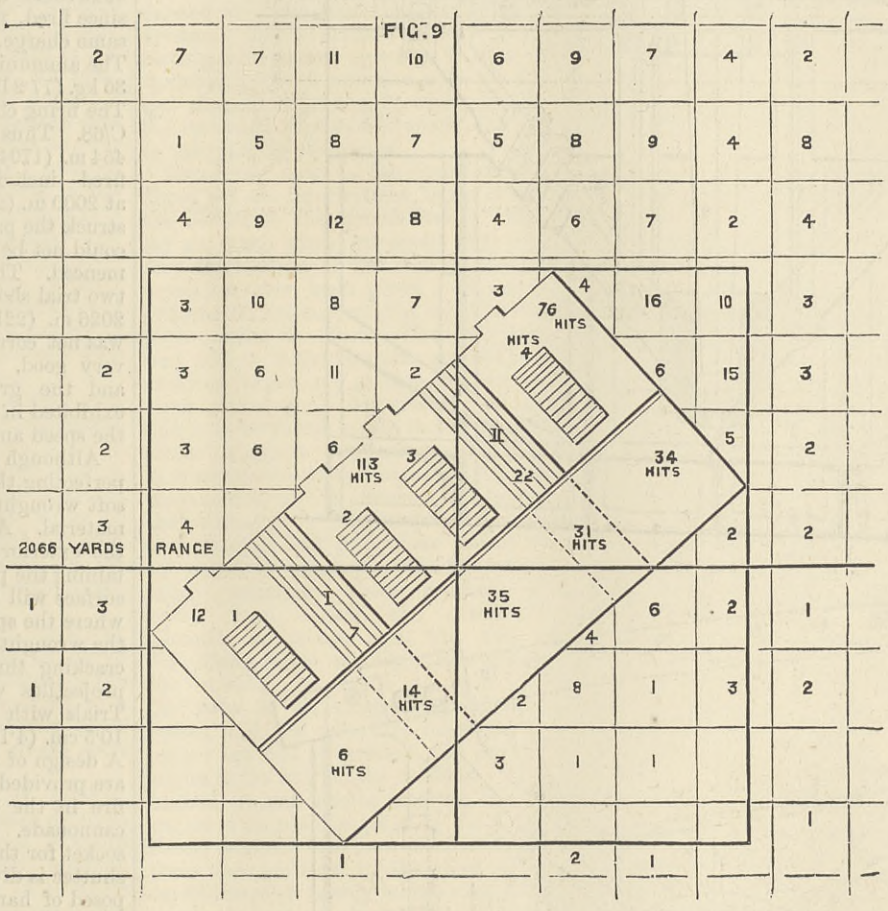


FIG. 10

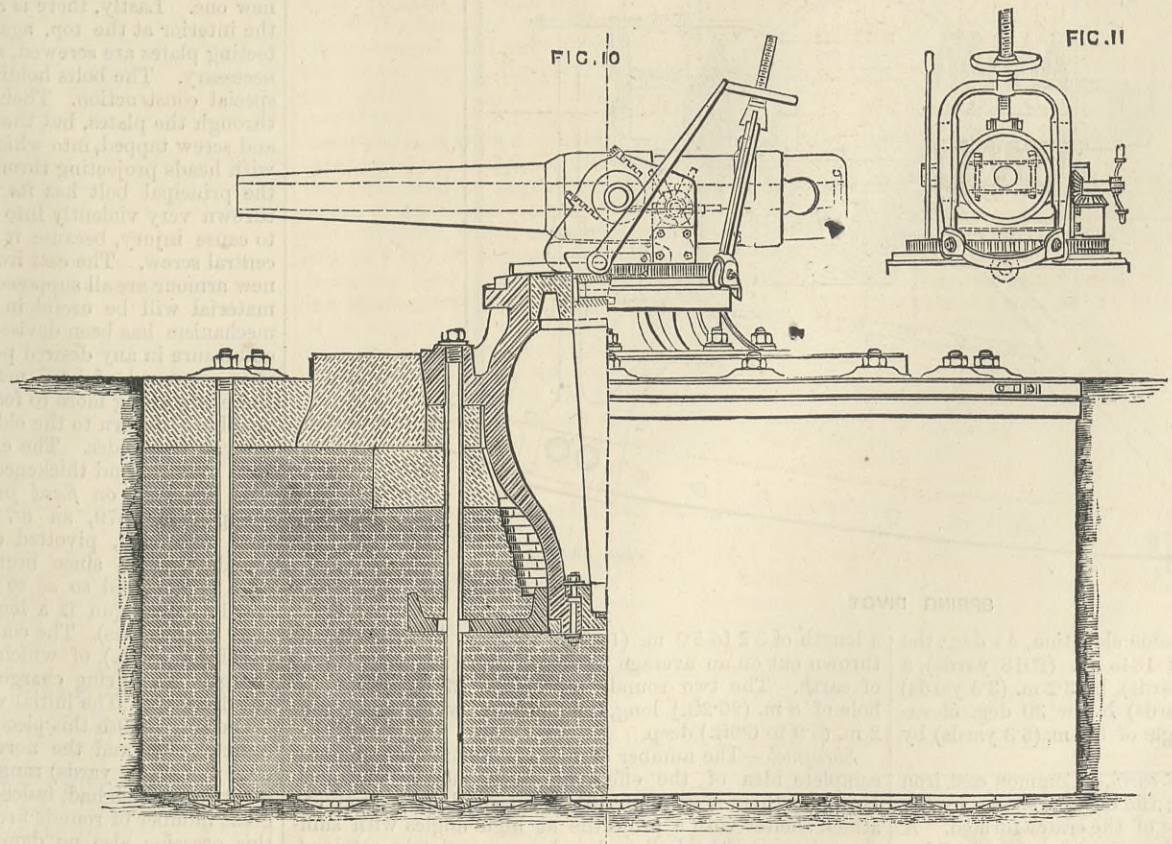


FIG. 11

with about the same charge its shell of 91 kg. (200·6 lb.) about as far as the 50 lb. mortar, whose shell weighed only 56 kg. (123·5 lb.) The 21 cm. mortar had a mean rectangle of only 3·5 m. (3·8 yards) in length, and 1 m. (1·1 yard) in breadth.

Particulars of Mortar Ammunition.

Kind of shell.	Length.		Length in calibres.	Weight.			
				Total.		Bursting charge.	
	mm.	in.		kg.	lb.	kg.	lb.
Common cast iron ..	586	23·1	2·8	91	200·6	4·8	10·6
Common steel.. ..	732	28·6	3·5	91	200·6	14·5	32
Torpedo shell, steel	1256	49·4	6	95	209·4	36*	79·4

* May be increased to 48 kg. (106 lb.) by employing prismatic powder with fine grained powder run into the interstices.

At its maximum range nearly 1600 m. (1750 yards) the 50 lb. mortar had a mean rectangle of 36 m. (39 yards) by 26 m. (28·4 yards). With the same elevation, 45 deg., the 21 cm. mortar had a range of 1845 m. (2018 yards), a mean rectangle of 9·2 m. (10·1 yards), by 3·2 m. (3·5 yards) At a range of 1600 m. (1750 yards) below 30 deg. elevation, it had only a mean rectangle of 5·8 m. (6·3 yards) by 3·4 m. (3·7 yards.)

The effect of filled shell against earth.—Common cast iron and steel shells were employed ; the effect is shown by the depth of penetration and the size of the crater formed. A steel common shell at—with a bursting charge of 14·5 kg. (32·0 lb.)—a range of 1881 m. (2057 yards), 28 deg. elevation, in sandy soil made a crater of a depth of 1·7 m. (5·6ft.); length, 4·7 m. (15·4ft.); breadth, 3·5 m. (11·5ft.) A cast iron common shell, with a bursting charge of 4·8 kg. (10·1 lb.), range 1315 m. (1438 yards), 55 deg. elevation, in sandy soil made a crater of a depth of 0·9 m. (3·0ft.); length, 2·0 m. (6·6ft.); breadth, 1·9 m. (6·2ft.), the shell itself penetrating to a depth of 1·0 m. (3·3ft.) These results were considered bad, owing to the small angle of elevation. On June 20th a steel shell with 45 deg. elevation, at a range of 1842 m. (2014 yards), made a crater 1·4 m. (4·6ft.) deep ; 4·1 m. (13·5ft.) long ; 4·0 m. (13·1ft.) wide, the shell itself penetrating to a depth of 2·5 m. (8·2ft.) The angle of 45 deg. was found better than 60 deg. for action as a mine.

Torpedo shells.—Ten of these projectiles, 6 calibres long, were fired. Their accuracy and effect were remarkable. Four rounds, fired on March 27th and 29th at an angle below 35 deg., attained the following ranges :—1094, 1103, 1091, and 1093 m. (mean 1095 m.—1104 yards.) The rectangle was only 12 m. (13·1 yards), although fired on different days. The craters had a depth of 1·0 to 2·2 m. (3·3 to 7·2ft.), and a width of 2·6 to 5·0 m. (8·5 to 16·4ft.), a length of 3·2 to 5·0 m. (10·5 to 16·4ft.) Each shell had thrown out on an average 7 cubic metres (9·2 cubic yards) of earth. The two rounds on March 29th produced a hole of 8 m. (26·2ft.) long, 5 m. (16·4ft. wide, and 1·8 to 2 m. (5·9 to 6·6ft.) deep.

Shrapnel.—The number of hits is not sufficient to give a complete idea of the effect of these mortar shrapnel. However there is no doubt that the desired end, namely, to attack shelter with a projectile at high angles with sufficient force to the bullets has been completely attained. The following results may be noticed :—No. 5 round, at 33 deg. elevation, bursting 45 m. (147·6ft.) above the ground, discharged in the interior of a battery of 360 sq. m. (463 square yards), 230 balls, and on the epaulment measuring 270 sq. m. (320 square yards), 120 balls—*vide* Fig. 9. Five rounds fired on March 24th gave a total number of hits of 510 in the interior of the battery (360 sq. m. or 463 square yards), and 369 hits on the parapet (270 sq. m. or 320 square yards), and 3831 on the area marked out, the same shown for round 5 in Fig. 7. The trial was repeated with less success on March 30th. Of five projectiles fired three only exploded on impact, so that their effect must be considered as *nil*; the two others gave 1136 hits, that is 568 hits per projectile. This day the firing was too far over. On March 27th a trial was made at a range of 3130 m. (3423 yards), with a charge of 3·6 kg. (7·9 lb.), the shrapnel, with 730 to 735 balls of 60 gm. (2·1 oz.), gave 403 hits the first, and 467 hits the second round. With a shrapnel with 26 gm. balls 247 hits were made, all on the last part of the portion aimed at. On March 29th the experiment was repeated with the same charge, 3·6 kg. at 36 deg. elevation. The shrapnel contained 730 to 735 balls of 60 gm. (2·1 oz.). In five rounds 1439 hits were made or 288 hits per round.

A comparison of Krupp's 21 cm. (8·3 in.) mortar with those of similar construction is made in a table, by which it appears that it only weighs about half the English 8in. howitzer, which is the lightest of the whole—Krupp's piece excepted. The light weight of Krupp's mortar is likely to extend its use, because it can be transported easily. The sole disadvantage is that its maximum range is rather less, viz., 3600 m. (3937·1 yards), but this is sufficient for siege purposes, and is counterbalanced by the numerous advantages. It is a howitzer, moreover, not a mortar, which should fire at ranges over 3600 m.

Muzzle pivotting gun by ball-and-socket joint in wrought iron plate.—This was tried at Bredelar in 1878, and at Meppen in 1879. No important change has been made in either gun carriage or armour. The fittings then applied have been proved to be good. The gun is the same piece which was at Bredelar and Meppen ; twenty-three rounds have been since fired, making a total of 450 rounds in all with the same charge, &c. The gun shows no sign of serious wear. The ammunition consists of common shell of cast iron of 35 kg. (77·2 lb., including a 2 kg.—4·4 lb.—bursting charge). The firing charge is 6·5 kg. (14·3 lb.) of prismatic powder C/68. Thus fired the projectile has an initial velocity of 454 m. (1794·5ft.). On March 30th, eleven rounds were fired—including trial shot—filled as on service at a battery at 2000 m. (2187·3 yards) range ; five rounds fell short, five struck the parapet. Although the effect of so few rounds could not be great, it was evident that a breach was commenced. Then twelve rounds of plugged shell—including two trial shots—were fired for speed against a target at 2026 m. (2215·7 yards) range. The laying of the piece was not corrected during the series.* The accuracy was very good. The mechanism of the carriage acted well, and the great advantages of the system were again exhibited in maintaining its direction throughout, and in the speed and ease with which it is worked.

Although the shield has not been altered, the efforts for perfecting the system have not ceased. A portion of the soft wrought iron about the port will be replaced by harder material. After various experiments it is decided to make the exterior and interior parts of the centre portion containing the port of hard and soft steel, so that the exterior surface will be hard, while the interior, with the portion where the spherical muzzle collar rests, will be soft. Thus the wrought iron bed will hinder as long as possible the cracking through of the entire piece, while the enemy's projectiles will break against a hard exterior surface. Trials with such a piece in the middle of a shield of 10·5 cm. (4·1in.) have given an entirely satisfactory result. A design of an improved shield is given. In this, means are provided for changing the parts exposed to the enemy's fire in the event of their not bearing a long continued cannonade. Thus the centre piece carrying the hinder socket for the spherical muzzle head is removable. The shutter is divided in two parts, and the upper one, composed of hard metal on the exterior, can be replaced by a new one. Lastly, there is a solid wrought iron strip along the interior at the top, against which wrought iron protecting plates are screwed, so that they can be removed if necessary. The bolts holding the plates together are of a special construction. Their screw only enters half way through the plates, but the bolts have axial holes drilled and screw tapped, into which are centred small screw bolts with heads projecting through the full-sized bolt head. If the principal bolt has its head shaken off it cannot be thrown very violently into the interior of the work so as to cause injury, because it is held in place by the small central screw. The cast iron blocks at the bottom of the new armour are all supposed to be of hard cast iron. This material will be useful in less exposed works. A new mechanism has been devised to support the shutter of the embrasure in any desired position. Like the centre piece, it is composed of hard metal on the exterior, and when there is nothing more to fear from the enemy's blows, it is possible to return to the old form of shutter, on which the exterior face slides. The exterior piece of the shutter has been rounded and thickened.

15 *cm. gun on fixed pivot.*—In the experiments at Meppen in 1879, an 8·7 cm. (3·4in.) gun 50 calibres long was tried, pivotted on a fixed bed. On the same foundation has since been placed a 15 cm. (5·9in.) gun, on a pivot fixed so as to have no recoil—*vide* Figs. 10 and 11. The gun is a long 15 cm. (5·9in.) gun, weighing 4350 kg. (4¼ tons). The common shell, of cast iron, weighs 31·5 kg. (67·4 lb.), of which 2·1 kg. (4·6 lb.) is the bursting charge. The firing charge is 8 kg. (17·6 lb.) of prismatic powder C/68. The initial velocity is 505 m. (1656·9ft.).

On March 29th this piece fired five rounds with plugged common shell and the normal firing charge at a target at 2026 m. (2215·7 yards) range. The object was to test the pivotting, which had, indeed, already completely resisted a great number of rounds fired with the normal charge. On this occasion also no damage was to be detected in gun, carriage, or foundation. The immovability of the gun was

* This piece, not recoiling, does not require to be laid, but only its aim altered if desired between successive rounds.

FIG 12

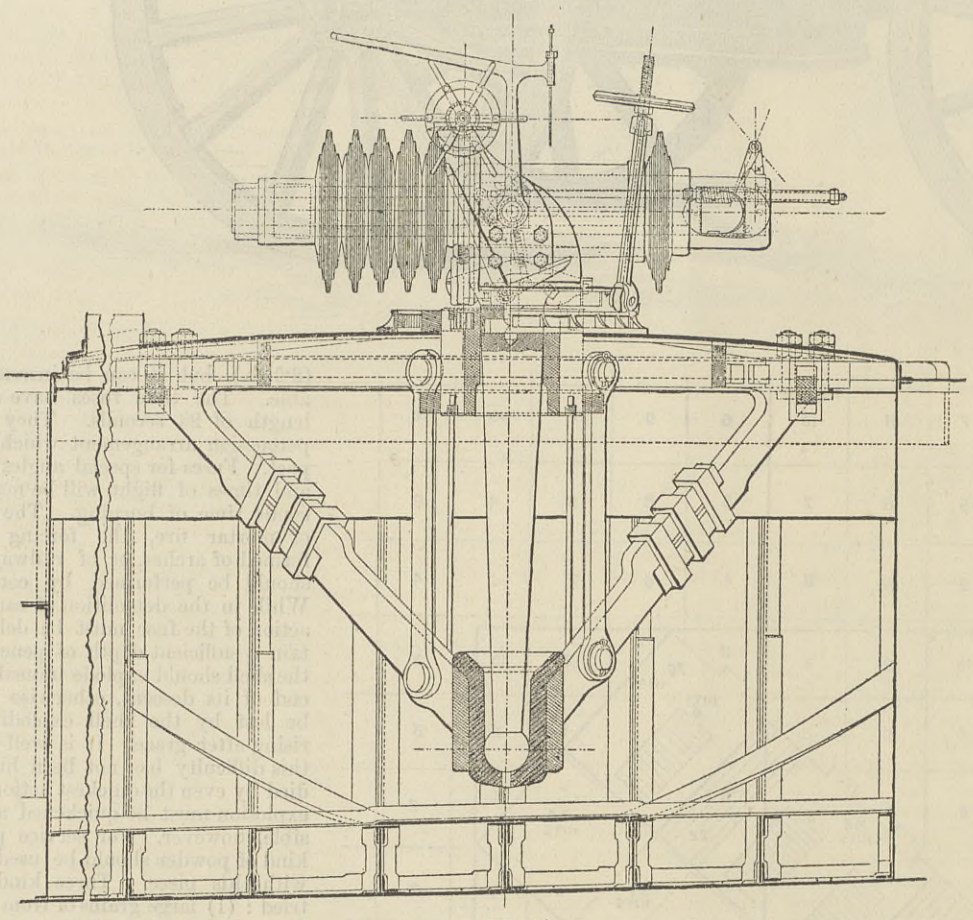
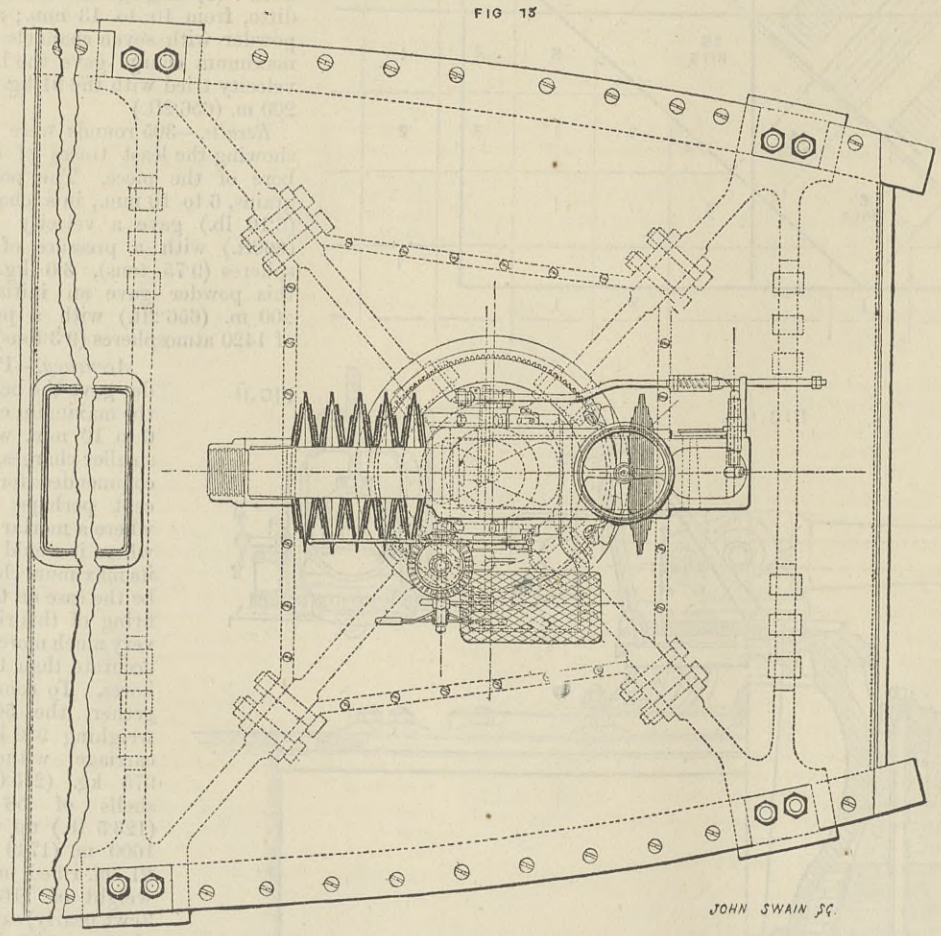


FIG 13



SPRING PIVOT

proved by laying small coins of money on it, which retained their place while the gun was being fired.* The mechanism of carriage, with the arrangements for elevation and traversing, acted well.

The chief advantages of the fixed pivot gun are as follows:—Easy working, rapid fire, great scope horizontally, a small object exposed. The gun is specially intended for coast defence, but it might be employed also in forts against land attacks. To protect the piece of cast iron which is round the pivot, and which is fitted at its base into masonry —*vide* Figs. 11 and 12—it will be necessary to have an annular screen, either a segment or complete circle. The men and carriage mechanism may be covered by an inclined shield fixed on the cheeks of the carriage.

Gun on spring pivot.—The spring construction of pivot allows the gun a certain recoil in its trunnion bearings, which recoil is limited by spring discs placed between the trunnion bearing-frame and the muzzle of the gun. The object is to diminish the effect of recoil and save the pivot, which may be specially important on board ship. This gun was mounted in a special manner, with the sole object of measuring the difference in the recoil with and without springs. Timber was employed to make a structure which need not here be described. The action of the gun on springs is as follows:—On firing, the six pairs of disc springs in front of the trunnion bearings are compressed, and the gun recoils about 80 mm. (3·15in.). The springs then recover themselves, and bring the gun forward again. In order not to force on the trunnion bearing frame too hard, a pair of stronger disc springs are placed behind it. To use the gun as on a fixed pivot the springs were replaced by a long socket, which slipped over the gun, resting against the trunnion bearing frame at one end, and screwing on to the muzzle at the other.† This spring pivot gun of 8 cm. (3·15in.) fired three rounds on March 29th, and after removing the disc springs it immediately fired three other rounds with rigid fittings without recoil. The weight of the projectile was 4·3 kg. (9·5 lb.); the charge, 0·5 kg. (1·1 lb.); the compression of the copper cylinders in the first three blows was 1·2 mm., 1·3 mm., and 0·2 mm. (0·047in., 0·051in., and 0·008in.). Without springs in the three following rounds the compression was 3·2 mm., 3·1 mm., and 3·5 mm. (0·126in., 0·122in., and 0·138in.). The copper used in the first two rounds with springs was too soft. The mean compression in preliminary experiments with springs had been 1·85 mm. (0·073in.), without springs 5·6 mm. (0·22in.). By careful experiments it has been found that a compression of 1·8 mm. (0·071in.) of a cylinder of copper of 25 mm. (0·984in.) diameter and 40 mm. (1·575in.) length, corresponds to 15 m. kg. (0·044 foot-tons) work; and the compression of 5·6 mm. (0·22in.) is about 60 m. kg. (0·177 foot-tons) stored-up work—four times as much. In this proportion there is a saving of shock effected by the springs. The springs have only been tried with a gun of 8 cm. (3·15in.) calibre as yet.

In Figs. 12 and 13 is shown a 10·7 cm. (4·2in.) gun, mounted complete for sea service with firing arrangements. The pointer—No. 1 of detachment—stands on a small platform on the carriage, so that he moves round with it. While laying the gun he has complete control of it, giving line and elevation by means of hand winches, while he fires and checks the movement of the piece with his foot. This gun will be shortly tried. The real value of the invention must be shown by continued trials with larger guns.

With the spring pivot gun has been brought out a new scaffold for pivot guns on board ship. In this all direct connection between the pivot socket and the bottom of the ship is avoided, the entire shock being transmitted to a bridge and deck. The object is to prevent shocks being imparted to the parts of the ship below water where leaks might be developed.

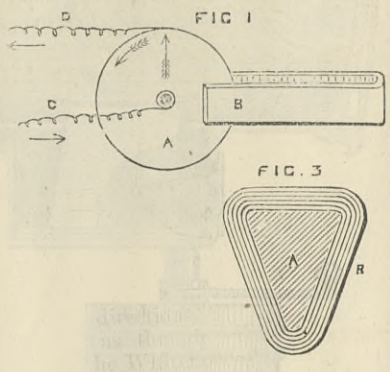
The experimental gunboat has a length of 15·25 m. (50·0ft.), a width of 3·56 m. (11·0ft.), and a mean draught of water of 1·3 m. (4·3ft.). The displacement is about 30 tonnes (29·52 tons). She has compound engines, 50-horse power indicated, which give a speed of 10 knots per hour. She carries up to the present time a pivot gun of 8·7 cm. (3·4in.), with a projectile 6·8 kg. (15·0 lb.). The trials made with this piece, with the normal charge of 1·5 kg. (3·3 lb.), have proved very satisfactory, both as regards the ease of working and the stability and strength of the vessel. The gunboat is now near Duisburg on the Rhine.

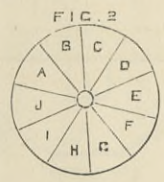
A floating battery of pivot guns has been designed which possesses the greatest possible stability and security against leaking, &c. The trials as yet made with models promise success.

DISC ARMATURE DYNAMO ELECTRIC MACHINES.

From a pamphlet recently issued by Messrs. Hammond, we learn that the Ferranti dynamo, to which we have alluded more than once, has a copper disc armature. No other information concerning it is supplied, and as M. Ferranti's patents were only taken out in August, 1882, they are as yet not to be seen. We are therefore unable to describe the machine in detail; but it will not be out of place to say a few words here concerning disc armatures in general.

We take it for granted that those who read what we are about to say possess a more or less minute knowledge of the construction of dynamos. They at all events know that a current of electricity is generated in a coil of wire whenever it is made to enter the sphere of attraction of a magnet—the magnetic field as it is called—and that a current of similar energy will circulate through the wire in the opposite direction whenever it is taken out of the magnetic field. The disc armature, properly so called, has, however, no wires. It consists simply of a plate of copper made to rotate between the poles of a magnet. Barlow showed many years ago that when a disc of copper A, Fig. 1, was mounted between the poles of a magnet B, and a current of electricity was sent through the wire C, across the disc and out through D, the copper disc would revolve. In 1831 Faraday made the discovery that by causing the disc to rotate, a current of electricity was set up; Faraday's result being the converse of that obtained by Barlow. It is not necessary to use a continuous circular disc to obtain this result. If, instead, a series of radial plates, as A, B, C, &c., Fig. 2, be employed, a current will be excited in each as it passes the poles of the magnet, Fig. 2, only in this case the currents





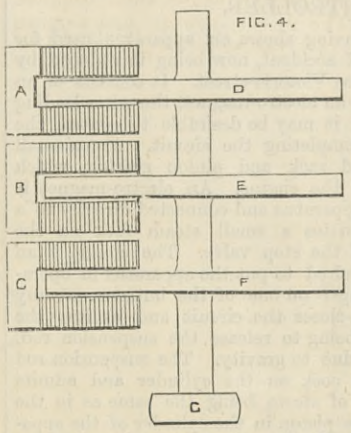
need not be continuous, but will flow alternately in opposite directions. In a word, each plate will behave precisely as though it were a portion of a wire coil. Indeed, the Whitehouse Mills Company, of Hoosac, U.S., showed at Paris what the inventor called an Arago disc dynamo. The armature, which was a comparatively thin casting, had radial openings in it, in each of which was mounted a coil of insulated wire wound on a wooden core and shaped as in Fig. 3, where A is wooden core, and B the insulated wire wound round it. Rotation takes place in the plane of the arrow.

Returning now to the simple disc. In it will be produced not an intermittent, but a continuous current from the centre to the circumference. We do not, we think, say too much when we assert that no completely satisfactory explanation of the reason why this current is developed has ever been given. Nearly all text books are reticent on the subject, the authors contenting themselves with stating the fact. The case is much the same, we may add, with the Gramme machine, concerning the action of which there are at this moment two distinct explanations in existence. Apparently the theory of the Faraday disc is to be found in the fact that every body in nature is either magnetic or diamagnetic. Coulomb was the first to discover this as far back as 1802, but he attributed the phenomenon to the presence of small quantities of iron in the substances on which he experimented. Faraday found that all solids and liquids are either attracted or repelled by powerful magnets. Those which are attracted he called magnetic, those repelled he termed diamagnetic. Iron, nickel, and cobalt are magnetic; while bismuth, antimony, zinc, tin, and copper are among the diamagnetic metals. If a copper bar suspended by the middle be made to spin horizontally between the poles of an electro-magnet, the moment a current passes, and the poles are magnetised, the motion of the copper bar will be arrested, and the bar will hang at right angles to the axis of the bobbins. If an iron rod be used instead, it will also be arrested, but it will hang at right angles to the position taken by the copper bar. It is on one theory assumed that lines of force traverse every magnet, and these lines are bent by the rotating copper disc, with an expenditure of energy which results either in the development of heat or electricity. Foucault caused a disc of copper to rotate at a high velocity between the poles of an electro-magnet, and with a very moderate current he raised the temperature of the disc from 10 deg. to 61 deg. Cent. very quickly. Why and how heat was produced in this case is as difficult to explain as any other development of the transfer of work into heat or *vice versa*. If our readers care to turn to Deschanel's "Natural Philosophy," Part III., they will find at page 684 and 5 an explanation of the action of rectilinear currents on currents movable round one extremity, which casts considerable light on the whole subject; but Deschanel's explanations are too long to reproduce here. All that is certainly known concerning the copper disc is that when rotated, in presence of a magnet, in such a way that currents of electricity cannot escape from it, the disc becomes very hot. If the currents can escape then the disc remains cool, and electricity is generated in quantity. Not many experiments have been carried out with the disc apparatus on a sufficient scale to give useful information. It is known, however, that the electricity produced in this way is of low tension.

From what we have said it will be seen that no patent can now be obtained for the use of a dynamo with a disc armature. But valid patents may no doubt be obtained for details in the construction of such a machine. It is not difficult to see that certain advantages may be possessed by the disc armature dynamo over others made with wire. Thus, for example, the whole cost of winding will be avoided, and sheet copper discs can be obtained at less cost than an equal weight of wire. The internal resistance of the armature may be made very small; and by putting a large number of discs on a single shaft a certain amount of compactness may be secured. In Fig. 4 three magnets are shown by A B C, and three discs by D E F, the belt pulley being at G.

Of course, the number of the discs may be magnified, and they may be made of almost any diameter.

It is by no means certain that the best results can be got by the use of plain copper discs. Indeed, it has been suggested to us that a very efficient machine may be made by combining copper discs and iron plates in a way which will be readily apprehended by all electricians. The defect in any machine of the kind appears to be that the electricity produced must have small potential. Of course, for certain types of lamp this is a matter of no importance whatever; but it is just as well that the fact should be known. In conclusion, we may repeat that the disc armature machine is as entirely incapable of giving out more energy than is put into it as is the wire machine. The fact that currents can be generated in a disc in the way we have described has long been familiar to every electrician. It is a suggestive circumstance that of the hundreds of inventors who have sought to improve the dynamo, no one, save Sir W. Thomson and Mr. Ferranti, have thought of using discs. As to their practical value, we possess, of course, no information whatever, in which we resemble the rest of the world. We may add that it is stated Mr. Ferranti has included in a patent, what has been called a disc armature, but is not one in the sense we have described, consisting instead of a waved copper strip, revolving in the plane of the armature disc.



THE PHOTOGRAPHIC EXHIBITION.

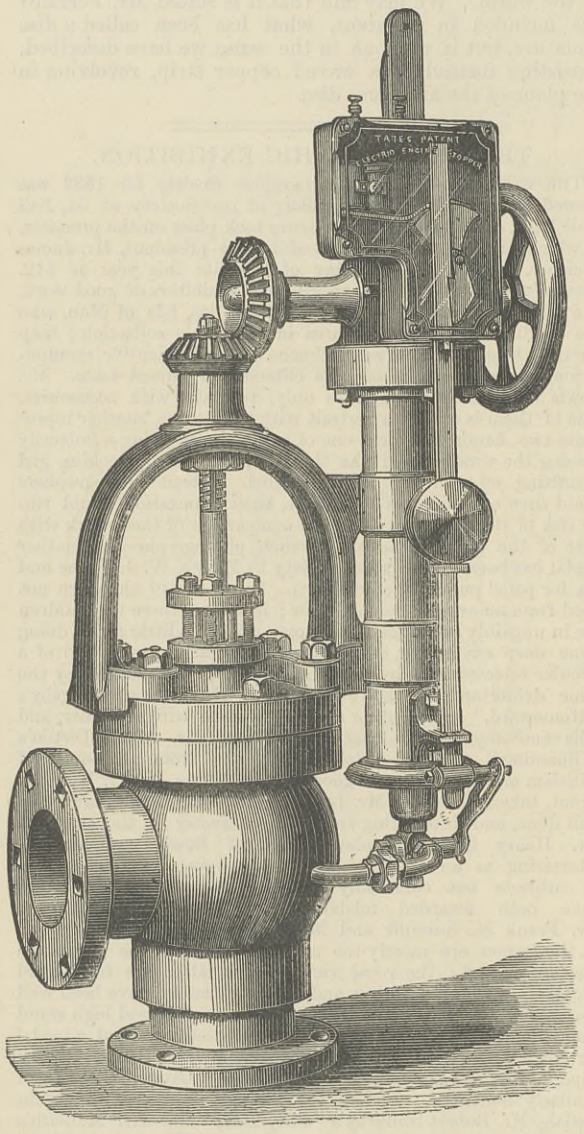
The exhibition of the Photographic Society for 1882 was opened last Monday, at the gallery of the Society, at 5A, Pall Mall East, and last Saturday a *soirée* took place on the premises, at which the guests were received by the president, Mr. James Glaisher, F.R.S. The number of exhibits this year is 512. Eleven medals have been awarded to exhibitors of good work, one of them to Mr. Abel Lewis, of Douglas, Isle of Man, who has produced the finest pictures in the whole collection; they are not alone admirable as specimens of good scientific manipulation, but as works of art, the outcome of refined taste. Mr. Lewis exhibits three pictures only, portraits, with accessories. One of them is simply a portrait with accessories, another represents two handsome girls, one of whom is watching a butterfly passing the window, and the third depicts a merry-looking girl practising on a violin. If all English portrait photographers could turn out pictures like these, their reputation would run no risk of deterioration, after the comparison of their work with that of the best Italian and French photographers. Another medal has been given by the Society to Messrs. W. J. Byrne and Co. for panel portraits of children. Some few of these are not good from an artistic point of view; in two or three the children are in ungainly attitudes, and in one of them a little girl is doing some deep sea fishing, while seated apparently on the top of a circular table covered by a cloth. Several of the pictures by the same exhibitors are, however, good. Mr. Robert Slingsby's "Homeward," representing a young woman with a pitcher, and hills and sky in the background; also Mr. Adam Diston's "Gloaming," received prize medals, and from all points of criticism are specimens of good work. Views by Mr. W. J. A. Grant, taken on board Mr. Leigh Smith's yacht Eira, are fairly well done, and interesting from the character of the subjects. Mr. Henry Stevens's photographs of flowers are equally interesting as an application of the powers of the art-science to subjects not commonly chosen; both these exhibitors have been awarded medals. Two other medallists are Mr. Frank M. Sutcliffe and Mr. J. G. Horsey; the sea views of the former are mostly too under-exposed for the groups in the fore-ground; the rural views of the latter are from good negatives, and the printing and delicate toning have been well done. Mr. H. P. Robinson takes a long-recognised high stand among landscape photographers, and has been awarded a medal for his "Wayside Gossip;" Messrs. Chaffin and Son's "Cherry Ripe," and Mr. Joseph Gale's "Doorway Group," have been similarly honoured. Among the pictures which did not gain medals, Mr. Robert Slingsby's "Lazy Nell," and Mr. McLeish's "Misty Morning on the Weir," as well as his "View on the Tees," are highly meritorious. When the Exhibition was opened to the public last Monday the attendance was but limited, nor is the lack of interest of the non-photographic public matter for surprise, for but a minor proportion of the pictures on view can be considered specimens of high art, and the non-technical public know and care little about the scientific merits of the methods of producing pictures. Our opinion from careful critical observation at home and abroad is, that in artistic portraiture, Italian and French photographers are as a general rule in advance of their English brethren; also that an international exhibition of the best work of the best photographers of all countries would do much to wake up latent energy at home. Moreover, a good supply of first-class pictures would enable the managers to reject others of inferior merit, instead of accepting a proportion of the latter to fill up vacant space, which is the only theory which seems to account for the exhibition of some of the pictures among those now on view. Everyone knows what beautiful results are displayed in certain coloured photographs on opal glass; also in the new "crystoleum" portraits, and how these are appreciated by the public, yet in the Exhibition such pictures are conspicuous by their absence. The Photographic Society may argue that such are not pure photographs, but photographs worked up by hand. True, but if photography be an art, why starve art to give precedence to science? Why not attract the public to the exhibitions by displaying that which will please them, instead of much which none but scientific photographers care to see? Moreover, it requires a man of genius to shine as a real artist, whilst any commonplace individual can work scientifically by rule and measure, as a kind of intellectual blacksmith, with no ideality in his nature. We know nothing of the mental machinery or interior working of the Photographic Society, but see that it could benefit itself, and increase the interest of the public, by including more classes of work in its sphere of operations; and, by recognising the fact that if it hereafter did more to subordinate science to art, such action would help to raise the section of commonplace photographers from the position of mechanics to that of artists. If it does not occupy this enlarged field itself, a future association of artistic photographers, which shall aim chiefly to produce things of beauty and to work upon human emotions, will soon take all the wind out of its sails, so far as the world outside photographers is concerned.

* In 1879 coins similarly placed were thrown off near the muzzle, but not lower down.

† It may be difficult to follow this brief description without all the drawings, &c., furnished in the report. The principle is simply as follows:—The gun can move back, pivotting on the ball joint at the bottom of its pivot. It is held, however, by a sort of outside cylindrical case, holding on to the muzzle at one end and bearing against a fixed structure at the other. When this outside case consists for part of its length of spring discs, the gun can recoil by compressing the springs; when a rigid metal case is substituted for the springs, the gun is rigidly held.

TATE'S PATENT ELECTRICAL STOP VALVE CONTROLLER.

The accompanying engraving shows an apparatus used for stopping engines in case of accident, now being introduced by Messrs. Duncan Bros., Queen Victoria-street. It consists of an ordinary Leclanche battery, an electro-magnet, the wires leading to any position from which it may be desirable to control the engine, and buttons for completing the circuit. Also a small steam cylinder, piston, and rack and pinion gearing, which actuates the stop valve on the engine. An electro-magnet is placed at the top of the apparatus and connected directly to a suspension rod, which actuates a small steam cock on the cylinder, seen at the side of the stop valve. The circuit is an open one, and when it is desired to put the apparatus in operation, the pressure of the finger on one of the buttons—at any distance from the engine—closes the circuit and excites the electro-magnet, the effect being to release the suspension rod, which falls with a velocity due to gravity. The suspension rod in falling opens the small cock on the cylinder and admits steam, the initial pressure of steam being the same as in the steam engine cylinder. The piston in the cylinder of the apparatus immediately ascends and the rack piston rod then closes the engine stop valve. The steam to work the apparatus being taken from the stop valve chamber from underneath the valve—*i.e.*, between the valve and the steam engine cylinder—the consequence is that as soon as the stop valve has been closed there is no longer any pressure in the small cylinder; and when it is desired to start the engine, the engine driver has simply to lift up the suspension rod to its normal position and open the stop



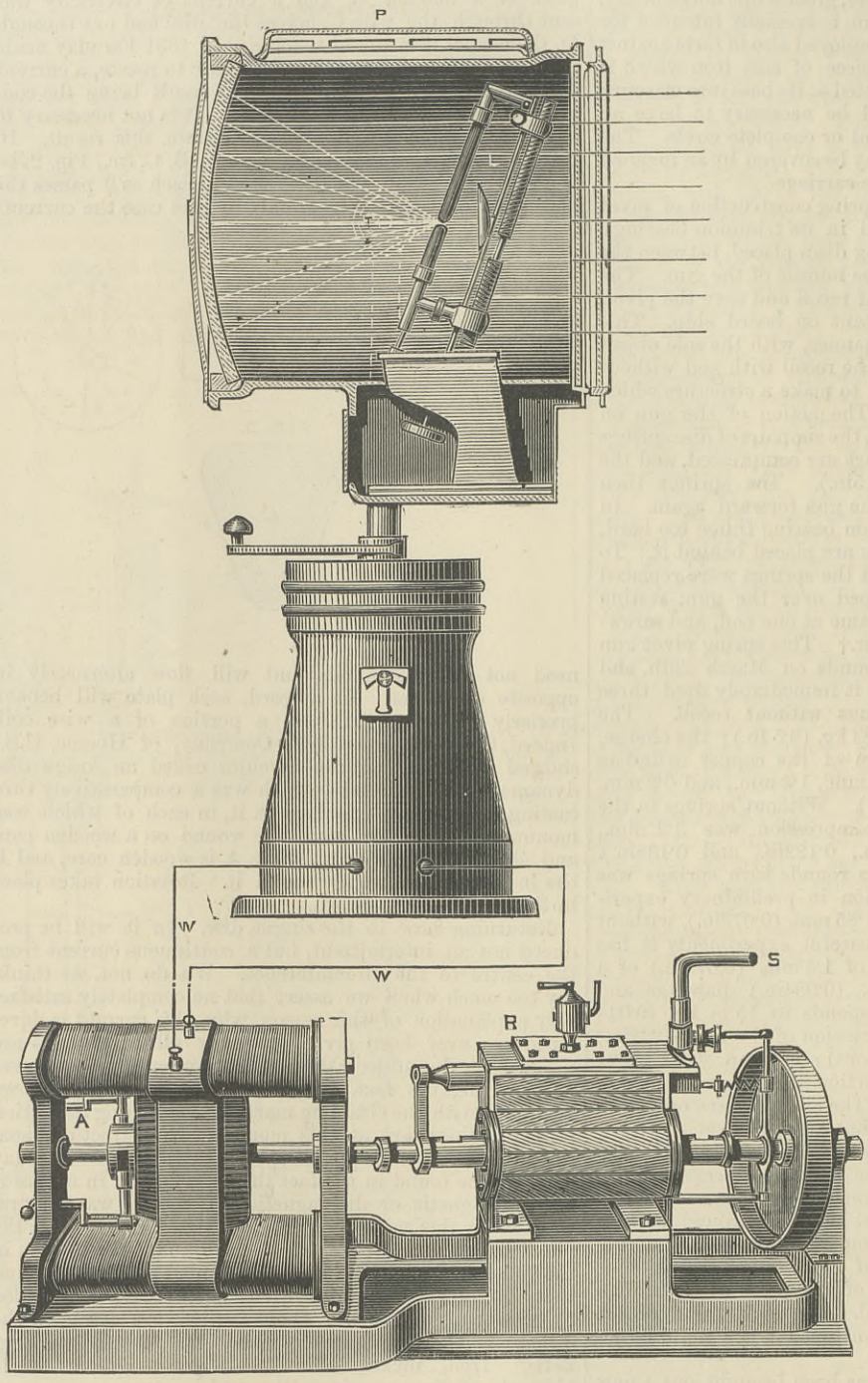
valve in the ordinary way. In lifting the suspension rod the small cylinder cock is again closed against the admission of steam, but the cock having three passages is opened for the inlet of atmospheric air. The act of opening the stop valve by the hand wheel operates also on the piston, which falls to the lower end of the small cylinder and is then reset for further use. When applied to the stop valves of condensing engines, a cock fitted on a pipe opening to the atmosphere is also actuated by the apparatus, and at the instant the stop valve is closed this cock is opened, thus admitting air into the condenser, destroying the vacuum and stopping the supply of water. The apparatus also stops the engine on which it is fitted, whenever the speed exceeds the ordinary rate by any given number of revolutions. This is effected by means of the throttle, or variable expansion valves, actuated by the engine governor. Short arms are fixed on the valve spindles which act as fingers to press in a push, or button, at any time the valve exceeds the usual range of lift or stroke. In all cases the apparatus resets itself when the engine is started. It will be seen that by placing buttons in suitable places the engines may be started in any room in a large factory. It would apparently be easy to make a small addition by which in the case of a governor strap breaking, steam could be immediately shut off, and so running away would be prevented.

Improved Maltings.—We are requested by Messrs. Stopes and Co., of Southwark-street, brewers' engineers, to state that the system of maltings, an engraving of which appeared in The Engineer of 7th July last, was prepared in part from the designs of Mr. Free, of Mistley, and comprised the kiln covered by his letters patent of 9th Feb., 1876.

Death of Mr. Benjamin Hick.—We regret to have to record the death of Mr. Benjn. Hick, of the firm of Hick, Hargreaves, and Co., after a long and painful illness. A grandson of the late Mr. Benjn. Hick, the founder of the works, he had been connected with them since the completion of his school education, and whilst inheriting to a considerable extent the mechanical talent of his grandfather, he had, by his energy of purpose, unswerving integrity and his kindly bearing to all around him, endeared himself to those amongst whom he lived and laboured for so long a portion of his comparatively short life. Mr. Hick died on the 2nd inst., aged thirty-seven years, and was buried at Christ Church, Walmsley, on the 5th inst.

NAVAL ELECTRIC SEARCH LIGHT.

THE BRITISH ELECTRIC LIGHT COMPANY, LONDON, ENGINEERS.



The accompanying engraving explains itself. It illustrates one of eight projectors, or "search" lights, made by the British Electric Light Company, Heddon-street, W., for the Admiralty. No regulators are used, the carbons being kept in adjustment by hand as the beam of light is swung round the horizon. A is the Gramme dynamo machine; L is the hand lamp; R is Hodson's rotary engine; S is the steam pipe; P is the projector; W are the wires conveying current to lamp; T are the trunnions of projector.

PICKWELL'S SELF-REGISTERING SHIPS' COMPASS.

Among the exhibits at the North-East Coast Exhibition which attract a very large share of attention, perhaps none is of more universal interest than the self-registering ships' compass invented by Mr. Robert Pickwell, civil engineer, Hull, and which we illustrate on page 273 of our present number. This instrument was shown at the Naval and Submarine Exhibition, recently held at the Agricultural Hall, but since that time it has been subjected to a series of most severe practical tests on passages between Hull and London, Hull and Newcastle, and Hull and Hamburg, with a view to ascertain its accuracy and usefulness, and in each case it has proved a remarkable success in keeping an accurate record of the working of the ship. So sensitive, indeed, is the apparatus, that the act of heaving the lead twice and of stopping to take the pilot on board are distinctly shown on the diagram.

In the engravings Fig. 1 represents an elevation of a compass binnacle and stand, of the pattern used by the inventor, and Fig. 2 a cross section showing the inside compass and lamp, and the adaptation of the patent self-registering apparatus under the compass card. A is the wooden stand lashed and screwed to the deck, which carries the ordinary bowl B, covered by the binnacle top C with glass windows, the stand being of any convenient height. Inside the outer bowl the compass bowl is hung on gimball rings in the usual way, and the compass card is seen below the glass cover or lid of the inner bowl, light being supplied at night by a top lamp, as shown in Fig. 2. The registering apparatus is fitted in the bowl below the card, and is indicated by the letter E on the engraving. It consists of a barrel, Figs. 2, 3, and 4, containing clockwork, which causes a second barrel within the first to continuously revolve at a given speed, the outer barrel being fixed and having two slots *e e* cut through on its upper surface parallel to the axis. The compass card has also a slot, shown by the line G G G, curved in such a manner that some one part of it is always across one or other of the straight slots in the drum, and as the inner barrel is when in use covered with sensitised paper, it will be at once understood that in whatever course the ship is being steered a ray of light either from the sun or from the lamp will pass through the small opening made at the intersection of the curved slot in the card with one or other of the straight slots in the drum envelope, and will produce a black mark upon the prepared paper, more or less distant from the centre of the card, and which from its position will give an exact indication of the course of the vessel at the time. The revolving motion of the drum gives the duration of time the ship's head is on each course, as well as the time such courses are changed.

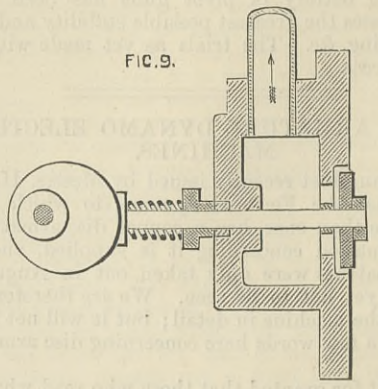
An actual diagram unwrapped from the barrel is shown in Fig. 5, vertical spaces representing directions, as indicated by the letters of the compass, and horizontal distances denoting time. To remove the paper the revolving barrel is drawn off like the drum of an ordinary Richard's indicator, through an opening in the side of the bowl, and all that is necessary to permanently fix the lines is to immerse the diagrams in a liquid solution for a short time. The papers are made for a day of twenty-four hours, or may be continuous so as to give the course for a period of three months, in which case it is proposed to enclose the apparatus in a locked case, which can only be opened by the owner of the vessel. The arrangement most in favour, however, is that for daily diagrams under the control of the captain, who can file them when fixed and produce them at the end of the voyage if required. He can also see the course made by his ship day by day in spite of thick weather, and without observation with the sextant, and can lay it down on his chart every twenty-four hours.

The advantage of having an accurate record of the working of a vessel will be at once recognised by every shipowner, and as with Mr. Pickwell's invention this can be obtained without interfering with the free action of the needles, or without even altering the ordinary visible portion of the compass as at present in use, we shall hope soon to hear of its general adoption. The apparatus as at present supplied can be fitted to any ordinary compass, provided the bowl is not less than 10in. diameter; but if necessary, a smaller size could be made suitable for a bowl of 8in. diameter. Mr. Pickwell received the highest award, viz., silver medal and special mention at the North-East Coast Exhibition.

THE "UNIVERSAL" GAS ENGINE.

The accompanying engravings illustrate a new and very simple form of gas engine, the invention of J. A. Ewins and H. Newman, and made by Mr. T. B. Barker, of Scholefield-street, Bloomsbury, Birmingham. It is known as the "Universal" engine, and is at present constructed in sizes varying from one-eighth horse-power—one man power—to one horse-power, though larger sizes are being made. The essentially new feature of the engine is the simple rotary ignition valve consisting of a ratchet plate or flat disc with a number of small radial slots which successively pass a small slot in the end of the cylinder, and through which the flame is drawn to ignite the charge. In our illustrations Fig. 1 is a side elevation; Fig. 2 an end view of same; Fig. 3 a plan; Fig. 4 is a sectional view of the chamber in which

FIG. 9.



the gas and air are mixed, with the valves appertaining thereto; Fig. 5 is a detail view of the ratchet plate, with pawl and levers and valve gear shaft; Fig. 6 is a sectional view of a pump employed in some cases to circulate water through the jacket; Fig. 7 is a sectional view of arrangement for lighting, and ratchet plate *j* with central spindle and igniting apertures, and the spiral spring *k*, and fly nut, showing the attachment to the end of the working cylinder f^1; b^5, b^5, bevel wheels driving the valve gear shaft; *e*, the valve gear driving shaft; e^2, excentric to drive pump; e^3, excentric or cam to drive exhaust valve; e^4, crank to drive ratchet plate; e^5, connecting rod to ratchet pawl; *f*, cylinder jacket; f^1, internal or working cylinder; f^2, back cylinder cover; *g*, igniting chamber; *h*, mixing chamber; h^1, flap valve; h^2, gas inlet valve, the motion of which is regulated by a governor; h^3, gas inlet valve seat; h^4, cover, also forming stop for gas inlet valve; h^5, gas inlet pipe; h^6, an inlet valve; h^8 cover, also forming stop for air inlet valve; h^9, inlet pipe for air with grating; *i*, exhaust chamber; i^2, exhaust valve spindle;

PICKWELL'S SELF REGISTERING COMPASS.

(*For description see page 272.*)

FIG. 1

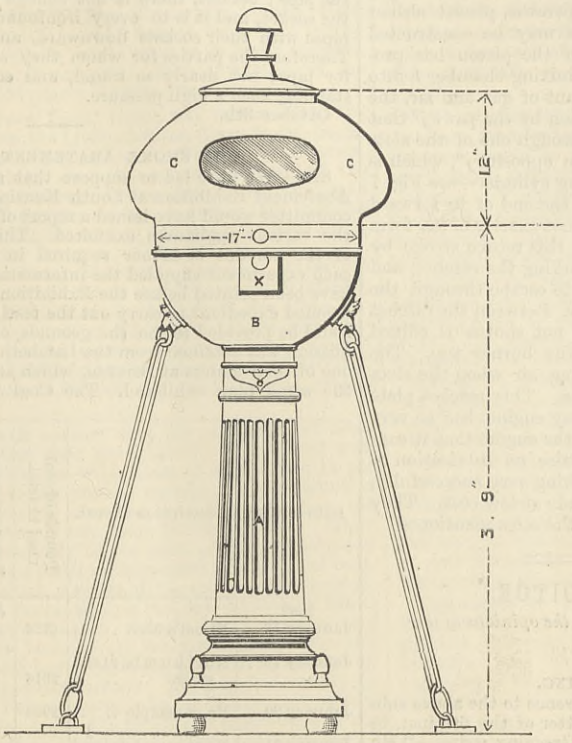


FIG. 2

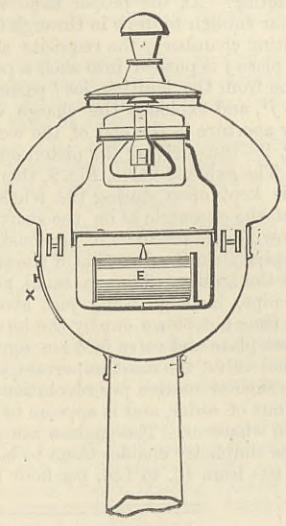


FIG. 3

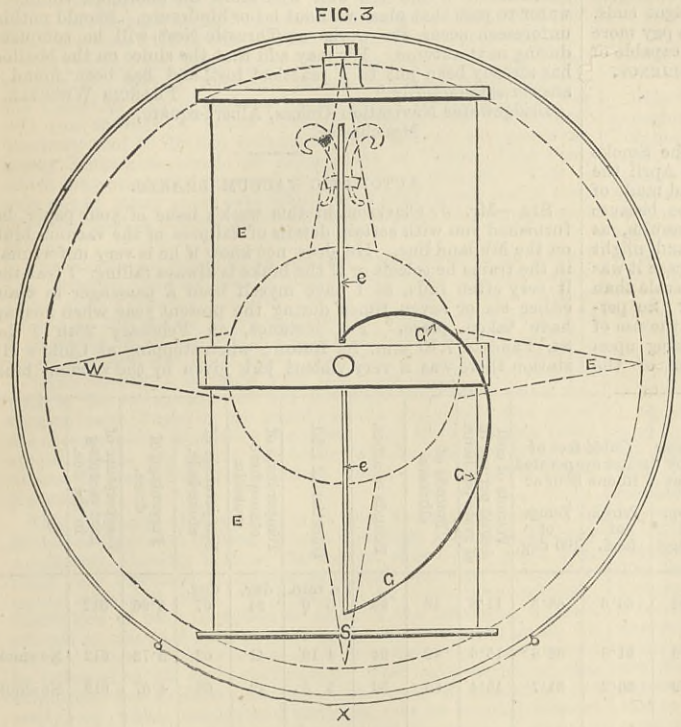


FIG. 4

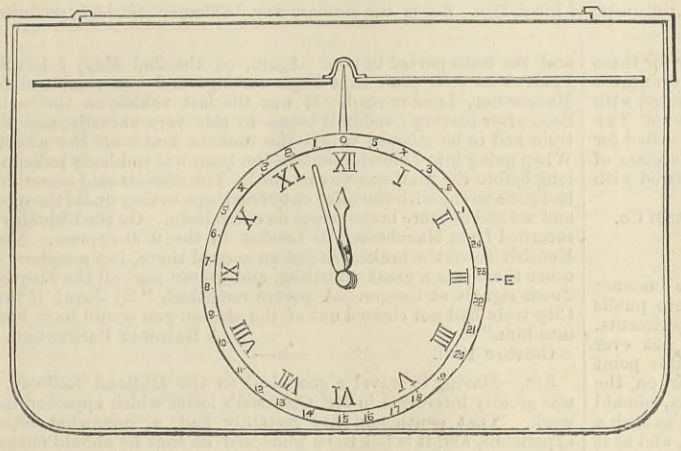
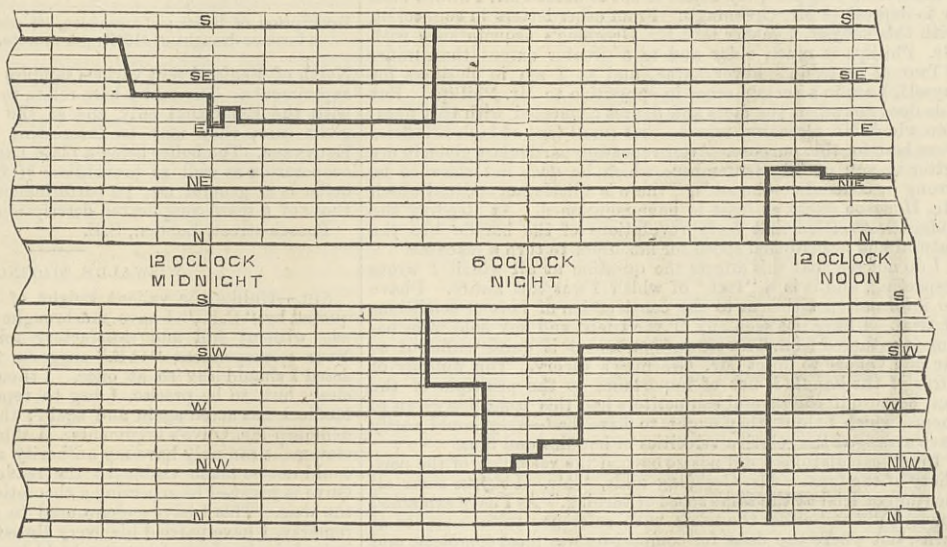


FIG 5



THE UNIVERSAL GAS ENGINE.

MR. T. B. BARKER, BIRMINGHAM, ENGINEER.

FIG 1.

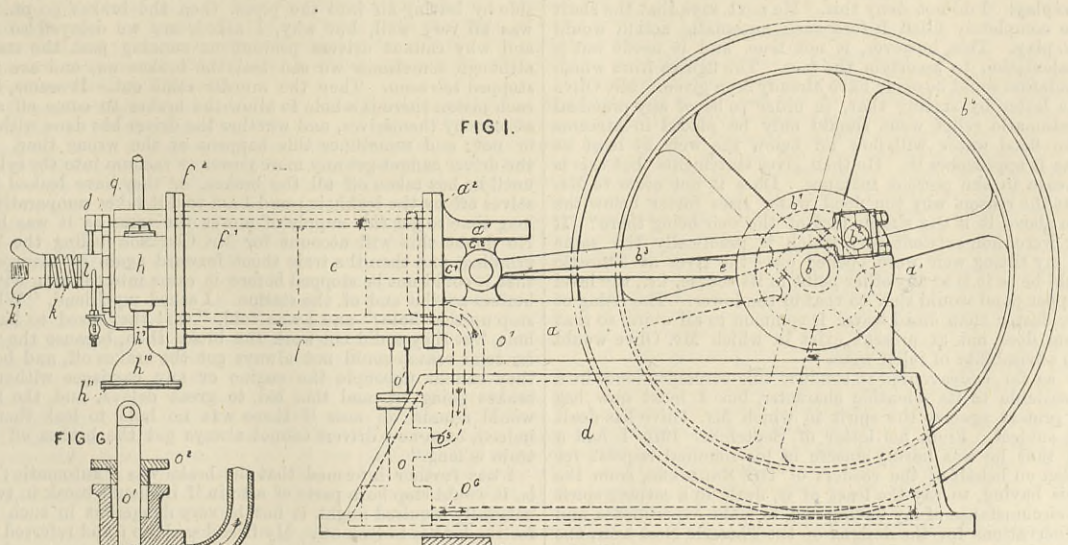


FIG 2

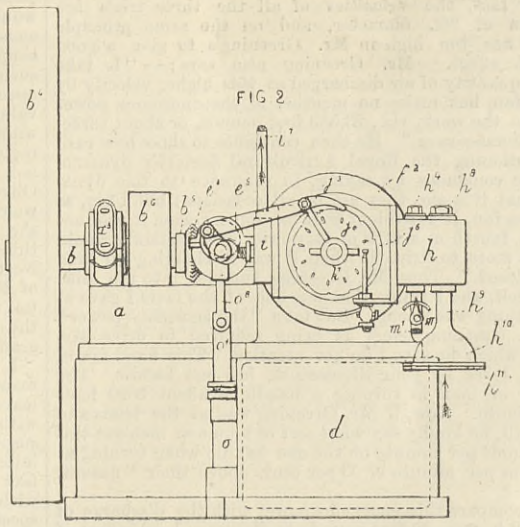


FIG 6

FIG 7

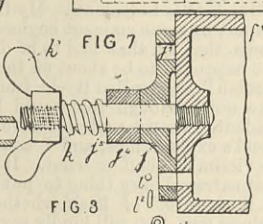


FIG 3

FIG. 8.

FIG 4

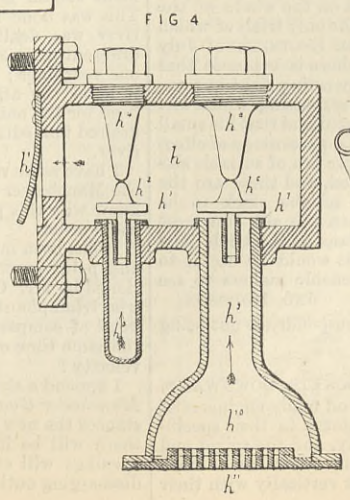
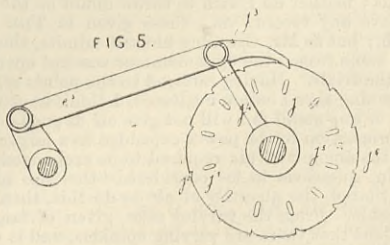


FIG 5.



i^7, exhaust pipe; j^6, lighting aperture through cylinder end; l, igniting gas jet; m, regulating and stop valve for gas.

The engine, it will be seen, is single-acting, and no compression of the explosive charge is employed. An explosive mixture of combustible gas and air is drawn through the valves h^2 and h^6 and exploded behind the piston once in a revolution; but by a duplication of the valve and igniting apparatus, placed also at the front end of the cylinder, the engine may be constructed double-acting. At the proper time when the piston has proceeded far enough to draw in through the mixing chamber h into the igniting chamber g the requisite amount of gas and air, the ratchet plate j is pushed into such a position by the pawl j^3 that the flame from the igniting jet l passes through one of the slots or holes j^1, and explodes the charge when opposite j^6, which is the only aperture in the end of the working cylinder—see Fig. 7 and Fig. 2—thus driving the piston on to the end of its forward stroke. The exhaust valve, Fig. 9, though not exactly of the form shown, is kept open during the whole of this return stroke by means of the excentric e^3 on the shaft working the ratchet, and thus allowing the products of combustion to escape through the exhaust pipe i^7 in the direction of the arrow. Between the ratchet disc and the igniting flame a small plate not shown is affixed to the pipe, its edge being just above the burner top. The flame is thus not blown out by the inrushing air when the slots in ratchet plate and valve face are opposite. This ratchet plate or ignition valve, the most important in any engine, has so very small a range of motion per revolution of the engine that it cannot get out of order, and it appears to require no lubrication or attention whatever. The engines are working very successfully, and their simplicity enables them to be made at low cost. They cost for gas from ½d. to 1½d. per hour for the sizes mentioned.

LETTERS TO THE EDITOR.

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

FAN TRIALS AT READING.

Sir,—Kindly allow me a few lines in reference to the above subject and in reply to Mr. G. O. Greening's letter of the 6th inst. in your paper. In reference to myself, Mr. Greening writes—"He writes from Newport in defence of Mr. Phillips's fan." Although I write from Newport, my object is not to defend Mr. Phillips's fan or to depreciate Mr. Greening's. From other letters in connection with this subject, I gather that Mr. Greening's acquaintance with Mr. Phillips is much older and to a greater extent than mine. "Two of a trade" never agree, and as I am in business for myself, I am in a certain sense in opposition to Mr. Phillips. But this does not affect the facts and figures connected with this question which Mr. Greening raised—that small fans at high velocities were best for this purpose. After repeating particulars given in my letter to you of 8th September—which he does not show to be wrong or contradict—he adds, "there is a little fact omitted which Mr. Hodgson ought at least to have mentioned. At Reading the judges first settled that forty revolutions of the handle was the natural and accustomed speed for labourers to turn a machine."

I do not see that this affects the question at all which I wrote respecting, and it is a "fact" of which I was not aware. I have no information either as to the construction of fans or conditions of trial. I have not seen any of the trials, and my sole information is gathered from The Engineer, and it is quite sufficient so far as I yet see to upset Mr. Greening's theory. The number of turns of the handle is not of importance to the principle of the fan, because if the several competitors had this condition given to them—which I think they ought to have had—they could easily have arranged the relative velocities of handles and fans.

In my calculations I did not go beyond the velocities of the periphery of the fans. Mr. Greening adds, "Mr. Hodgson sinks all mention of trial at the same speed of turning." As I have explained above, I did not select the trials with reference to the number of turns, but where the data for comparison was most complete, and with reference to these several trials of Mr. Phillips's fans. The first with 40 turns of the handle, running at a speed of 2512ft. per minute at the periphery of fan, gives ·47in.; at 60 turns and 3768ft. per minute. ·95in.; at 66 turns and 4145ft. per minute, 1·2in. Mr. Greening's fan, when running at a velocity of 6784 at the periphery, or over 50 per cent. greater velocity, gives 1·3in. This only proves what I before stated, that small fans at high velocities are not the best, and does not at all prove that Mr. Phillips's fan was wrongly constructed to work at a slow velocity. In fact, the velocities of all the three trials are slow for a fan of 2ft. diameter, and on the same principle the velocity was too high in Mr. Greening's to give a good percentage of effect. Mr. Greening also says:—"I take credit for this quantity of air discharged at this higher velocity by Mr. Phillips's fan, but make no mention of the enormous power required to do the work, viz., 23,580 foot-pounds, or about three-quarters of a horse-power." He then continues to show how rash I was in questioning the Royal Agricultural Society's dynamometer; but he concludes by saying, in reference to this dynamometer, "that it is one they use on all occasions; but I say, as regards my own fan, it is evident that for some reason it was not operating to a fourth or a fifth of its power, or it certainly would have required more to drive it when it was discharging air than when it was closed." Thus Mr. Greening tumbles into the same boat with myself, and I think that was one of the facts I gave as showing something was wrong. But take "the enormous power" to which Mr. Greening refers as being required to drive Mr. Phillips's fan, which he says I do not mention. This hand fan of Mr. Phillips's, I see by your illustration, has one handle. The average power of man in turning a handle is about 2600 foot-pounds per minute. Now, if Mr. Greening was at the trials and saw all this, will he kindly say what sort of a man or men got this 23,580 foot-pounds per minute on the one handle when turning at sixty revolutions per minute or 50 per cent. above their "natural speed."

But, again, compare this enormous power with the discharge of air, and we find it takes 22 foot-pounds to discharge 1 cubic foot of air. Then take Mr. Greening's fan, and we find it takes 41 foot-pounds to discharge 1 cubic foot of air. Of course I, as well as Mr. Greening, would hesitate to throw doubt on the whole of the trials; neither do I wish to throw doubt on the only trials of which I have any record, viz., those given in The Engineer of July 28th.; but as Mr. Greening himself admits, there is evidence that for some reason the dynamometer was not operating right in some of the trials. Having referred to the points respecting which Mr. Greening says I before neglected, I think he will find that his small fan or any small fan will not give off as good a percentage of effect in proportion to the power expended as a larger fan of suitable size for the amount of air required to be exchanged, and these are the main questions to be considered—the size of the stack to be ventilated, the quantity of air to do this, then the size fan most suitable. From the varying sizes given of fans at the trials it is evident that there are varying opinions, and it would be useful to know more of the experiments and trials to enable makers to see whose opinions are best supported. Jno. Hodgson.

[The value of a continuation of this correspondence not being apparent, it must stop here.—Ed. E.]

THE CASTING OF PIPES WITH THEIR SOCKETS DOWNWARD.

Sir,—Much has been said of the above, and many engineers of the present day still adhere to it, and put a clause in their specification stating they are to be cast in this way, and the spigot end cut off in a lathe. Now, as a practical man, allow me to state pipes are not as sound cast in this way as cast vertically with their socket upward, because, in the first place, you cannot put such a head of metal to feed the pipe on the spigot as you can on the socket end. Secondly, if you do put a fair head on the spigot end, it will have "set" before it can have fed the body of the pipe, as you cannot, of course, put it thicker on that part immediately adjoining the spigot than the thickness stated to be in the body of the pipe; besides, there is not enough metal in the body to feed the socket, and it is to every ironfounder more expensive to cast pipes with their sockets downward, and cut off the spigot ends. Therefore the parties for whom they are made have to pay more for pipes not nearly so sound, and consequently not capable of standing such a high pressure. Experience.

October 9th.

THE SMOKE ABATEMENT EXHIBITION.

Sir,—We were led to suppose that at the close of the Smoke Abatement Exhibition at South Kensington on the 14th April the committee would have issued a report of the tests they had made of the various appliances exhibited. This delay cannot be because of the amount of labour required in compiling the results, as each experiment supplied the information at the time, and might have been printed before the Exhibition closed. In our case it was deemed expedient to carry out the testing upon a larger scale than could be provided for on the grounds of the Exhibition. So permission was obtained from the Lambeth Waterworks for the use of one of their boilers at Brixton, which are fitted and working upon the same plan exhibited. The Coal Trade Association of the North of England sent various samples of coal especially for these experiments. The tables here relate to the official trials connected with the Exhibition only, and as the results were recorded with great care, they may be interesting to many readers of The Engineer. The boiler being a plain Lancashire one, was tested for evaporation as well as prevention of smoke, and as this class of boiler is in general use, its performance might be compared with those of a more complicated description.

Date of trial.	Description of coal.	Pounds of coal used in trial.	Temperature of feed.	Pounds of water evaporated by 1 lb. of coal at		Cubic feet of water evaporated in one hour at		Pounds of coal burnt per sq. ft. of grate per hour.	Pounds of clinkers.	Pounds of ashes.	Duration of trial.	Temperature of atmosphere outside.	Temperature of stoke-hole.	Percentage of dross.	Temperature of heat escaping in the flue.	
				Temp. of feed.	Temp. of 100 deg.	Temp. of feed.	Temp. of 100 deg.									
1882.			deg.								hr. min.	deg.	deg.			
January 18 ..	Nixon's Nav.	2128	82	11·75	11·94	66·6	68·3	11·8	42	85	6 0	34	67	5·96	612	—
January 19 ..	Northumberland steam	2016	92	10·91	10·99	81·8	82·8	15·6	42	34	4 18	41	62	3·72	612	No smoke
January 20 ..	No. 2 sample	2968	89	8·59	8·69	80·2	81·7	19·4	85	36	5 5	42	68	4·07	612	No smoke
January 21 ..	Northumberland rough and small..	2576	93	8·92	8·98	70·76	71·7	16·5	252	156	5 12	38	62	15·83	612	No smoke

Description of boiler:—Lancashire, 7ft. diameter by 28ft. 6in.; diameter of tubes, 33in. Set in the ordinary way. Chimney 95ft. high, producing a furnace draught of 1100ft. per minute.

Pocock-street, London, S.E. W. A. Martin and Co.

WISWALL'S TILTING WEIR.

Sir,—Unlike the valiant knight of Cervantes, in the instance quoted by "C.E.," I have not brought my tilting weir into public use without full and satisfactory rehearsals and experiments. Your correspondent "C.E." suggests that if my weir has ever acted I should say so at once. I thought I had made this point clear, but, to be precise, I beg to repeat that the weir on the Medlock has acted again and again; this, "C.E." thinks, should demolish Mr. Olive's arguments. I think, however, that as such a statement can only have my authority as to its veracity, and as it could not be made visible to the readers of The Engineer, Mr. Olive is justified in expecting a theoretical reason for the action of the weir. This I have endeavoured to give him, and, as "C.E." remarks, I have parried his every thrust up to the present, until, indeed, he has been driven to shield himself in the (supposed) tortuosities of the Medlock tunnel. The last argument Mr. Olive brings to bear I really do not consider worthy of serious reply. He says that the velocity of the water through the tunnel is due simply to the vertical drop of the shaft; that is perfectly true. He says that on reaching the bottom of the vertical shaft it would be dissipated if it did not gather so as to form a head. This is also true. He further states it would thus gather until the tunnel was submerged before the automatic action could come into play. I do not deny this. He next says that the shaft would be completely filled before such automatic action would come into play. This, however, is not true, and it needs but a simple calculation to ascertain the fact. The figures from which such calculation could be made have already been given. Mr. Olive opens his letter by stating that, in order to be of any practical value, automatic relief weirs should only be placed in streams where the flood water will flow off below the weir at least as rapidly as it approaches it. He then gives statements that this is not the case in the present instance. Does it not occur to Mr. Olive that the reason why the flood water rises faster below the weir than above it is the simple fact of the weir being there? If the weir were non-existent—or, which is practically the same thing, if my tilting weir were opened out—the river at Throstle Nest would be as it is at any other point in its course, *i.e.*, the level of the upper pond would sink to that of the lower. The rising of tail water faster than head water is common to all weirs, so that the stream does not at present exist in which Mr. Olive would grant the advisability of relief weirs!

I have so far endeavoured to conduct this correspondence in a manner suitable to its scientific character, but I must now beg leave to protest against the spirit in which Mr. Olive has dealt with the subject. From his letter of September 19th I had a suspicion that he was hardly sincere in his nominal request for information on behalf of the readers of The Engineer, from the fact of his having, to say the least of it, dealt in a carping spirit with the circumstance of my having had to make experiments and special observations for the designs of the Throstle Nest weir, the very means, by-the-bye, which "C. E." suggests as most reliable. In his last letter I quite agree with Mr. Olive that river improvement should be commenced down stream and carried upwards. This was done in the present instance, as the lowest weir on the river was dealt with two years ago, although in a somewhat different manner to Throstle Nest, and the next lowest was finished one year since; and, further, I should at the present time have had in hand the alteration of the third from the tideway, had it not been for the outside influence of Manchester property owners, who desired immediate relief from floods in the upper reaches of the river.

I have some reason to think that Mr. Olive is in the service of the Manchester Corporation; if this is so, he of all men should know why this particular improvement has taken place out of the usual order.

It has been my aim honestly and exactly to explain each feature and point in connection with my weir as they have been questioned by Mr. Olive; but what am I to think of a correspondent who triumphantly asks the verdict of your readers upon a statement of comparative discharging capacities of two outlets, and at the same time omits from his calculation the important factor of velocity?

I append a short extract from a report which appeared in the *Manchester Guardian* on March 8th, 1882:—"Under these circumstances the new weir will consist of a series of skeleton frames, and there will be in it fourteen openings each 10ft. by 8ft. These openings will extend across the river, and will afford additional discharging outlets, exceeding by 1100 superficial square feet the discharging capacity of the old weir. The sluices in this instance, as is the case with the one placed in the Medlock, are to be fixed on a horizontal shaft or axle, in such a position that when the river rises to the extent of 2ft. or 2ft. 6in. above the weir the weight of the water will cause them to assume a horizontal position. Under these circumstances the obstruction in the river at Throstle Nest will be reduced to the smallest possible proportions, for the peculiar construction of the new weir will allow an enormous volume of water to pass that place without let or hindrance. Should nothing unforeseen occur, the works at Throstle Nest will be completed during next autumn. We may add that the sluice on the Medlock has already been put to a practical test, and has been found to answer satisfactorily." Francis Wiswall.

Bridgewater Navigation Offices, Albert-square, Manchester.

AUTOMATIC VACUUM BRAKES.

Sir,—Mr. J. Clarkson, in this week's issue of your paper, has furnished you with certain details of failures of the vacuum brake on the Midland line. He does not know if he is very unfortunate in the trains he selects or if the brake is always failing. I fear that it very often fails, as I have myself been a passenger in trains either six or seven times during the present year when mishaps have taken place. For instance, on February 25th I left St. Pancras 7.10 a.m. for Luton; when stopping at Child's Hill station there was a very violent jerk given by the vacuum brake and the train parted in two. Again, on the 2nd May, I left St. Pancras at 3.30 p.m. in a bogie carriage and van combined for Manchester, London-road. It was the last vehicle on the train. Soon after leaving London it began to ride very uneasily, and the train had to be stopped to get the vacuum brake off the wheels. When going into Leicester station the train was suddenly pulled up long before the platform was reached. The officials said something had gone wrong with the valve on our carriage, so they undid the pipes and we had no more brake power on our vehicle. On the 13th May I returned from Manchester to London by the 9.50 express. Near Kentish Town the brake was put on several times, but somehow or other there was a great whistling, and we ran past all the Kentish Town signals at danger. A porter remarked, "By Jove! if that City train had not cleared out of the station you would have been into him." A Railway Passenger.

October 10th.

Sir,—Having to travel a good deal on the Midland Railway, I was greatly interested in Mr. Clarkson's letter which appeared last week. That gentleman has certainly had a somewhat bitter experience, and it is not to be wondered at that he should change his route, and travel by the North-Western line instead of the Midland for the future. It may interest Mr. Clarkson to know that my experience of the working of this brake is very much the same as his, though not quite so exciting. In fact, Sir, so frequently have I been late, and so often have we run past stations, that I was rendered as curious as your correspondent to know the cause. Having a friend in the engineering department on the Midland, I have made inquiry, and am able to tell Mr. Clarkson something, though I may not be quite correct in the technical details, nor do I know that he will derive much comfort from it. It seems that the power that works the brake is a vacuum, and is under all the carriages. This vacuum is kept up from the engine, and on both sides of a piston on every carriage, and when it is destroyed on one side by letting air into the pipes, then the brakes go on. This was all very well, but why, I asked, are we delayed so often, and why cannot drivers prevent us running past the stations, although sometimes we can feel the brakes on, and are nearly stopped too soon. Then the murder came out. It seems, Sir, in each piston there is a hole to allow the brakes to come off almost at once by themselves, and whether the driver has done with them or not; and sometimes this happens at the wrong time. Then the driver cannot get any more power or vacuum into the cylinders until he has taken off all the brakes, or they have leaked themselves off by the leakhole; and I am told it takes comparatively a long time to get this supply of power the same as it was before. No doubt this will account for Mr. Clarkson feeling the brakes grinding, and then the train shoot forward again at Liverpool, so that it could not be stopped before it came into collision with the buffers at the end of the station. I asked my friend, "Why not stop up this hole?" and I was told, "Oh! they used to have no hole, but they could not work the brake then, because the driver for some reason could not always get the brakes off, and besides, they cannot uncouple the engine or any carriages without the brakes going on, and this led to great delays, and the brakes would remain on now if there was no hole to leak them off; indeed, even now drivers cannot always get the brakes off if the train is long."

I was further informed that the brake was "automatic;" that is, it would stop both parts of a train if it should break in two. I naturally inquired might it not be very dangerous in such a case for the brakes to leak off. My friend said no; and referred me to a report by some eminent engineers—I forget the names—who had shown that all that had to be done was for the guards, or anyone who happened to be about on the line, to put a piece of wood—a "scotch" they called it—in front of the wheels, and that if they were quick enough this would be quite sufficient to prevent any accident. I must confess I have not been much reassured by my friend's explanations, and I can hardly tell whether I have been the victim of chaff or what. It seems to a plain business mind a most extraordinary thing to put a brake on on purpose, and then let it come off of itself whether you want it to do so or not. Perhaps you, Sir, will kindly say what are the facts of the case.

The Midland Company once gained a reputation for being a sort of pioneer amongst railway companies in all that related to improvements, and safeguards, and energetic management; but whatever the cause, it certainly does not merit such a character with respect to safety brakes. Traveller.

London, October 11th.

DIVING IN DEEP WATER.

Sir,—A "diver" told me the other day that he went down a shaft in 180ft. of water and changed a clack in a set of pumps. He said he has not been able to descend more than 80ft. in the open sea, because the pressure is greater on his body in the open sea or space than when inside of a shaft or cylinder. It is difficult to understand why this should be the case, but "facts are chiels that winna ding," and I should like to know if this is the experience of other divers, and the reason why? R. M.

September 21st.

RAILWAY MATTERS.

A TRIAL is now being made with a number of sleeping and *restaurant* cars between Paris and Vienna, by the International Sleeping Car Company.

THE station of the Compagnie des Chemins de fer de l'Ouest at St. Lazaire has now been lighted some time with the Edison light. Ten Z-type machines and 120 B lamps, eight candles, and 60 A lamps, sixteen candles, and a 20-horse engine are used. The Salle des Pas Perdus is lighted with suspended sixteen-candle lamps, two in each lamp. Several systems have during the past few years been tried at this station, but all have been given up.

THE *Colonies and India* says: "A suitable pass has been found through the Selkirk Range in British Columbia, which shortens the Canadian Pacific Railway by about 100 miles, and the line will run through a better country both in the North-West Territory and in British Columbia. The railway will pierce the Rocky Mountains about 100 miles south of Yellow Head Pass, which was originally intended to have been utilised." This is only one of many short cuts which have been found, and if they increase much in number there will not be much railway to build at all.

IN concluding a report on an accident which occurred on August 1st, between Chorley and Adlington junction, on the Lancashire and Yorkshire Railway, when the leading and driving wheels of the engine of an up passenger train from Fleetwood to Manchester ran off the rails at a spot nearly 2¼ miles from Chorley, where the line was being relaid, Major-General Hutchinson says: —"The company's servants with the train appear to have acted well in the emergency. It was fortunate that there was a continuous brake [Fay's] in the guard's hands, applying to five out of the seven vehicles composing the train. Had the continuous brake applied also to the engine and tender wheels, and been under the control of the driver, the accident would have been altogether prevented."

THE catalogue of the exhibits at the National Exhibition of Models of Improved Railway Wagon Couplings and other Railway Appliances, recently held at Darlington, shows that there were many very ingenious appliances exhibited, and that the arrangements were well made. A brief, and in most cases sufficient, description of each invention is given in the catalogue, which is printed on one-half only of each page, so as to leave room for visitors' notes. This is a feature which, though not new, should be followed at all such exhibitions. The main object of this exhibition was to show that there are plenty of appliances, not costly, by which wagons and carriages may be coupled without getting between the vehicles, the cause of the death of so many men every year.

ON the 12th September, when the Cologne and Brussels express was running down the incline at the back of Liège at full speed, and when near the station of Remicourt, the leading axle of the engine broke. The engine ran off the rails, jumping and floundering over the sleepers and ballast for about 100 metres, when the action of the automatic brake brought the train to a stand. The jumping of the vehicles was so severe that it was feared the train might altogether leave the rails, which, at the speed the train was travelling, would have caused most terrible results, for it was running on a high bank close to a bridge when the accident happened. The train, however, like all the Belgian State trains, was fitted with the Westinghouse brake, and the passengers in this case felt that it had saved them their lives.

THE Railway Couplings Exhibition at Darlington, which opened on Tuesday, the 3rd inst., was closed on Saturday. Although financially the exhibition will entail some loss on the Amalgamated Railway Servants' Society, it is felt that a great end has been gained in bringing together such a variety of railway coupling appliances, automatic and otherwise, from different parts of the world to a railway centre. Trials have been made and awards given by competent judges. The object of the exhibition was to give railway officials an opportunity of studying the different new methods of coupling, with a view to their adoption for the purpose of saving life. One point elicited by the exhibition is that the dangerous method of coupling in use in this country has been almost, if not entirely, superseded on American railways.

WE gather the following as a general summary of the leading features of the report of the Victorian Board of Land and Works on the Victorian railways in 1881:—Total debenture capital raised, £17,672,460; total yearly interest payable, £918,218; unspent balances of loan moneys, £1,690,689; unspent balances of the Railway Loan Liquidation and Construction Account, £42,157; amount spent on capital account during the year, £562,535; total spent in construction at 31st December, 1881, £18,603,830; at an average cost per mile open of £14,919; expenditure from debenture capital, £15,918,518; expenditure from consolidated revenue, £2,544,323; total mileage open for traffic, 1247 miles; average mileage open for traffic, 1215 miles; total miles in course of construction, 159; further length authorised under Act 682, 291 miles; gross revenue earned, £1,665,209; working expenditure, £913,572; profit on working, £751,637.

IN concluding a report on an accident which occurred on the 21st August at Wolverhampton Station on the Great Western Railway, when a passenger train from Birmingham was running into Wolverhampton Station, the leading wheels of the engine left the rails at some facing points ordinarily covered by a wood cover, part of which had been removed and may have fouled the points. The two leading carriages were dragged off the rails and upset across the end of the platform. Major Marindin says: "This accident shows how important it is that the greatest care should be taken when moving any of these facing-point covers, of which there are great numbers upon all lines of railway. Where practicable they should, when in a separate piece, be placed outside the rails, and not in the four-foot way, but I think it is far safer to have them fitted with hinges to turn back upon the fixed part of the cover according to the pattern adopted upon some lines. No doubt at the speed at which the train was actually running, the application of a quick-acting continuous brake would have so checked the speed of the carriages that they might have escaped from being upset across the end of the platform; but unless this brake had been an automatic one, it would have ceased to act when the couplings parted, and it is also more than probable that, if the train had been so fitted, the driver would have been running at a considerably higher speed, and the result might have been the same."

LOCOMOTIVE builders in Manchester have plenty of work in hand for export, and we may add a few particulars with reference to a number of specially designed engines for steep gradients and sharp curves, which Messrs. Nasmyth, Wilson, and Co., Limited, of Patricroft, near Manchester, are constructing for two of the South American railway companies. One order is for the Sangira and Carracas Railway Company, and the engines are constructed to travel on gradients averaging about 1 in 26, with curves in some cases of 140ft. radius. The engines have only a 3ft. gauge, but are fitted with cylinders of 14½in. diameter and 22in. stroke, and supplied with Joy's patent valve motion. To enable the engines to pass round sharp curves a special arrangement is introduced. The engines are carried on six coupled wheels, with a four wheel bogie, and the six coupled wheels are kept as close together as possible under the barrel of the boiler, the rigid wheel base being only 6ft. 5in., whilst the bogie has a lateral play of 3in. or so each way, in addition to the swivelling movement. The locomotives are tank engines, carrying their own water and fuel, weighing altogether 33 tons when in working order, and are constructed to take a load of 80 tons up continuous gradients of 25 miles. Passenger engines of similar construction but of heavier weight, having 16in. cylinders and 24in. stroke, with four coupled wheels and four-wheeled bogie in front, are being constructed for the San Paulo Railway, South America, and the firm have also in hand an order for the Bengal Central Railway.

NOTES AND MEMORANDA.

IN roller milling it appears to be agreed that the best roller periphery speed is between 5000in. to 5500in. per minute, which for a roller of 9in. diameter requires about 200 revolutions per minute.

THE largest fly-wheel ever constructed in the United States has been successfully finished at Newark, in the State of New Jersey. It is constructed in seven sections, each weighing seven tons. The diameter is 25ft., and the face 7ft. 6in. In turning up the wheel the lathe was two weeks running, and 5 tons of chips were turned off the surface, which, if a fact, would seem to indicate that the casting was not of the most accurate. Each revolution of the wheel on the lathe occupied nearly six minutes.

DURING the year the Swiss Postal Union was reinforced by the accession of Chili, Columbia, the Little Antilles, Grenada, St. Lucia, Tobago, the Turks Islands, Barbados, St. Vincent, Guatemala, Haiti, and Paraguay, while, since the commencement of the present year, Hawai and Nicaragua have also joined. In round numbers, the amount of business carried on during 1881 included the transmission of 3,866,000,000 letters, 649,000,000 postal cards, 3,000,000 cards with paid answers, 1,983,000,000 newspapers, 1,023,000,000 printed packets, 64,000,000 patterns, 98,000,000 small parcels. The Post-office orders granted were 95,000,000, representing a value of 8,045,000f. daily throughout the globe, the Postal Union expedites upwards of 13,000,000 letters and post-cards, without counting printed matter, while the distribution of each year includes 3,448,000,000 letters in Europe, 1,246,000,000 in America, 76,000,000 in Asia, 36,000,000 in Australia, and 11,000,000 in Africa.

BY the revised census it appears that the population of Scotland on the 4th of April last year was 3,735,573. Compared with the population of 1871 this was an increase of a little over 11 per cent. At the beginning of the present century the population of Scotland was only 1,600,000 in round numbers, so that the increase since then has been no less than 132·25 per cent. While in 1871 the towns contained only 58 per cent. of the population of Scotland, in 1881 the urban residents numbered nearly 62 per cent. The northern division, which consists of the counties of Shetland, Orkney, Caithness, and Sutherland, is the only one which shows a decrease for the last two decades, though Ross, Cromarty, and Inverness show a slight decrease on the last decade. The two counties in Scotland which have shown the greatest increase of all are Stirlingshire and Dumbartonshire. As might naturally be expected, the county of Lanark contains by far the densest population to be found in Scotland, yet the number of inhabitants to the square mile is not so great as it is in Mid-Lothian and Renfrew.

A MINE has been found in a mountain near Salzburg, Austria, which, it is considered, gives indications of having been occupied and abandoned at least two thousand years ago. It contains a large and confused mass of timbers, which were used for support, and a number of miners' implements. The timbers were notched and sharpened, but were subject to an inundation, and left in confused heaps. The implements were mainly wooden shovels, axe-handles, &c. Among the relics, also, was a basket made of untanned rawhide, a piece of cloth woven of coarse wool, the fibre of which is very even and still in good preservation, and a torch, bound together with flax fibre. The probabilities are that the ancient salt miners were overtaken by the flooding of the mine, as mummified bodies have been discovered also. The find seems to have belonged to the pre-Roman times, as the axe-handles were evidently used for bronze axes, specimens of which have been found upon the surface of the mountain. The relics are of a high order, the basket being superior even to some that were used in the early historic times.

A CORRESPONDENT, Mr. Gilbert Kapp, writing from Chelmsford "On Detecting Short Circuits in the Bobbins of Dynamos," says, "Lately, whilst examining a dynamo, I noticed that it was working very heavily and that the bobbin heated to an alarming extent, although only giving off the normal current. Upon approaching a piece of iron to the field magnets I felt very marked pulsations in the intensity of the field, pulsations at once stronger and slower than those usually found in the field of a dynamo which is working well. This phenomenon was caused by a short circuit inside the bobbin, producing heavy local currents at the moments when the short circuited coils passed the pole pieces. These heavy local currents again reacted upon the field and distorted the lines of force in it. Here we have then an easy way of finding out whether a bobbin is short circuited or not. Any small piece of soft iron—an ordinary key for instance held in the hand and approached to the pole piece of one of the field magnets—is sufficient for the purpose. A telephone would probably answer still better, as being able to detect by sound defects too small to be found out by the more primitive method of the key. Perhaps other electricians have before now discovered the same thing, but as this method of testing a bobbin is so very simple and might in some cases prove useful to one or the other of your readers, I have ventured to give a description of it."

ACCORDING to the "Proceedings" of the Royal Geographical Society, there is reason to think that the apparent difference in the sea-level at Bombay and at Madras is due to instrumental error. From the spirit-levelling operations, made in connection with the Indian tidal observations, and carried across the peninsula from Bombay to Madras, the mean sea-level appeared to be about 3ft. higher at Madras than Bombay. That there are variations in the general level of the ocean surface at different places, when referred, say, to the earth's centre, is possible enough when the attractive influences of mountains are taken into consideration, but General J. T. Walker, C.B., Surveyor-General, points out that they would not be appreciable because the causes must equally affect both the spirit-levels of the instruments and the water-levels of the ocean. After patient investigation, General Walker comes to the conclusion that the cause is to be found in an accumulation of minute errors in the course of the levelling operations, due to the fact that when the general direction of the lines of levels is towards the sun or opposite to it the observer gets a side view of the bubble, refracted obliquely through the thickness of the glass tube, and is thus inclined to regard the outer edge of the rim of the bubble at the end nearer the light and the inner edge of the rim at the other end for the bubble itself. Consequently there is a tendency to assume the instrument to be level when in reality the end towards the light is depressed.

A NATURAL copper-plating bath is thus characteristically described by a Californian paper:—"Two years ago, at a mine operated by Wm. Utter, at Campo Seco, near Milton, water came in and work stopped. To keep the large iron-bound and iron-bailed bucket used to hoist rock from drying up and falling to pieces it was let down into the water. Next season when it was drawn up, lo, a miracle! It was copper-bound and copper-bailed. From this has sprang quite an industry, and the mine has been sustaining itself from ore water ever since. The water contains an acid which has the property of taking into solution the particles of iron thrust into it, and it has also copper in solution which is let go, particle by particle, as the iron is picked up. It is a simple chemical exchange, and this mine may make another profit still if it will get another chemical into the water which will make the acid lay down the iron, which, as a black flood, the water carries down into the Stanislaus river. The copper industry consists in taking bundles of scrap iron and old tin to the mine, where it is thrust into vats of water caught up, in which the metals are soon changed to copper, the residue of the iron taking the form of a black stream and flowing away. To make sure of making the water swap all its copper for iron, which it is glad to do without boot, one vat is placed below another down the bank to the river, and when the water escapes it has eaten its fill of iron and left pay for its meal in genuine copper." Our American contemporary may see this natural process in regular use at Amlwch in Wales, where both the copper and oxide of iron are obtained by means of a number of settling lakes one below another from mountain to the sea level.

MISCELLANEA.

IRON chess boards and chessmen, with concealed magnets to steady them on the board, are sold for travellers in Berlin.

THE divining rod is occupying a good deal of attention in the daily papers again, and the application of a Hughes induction balance for the purpose is suggested.

A CORNISH boiler, about 20ft. in length, exploded on Monday at the works of the Stephenson Tube Company, Liverpool-street, Birmingham, and caused the death of three men.

THE contract for the large dam at Prospect, New South Wales, which forms part of the new Sydney waterworks and mill, to cost about £437,000, is placed in the hands of Messrs. MacGingan and Co.

SOME experiments on the calorific value of the Souris coal has been made with an engine of the Canada Pacific Railway. The coal is said to have generated steam freely, burning with a bright flame, and leaving little or no ash.

MESSRS. YARROW AND CO. have just completed for the Roumanian Government three small torpedo boats for service on the Danube. These boats are fitted up with a view to be used as police boats unless required for war purposes.

DURING the recent war, Colonel Keyser ascended one of the Pyramids near Cairo, and setting up a heliographic mirror, reflected a ray of sunshine to Alexandria, a distance of some 120 miles. The signals, appearing as bright points, were distinctly readable on the coast.

MESSRS. S. WORSSAM AND CO., of Oakley Works, Chelsea, have just published a new edition of their well-known wood-working machinery catalogue, which is well illustrated with engravings which clearly show the construction of the various machinery, and in many cases the details.

WATERLOO HOUSE, which comprises the extensive premises bounded by the quadrangle formed by Cockspur-street, Trafalgar-square, Pall Mall East, and the frontage directly looking down Pall Mall, in the occupation of Messrs. Halling, Pearce, and Stone, is now lighted by sixteen arc electric lights, furnished by the Metropolitan (Brush) Electric Light Company.

THE report of the Chamber of Commerce shows that the Middlesbrough furnaces have turned out 1,072,178 of Cleveland pig iron this year, and 316,000 tons of basic, spiegeleisen, and hematite iron. The stocks have decreased 100,766 tons since the beginning of the year. The finished iron and steel exports amount to 237,754 tons, exceeding those of 1881 by 40,000 tons.

ON Saturday, 30th ult., Messrs. Edward Finch and Company launched from their yard at the Bridge Works, Chepstow, a very superior modelled, built, and arranged iron steamer, for Messrs. Cuthbert and Hancock, Cardiff. Her principal dimensions are 200ft. length, 30ft. beam, and 15ft. depth of hold, with a dead weight capacity of about 1100 tons. She will be fitted with Clyde-built engines.

THE Bow and Bromley Institute, at the railway station, Bow, has now been established twelve years, and the syllabus just published by the secretary, Mr. W. H. Parr, shows that those who wish to learn may attend a series of classes and lectures on building construction, draining, mathematics, mechanics, magnetism, and electricity, relieved by evenings of amusement by concert, &c., at nominal cost.

THE following shows the result of the trade of the port of London for the week ended September 30th:—Number of vessels entered in, 253; tonnage, 142,286; number of steamers entered in, 163; tonnage, 105,853; number of vessels entered out, 160; tonnage, 79,853; number of steamers entered out, 105; tonnage, 59,850; cargo of vessels cleared out, 149; tonnage, 85,897; cargo of steamers cleared out, 101; tonnage, 59,844. Total British vessels cleared out, 111; tonnage, 64,527; British steamers cleared out, 75; tonnage, 43,042; British sailers cleared out, 36; tonnage, 21,485.

THE Paris Opera-house is now lighted with Swan lamps. They have been placed in several parts of the building, but most prominently in the *foyer*, the extremely elaborate decorations of which have been entirely spoilt by the gas. To light the *foyer* with gas, ten chandeliers, with forty-eight lights on each, were used—equivalent to about 4800-candle power. Two of these chandeliers have been fitted with forty-eight Swan lamps each. These were run up to about 40-candle power, making a total of 3840 candles for the two chandeliers—almost exactly equal to the eight remaining gas-lit chandeliers. The effect is very advantageous and pleasing.

MESSRS BOWYER AND PRIESTLEY'S flour mills at Buckden, near Huntingdon, have just been fitted up with incandescent lamps, the electric current being generated by a Siemens continuous current machine, which is capable of maintaining sixty incandescent lamps, a number of which are distributed in all parts of the mill passages, engine and boiler house. As the mill runs all night, the steady, brilliant, and colourless light is found very advantageous, and enables the attendants of the various machines to examine the quality of the flour as well as by daylight. The installation was intrusted to Messrs. Charles Powis and Co., London, and we understand the light is giving great satisfaction.

MESSRS. SCRIVEN AND CO., Leeds Old Foundry, Leeds, have received the highest award—a silver medal—at the North-East Coast Marine Exhibition, Tynemouth, for improved labour-saving machine tools and special appliances for iron shipbuilders, marine engineers, and boiler makers. Messrs. W. H. Allen and Co., of the York-street Works, Lambeth, have received the first prize silver medal for the centrifugal pump exhibited by them at the North-East Coast Exhibition. Messrs. Amos and Smith have received similar recognition of the excellence of their steam steering gear. For their lifeboat, or ships' boat, or raft, Messrs. Timmis and Hodgson of 17, Great George-street, Westminster, have also received a first prize.

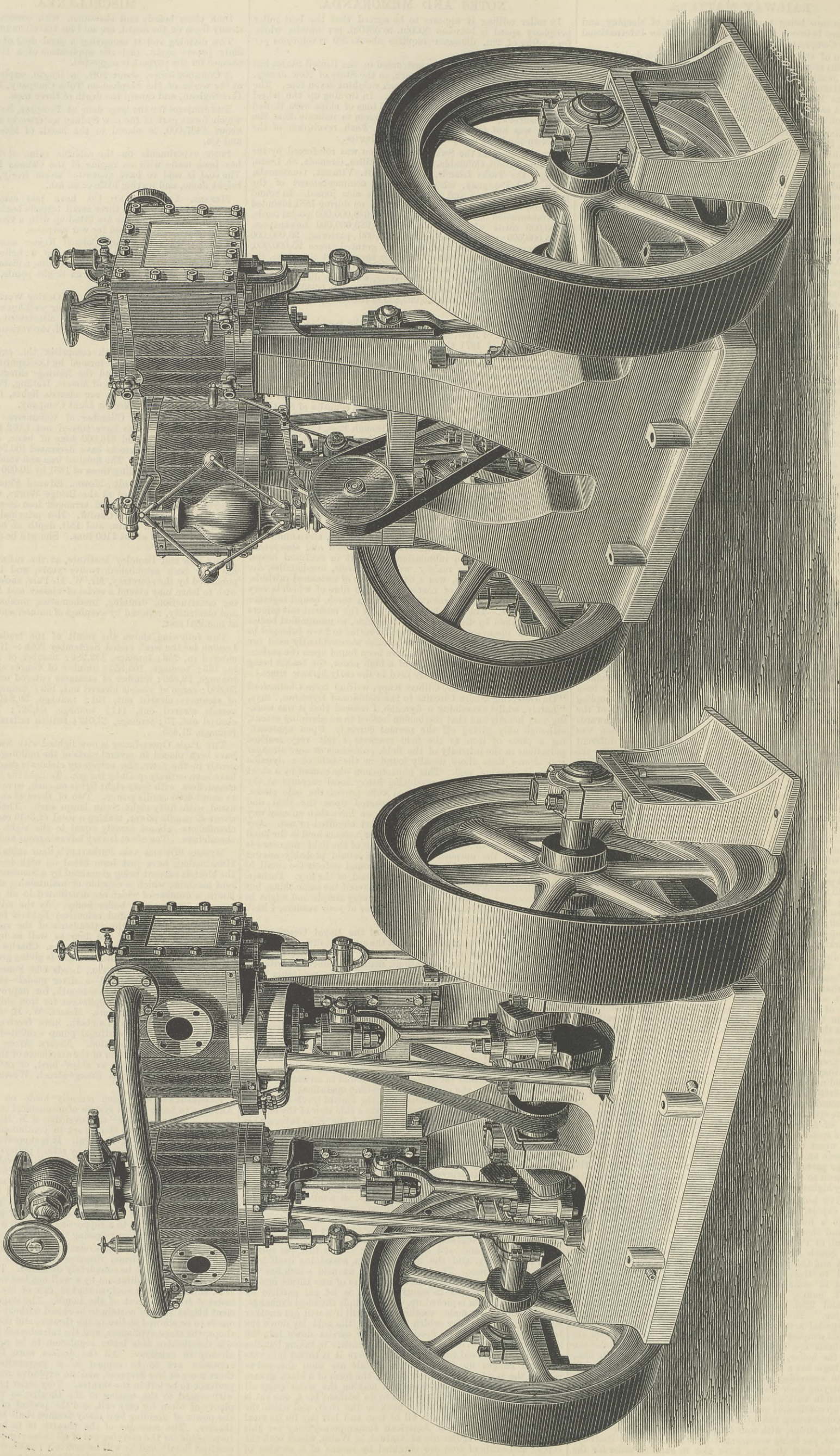
EXPERIMENTS have been recently made on the canal from Antwerp to Liège with a system of mechanical traction of boats by means of a moving cable—the invention of M. Rigoni. An endless cable made of Bessemer steel is set in continuous motion by fixed engines on the banks of the canal. It is supported along the bank by special pulleys, and directed by return pulleys of large diameter lodged in chambers of masonry under the level of the tow-path. The length of the cable is eight kilometres, or five miles. Thus a canal is divided into as many sections, each worked by a fixed engine, as this length of five miles is contained in it. The steam engine acts on the cable through a clip-pulley. The attachment of the boats to the cable is by means of cheeked nippers embracing the cable. On coming to a supporting pulley or a pulley at a curve, the nippers pass without releasing the cable.

THE recent Imperial decree relating to the precautions to be taken against fire in the Vienna theatres enacts that all theatres built from this date are to be completely detached. The stage is to be divided from the auditorium by a wall not less than 20in. high and 18in. thick above the roof, so that in case of fire the stage may be isolated from the rest of the house. The stage must be of sufficient height for the curtain to be raised without being rolled. No one is to be allowed to live in the theatre, and the stage carpenter's shops, the stage appliances, and the refreshment bars are to be outside the theatre, this latter regulation to be applied to theatres already in existence. All the dresses worn by the actors and actresses are to be dipped in a preparation which makes them more or less fireproof, and no explosive matter is under any pretence to be left in the theatre. Very strict provisions are made with regard to the seating of the theatre, so that there may be plenty of room for easy exit, and the prefect of police is to have the power of deciding how many firemen shall be allotted to each theatre. The manager of the theatre is to be held personally responsible for the carrying out of all these regulations down to the smallest detail, and he will be severely punished if, upon the very first alarm of fire, he fails to give the public notice.

ELECTRIC LIGHT ENGINES FOR THE SPANISH GOVERNMENT.

MESSRS. W. H. ALLEN AND CO., YORK STREET WORKS, LAMBETH, ENGINEERS.

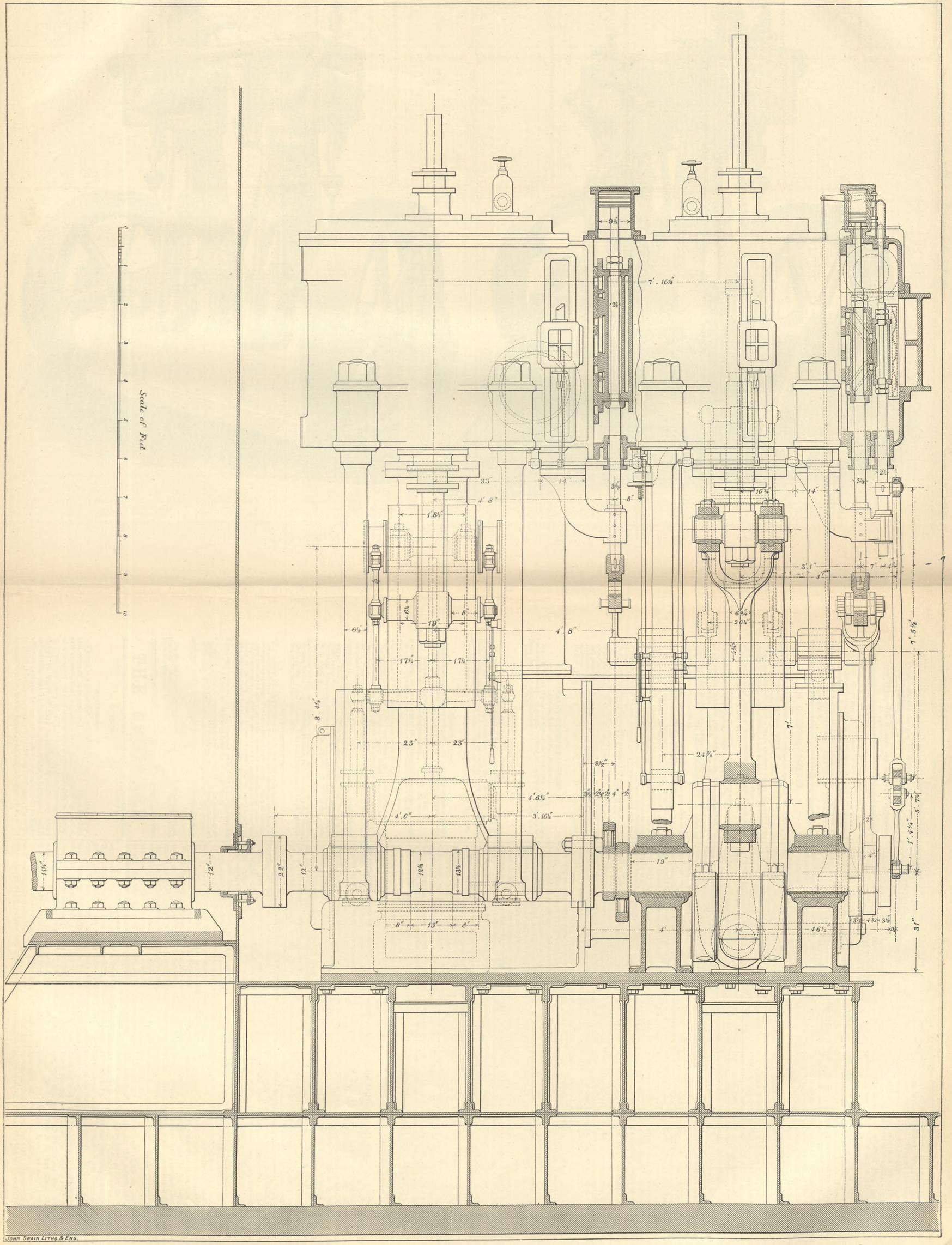
(For description see page 279.)



COMPOUND ENGINES OF THE STEAMSHIP LEERDAM—SECTIONAL ELEVATION.

THE NETHERLANDS STEAMBOAT COMPANY, FYENOORD, ENGINEERS.

(*For description see page* 214.)



JOHN SWAIN, LITHO. & ENG.

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame Boyveau, *Rue de la Banque.*
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NEW YORK.—The Willmer and Rogers News Company, 31, *Beekman-street.*

PUBLISHER'S NOTICE.

*** *With this week's number is issued as a Supplement, engravings of the Compound Engines of the Steamship Leerdam—Sectional Elevation. Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.*

TO CORRESPONDENTS.

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

*** *We cannot undertake to return drawings or manuscripts; we must therefore request correspondents to keep copies.*

*** *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.*

G. B. C. (Bristol).—*We regret that we are unable to aid you. We do not know where the photographs you wish for can be procured.*

R. J. S.—*A great many inventors have devised means for utilising the power of the waves; not one of them has made money, and we can only advise you to spend no more time in working out an idea of no practical utility.*

Vicar of Bray.—*The Cornwall, an engine on the London and North-Western, was fitted with driving wheels* 10*ft. in diameter, and ran with them for some years. The Bristol and Exeter engines had driving wheels* 9*ft. in diameter. The engines on the Great Northern and the Great Western have wheels* 8*ft.* 1*in. diameter to begin with, the extra inch being allowed for turning down.*

C. L. (Frankfort-on-the-Maine).—*The catalogues of the exhibitions to which you refer can always be purchased in the exhibition buildings, and as a rule copies can be obtained by persons who do not visit the exhibitions by applying to the secretaries. Of course, the surest way to obtain one is to ask some friend visiting the exhibition to send you a copy. As the catalogues are only published in the exhibition building, and as every one is supposed to know this, we have not kept back any information on the subject, as you appear to think. We have no doubt that your letter has been overlooked in the hurry of business by the Secretary of the North-East Coast Exhibition.*

GRANITE WORKING MACHINERY.

(*To the Editor of The Engineer.*)

Sir,—Will some of your correspondents kindly give me the names of a few first-class makers of granite working and polishing machinery and plant, chiefly for architectural work? Colonial.

London, October 10th.

FOUNDRY MIXTURES.

(*To the Editor of The Engineer.*)

Sir,—Replying to "Foundry Manager" in The Engineer for this week, I beg to inform him that the best class of iron I find for the class of castings he names is No. 2 Goldendale, No. 3 Madeley Wood, and No. 1 Glengarnock. Properly mixed with good scrap, these brands will run fluid and the test bars will stand a very good test.

October 10th. Another Foundry Manager.

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Advertisements cannot be Inserted unless Delivered before Six o'clock on Thursday Evening in each Week.

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

DEATH.

On the 9th Oct., at Sherley Lodge, Ealing, after a very short illness, Middleton Rayne, M.I.C.E., late Chief Engineer of the Indus Valley State Railway, aged 51. Indian papers, please copy.

THE ENGINEER.

OCTOBER 13, 1882.

ENGINEERING IN THE NAVY.

There is a great deal of engineering done in the Navy; and some of it is very well done—not all. No competent and unprejudiced engineer could make a careful inspection of a modern man-of-war without finding much to praise, and we are sorry to add, a good deal to condemn. It would be waste of time to attempt to point out every defect that may be found in even a single ironclad; but it will not perhaps be out of place to endeavour to indicate in general terms the reason why defects in design, material, or construction, can be found in an English man-of-war. It may be argued at the outset that as nothing is perfect, finality in excellence is not to be found in our Navy as an exception to anywhere else. This we willingly concede; but the concession in no way affects our statement. There are certain standards of excellence to which the work of the engineer ought to come up; and yet these standards do not represent the very best that may be done. But, in the Navy these standards are not reached in certain respects, and it is of this we complain; and the reason why they are not reached is, we assert, because the engineering department is not co-equal in authority with the construction department. In other words, the engineer is subordinate to the shipwright. This is due to the unanticipated survival of an old theory. Before the days of steam, the engineer had nothing to do with ships. Before the Crimean war he was admitted departmentally on sufferance. After the Crimean war he began to be necessary, but he was none the less odious for all that. As time went on, and heavy guns and high speeds were needed, the engineer grew in his influence, and promised at last to overshadow the shipwright. This was not pleasing in official eyes, and the shipwright, otherwise the constructive department, retains its supremacy. There is no Chief Engineer at Whitehall, or anywhere else, who possesses the power of doing what he thinks best. "Give and take" is necessary, we are told, in designing a ship of war; but the engineers have to do all the giving, and the result of adverse circumstances is that their work is sometimes not quite what it ought to be. There is, moreover, another reason which must not be overlooked. The naval architect makes now and then tremendous demands on the engineer. The engineer meets the draughts on his skill after a fashion. The constructive department is only too pleased if they are met at all; and as the Board of Admiralty is the constructive department in a very large sense, no questions are asked, and no trouble is given. Thus, for example, when a First Lord of the Admiralty promises that her Majesty's ship Little Buttercup shall attain a speed of 19 knots, he is not disposed to ask many questions as to how this speed has been attained if only it can be kept up for two or three hours. The First Lord has kept his word, and he need not concern himself further as to how or in what way his possibly rash undertaking has been complied with. The engineers, however, in authority at the various dockyards know all about these things. They know how much of the reputation of our ironclads for speed is well founded and how much is not. They know the price paid for a triumph of a few hours; but they do not speak out, partly because they lack courage, partly because they have suffered their influence to be neutralised, and instead of asserting their own opinions they have submitted to be overruled. In writing this we do not speak at haphazard. There is not a single great dockyard in the kingdom wherein the engineering department is not subservient to the constructive department. The fact is well known. It is a thing of ordinary conversation in the dockyards, and is regarded indeed as a matter of course.

We have no desire to find fault with the constructive department for this. The mischief has to a great extent resulted from want of resolution on the part of the engineers who hold official positions in our dockyards. They have been nominally consulted, and they have either not expressed their own independent views fully, or else they have permitted themselves to be overruled. Without for a moment meaning to disparage the able engineers who now hold the highest positions which they can attain in the service of the Admiralty, we assert that there is wanted now, and has been wanted for some time, a thoroughly able man, by which we mean a man of great resolution and force of character, to look to the system adopted in carrying out the engineering work of our Navy. It is, unfortunately, a rule of the Admiralty that independent observations concerning what goes on at a trial trip, let us say, of one of her Majesty's ships, shall never be made. The representative of a single newspaper is permitted to be on board, and it is quite certain either that he is incompetent to pronounce an opinion as to what is going on, or else that he holds his tongue. We might cite many examples of this—for the truth leaks out in spite of official reticence—but one will be enough. Not long since the trial took place of a very fast addition to our Navy. She proceeded to make her six-hours' full-speed run, and at the end of two hours the trial was brought to an abrupt conclusion by the melting of the fire-bars in more than half her furnaces. The semi-official report stated next day that "a slight defect had manifested itself," and the full-speed trial was abandoned for the moment, and tests were made of the turning powers of the ship. On her next trial fifty tons of spare fire-bars were put on board, and the bars were kept from melting by the stokers flinging buckets of water into the ashpits. Even with this a full speed run of six hours was not made, although the ship remained at sea for six hours, but our contemporary pronounced the run satisfactory in every respect. We do not give the name of the ship, and it is possible that, on the old principle of throwing caps among a crowd, several vessels will be named by those who know them best as complying with the circumstances as we have related them. It is, indeed, an old story that the speed attained on the measured mile or on the six hours' trial is not the true speed of the ship, or near it, and we are unquestionably living in a fool's paradise in this respect.

We in no way blame the engineers who build the engines for this. They guarantee that the engines which they supply shall on trial indicate 5000, 7000, 10,000-horse power, or whatever may be stipulated, and they keep their contract to the letter; indeed, they always give a little more than the Admiralty bargain for; but all the time they are perfectly well aware that if such machinery was put into a merchant ship it could not be regularly worked up to the stipulated power. Here two questions arise for solution. In the first place, would it not be well to contract for a more moderate duty from a given weight of machinery? and, in the second place, is it not possible—as it is certainly desirable—to get in reality the extremely high speeds which we now only think we have, because, forsooth, a pair of engines have indicated an extravagantly high power for a few hours? We hold that there can be but one answer to this. It is of the utmost importance that our ships of war should be able to steam at very high speeds for hours together; and we believe that if the engineer department had sufficiently asserted itself this end would have been attained long ago, and can be maintained even now. The reason why long high-speed runs cannot be made is because the engines and boilers are too small for their work. This is especially true of the boilers. As a sufficient quantity of heating surface is never provided to let the work of steam making be done quietly, fires have to be forced by various expedients, of which the steam blast in the chimney is the favourite. On trial trips an extra crew of trained stokers is always put on board, and it is well known in the dockyards that these men can seldom stand a more than two hours' spell, the labour and the heat in the stoke-holes being alike excessive; an extra 20 per cent. of boiler power is the thing needed. The constructive department, however, maintain that it is impossible to find space for more boilers; but in the same breath they add that a high speed is essential to the success of their design. On this latter point, however, they are obviously inconsistent. It is not to be supposed that when they speak of high speed, they mean that the attainment of the stipulated number of knots per hour for six hours only is enough. That may be sufficient to enable a First Lord of the Admiralty to redeem his pledges to Parliament, but it cannot be enough to satisfy a naval architect who has asserted that a speed of, say, seventeen knots is essential to the success of his design. He must know that this can only mean that the normal full speed of his ship shall be seventeen knots. Now, it is quite clear if this be true—and how can its truthfulness be questioned—that the extra boilers of which we speak are absolutely necessary, and that room must be made for them. If the engineer could make his voice heard, he would insist on this, and would take care that the power needed could be got without all but superhuman exertions. It seems, however, that the high speeds talked of are not essential to the success of our ships of war. If they were we should be in a sorry plight, and the engineers fully understanding this, would, if they had the necessary power, set themselves to oppose what are now known as full-speed trials; because in order that a pair of engines, which will work beautifully for days together at 5000-horse power, may indicate 8000-horse power for a few hours, certain peculiarities of structural detail are introduced which may go far to spoil the engines for their regular work. In one word, if the engineer element was more powerful than it is, we ought to have, and probably would have, more truth and less sham about the speeds of our men-of-war. We do not blame, be it understood, the constructive department. That department has its own sorrows and trials, and marvellous great difficulties to contend against. When it finds the engineering department give way it is not remarkable that it should succumb to temptation, and overtax that branch of the service. In the case of one ship built some years ago, the space available for machinery and boilers was so reduced that the Admiralty for a long time found it impossible to get a firm to undertake the construction of engines and boilers to do the requisite work. It is well known that the difficulty was never fully got over, and that the engine-room and the stoke-hole were practically mixed up together in the most unsatisfactory way. In this case either the Admiralty engineers had never been consulted at all by the Chief Constructor, Mr. E. J. Reed; or else they had refrained from stating the truth; or else their objections were overruled.

It may be said that we exaggerate defects. We think not. So long as our ships have only to make fair weather cruises from one port to another little trouble will be experienced. The fleets will find their way under easy steam power from Portsmouth to Gibraltar, from Gibraltar to Malta, and so on. But if we are to have serious fighting the weak places will be found out, and these, we say without fear of contradiction, will be discovered in the work of the engineers, and not in that of the shipwright. Engineering has suffered in the Navy that shipwrighting may flourish. It is not often that our ships of war are caught in heavy gales, and it is well for them that such is the case. The turret ship Belleisle now at Cork was caught on Sunday week in the storm which then blew. That it was a very heavy gale indeed is indisputable. But making this allowance, the reputation of the ship has suffered terribly. We learn that large quantities of water found their way into the ship, and that a water-tight (?) compartment being defective, it was at one time feared that the fires would be put out. This was bad enough, but worse was to come. The engines running at first at less than half speed, made about twenty revolutions per minute. The captain, however, ordered full speed, and in a very short time the bearings got hot. The ship was then close to a lee shore, and the speed of the engines had to be reduced again to twenty revolutions, and it was expected that she would go ashore. Here we have a notable instance of the failure of the engineering department—a fine ship with her crew being placed in the utmost peril the moment any real strain had to be met.

We do not desire to cast blame on any department. The defects which exist are the defects of a system, and not of individuals. They have grown up until they are far too powerful in their influence to be dealt with by Mr. Barnaby or any one else single-handed. What is imperatively needed is a more equal distribution of power between the two departments. If the engineers say now that a thing cannot be done, and the constructor's department say that it must be done, it is done after a fashion. But if the engineers insist on having their wishes carried out, and the naval architects say that what they wish cannot be done, then it is not done at all in any fashion. At another time we may give our readers instances of what we mean. For the moment we have said all that need be said. Apathy is apt to prevail in Government offices. If what we have written will induce

the engineering department of the British Navy to assert itself a little more than it has done hitherto our present object will have been served.

THE TOWER BRIDGE SCHEME.

Within the last few days three important reports on the means of communication between the north and south sides of the Thames east of London Bridge have been published. They have been written by Sir Joseph Bazalgette, Colonel Haywood, and Mr. Horace Jones. It is unnecessary to reproduce these reports in our pages, as they have already appeared in the columns of the daily press. Taking Sir Joseph Bazalgette's report first, we find that it deals not alone with the so-called Tower Bridge, but with the providing of means of transit between the north and south banks of the Thames for a considerable distance. He holds after duly considering all the schemes which have been proposed, that a high-level bridge crossing the river in one span, at an elevation of 85ft. above Trinity high-water mark, would be the best solution of the difficulty, while near Shadwell and Blackwall he would construct tunnels. The ascent at the north side of the new bridge would be 57ft., and on the south side 92ft., the mean gradient being 1 in 40. As to the expense and the means of defraying it, Sir Joseph states that, assuming that it should be determined to construct the high-level bridge at the Tower, and one tunnel at Shadwell and another at Blackwall, at an aggregate cost of £5,200,000, and that this sum could be borrowed at 3½ per cent. and be paid off in sixty years, the annual expenditure would amount to £207,660, or £570 per diem. This, at the present rateable value, represents a rate of about 1¾d. in the pound. But there are other sources from which funds in reduction of this rate might fairly be raised. The coal and wine dues, which expire in July, 1888, produce £285,000 per annum, or more than the amount required, and no work of greater utility or benefit to the metropolis could be urged upon Parliament in order to justify the further extension of these dues. Sir Joseph Bazalgette estimates that from a ¼d. toll on the foot-passengers and 1d. on the vehicles £616 per day would be produced; or more than would be required to pay off the capital and interest on £5,200,000.

Mr. Horace Jones, besides suggesting the construction of various new streets, proposes the building of a high-level bridge, with a clear headway of 82ft. 6in. at high water. Personally he is in favour of a Bascule, or opening bridge. The high-level bridge might, he holds, more or less interfere with above 1000 tons burden of shipping *per diem*, or about 30,000 tons in the course of a year, supposing that no alteration whatever was made in the topmast or truck-head of the various vessels; but he considers that 82ft. 6in. might be taken as a practicable, though minimum height, and with a very slight fall of the tide the greatest portion of the traffic would be still less interfered with. Mr. Leach, engineer to the Thames Conservancy, would fix the clear head or water-way at 100ft. above Trinity high-water mark. This would give 17ft. 6in. additional elevation, and would, Mr. Jones holds, greatly increase the difficulties of the approaches. He is of opinion that a high-level bridge, if constructed as a suspension bridge, could be kept within a sum of £2,000,000, including an eastern approach, or spur, from East Smithfield; but for a rigid bridge, of equally handsome appearance, with approaches, his estimate would be about £2,150,000. With respect to a low-level bridge it would, he considers, be sufficient to take the same height as London Bridge, viz., 29ft. 6in. above Trinity high-water mark. The cost he puts at £750,000. A subway, with direct northern approaches from Whitechapel-road, and a spiral approach from the south side, would cost, he estimates, about £1,500,000. If with a spur from East Smithfield, about another quarter of a million. A high-level bridge would require, from the centre of the river due north and south, an ascent and descent together of about 5700ft., whilst a subway at the same gradients, and in the same direction, would require a descent for ascent of about the same distance. In a previous report Mr. Jones approximately estimated the cost of a low-level bridge, having mechanical means for opening and closing a portion of its length, with approaches, machinery, maintenance, &c., at a sum of less than £750,000; and he still thinks this may be regarded as the probable cost of such a structure.

The third report, by Colonel Haywood, virtually endorses all that we have said on the subject. He holds that a low-level bridge is the only adequate solution of the difficulty. He maintains that no relief can be given to traffic excepting by the formation of a bridge across the river by the Tower, with very ample approaches to it on both sides of the river. To the east of the Tower of London a good approach already exists in the Minories, which is 46ft. wide, and has a daily traffic through it in twelve hours of 3000 vehicles only. By way of this thoroughfare the City traffic from the bridge could reach Leadenhall-street, Fenchurch-street, and Houndsditch; whilst that going to the east and north-east would avoid the City altogether. A street 60ft. wide should, Colonel Haywood holds, be formed, beginning near the southern end of the Minories, and terminating at Whitechapel High-street, opposite to Commercial-street; by that line traffic would pass between the new bridge and Shoreditch, Bethnal Green, Hackney, and other eastern and northern districts, avoiding its present route through the City. South of the river the main approach to the bridge should at least be carried nearly in a straight line to the Old Kent-road by Great Dover-street; but the best and, indeed, the proper thing to do would be to carry it in the direction of and to somewhere in the vicinity of Camberwell Green. A low-level bridge, similar to London Bridge, should be constructed. No doubt the cost would be great on account of the compensation to wharfingers and others, although it is, he thinks, exaggerated in the minds of most people. He does not consider that with all the changes which might result from the formation of a close low-level bridge the commerce of the City would suffer in the long run, even if it suffers at all. The question of metropolitan fish markets appears to him to be in an unsettled state, and ultimately, he believes, either one market of very much greater capacity and convenience in every sense than Billingsgate, will be made, or else that more than one, if not several markets for fish, will be constructed. It is not probable that, for all time, Billingsgate will be the only site. If a close bridge be erected by the Tower, how to get vessels or fish to Billingsgate must be thought about, and then would arise the consideration as to whether a fresh site to the east of the new bridge might not be found; and, adds Colonel Heywood, a site at once suggests itself close to the City, sufficiently central for the needs of the fish trade, with good approaches, and close to the Metropolitan Railway. A swing, draw, or Bascule bridge, Colonel Haywood looks upon in the light of a compromise, made wholly with a view of preventing injury to the wharves and Billingsgate Market—a compromise by which the port trade would be allowed to interfere for all time with the convenience of a vast population; whilst he regards the height of a high-level bridge as largely diminishing its advantages as a highway across the river—to his mind a vital objection to it.

It will be seen from these statements that two competent authorities are in favour of a high level bridge. When we come to examine the reports, however, it will be found that no question is raised by anyone but that a low level bridge is in every respect better than a high-level bridge. The objection existing both in the mind of Sir J. Bazalgette and Mr. Jones is purely one of expense, not that the low-level bridge will cost more than its rival, but because of the compensation which will have to be paid to wharfingers and others. Nothing, we think, can be more injudicious than an attempt to save money by adopting a compromise. For an indefinite sum, say, £2,500,000, we should get a high-level bridge which would satisfy no one when it was finished. It would be called a nuisance by shipowners, and it would not please those who had to send heavy goods across it. Mr. Jones admits that it would interfere with perhaps 1000 tons of shipping per day, and it is well to bear in mind that all the schemes which have hitherto been brought forward for getting proper approaches to a high-level bridge have been condemned on careful examination.

Even though a new low-level bridge cost £6,000,000, the metropolis is perfectly competent to meet the outlay almost without a thought. The money could be readily raised at less than 3½ per cent., and this would be more than defrayed by the coal and wine dues, the abolition of which would confer no real benefit on anyone but the coal and wine merchants of the metropolis, the gas companies, and certain manufacturers. The public at large would not be gainers. But the proper course to pursue would be to spend even a larger sum of money in carrying out improvements which must be effected some time, and which would at once return a large profit. We propose nothing less now than we have proposed before, namely, the construction of a suitable low-level bridge somewhere near the Tower, and the building of a fine quay or embankment on the north side of the river, at all events between the two bridges, and on this quay should be erected a splendid group of warehouses fitted up with every modern convenience. The rent of these warehouses would bring in an enormous sum, and it is easy to see how the whole of them could be put in ready communication with the shores of the river below bridge by lines of rails, laid, if deemed expedient, in a subway; while by making suitable arrangements, barges might still be loaded and unloaded just as they now are higher up the river. The bridge would answer its purpose perfectly, and shipowners would very soon find that they could send large steamers up stream just as well as they do now. As we have already pointed out, screw steamers of over 1000 tons cargo capacity now go up even to Battersea, and there is no good reason why this practice should not extend. No doubt a certain amount of audacity is required on the part of anyone who would propose that the City should spend five or six millions sterling. But if, on the other hand, the expenditure has become absolutely necessary, it is but waste of time to grumble about it; while if the outlay can be made to pay, then it is obvious that there is really nothing to grumble about. The construction of a high-level bridge would be at best but an expensive compromise; and to save a couple of millions we would, in a sense, waste three. There is an old adage, which tells the world "that the good thing is the cheap thing," and it has a special application to the Tower Bridge scheme.

FORECASTING THE STATE OF THE WEATHER BY THE AID OF THE RAIN-BAND.

A very interesting letter, written by the Astronomer-Royal for Scotland, and published a few days ago in the columns of the *Times*, shows that we have at last some scientific method of arriving at a knowledge of the weather about to come to us. The rain-band, or chief band of watery vapour, is between the orange and yellow of the row of colours making up the solar spectrum, and can be distinctly seen and studied in one of those little pocket spectroscopes which are now made by any optician. Professor Piazzi Smyth gives some interesting observations made day by day for a fortnight during last month by a lady, and side by side with them a record of the rainfall, as noted at the Royal Observatory, Edinburgh. When the intensity of the rain-band was 0 or 1 the weather was dry, no rain fell; but with an intensity of 2 rainfall begins; and with 3 it may be very heavy. To see the rain-band best do not look at a dark part of the sky or of black clouds therein, but look rather where the sky is brightest, fullest of light to the naked eye, and where you can see through the greatest length of such well-illumed air at a low rather than a high angle of altitude, and either in warm weather or, above all, just before a heavy rainfall, when there is and must be an extra supply of watery vapour in the atmosphere. In a larger spectroscope devised for the special work of observing the changes in the rain-band, what is a very narrow fringe to an almost infinitely thin black line in the pocket spectroscope is so magnified as to fill the whole breadth of the field. The solar line D is broken up into D_1 and D_2, arising from the incandescent metallic —not metalloid, as stated in Professor Smyth's letter—sodium in the sun; and in and between and about these lines are several of the terrestrial water vapour lines which vary in intensity while the D lines undergo no change and are most useful for reference. Then there is a long breadth of band towards the red side of D_1, and a pair of lines not so widely apart as the D lines, but sometimes just as sharp and black; then two or three fainter bands; then a grand triple, of which the nearer line shows sometimes greater blackness than either D line; then beyond these three distinct, equal-spaced, isolated bands; and further away towards the red a stretch of faint bands. Upon the little pocket instrument, marking 0 on its very small scale, every member of the long rain-band group in the large instrument, unless a vanishing trace of one or two of the strongest, was utterly gone; and, as regards this large spectroscope, a scale of 30 in place of 3 might easily be employed. The Astronomer-Royal for Scotland has already been able to forecast the weather with marked success, and there is no reason why this new weapon in the hand of scientific men should not be of very extended use.

MINING ACCIDENTS.

One of the useful parts of the work of the North Yorkshire and Cleveland Miners' Association is that of the recording and tabulation of the number and class of accidents in the mines in the district. Such a record it has just compiled for the past half-year—one stating the nature and result of the accident, its cause, and often but not invariably giving the age of the workman and the length of time he had been employed in the mines. In the six months there were seven fatal accidents recorded, but the secretary states that these are far below the real number in his opinion, and thus the report of the inspectors must be awaited before any real comparison can be made. Of the accidents that were not fatal, there are from one to thirty-two recorded at sixteen distinct mines. The youngest person whose age is given is that of a boy of fourteen who had been one year employed at the mines, and the oldest recorded is fifty-three. The longest period of employment of any of the injured is sixteen years, and remembering the comparatively short life of the Cleveland iron miners, the period of work, where recorded, is tolerably long in general. By far the greater number of accidents have occurred through the falls of roof or falls of stone, and the frequency of this class of accident seems to point to the need of still greater care in the timbering of mines, in the working after shots, and generally in the endeavour to secure a firm "roof" during the period of work. The fact that there were 170 serious accidents in the mines to miners connected with the Association during the first half of the present year, even although there was a production of some three million tons of ironstone out of the mines, is a serious comment on the system of working, and that the more especially when it is remembered that there is an almost total freedom from accidents caused by gas in these mines. In the past they have been very free from accidents of a serious nature in proportion to the extent of their production; but in the last two or three years the number of fatal accidents has grown, and it is desirable that there should be an endeavour not only to keep that number in check but also to reduce it. It is, therefore, a useful task that has been for some time undertaken by the miners of the district through their officers—to record the accidents, to mark their causes, and any of the accompaniments they can learn; for it is by the slow and laborious accumulation of facts that the causes and the remedies may be best learnt. That record, however, needs to be full; and so far as fatal accidents are concerned we have it accurately in the mine inspector's returns, but the record of those that were not fatal needs also to be as fully kept.

LITERATURE.

"Les Arsenaux de la Marine." By M. Gongeard, late Minister de la Marine. Berger, Levrault et Cie., Rue des Beaux Arts, Paris. 1882.

The author explains that while it is impossible to give the necessary time to produce an elaborate and profound treatise, he feels it to be his duty to write briefly on facts which he knows from official experience; facts which he thinks are better known out of France than in the country itself. At the same time he has suppressed information which he thought it would be detrimental to publish. The writer dwells on the importance of the perfection in system which alone can give the rapidity in action necessary for success in modern war—in which where one counted time formerly by months, one must now reckon by days, or indeed by hours. He has a general scheme to recommend, though no doubt faults may be discovered in detail in working it out. He recommends—(1) A special system of coast defence to be placed in the hands of the Navy; (2) the readministration and new system of management of the ports, and the suppression of the "Caisse des Invalides," by which means an annual saving of over a million might be effected; (3) the interior order and defence of ports—for this a special plan is proposed; (4) a new system of provision of expenses in the budget; (5) a special naval minister to be appointed to attend to the above. The author considers in succession the geographical functions of ports, especially with a view to war purposes, their functions as to trade, the re-arrangement of expenses, places without harbours, general expenses, improvement of naval ports, construction of ports, relation of the navy to trade and industry, artillery, functions of naval ports in time of peace and in time of war, relation of the Naval Department with other State departments. We can commend the volume to our readers.

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THE SMELTING OF SPATHIC ORES IN STYRIA.

The ores produced in the workings of the Styrian Erzberg, visited by the Iron and Steel Institute, are for the most part smelted in the immediate vicinity at Eisenerz and Hieflau on the northern and at the different furnaces in Vordernberg on the southern side, the remaining portion of the output being exported to Neuberg, Zeltweg, and Schwechat. The furnaces on the Vordernberg side are the most numerous, and in many respects the most interesting, as among them examples may be found of every degree of development from the old open-topped cold blast furnace to those with the most approved modern arrangements for taking off the waste gases at the furnace top and applying them to blast heating and ore calcining. The total number of furnaces or "wheel works"—Radwerke—is fourteen, which are numbered in order from north to south, following the course of the brook which supplies the motive power, the same system of numeration having been in use without change for more than four centuries. Among these three were specially selected for the visit of the members of the Iron and Steel Institute, namely, Nos. 13 and 14 in Vordernberg and Prince Schwarzenberg's furnace at Trofoiach. The first, or Radwerke No. 13, is an example of the older method of working with cold blast in a furnace of very small size, and notwithstanding these drawbacks, producing a high-class of pig metal with fairly advantageous results. The leading dimensions are as follows in Vienna feet, about 4 per cent. larger than English feet:—Total height, 28ft.; height from hearth bottom to top of boshes, 7ft.; diameter of hearth bottom, 44in.; of boshes, 6ft.; of throat, 30in.; depth of hearth below tuyeres, 14in.; capacity, 440 cubic feet. The interior lining is made throughout of blocks of serpentine, and the hearth moulded of a mixture of fire-clay and magnesite—native carbonate of magnesia. Small as the above dimensions appear at the present day, they represent a considerable advance upon those of previously existing stacks upon the same spot. Up to within the last sixty years, the height was only 18ft., which in 1832 was raised to 21ft., and in 1848 to the present height of 28ft., the blowing engine now in use being erected at the latter date. For the last quarter of a century this furnace has been threatened with reconstruction, but it has maintained its ground, partly because in good years there has been a lack of time, and in bad ones of funds to spend in building, but more particularly because it has continued to give a high quality of pig iron under favourable working conditions.

The production corresponding to the different heights given above has been at the rate of three, four, and ten hours in twenty-four hours. The blowing engine, which is one of the curiosities of the valley, has two oscillating cylinders of 3¾ft. diameter and 3ft. stroke. The volume of the cylinders is 33 cubic feet, and the volume of blast at eight strokes per minute is 1060 cubic feet, which is delivered at the ordinary atmospheric temperature at a pressure of 30 lines of mercury. The furnace is blown by two tuyeres of 1¾in. diameter. The charge of charcoal measures 6·25 hectolitres; that of ore by weight is 220 kilogrammes, exclusive of fluxes in variable but always small quantities. The furnace is usually kept in blast for four years and upwards, during which time the average annual production is 3600 tons. As a more detailed example of the working, the results obtained during the week preceding the meeting—that is, from the 13th to the 19th of August—were given, from which it appears that the furnace had then been blowing continuously for 107 weeks, and that each charge of charcoal of 6½ hectolitres carried an average burden of 240 kilogrammes of ore; 642 charges passed through the furnaces during the week, giving a total consumption of 150 tons ore, 80 per cent. of roasted lumps, and 20 per cent. of unroasted small ore, and 3900 hectolitres of charcoal. The other materials were 4½ tons of washed metal recovered from the slags and burnt castings, and 9 tons of flux, a very siliceous clay. The furnace was tapped fifty-six times, eight times daily, and yielded 70 tons of white pig metal. The average yield of the ore was 46½ per cent., and the consumption of charcoal 55·7 hectolitres per ton of metal made. As the weight per hectolitre is 15 kilogrammes, these figures correspond to a fuel consumption equal to 83½ per cent. of the weight of the metal made, or 16¾ cwt. per ton.

The second furnace to be noticed, Radwerke No. 14, was last rebuilt in 1875-76, and its dimensions, translated into metrical quantities from those in Austrian feet, are as follows:—

	Metres.	Metres.
Diameter at hearth bottom	1·422	
Diameter at the boshes	2·212	
Diameter at the throat	1·264	
Height from hearth bottom to top of boshes		2·212
Height of cylindrical stack above boshes		1·896
Height of conical upper stack to throat		9·166
Total height		13·274

Cubic contents 34 cubic metres (1200 cubic feet).

The hearth bottom, made of fire bricks free from quartz, is 1 metre thick; the inner stack lining for the lower 10 metres of its height is built of natural blocks of serpentine, and the remaining 3·274 metres to the throat of talcose schist. The outer stack is made up of two concentric walls, one in common brick and the other in rubble masonry, the intermediate spaces being filled with loosely packed material to prevent loss of heat by radiation. The furnace is blown by three bronze water tuyeres, cooled by a circulation of pure spring water, which contains so little mineral matter that it has hitherto only been necessary to clean out the deposit once in four years' working. The tuyeres are 0·420 metre above the hearth bottom, extend 8 centimetres into the hearth, and plunge at an angle of 3 deg. to the horizontal plane. Their axes are so grouped that the direction of each jet is 8 centimetres to the right of the centre of the furnace, or, as is locally said, the furnace is blown 8 centimetres "over the middle." The use of inclined or plunging tuyeres is common in all the older furnaces, and has for its object the production of a white iron free from silicon and graphitic carbon. The product, though spoken of as white cast iron, more nearly resembles the refined metal of the old refinery or running-out fire of South Wales and Yorkshire.

The waste gases are taken off by apertures in the circumference of the stack, the annular space for collecting them being formed by a sheet iron cone 14 metres high suspended in the throat, which is not closed. They are employed only for calcining ore and heating the blast, water power being available for the blowing engines and lifts. The ores are calcined in Fillafer's patent gas kilns, which are in general use throughout the district. Twelve of these are in use, arranged in pairs back to back in six series. Each is 1·422 metres long, 2·657 metres high, and 0·526 metre broad, giving a rectangular chamber of a capacity of 2 cubic metres; the ore is charged at the top and retained by a grating of movable bars at the bottom. The gas brought by a horizontal main is delivered by a series of vertical flues in the lower part of the brickwork into the burners, which have smaller horizontal channels on each side of the kiln, 260 mm. above the level of the grate, perforated by seven slits 80 mm. broad and 6 mm. high, giving fourteen jets to each kiln. The roasted ore is removed by drawing one or more of the grate bars, when it falls into a cooling chamber below, where it is loaded directly into the charging barrows of the furnace. In the twelve kilns 40 tons of ore in lumps are roasted in the twenty-four hours, the loss of weight being about 28 or 29 per cent. The small ore cannot be treated in these kilns alone, as it packs too close and stops the draught; but in Eisenerz a special kiln is used for this variety of ore, having a bed about 12ft. long, inclined about 30 deg., down which the ore travels, while the flame of a series of jets of gas passes through in the other direction. This, however, is not in general use, the usual practice being to add a certain proportion to the roasted ore in the furnace charges.

The blast used is heated to 480 to 600 deg. Fah. in an iron pipe stove of the so-called Westphalian pattern, in which the heating pipes are horizontal, the joints and connections being made outside the stove. Each of these contains twenty-four pipes arranged in six series, one above the other. The tubes have an oblong section of 343 mm. high and 92 mm. greatest breadth for a cross section of only 251 square centimetres, the total heating surface begin 35 square metres. There are two stoves of these dimensions, but only one is used at a time.

The blast is furnished by an inverted direct-acting cylinder, of 1·817 metres diameter and 1·58 metres stroke, or 4·1 cubic metres capacity, which, at 7½ revolutions, or 15 strokes per minute, gives a gross volume of 61·5 cubic metres per minute, which is delivered at a pressure of 145 mm. of mercury, and heated to 482 deg. Fah., by three 52 mm. tuyeres. The effective volume of blast reaching the furnace is 46 cubic metres per minute. The blast regulator is a horizontal main, of 80 cubic metres capacity.

The furnace lift is on the water-balance principle, but is somewhat complicated by the circumstance that the ore has to be lifted 48ft. and the coal only 30ft., so that the water-power is only necessary in raising the former, the weight of the empty ore wagon falling through the full height being sufficient to raise that loaded with coal through the smaller height. This is done by using different cages upon the same shaft, which run over pulleys whose radii are to each other in the proportion of the differences of the lift, or as 5 to 8. The waste water from the lift is stored in a large cistern between successive tapping times, and is used in granulating the slags. Power is furnished by an overshot water-wheel of 7·191 metres diameter and 3·319 metres breadth of face, weighing 23 tons, making 47 revolutions to 7·5 of the blowing engine. The minimum supply of water in the driest weather is 0·31 cubic metres per second, with a fall of 8·297 metres, equal to about 34·5 gross horse-power, which in summer is increased about 50 per cent. A second smaller wheel, a Legeure turbine, of 20-horse power, drives the accessory machinery.

The materials smelted are, as in the preceding instance, calcined large and raw small ore, in about the same proportion of 80 to 20; but besides the siliceous clay, forge and mill cinders from the Donawitz Works are also used as flux, which necessitate a further addition of lime for their decomposition. The charcoal is of two kinds, about 10 per cent. being made from hard wood, mostly beach, and the remaining 90 per cent. from soft woods, pine and fir. The forests attached to the works only satisfy about 70 per cent. of the requirements, the remainder being brought from other places, which are often at a considerable distance. This continual increase in the scarcity of charcoal is a chief difficulty in the conduct of the blast furnaces in this district, as although less is required now per ton of metal made than formerly, the increased make has so greatly augmented the demand that charcoal is now brought by railway as much as 400 or 500 miles to the furnace.

The details of the charges are—Ore, 180 kilog. calcined, 60 kilog. raw; cinder, 50 kilog.; clay, 5 kilog.; lime, 6 kilog.; coal, 0·75 cubic metres, or 105 kilog. The charges are so regulated that the weights can be kept intact; if the furnace shows a tendency to work hot, double charges of ore are added occasionally, while, on the other hand, if there is a tendency to scaffolding and scouring, a blank or double charge of fuel is used. This is, however, exceptional. By a curious local custom the siliceous flux is added with the fuel and the lime with the ore. The slags, like those of charcoal furnaces generally, are more siliceous than those of coke furnaces. They run rather fluid, and are of a light green colour when cold, from the presence of reduced iron and manganese. In composition they approximate to bisilicates with about 45 per cent. of silica.

The furnaces are worked entirely with closed breasts, both metal and slag being allowed to accumulate in the hearth, and are tapped simultaneously. This construction, though now common in every ironmaking district since the introduction of the Lürmann slag tuyere, was formerly peculiar to Styria and Carinthia, and the furnaces were customarily described in metallurgical treatises as *Blauöfen*, which became in French *Four bleu*, and in one instance in English *blue oven*, but no such word has ever been known in the country whence it was supposed to be derived; it is, in fact, a misconception of the local term *Blaahaus*, which is the exact equivalent of the old Cornish Blowing-house, and refers as much to the bellows as to the furnace.

Formerly the iron and slag were allowed to run into the same bed, and the latter when partly cooled to a viscid condition, was drawn off the surface of the metal plates by hooks. But at the present time the practice of granulating it by a stream of water is generally adopted. At the works under description the contents of the hearth are run through a channel partially closed by an iron shutter. The metal being heavier runs through the opening below the shutter into the sand bed, while the slag being kept back rises in front of the obstacle and flows into a separate channel, where it meets a jet of water, and reduced to the condition of coarse sand, which can be used for building and other purposes instead of natural sand, but is mostly borne into the river and carried away by the stream in flood time. The cake of metal, weighing about 2½ or 3½ tons when solidified, after about half an hour is drawn out and allowed to cool in the open air, when it is broken up into irregularly shaped pieces for use in the puddling furnaces and forges. As a rule it is white, granular, or finely laminated on the fracture with numerous large or small holes, very much resembling refined iron that has been cooled with water. The composition is as follows:—

Total carbon ...	3·28 per cent.	Sulphur	0·03 per cent.
Manganese ...	0·71 ,,	Phosphorus ...	0·02 ,,
Silicon	0·13 ,,	Copper	traces.

The daily make of the furnace is about 22½ tons; the consumption of charcoal 70·1 per cent. by weight on the iron produced, or a notable economy on its unimproved neighbour No. 13.

ELECTRIC LIGHT ENGINES.

We illustrate on page 276 a pair of self-contained vertical engines constructed for providing power for electric light, designed and manufactured by Messrs. W. H. Allen and Co., of York-street Works, Lambeth, for the Spanish Government, for the installation of the War-office and streets leading thereto, at Madrid. The engines have been made to occupy the least possible space, and to form as compact a machine as possible. The cylinders are 9in. diameter by 8in. stroke, and intended to work at 300 revolutions per minute with a pressure of steam of 80 lb., when they will indicate 100-horse power. The cranks, which are of the best selected steel, are placed at right angles, and are bolted together in the centre, having the balanced weights forged on solid; this coupling forms the pulley for driving the governor. The cranks are supported by six bearings of manganese bronze, each 5in. long. The fly-wheels, which are turned all over inside as well as outside, having a counter-weight cast out, are so arranged as to exactly balance the whole of the working parts, thus securing a very steady movement. The two engines are connected by one copper steam-pipe, upon which is placed the throttle valve. This valve works upon two fine centres without bearings, rendering the valve extremely sensitive.

The arrangement of the engines is good, and they are specially suitable for working on board ships, or in limited or underground spaces where electric lighting machinery often has to be placed. The workmanship is of that superior quality for which Messrs. W. H. Allen and Co. have become well known.

New Steel Works at Workington.—Messrs. Chas. Cammell and Co. are having some new steel works built at Workington, which will be ready for business purposes at no distant period. The brickwork is very far advanced, 300 workmen being employed in the erection.

The Law of Libel.—Mr. T. Hughes, Q.C., Judge of the Nantwich County-court, yesterday gave an important decision on the law of libel by deciding that an editor might alter an advertisement to prevent a libel. An application had been made by Dr. Mackie, of the *Warrington Guardian*, for a small account, the payment of which had been refused on the ground that he had changed "machinations" to "doings." This was brought forward as a test case and decided in favour of the newspaper.

The Vienna Elevated Railway.—The *Neue Frei Presse*, evening edition, of the 5th October, 1882, states that it has received information from the most reliable source that the Government has already determined to grant the concession to the English company "Fogerty." The municipality and magistracy will only now have to discuss the question of technical construction. The line will be concessioned as an elevated railway, and the entire iron required for construction, from about 150,000 to 180,000 tons, will be furnished by works in Austria. A contract for the greater portion of this quantity has already been concluded with the Wittkowitzes Ironworks.

Trial Trip.—The fine twin-screw tug, Lady Wood, constructed by Messrs. Lewis and Co., of Blackwall, for Mr. Sidney Turner, of Natal, went on Saturday last for her trial trip on the Thames. Four runs were made on the measured mile below Erith, the mean speed obtained being ten knots, with an average boiler pressure of 74 lb., the engines making 133 revolutions per minute. This vessel, which has been designed for use at Port Natal, is supplied by Messrs. Alex. Wilson and Co., of Vauxhall Ironworks, with two pairs of compound engines of their most recent design, capable of indicating not less than 300-horse power, and the machinery was supervised throughout its construction by Mr. J. F. Flannery, of 9, Fenchurch-street. The trial trip was in all respects satisfactory, and the vessel will shortly sail for her station at the Cape.

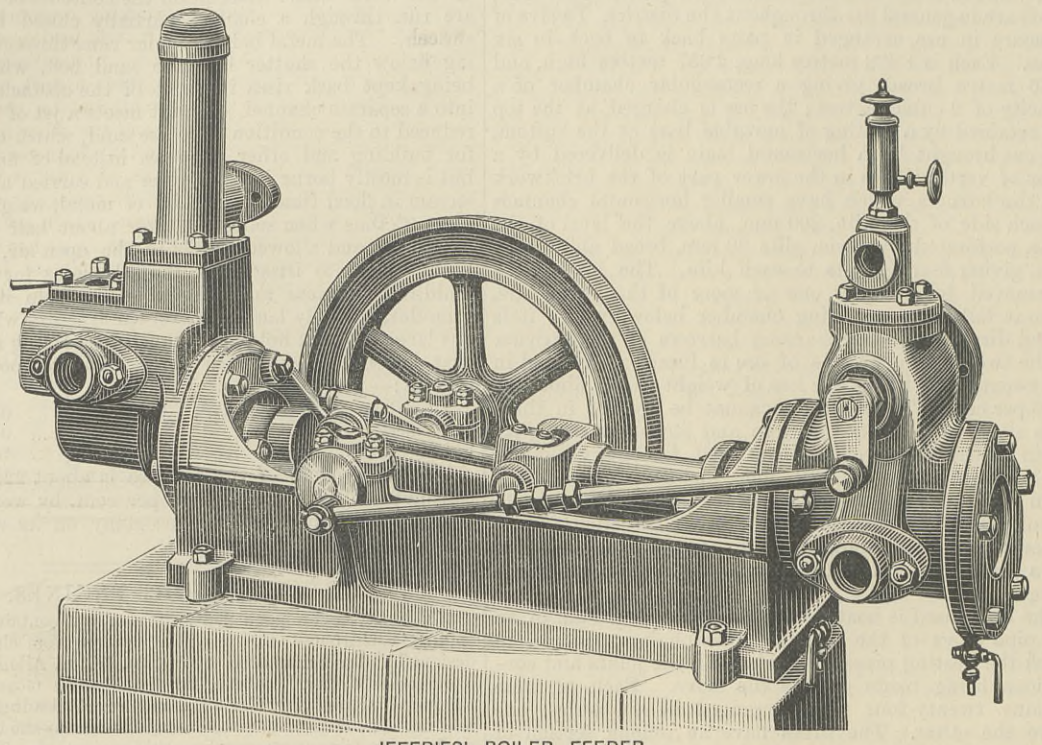
Naval Engineer Appointments.—The following appointments have been made at the Admiralty:—Lewis P. Lewis, chief engineer, to the Crocodile; George J. Weeks, chief engineer, additional, to the Asia; Robert Burridge, chief engineer, to the Rifleman, vice Murdock; William H. Keats, chief engineer, to the Dragon; John H. Adams, engineer, to the Asia, additional, for service in dockyard for training school for engineer students; Robert Balcomb and Josiah P. Thomas, engineers, to the Crocodile; George F. Laird, engineer, additional, to the Asia; John S. Sanders, engineer, to the Euryalus, vice Langmid; William T. Wiggins, assistant engineer, to the Osprey; James Armstrong and Henry J. Oram, assistant engineers, to the Crocodile; and George V. Cawley, assistant engineer, to the Bellisle, vice Sanders.

American Adulterations.—Under the head of "Communications," the secretary read a letter from the office of the Secretary of State of Indiana, asking the club to use its influence to stop the adulteration of food and drink, and inquiring if Brother Gardner had any suggestions to make. "I has given dis adulturashun subjec considerable thought," said the old man, as he elevated his glasses. "When I take home fo' cents' worth of bakin'-powder, I am made to realise dat my biscuit am to be mixed wid alum, cream tartar, chalk, clay, and de laud only knows how much bran-mash, beeswax, an' lemonade left ober from de las' picnic. Dey adulterate my sugar, my tea, my coffee, my beer dat I keep in case of sickness, and when I carried home de las' codfish I found whar dey had tried to adulterate him wid scrap iron. As to de remedy, it seems to me dat if we would all agree to lib fur six months on co'n-meal an' bacon, it would stop dis wickedness; but I should want to see de hogs killed an' de co'n husked wid my own eyes."—*Detroit Free Press.*

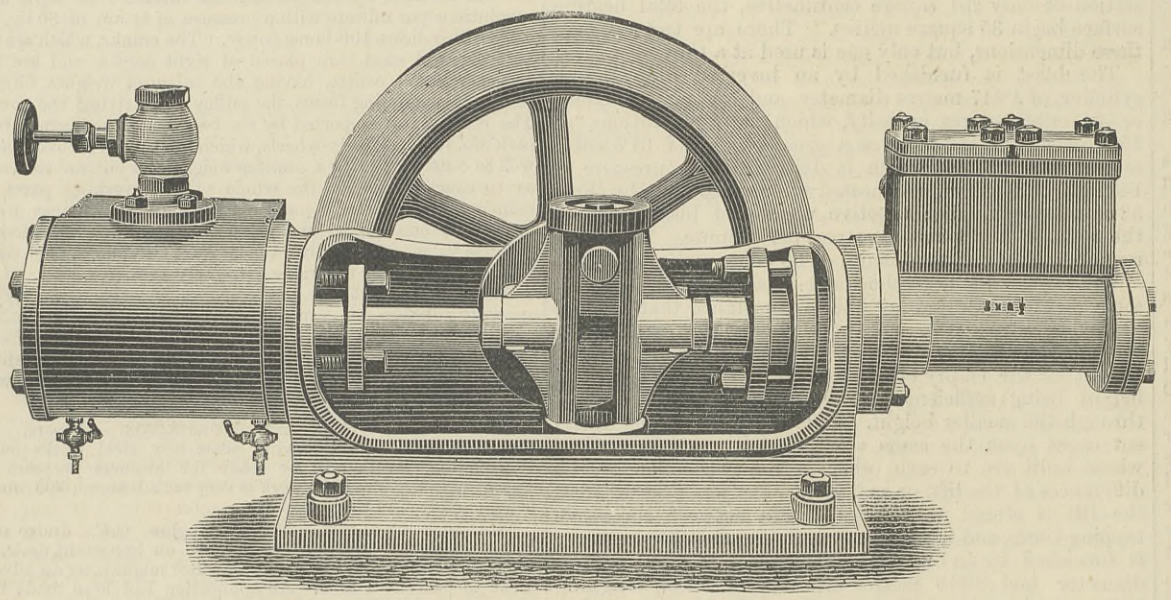
MARINE ENGINEERING AT THE NORTH-EAST COAST EXHIBITION.

No. IV.

Messrs. Tangye Bros. make a large display of their specialities, among which we may particularly mention Jeffries' patent boiler-feeder, in which both steam and water cylinders are combined on one rigid bed-plate. The steam slide valve is of the Corliss type, with a metallic joint in place of the usual stuffing-box. The pump valves and seats are of gun-metal having a large area, and so requiring but little lift. The whole machine is placed under a steel casing, not shown in our engraving, which effectually keeps out the dirt, and which, being hinged to the bed-plate, can be readily removed for purposes of oiling, &c. In the ram pumps, which have been designed to do the work of ordinary injectors as boiler feeders, the suction and delivery valves are of the spherical shape, and thin boxes can be turned to the right or left to suit circumstances. The gun-metal ram, on which the piston is fixed, passes into the steam cylinder, thus giving the maximum length of stroke with a short pump. Barnes' donkey pump, of which the crank shaft and crank disc and pin are of steel, fitted into hard cast iron bearings, and Tangye's high lift centrifugal pumping engine are also shown. These engines, we are informed, are capable of raising 1000 gallons per minute to a height of 15ft., they have a steam cylinder 6½in. in diameter, 7½in. stroke. The pump, 8in. in diameter, is combined with the engine on a massive bed-plate, so as to require but little foundation.



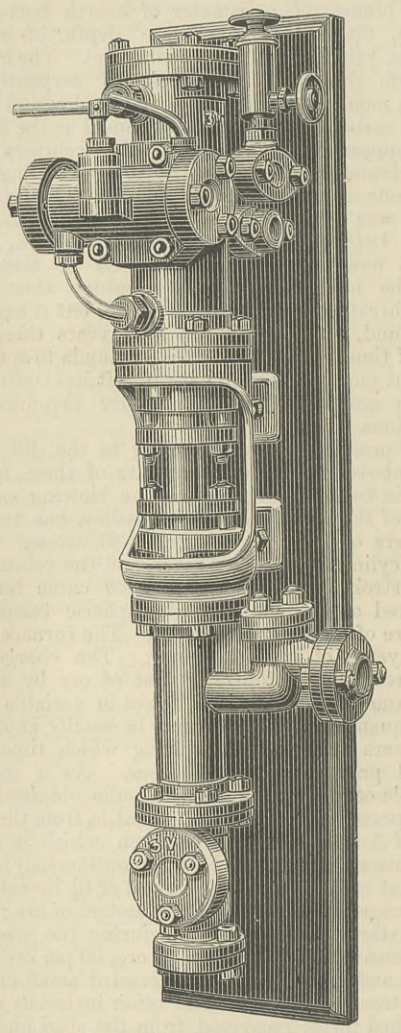
JEFFRIES' BOILER FEEDER.



BARNES' DONKEY PUMP.

Messrs. Scriven & Co., of Leeds, exhibit their new patent portable hole-cutting machine for cutting side lights in ships after the hull is plated, manholes in tanks, boilers, &c. This machine will cut circular holes from 4½in. diameter to 12½in.; it is made entirely of cast steel and gun-metal in order that it may be of such a weight as to be easily portable, being at the same time strong. It consists of a main frame of bridge form which is fixed outside the hole to be cut, by a spindle passing through the plate to be cut, which spindle is secured by a nut and cross bar on the opposite side of the plate. This spindle, which is fixed in the centre of the bridge frame, has cut upon it a screw which carries upon it a feed nut for giving a continuous self-acting travel to the cutting tools, and a disc wheel which carries the cutting tool, which can be adjusted to any size of hole within the range of the machine. The bridge frame also carries a shaft and pinion, which gears into the disc wheel, and is worked by means of a handle by one man. The machine will work upon straight, concave, or convex surfaces, and the inventors tell us that one man can cut a hole 12in. diameter through ½in. plate in fifteen minutes. Messrs. Scriven and Co. also exhibit a self-acting radial drilling machine which has been specially designed for drilling keel bars, girder booms, &c. Two of these machines placed 6ft. apart will drill the holes in a keel bar 12in. wide and 12ft. long without removing the bar. Each of the machines radiates in a trunnion carriage, and by the transverse motion of the carriage carrying the drilling spindle upon the arm, enables the drills of the two machines to operate upon any portion of the bar. The self-acting feed motion is driven direct by gearing which can be started or stopped at will, so dispensing with belts and avoiding the slipping of the feed. The spindle may also be adjusted by hand. Both machines are driven by one belt, which is overhead and out of the way of the attendant. On this stand will also be found a large working model of Messrs. Scriven's vertical plate-bending machine, which was recently illustrated in the pages of The Engineer, for bending the heaviest class of steel and iron shell plates for marine boilers. They also show their patent hydraulic keel plate bending machine, for bending the garboard strake of bar keel on plate keel ships and other purposes. It will bend both sides of a plate uniformly or with any required degree of twist at one heat and one operation. Plates may also be bent to a channel section thus ⋂, with either a parallel or a taper channel. The bed of the machine is so made that it can be widened out either parallel or taper to bend different sections. The plates while being bent are held on the bed of the machine by a strong beam worked by hydraulic cylinders, and the rollers for bending the plates are also worked by hydraulic cylinders supplied from an accumulator. Before passing from this exhibit we may add that it also included a large scale working model of the vertical plate-bending machine—recently illustrated in these pages—for bending the heaviest class of steel and iron plates for marine boilers. The axles of the rollers are placed vertically, and the plate when passing through them, being on its edge, supports itself. The plate always travels in a horizontal position, and any curvature put upon it by the rolls is retained, and it comes out of the machine perfectly circular and without the double curvature at the ends, as in the case of plates bent by the ordinary type of plate-bending machines. Plates may thus be bent to any radius, or to a complete circle so as to form a tube, for the front roller is removable, so that the tube when bent may be taken off. The whole machine is neat and compact, and the driving gear being under ground is out of the reach of dust and dirt, while being easily accessible for purposes of examination, lubrication, &c. It also possesses the advantage of occupying but little room on the floor of the workshop, and it can if necessary be against the wall.

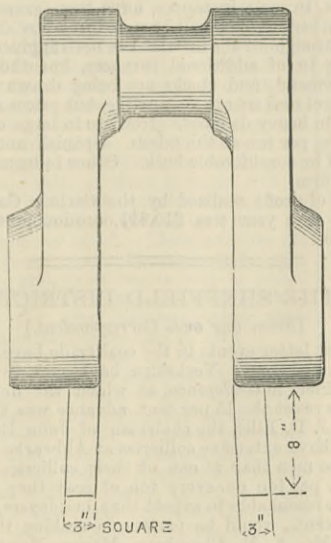
SCRIVEN'S PLATE-CUTTING MACHINE.



TANGYE'S RAM PUMP.

Mr. Dickinson, Palmer's-hill Engine Works, Sunderland, exhibits some of his patent crank shafts, which we illustrate, and which can be at once understood by a reference to the engraving. These shafts are growing in popularity

amongst the shipowners and their superintending engineers of the north-east coast. The webs and pins are made of the best cast steel by Messrs. John Spencer and Sons, of Newburn. The table below shows a test to which pieces cut from the cast steel crank webs were submitted, and fully explains itself without any further remark. The

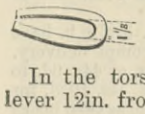


sketch shows how torsion and tensile test-pieces were cast on cranks; the test-pieces as cast being 3in. square and 8in. long, they were afterwards cut into test-pieces of the dimensions given on accompanying list of tests, the transverse test-pieces being cast from same material and at same time, but separately. Both cranks were cast at same time from same material, and are marked S 74¹ and S 74² to distinguish them.

Method of test.	Tensile.		Torsional.		Transverse.
Mark of test	S 74¹	S 74²	S 74¹	S 74²	S 74
Length of bar ... inches	7	7	7	7	14
Size of bar ... ,,	1 5/16*	1 5/16*	1¼†	1¼†	1¼†
Size of specimen ... ,,	·755*	·753*	1·128*	1·128*	1¼†
Original area ... sq. ,,	·4476	·4453	1·00	1·00	1·5625
Fractured area ... sq. ,,	·2734	·229	1·00	1·00	
Permanent set induced—tons per sq. inch	12·23	13·03	7·617	8·161	22·3
Maximum stress—tons per sq. inch	29·64	25·91	31·015	30·47	46·3
Contraction of area — per cent.	38·91	48·57			
Elongation in length of 5in. per cent.	25	31¼			
Maximum deflection, inches					5·96
Maximum angle through which test piece passed degrees			274	275	120

* Circular inches. † Square inches.

In the transverse tests the distance between supports was 10in. The angle given is 180 deg., less the arithmetical mean of included and external angles of test-piece; S 74 after having drawn through between supports was taken to a 2-ton hammer, and submitted to repeated blows till ends met; outside showed no sign of fracture.



In the torsion tests the actual load in lbs. at end of lever 12in. from centre of test-piece was—

	S 74¹	S 74²
Elastic limit	400·75	429·37
Maximum stress	1631·62	1603·0

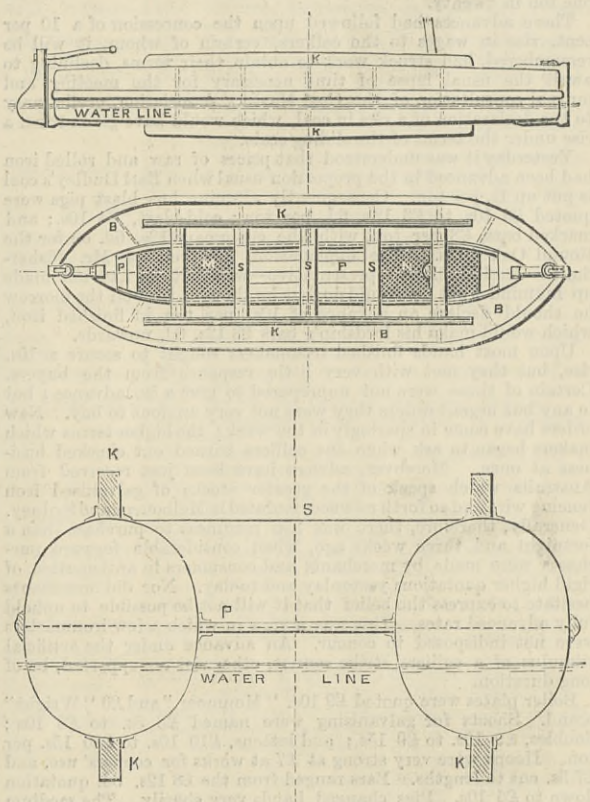
Messrs. Palmer's Shipbuilding and Iron Company, Jarrow-on-Tyne, in addition to a fine collection of models in Section 1, also shows a model of a modern blast furnace, a case containing specimens of various minerals, &c., in connection with the manufacture of pig iron, a case showing the comparative quantities of minerals consumed in making pig iron, and a large steel crank shaft, all which have been arranged for display in the marine engineering section. The shaft is a steel built crank shaft 13½in. in diameter, and is intended for a pair of engines whose cylinders will be respectively 38in. and 71in. diameter, having a stroke of 48in. The shaft, webs and pins are all separate, the webs being keyed on to the shaft by means of keys 3in. by 3½in. by 10⅝in. long. The webs are 10⅝in. in thickness, and the shaft comes through 1/16in. The crank pins, which are the same diameter as the shaft, namely, 13½in., are 3ft. ¾in. long over all, or 15¼in. between the webs. The cranks are at 9ft. centres, and the entire shaft is 18ft. long over all, being provided with coupling flanges 2ft. 3⅞in. at either end.

Messrs. Rose and Duncan, Whitefield Works, Glasgow, exhibit a neat little pair of engines, which are specially suited for yachts and launches, and which have gained at the Exhibition the only diploma of merit—indeed, the only honour awarded to yacht engines. The cylinders are respectively 3¼in. and 6in. in diameter, and the stroke is 5in. The peculiarity of this engine consists in the simplicity of the reversing gear. There is only one excentric for both cylinders, and it is keyed firmly on to the shaft. There are no links or quadrants to wear slack and get out of order, and the moving parts of the engines have been designed to balance each other; reversing is effected by changing the exhaust into a steam passage and *vice versâ*. This has long been done by Messrs. Glen and Ross in a very neat application of the principle. It is also used in steam windlasses, &c., to a considerable extent; but in all these cases at the expense of having no expansion, because the excentric must be at right angles to the crank, in order that there may be the same angle between the excentric and crank, in whichever direction the engine is rotating. Going in one direction the excentric is a right angle ahead of the crank, in this case the slide valve acting as an ordinary slide valve, with steam at the ends and exhaust through the middle. Going in the other direction the excentric is a right angle behind the crank, in this case the slide valve having steam in the middle, and exhausting at the ends. The angles must be right angles or the slide valve would be in a different position as regards distribution of steam in the two directions. The consequence is that the valves cannot have lap for expansion, and steam is carried full stroke; exhaust also goes on full stroke. Notwithstanding this loss of expansion, it is found in many cases that the expense and annoyance of the wear and tear of link motion more than counterbalances the loss of economical use of the steam. The engine shown has a valve arrangement that admits the exhaust steam from the high-pressure cylinder to work the low-pressure cylinder, and so get expansion. The cranks are set opposite—or a little off to avoid a dead point—and thus the moving parts balance each other. When the slide valve of one cylinder is acting as an ordinary slide—viz., steam at the ends, exhaust in the middle—the other cylinder's slide valve is acting as the reverse, and consequently one excentric—at right angle ahead of one crank and right angle behind the other—actuates the two slide valves; so that they work up and down simultaneously. All the valves are piston valves in equilibrium, with a simple but effective packing. The reversing valves are two valves that work simultaneously also, and one only is moved when the engine is to be reversed. There is no intermediate receiver, and the firm claim the continuous expansion as one of the special features of the arrangement. The particular engine at the Exhibition is one of the usual type, built on Mr. Robert Duncan's patent by the firm, and has not been got up specially for exhibition. There is a fashion now of making launch engines with polished steel standards, gun-metal frames, castings, &c.; but the box columns forming double girders as made by Messrs. Rose and Duncan, though probably not so pretty, are extremely stiff and save the owner a considerable amount of trouble and expense in keeping bright and clean. The type is quite new, but has been tried and found satisfactory on board the steam yacht Ville de Suances, which has been lately supplied for use as a passenger-carrying vessel to one of our popular Spanish bathing resorts. The boiler of this little boat is of steel and carries a pressure of 150 lb. per square inch. The trials were carried out under the direction of Dr. Thomson, Professor of Engineering, Glasgow University, and Mr. Thomson, of Messrs. Denny Bros., Dumbarton. The patentee tells us that the engine now under notice, which is being exhibited, is capable of developing 14-horse power, while using steam equal to a single 4in. × 5in. ordinary high-pressure cylinder.

Close to this engine Messrs. Alley and Maclellan, Sentinel Works, Glasgow, show others of a totally different character, in design and finish probably one of the best finished exhibits of the entire Exhibition, namely, a pair of high-pressure non-condensing engines for steam launch, and is made entirely of polished steel and gun-metal. The working parts where two gun-metals rub one another are made of different mixtures of metal. The diameters of the cylinders are 4in. each, and the length of the stroke 4½in.

Messrs. Black, Hawthorn, and Co., Gateshead, show a small four-wheeled outside cylinder saddle tank locomotive of light weight, and complete in all its parts for a 3ft. gauge railway; cylinders, 5in. diameter; stroke, 10in.; copper fire-box and brass tubes; working pressure, 150 lb. per square inch. The wheels are 1ft. 8in. in diameter, and the wheel base is 3ft. As this little engine will pass round curves of 20ft. radius, it is very suitable for dock, harbour, and pier works. There are also exhibited on this stand two donkey pumps, one for ballast and the other for feed; the first has a steam cylinder of 7in. in diameter, with a pump of 8in., and having a stroke of 10in., while the second has a steam cylinder of 8in. diameter, a pump of 4in., and a stroke of 8in. Both pumps, which are double-acting, are lined with brass. The crank shaft has on it a double eye, which forms part of a universal joint for coupling a shaft to work the turning gear of the main engines.

Messrs. Timmis and Hodgson, of Great George-street, Westminster, exhibit one of their life and



TIMMIS AND HODGSON'S LIFEBOAT.

ship's boats, which we illustrate herewith. The boat is made in halves, top and bottom, and each has a deck, and both are alike, with keels, &c., complete. It can be launched either side uppermost, and the two halves are hinged together along one side. The top side can be turned back and the two halves make a raft. In the engraving B B are water-tight bulkheads; K, keels, and, or, gunwales; S, seats; P, deck planking; N, deck netting, through which any water that is shipped runs. It is claimed that the boat will sail, row, and paddle, and reference to the engravings will show to how many purposes the boat can be put. It is made of 13 b.w.g. steel, has numerous bulkheads, and can be launched into the sea if necessary without davits.

Messrs. Beck and Co., of London, also appear with an attractive display of specialties in steam and water fittings, including their well known whistle and their "impermeator" or lubricator for the cylinders and steam chests of marine and stationary engines, a feature of which is that it can be adjusted to give a slow regular feed lasting twenty-four hours or may empty itself in a few minutes.

The boiler at this Exhibition used for driving the machinery is constructed on the Fox and Hopkinson principle, with corrugated flues and conical pipes for circulating the water, and during the month it has been at work it has been examined by many thousands of visitors. On being opened the other day for internal inspection, in presence of many officials and gentlemen interested in boilers, a very remarkable sight was presented, which to many was a real surprise. The water used is of a very hard character, and forms scale rapidly; but on opening the boiler the scale which had formed on the flues was found precipitated at the bottom of the boiler, the corrugated flues having stripped themselves from scale. The general appearance and remarkable result led to a recommendation that this condition of the boiler and deposit of scale should be photographed. Accordingly Mr. Farmer, of the Maxim-Weston Electric Light Company, in conjunction with Mr. Stabler, photographer, of Sunderland, succeeded in obtaining some perfect views of the interior of the boiler. These photographs have been seen, as well as the boiler examined by numbers of engineers who have visited the Exhibition during the last few days, and the whole result is considered a very remarkable achievement, and one interesting to the mechanical and scientific world, as it establishes the fact that interiors of machinery can be photographed by this means. This boiler has been said to be self-cleansing and to strip itself of scaly deposit, and by the result shown at this Exhibition this seems to be an established fact.

FIG. 1

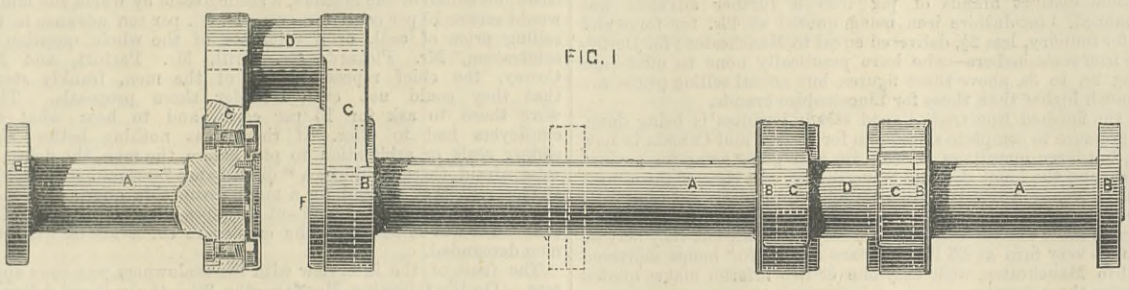


FIG. 2

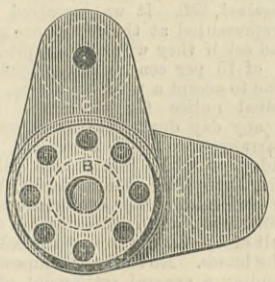


FIG. 3

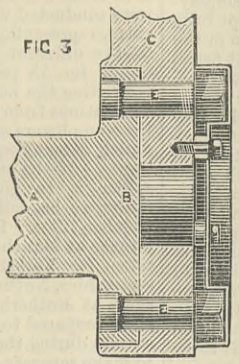
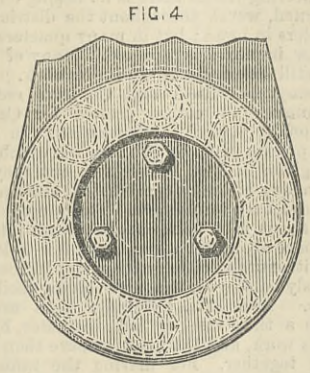


FIG. 4



DICKINSON'S CRANK SHAFT.

UNLIKE many removed buildings or structures of historic interest, the Smeaton's Eddystone lighthouse will actually be rebuilt, and the Duke of Edinburgh will lay the foundation-stone on the 26th inst. at Plymouth.

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

(*From our own Correspondent.*)

When yesterday—Wednesday—the first of the current series of ironmasters' quarterly meetings began in Wolverhampton, circulars had been received from the Earl of Dudley; from Messrs. John Knight and Co., Kidderminster; and from Messrs. Hatton, Sons, and Co., Bilston, intimating that all previous price lists had been withdrawn, and that orders could only be accepted "subject to our prices at quarter-day next." The last two firms are makers of best stamping sheets; and Messrs. E. P. and W. Baldwin, of Wilden and Wolverhampton, who are in the same line, had, it was intimated, been unable, "owing to the crowded state of their books," to accept more orders at £13 for their "Severn" brand of the same class of sheets.

The circular from the Round Oak Ironworks—Earl Dudley's—had been preceded by one from his lordship's colliery offices, announcing a rise of 1s. per ton in coal and making the new prices of thick coal—East of Dudley, furnace sorts, 11s.; forge, 10s.; steam, 10s.; engine slack, 5s. 6d.; Ramrod Hall forge slack, 5s. 3d. Heathen coal was priced—forge, 11s.; engine slack, 5s. 6d. New mine coal, 10s. 6d.; engine slack of same, 5s. 6d. West of Dudley the prices for thick and also heathen coal were, best household, 14s.; furnace, 10s. 6d.; steam, 9s.; bright screenings, 9s.; steam screenings, 8s. 6d.; engine slack, Himley best, 5s.; ditto ordinary, 4s. 6d.

From the same Dudley offices there had likewise come out a new limestone list. This made grey crystalline at the quarries, for blast furnace purposes, 4s. 6d.; and blue or thick bed, for agricultural and masonry purposes, 4s. 3d. per ton, and allowing one ton in twenty.

These advances had followed upon the concession of a 10 per cent. rise in wages to the colliers, certain of whom, it will be remembered, had struck work to obtain their terms, declining to await the usual lapse of time necessary for the meeting and mutual consultation of the Coal Masters' Association, preliminary to the declaration of a rise in coal, which would have given them a rise under the terms of the sliding scale.

Yesterday it was understood that prices of raw and rolled iron had been advanced in the proportion usual when Earl Dudley's coal is put up 1s. per ton. Consequently all-mine hot blast pigs were quoted £3 10s. to £3 12s. 6d. per ton; cold-blast, £4 10s.; and marked bars, £8 per ton, with the customary 12s. 6d. on for the Round Oak bars. The explanation, however, of Mr. Fisher-Smith—Earl Dudley's representative—was that he had not made up his mind what he should do, but he thought that on the morrow he should declare an advance of 10s. per ton in finished iron, which would make his lordship's bars £8 12s. 6d. upwards.

Upon most hands finished ironmakers sought to secure a 10s. rise, but they met with very little response from the buyers. Certain of these were not unprepared to give a 5s. advance; but in any but urgent orders they were not very anxious to buy. New orders have come in sparingly in the week; the higher terms which makers began to ask when the colliers turned out checked business at once. Moreover, advices have been just received from Australia which speak of the greater stocks of galvanised iron fencing wire and so forth now accumulated in Melbourne and Sydney. Generally, therefore, there was less readiness to purchase than a fortnight and three weeks ago, when considerable forward purchases were made by merchants and consumers in anticipation of rigid higher quotations yesterday and to-day. Nor did merchants hesitate to express the belief that it will not be possible to uphold fully advanced rates. This was a view in which a few ironmasters were not indisposed to concur. An advance under the artificial stimulus of a colliers' strike cannot, otherwise unsupported, be of long duration.

Boiler plates were quoted £9 10s. "Monmoor," and £9 "Wright" brand. Sheets for galvanising were named £8 5s. to £8 10s.; doubles, £9 10s. to £9 15s.; and lattens, £10 10s. to £10 15s. per ton. Hoops were very strong at £7 at works for coopers' use, and £7 5s. cut to lengths. Bars ranged from the £8 12s. 6d. quotation down to £6 10s. Pigs changed hands very charily. The medium qualities were quoted quite as high proportionately as the best, and such figures as 50s., 52s. 6d., and 55s. were named for Northamptonshire, Lincolnshire, and Derbyshire.

At the quarterly meeting this afternoon Staffordshire all-mine pigs were quoted 5s. per ton higher, making them 70s.; but the Lilleshall Company, Shropshire, made no advantage. Staffordshire second and third-class pigs were quoted up 2s. 6d. to 5s., making the former 57s. 6d.; marked bars were advanced 10s., making Earl Dudley's £8 12s. 6d. and other makers £8; boiler-plates similarly advanced, making them £9 to £9 10s. Best thin sheet firms refused orders except at 20s. rise. Makers of ordinary merchants' sheets declined to quote, being full of orders. The galvanisers advanced sheets 10s., making the minimum price £15 at outports. The Welsh tin-plate makers met and advanced cokes 6d. per box, making them 17s. Liverpool New mills will start in the Principality directly.

The annual reports of the engineers to the South Staffordshire Mines' Drainage Commissioners were discussed by that body on Wednesday in Wolverhampton, and there was complaining that although £7500 had been spent during the year in pumping the Bilston district, yet the water stood at a higher level now than ever before. The chairman, Mr. Walter Williams, explained that if the expenditure had not been incurred the mines would have been wholly drowned out.

Mr. Williams, however, agreed with other members who expressed the view that the surface works ought to be pushed forward much more rapidly than at present. If this was done the cost of deep pumping would be greatly lessened. Instead of as now being £17,000 a year, he thought that it might be brought down to £10,000, when all the surface works in the Tipton and Bilston districts were executed.

The first claim under the Employers' Liability Act in the Kidderminster district came before Sir Rupert Kettle, as county-court judge, on Wednesday. The claim was made by a tin stamper of Stourport, against the Anglo-American Tin Stamping Company, for injuries caused through alleged defect in a stamping machine, and damages were laid at £180. An amicable settlement was ultimately arrived at, liberal terms being, it was stated, offered by the defendants.

The local Board of Sedgley, near Wolverhampton, are desirous of borrowing £8000 to provide a supply of gas. On Tuesday Major Tulloch held the inquiry on behalf of the Local Government Board, and when it was finished suggested that a loan of £10,000 should be asked for.

Various members of the Gas Committee of the Manchester Corporation have just visited the neighbourhood of Hanley, primarily to inspect the Bucknall Collieries of the Chatterley Coal and Iron Company, where a valuable layer of cannel coal, giving a 22-candle illuminating power of 11,400ft. per ton, has been struck. This layer has been found in the Bambury coal, which is 5ft. thick, the cannel being about one-fourth of the seam's depth. The company has also discovered a very good seam of best quality house coal 6ft. 2in. thick. The visitors also viewed the new blast furnaces erected at Great Fenton by the Stafford Coal and Iron Company, which had been lit for the first time. These furnaces, which have been constructed on the most modern principles, are intended to produce No. 1 foundry pig iron, and will probably compete with Scotch brands.

The colliery owners of North Staffordshire have conceded the men's demand for an advance in wages of 10 per cent., but "under protest," on the ground that the application was premature.

The engine fitters and others employed at the works of Messrs. Hartley and Arnoux, Stoke-on-Trent, and of Mr. Boulton, Burslem, have come out on strike on account of their masters' refusal to give a 7½ per cent. advance in wages. The masters are still determined not to concede the rise, and are filling up the vacant places by fresh workmen.

The masters in the Darlaston nut and bolt trade, in reply to the men's demand for a 15 per cent. advance in wages, have consented to give a rise of 10 per cent. upon bolts from ¾in. to ½in., leaving the payments of all other sizes untouched. The men at first pressed that the advance should be on all the sizes instead of on the first five only, but they eventually accepted the offer, It will come into force at the end of this month, and continue until the end of June next year.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—I still hear complaints being generally made that trade in Lancashire is not what may be termed good, at least not so good as it is in other important centres of industry, and that makers, both of pig and manufactured iron, cannot get as good prices here as they are able to realise in other markets. Producers of iron, however, seem to be rapidly getting into the position of being so fully sold as to be indifferent about securing further orders at present, and of course firmer in their prices. For a considerable time past Scotch and North of England iron has been going away so freely for shipment at Glasgow and Middlesbrough that makers have not been under much necessity of seeking business here; the district makers of Lincolnshire and Derbyshire have also recently for the most part had their books so full that they have not been at all eager for orders, and any business offering being largely as a consequence left practically in the hands of the Lancashire furnace proprietors, who were relatively much lower in price, local makers have now pretty well filled up their books far into the first quarter of next year. The local forges are also all full of work, and in many cases are scarcely able to keep up with their deliveries.

At the Manchester iron market on Tuesday there was not any large weight of business reported, but inquiries seemed to be more numerous, and owing to the causes mentioned above prices were decidedly firmer. Lancashire makers of pig iron who have been doing business lately on the basis of 46s., less 2½, for forge and foundry qualities delivered equal to Manchester, with 1s. to 1s. 6d. per ton above this figure realised recently on a few odd sales, have withdrawn their quotations altogether, and, pending the result of the quarterly meetings, were not open to enter into further engagements, although fair inquiries were made which would no doubt have resulted in orders at an advance upon their late list rates. In some distinct brands of pig iron a further advance was announced, Lincolnshire iron being quoted at 49s. for forge and 50s. for foundry, less 2½, delivered equal to Manchester; for Derbyshire iron some makers—who have practically none to offer—are asking 2s. to 3s. above these figures, but actual selling prices are not much higher than those for Lincolnshire brands.

In the finished iron trade a good steady business is being done. The pressure to complete shipments for Russia and Canada is now over, but large quantities of iron are still going away for general export, and the home demand is increasing. In view of the almost certain advance in prices at the Birmingham quarterly meeting, local makers in some cases would only quote subject to quarter-day rates. Prices to some extent were consequently nominal, but they may be given as very firm at £6 10s. for bars and £7 for hoops delivered equal to Manchester, with only one or two inferior makes quoted at under these figures.

In the engineering trades there is no falling off so far as employment is concerned, works throughout the district being kept fully going with orders in hand; but in many quarters a decrease in the number of new inquiries is reported. Many of the largest firms, however, are still securing plenty of new work.

Messrs. Nasmyth, Wilson, and Co. have recently been manufacturing a number of cotton presses for Calcutta and Bombay of exceptionally powerful construction. In arrangement they are similar to presses made by the firm of which a description has already been given in The Engineer; but they are much more powerful than any hitherto constructed, and in some details improvements have been introduced. The presses stand about 40ft. high over all, about 25ft. being above ground, the working parts occupying a space about 8ft. square, and the holding-up pillars are constructed with nuts at either extremity, in the place of the solid heads previously employed, the nuts giving facility for taking up any slackness. Two 14in. hydraulic rams are provided, with between these a third ram, of 7½in. diameter, by which the press is run up to its work, and the final pressure then given by all three rams working together. For driving the rams the presses are fitted with Messrs. Nasmyth and Wilson's patent double-power engines, and there are twelve pumps, all of which are worked to begin with, but the finishing pressure is given by four only. The cotton box is constructed to hold 500 lb., and all the parts of the press are made exceptionally strong.

The Manchester ship canal project continues to be pretty warmly debated by correspondents in the local press, some of whom are apparently far from reconciled to the abandonment of the original tidal navigation scheme. Mr. Fulton, however, would seem to be wavering somewhat in his views with regard to his own proposal, as since the first issue of his report he has introduced an additional paragraph, which, following immediately upon a most vigorous condemnation of the introduction of locks, reads rather strangely, and I may as well quote it in full:—"As some discussion took place as to the desirability of constructing locks near the Manchester terminus, I prepared a plan, which shows an arrangement for the construction of two locks, with a lift of 15ft. at each lock; the first lock to be placed a short distance above Barton Aqueduct, and a second near the proposed basin. A copy of the plan I ventured to submit to the chairman, Mr. Adamson, on the 8th August." It is, however, obviously too late in the day for Mr. Fulton to alter his scheme; the committee have unanimously adopted the plan proposed by Mr. Williams, and for the carrying out of this they are now engaged in an actual canvas throughout the district to secure the necessary funds for obtaining the requisite Parliamentary powers. The preparation of the necessary plans and documents is also being pushed forward for deposit by the end of the present month. In the Liverpool press, where the scheme cannot be expected to be regarded with favour, the project is commented upon partly in a serious vein with the view of showing its utter impracticability; and partly in a spirit of ridicule; but there is no relaxing of the efforts in this district to carry it to a successful completion.

The coal trade continues active, the arrears of deliveries on account of orders taken last month being still sufficient to keep pits fully going, and as to a large extent the men are restricting the output; this has a tendency to keep up a scarcity of supplies. All classes of fuel are going away freely, although the pressure of actually new orders is not very great, and prices are firm at the full advance. The average quotations at the pit mouth are about as under:—Best coal, 9s. 6d. to 10s.; seconds, 7s. 6d. to 8s. 6d., common, 6s. to 7s.; burgy, 4s. 9d. to 5s. 3d.; and ordinary slack, 3s. 6d. to 4s. per ton. A good shipping trade is being done at prices about 1s. 6d. above last month's rates, steam coal delivered at Garston Docks on the high level, Liverpool, fetching 8s. to 8s. 6d.; seconds house coal, 9s. to 9s. 6d.; and better qualities, 11s. to 11s. 6d. per ton.

There is no material change to notice in the position of affairs with regard to the miners' wages agitation, but the men appear to be quietly making preparations for enforcing an advance if necessary at the close of the month, and if their demands are not conceded a strike seems very probable.

At a special meeting of the members of the Manchester Coal Exchange, it was resolved to take the requisite steps for incorporating the society, and a scheme for this purpose which had been drawn up by the committee of management was adopted.

Barrow.—The pig iron market of this district continues in a very animated state, and the number of inquiries are not only well maintained but there is a corresponding tendency to increase the bulk of their orders. With the shipping season drawing to a close, consumers of pig iron are anxious for delivery, and in some cases have paid prices a trifle higher than those quoted. Continental buyers have largely increased their demands during the past month or two, and the orders now held on their account are of considerable tonnage. American buyers are more plentiful, and appear anxious to put orders in hand at once, and, if possible, to secure early delivery. No. 1 Bessemer is quoted at 59s.; No. 2, 58s.; and No. 3 forge, 57s. per ton, net f.o.b. West Coast ports. These prices, however, in some instances, have been exceeded, and it is likely that another advance will be noted in a few days. The output of metal throughout the district has been augmented somewhat by the blowing in of additional furnaces, but the supply is not equal to the demand, and stocks are being drawn upon to meet deliveries. Steel makers are very active, but prices are unchanged. Steel rails are in heavy demand. Iron ore in large consumption at from 14s. to 15s. per ton at the mines. Spanish and Irish ores are being imported in considerable bulk. Other industries unchanged. Coal and coke firm.

The amount of profit realised by the Carlisle Gas and Waterworks for the past year was £10,191, or double the amount of seven years ago.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

Since my last letter events in the coal trade have moved rapidly. The coalowners of South Yorkshire have met twenty-two delegates of the miners in conference, at which the determination of the masters to resist the 15 per cent. advance was stated very distinctly. Mr. J. D. Ellis, the chairman of John Brown and Co., Limited, who have extensive collieries at Aldwarke Main and Car House, told the men that at one of their collieries the company were losing 2d. per ton on every ton of coal they raised, and he asked if it was reasonable to expect that employers, by advancing wages 15 per cent., would be parties to making that loss 3d. or 4d. per ton. Mr. A. M. Chambers—Messrs. Newton, Chambers, and Co., Limited—pointed out that the advance of 1s., which on an average had been secured in South Yorkshire, applied to only one kind of coal—the "soft" or house coal—while steam fuel, gas, and other sorts all remained at low rates. After carefully listening to both sides, it seemed to me that the argument was all with the masters, though it was pretty clear that the miners' officials and delegates were there with tied hands. When the chairman offered them, on behalf of the masters, a sliding scale by which the miners would secure 15 per cent. for every 1s. 8d. per ton advance in the selling price of coal, or a reference of the whole question to arbitration, Mr. Pickard, Mr. Trill, Mr. Parrott, and Mr. Cowey, the chief representatives of the men, frankly stated that they could not even consider these proposals. They were there to ask for 15 per cent., and to hear what the employers had to offer. If there was nothing better than sliding scale or arbitration to put before the men, the delegates were afraid there would be a "disturbance"—meaning thereby a strike—and they pressed for a more favourable offer. The coalowners stated they could hold out no hopes of any other offer. The coal trade was so bad that the employers could not do what the men demanded.

The fruit of the interview with the coalowners was soon apparent. On the following Monday—the 9th—the colliers' delegates held their adjourned conference at Rotherham. The proceedings were conducted with closed doors. There were present 132 delegates, representing 27,674 colliers. The result of the ballot taken at the different collieries was reported as follows:—For giving notice for 15 per cent. advance, 18,407; against, 771. For restricting the output, 6954; against, 650. It was resolved that deputations from all collieries represented at the conference go to their employers or managers and ask if they will accept a pit-head notice demanding an advance of 15 per cent. on their present wages. If the employers decline to accept a pit-head notice, each collier is to give an individual notice for the same, such notice to be delivered ending any day during the week ending October 21st. It has been arranged to hold a general conference at Manchester next Friday, at which joint action will be taken for Yorkshire, Lancashire, Derbyshire, Staffordshire, Worcestershire, Nottingham, and Warwickshire. The conference meets again at Rotherham on the 30th inst., when all delegates must come prepared to state the result of the deputations to the colliery owners during the running of the leases. No colliery is empowered to make separate conditions pending a general settlement of the question.

In Derbyshire the colliery owners have very generally offered advances of from 5 to 12½ per cent. In several cases the men having been slow to accept the offers, or having declined them, they have been withdrawn.

Fresh plates, on the composite principle, have been ordered for the Italian vessel Italia, which will be by far the most formidable war-ship afloat. It is the barbette type, with steel-faced plates of 19½in.—equal to 24in. of iron at least—placed slantwise at an angle of 50 deg., so as to cause the shot to glance off the armour. The Italia will be armed with 100-ton guns, like the Duilio and the Dandolo. A sister ship to the Italia will be the Lepanto; the order for the plates are expected to be received ere long. Italy is rapidly becoming a great naval Power, her strides since the Battle of Lissa having been extraordinary.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

The quarterly meeting of the Cleveland iron trade, held at Middlesbrough on Tuesday last, was well attended, but there were not many visitors from a distance. Nothing very special marked the occasion as different from an ordinary market day. Messrs. Butter Bros., of the Roseberry Steel Works, Middlesbrough, were the only exhibitors, their exhibits consisting of steel castings for colliery and engineering purposes.

The pig iron trade continues to be firm and cheerful in tone. The demand was not, however, quite so great on Tuesday as during the previous week, but there is every probability that for the remainder of the year current prices will at least be maintained, and perhaps even advanced. Producers have every reason to be satisfied with the outlook. Heavy shipments continue to be made, stocks are diminishing, and, as it has been decided to adhere to a restrictive policy, it is not at all unlikely that for some time to come the consumption will exceed the make.

During the last few days large quantities of No. 3 g.m.b. have changed hands at 44s. 7½d. per ton, f.o.b. for prompt delivery. On Tuesday last there were more buyers than sellers at 44s. 6d. to 44s. 9d. per ton. Makers were offered as much as 44s. 10½d. for f.o.b. deliveries of No. 3, but they were firm at 45s.; and as their books are for the present well filled they can afford to wait. There are many inquiries for November and December deliveries, but sellers are indifferent, as only present prices are offered.

There is but a poor demand for warrants; Connal's No. 3 have been offered at 44s. 6d., but buyers do not consider they are worth so much, and little business has been done. Warrants are not usually taken when makers' iron can be had.

The stock of iron in Connal's store has been decreasing steadily since the last report. On Monday night the amount held was 107,303 tons, being less by 1555 tons than a week ago.

So far this month the shipments of pig iron from the Tees have been even more remarkable than they were last month. Up to Monday night the amount shipped was 30,969 tons, being an average of over 4400 tons per working day. In the corresponding period of September only 22,100 tons were exported.

There is still no improvement in the finished iron trade. The prices quoted are very low, and very little business is being done. Shipbuilders are busy, but do not find it easy to secure fresh orders.

Ship plates in large quantities may be had at from £6 12s. 6d. to £6 15s., though £7 is paid for small lots; common bars are quoted at £6, and shipbuilding angles about the same, all f.o.t. at works, less 2½ per cent. discount.

The steel trade is looking up somewhat. It is a long time since the coal trade has been so cheerful, the higher prices are being fully maintained, and there are rumours that still further advances will be made.

The accountants appointed to inspect the Cleveland ironmasters' books, in connection with the sliding-scale of the Cleveland Miners' and Blast Furnacemen's Association, issued their certificate on Saturday last. It shows that the average price of pig iron for the quarter ending September 30th has been 43s. 2·04d. per ton. By the above ascertainment the wages of all the men working by the ton or by the shift at blast furnaces will be advanced 1¼ per cent. The miners' sliding-scale is worked on the decimal system, and they do not receive quite so much. Their advance for the present quarter will be nine-tenths of a penny per ton, and datal wages will be raised ¾ to 1 per cent. Blast furnacemen have received altogether 14 per cent. advance under their sliding-scale since its introduction in 1879.

The standing committee of the Northern Manufactured Iron Trade Board of Arbitration held a meeting at Midddlesbrough, on Tuesday, when it was decided to issue the following notice, which will be posted in all the works connected with the Board at once:—"The standing committee, at a meeting held on Tuesday at Middlesbrough, decided:—First, that a ballot be taken at the various works connected with the Board on Saturday, the 14th inst., in order that the operatives may declare by their votes whether they are prepared to loyally abide by any arrangement made by the Board or by the award of any independent abitrator jointly selected by the full Board; secondly, that the full Board meet at Darlington, on Monday, the 16th inst., to receive the result of the ballot, and, if favourable, to make such arrangements for the settlement of the wages question as may be necessary." This ballot has reference merely to the impending settlement of wages to take effect at the close of the "Pease award," on the 28th inst., and has nothing to do with the general question of the continuance of the Board of Arbitration.

It is understood that the employers connected with the North of England iron manufacturing trade have appointed a committee to consider the whole question of the continuance of the present Board of Arbitration, with certain modifications, which most of them consider absolutely necessary. This committee will confer with the representatives of the Ironworkers' Union next week, after the present wages question has been either settled or put in training for decision. The leading operatives have made up their minds, as well as the leading employers, that the present constitution of the Board is such as to leave no chance of harmonious working in the future. It is generally agreed, however, by both sides, that the principle of arbitration ought to be maintained, and strengthened if possible. Under these circumstances it is highly probable that some scheme will be arrived at which will be mutually satisfactory to both parties, and which will enable future adjustments of wages to be made in this important trade without perpetual difficulties which have recently encompassed it.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE favourable reports issued by the ironmasters both in Scotland and Cleveland have, of course, not been without their effect on the iron market. But as in the case of the Scotch returns—the result was anticipated for some days—they did not by themselves exercise any marked influence upon business. For several days after they were issued, indeed, warrants tended downwards, as a consequence, it is alleged, of apprehensions of dearer money; and at the close of last week considerable quantities of iron were pressed upon the market. This week the tone has been somewhat improved, aided in a measure by the favourable statement of the secretary of the Iron Trade Association with reference to the very decided reduction of stocks in England. The past week's shipments were fairly good, and the inquiry from abroad is pretty well maintained. At home the consumption of pig iron is on an extensive scale, although current purchases do not seem to be quite so important as they were a week or two ago. The statistics available as to stocks show that those in warrant stores have decreased 3805 tons since Christmas, and those in makers' possession 106,072 in the same time, making a total decrease of 109,877 tons. This is a very good result, but as additional furnaces will now probably be put in blast, it is not likely that this satisfactory state of matters will be maintained to the end of the year.

Business was done in the warrant market on Friday morning at 51s. 5d. to 51s. 1d. cash, and 51s. 7½d. to 57s. 3d. one month, the afternoon quotations being 51s. 2d. to 51s. cash, and 51s. 4½d. to 51s. 3d. one month. The market opened dull on Monday with business at 51s. to 50s. 9d. cash, and 51s. 4d. to 51s. one month. In the afternoon the prices were 50s. 10½d. to 50s. 9½d. cash, and 51s. 1½d. to 51s. one month. On Tuesday forenoon the market improved in tone, with business at 50s. 11d. to 51s. 3½d. cash, and 51s. 3d. to 51s. 6d. one month. The afternoon quotations were 51s. 3½d. to 51s. 5d. cash, and 51s. 6½d. to 51s. 8d. one month. On Wednesday transactions were effected between 51s. 4d. and 51s. 7d. cash. To-day—Thursday—business was done in the forenoon at 51s. 4d. to 51s. 5d. cash, and in the afternoon up to 51s. 6½d. cash, and 51s. 9d. one month.

The four furnaces that were recently put out at Shotts for repairs have been re-lighted, so that there are now 111 in blast, as compared with 105 at the same date last year. Makers' prices are well maintained as follows:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 66s.; No. 3, 56s.; Coltness, 70s. and 56s.; Langloan, 68s. and 56s. 6d.; Summerlee, 65s. 6d. and 55s.; Calder, 65s. and 54s. 6d.; Carnbroe, 59s. and 53s.; Clyde, 55s. 6d. and 53s.; Monkland, Quarter, and Govan, each 53s. and 51s.; Shotts, at Leith, 66s. and 56s. 6d.; Carron, at Grangemouth, 53s.—specially selected, 57s. 6d.—and 52s.; Kinneil, at Bo'ness, 51s. 6d. and 50s.; Glengarnock, at Ardrossan, 59s. and 53s.; Eglinton, 54s. and 51s. 6d.; Dalmellington, 54s. and 52s.

All the malleable works are reported to be well supplied with business; but new orders are not coming to hand this week quite so freely, the inference being that the purchasers brought out by the advance in the prices of pig iron are well-furnished; in the meantime, there is no material change in prices.

Greater activity prevails at the rolling mills employed in the manufacture of plates and other shipbuilding irons, and as new shipbuilding contracts of considerable importance have just been placed, there is every probability that this satisfactory state of matters will continue.

The coal trade is, upon the whole, in a favourable state, although the shipments of the past week fall short of those of the corresponding figures last year—the past week's being 52,486 tons, against 59,728 in the same week of 1881. The inland trade is for the most part good, and prices f.o.b. are firm, as follow:—Main, 6s. 6d. to 7s.; ell, 7s. to 8s. 3d.; splint, 7s. to 8s.; steam, 7s. 3d. to 8s. 6d. Dross does not show any alteration, as the demand for it is, as usual at this season, rather slacker.

The question of the miners' wages is still unsettled. In Fifeshire the secretaries of the employers and workmen have corresponded at length with reference to the matter. Mr. Connel, of Burntisland, writing on behalf of the masters, says, that buyers are refusing to pay the advanced shipping prices on the ground that they can purchase to better advantage from other districts. But the coal-masters, he said, had affirmed their determination to do all they possibly could to secure the advanced rates. He hoped soon that the advance would be established, and then the men might rest assured that their wages would be increased. Mr. Weir, the secretary to the miners, replies, that in the opinion of the latter such an advance in prices has been already established as to enable the coalowners to grant an increase of at least 15 per cent. on the miners' wages. But the leaders of the men desire evidently to act with caution. They propose in the West not to strike but to reduce the output of coal, but it is doubtful whether the men generally will agree to this proposal.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

THE Neath Abbey Works, which has an old and established reputation for marine, mill, and other engines, has been satisfactorily employed of late, and good work was turned out a few days ago.

My attention has been called by an influential employer in Wales to the lack of speculation in starting other industries, and he contends that Wales is now spending thousands of pounds annually for machines bought at Sheffield, Newcastle, or Manchester, which might be made here. It has been demonstrated practically that the Landore plates are equal to the best, but shipbuilding is only feebly carried on in Wales. De Bergue used to turn out excellent boilers, pitheads, &c., but the works are closed. Anchors used to be made at Taff's Well, but are made no longer. Chains are still made at Lennox's Works, Pontypridd, but not to the extent that they might be. Iron bridges are made at the excellent little works of Crumlin for all parts of the world, but they are not half so busy as they might be. In fact, a long indictment is framed against Welsh capitalists for not encouraging these and kindred industries. The fact is, however, that skilled labour drifts off to great English centres, and there is not enough speculation in the Welsh character to enter into keen rivalry, though the mineral riches are near to hand. Messrs. Crawshay sold all their old iron and puddled bar lately, and the whole went to Sheffield, though at a carriage rate of 15s. per ton.

The iron and steel trade is buoyant, and market rates are looking up. Bar iron is in demand, and several foreign shipments have taken place this week. Constantinople is a large buyer. Steel rails are in good demand, and most of the works are busy. At Dowlais on Saturday last the "big pay," as it is called, took place, when £15,000 was paid away to workmen and colliers. The magnitude of the business now done there is well shown by this fact.

More buyers for stocks of old Welsh ore are coming into the market. When these are dearer it will be a question whether the small quantities worked in connection with the coal works will meet requirements. So there is a likelihood of a little Welsh iron mining being again carried on.

Three new steamship companies have been launched—the Eureka, in which Bristol and Cardiff merchants are interested; the Gardepee, principally Cardiff coalowners and shippers—Messrs. Thorel, Gibbs, and others; and the Rhymney, started by the same company.

Large outputs and fullest work at the principal collieries continue to be the order of the day. Most of the Rhondda collieries are doing good work. I note that the Great Western is putting down a compressed air engine for underground haulage. On Wednesday last, in the time from 7 a.m. until 4 p.m., 1300 tons of coal were raised there.

The Caed-penmaen Engineering and Foundry Company, Pontypridd, has been formed, and is expected to return 12 per cent. on investments.

An important meeting of anthracite coalowners and men was held on Monday at Ystalyfera, Swansea Valley, when an agreement and sliding scale was asked after and signed. This will have an excellent effect in given solidity to the anthracite trade.

The coal trade generally is very good, and great animation prevails. There was a total of 225,000 tons of coal sent from all the Welsh ports last week. Cardiff port was particularly high, and the prosperity now prevailing is evidenced by the many new steamship companies starting. I have not heard of any further efforts in floating the Barry Dock scheme. Some hold it to be only a diplomatic movement, and are not likely to go farther than on paper.

New collieries are being projected, one in the Rhymney Valley by Sir George Elliot, and another at Llancaiach, where it is intended to work the rider overrunning the Mynyddyslwyn seam.

Patent fuel is in good steady requirement at present.

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.

27th September, 1882.

4599. SECONDARY or STORAGE BATTERIES, W. Clark.—(*N. de Kabath, Paris.*)
4600. DEVICE for SUSPENDING PICTURES, &c., W. R. Lake.—(*H. R. Heyl, Philadelphia, U.S.*)
4601. CABLES for HAULING TRAMWAY or other VEHICLES, W. R. Lake.—(*S. H. Terry, Guthrie, U.S.*)

28th September, 1882.

4617. BULLET-PROOF SHIELDS for PROTECTING GUNNERS, J. B. Parkin, Woolwich.
4618. FIRE-GRATES for STOVES, E. Whillier, London.
4619. STAYS or CORSETS, R. Young & R. Neilson, Bristol.
4620. SAFES or BOXES, H. Harris, Northampton.
4621. SLIDE-VALVE, &c., MECHANISM for LOCOMOTIVE and other ENGINES, W. R. Lake.—(*N. Bonnefond, Paris.*)
4622. TOBACCO PIPES, T. E. Quirk, Roslyn.
4623. PREPARATIONS of ANIMAL VACCINE, E. T. Darke.—(*Dr. E. Warlomont, Brussels.*)
4624. ROLLING MILLS, W. R. Lake.—(*G. Erkenzweig, Hagen, Prussia.*)
4625. PLANTE'S SECONDARY BATTERIES, St. G. L. Fox, London.
4626. GOVERNORS for REGULATING the SPEED of STEAM ENGINES, &c., P. B. Elwell, Wolverhampton.

3rd October, 1882.

4692. BICARBONATE of SODA, A. W. L. Reddie.—(*B. T. Babbitt, New York, U.S.*)
4693. MACHINES for EXCAVATING EARTH, J. F. Sang, London.
4694. GENERATING, &c., ELECTRICITY, E. Edwards, London, A. St. George, Redhill, and H. Phillips, London.
4695. ELECTRIC LAMPS, E. Edwards, London, and A. F. St. George, Redhill.
4696. ELECTRICAL ACCUMULATORS, &c., A. F. St. George, Redhill.
4697. MAKING GAS, A. Wilson, Handsworth.
4698. TRICYCLES, H. C. Bull, Brooklyn, U.S.
4699. PREVENTING SEA SICKNESS, G. Tagore, London.
4700. STOVES, &c., S. Sturm, Cologne.
4701. FOOT APPLIANCE for SWIMMING, J. Imray.—(*La Société P. Garcet et Nisius, Paris.*)
4702. BEDSTEADS, &c., G. Lowry, Salford.
4703. REFRIGERATORS, &c., P. Jensen. — (*C. Klein, Germany.*)
4704. METALLIC FRAMES for BEDSTEADS, &c., B. J. La Mothe, New York, U.S.
4705. VESSELS for DOMESTIC USE, T. A. Brown, South Norwood Hill.
4706. MAKING PAPER BAGS, W. L. Wise.—(*M. N. Stanley, New York, U.S.*)
4707. STAND for SUPPORTING BICYCLES, &c., G. E. Vaughan and J. Walton, West Bromwich.
4708. SPRING MOTORS, W. P. Thompson.—(*A. E. Rouif, Montreal.*)
4709. CONCENTRATING SULPHURIC ACID, A. J. Boult.—(*J. Gridley, Brooklyn, U.S.*)
4710. RAILWAY COUPLINGS, W. Johnson, Liverpool.
4711. TRICYCLES, &c., W. Briscall, Liverpool.
4712. ELECTRIC BELLS, &c., B. W. Webb, H. P. F. and J. Jenson, London.
4713. ELEVATORS for LOADING, &c., VESSELS, W. Clark.—(*A. D. Fox, New York, U.S.*)

4th October, 1882.

4714. ALKALIES, E. W. Parnell, Widnes, and J. Simpson, Liverpool.
4715. STOVES, &c., J. Bateman, London.
4716. SPINDLES, &c., I. Briggs, jun., Wakefield.
4717. DYNAMO, &c., MACHINES, J. Gordon and J. Gray, London.
4718. ELECTRIC RAILWAYS, J. Hopkinson, London.
4719. LOOMS for WEAVING J. Ratcliffe, Great Harwood.
4720. SPINNING, &c., COTTON, T. Coulthard, Preston.
4721. STEAM BOILERS, &c., G. F. Redfern.—(*C. P. G. Sack, Mariefred.*)
4722. TREATING FIBROUS PLANTS and TEXTILE MATERIALS, E. G. Brewer.—(*La Compagnie Generale des Fibres Cosmos, Brussels.*)
4723. FURNACES, &c., J. Findlay, Glasgow.
4724. ELASTIC FABRICS, W. R. Lake.—(*T. H. Ball, U.S.*)
4725. BICYCLE SEATS, W. R. Lake.—(*J. L. Wilson, U.S.*)
4726. DOOR LOCK, &c., W. A. Barlow.—(*F. W. Boldt and P. C. A. Vogel, Hamburg.*)
4727. TRAPPING SEWERS, &c., W. A. Barlow.—(*L. Henry, Brussels.*)
4728. SHARPENING CALKS on HORSESHOES, W. R. Lake.—(*F. A. Roe, New York, U.S.*)
4729. TRICYCLES, &c., E. Brown, Birmingham.
4730. CHIMING CLOCKS, W. Lake.—(*J. Lindauer, U.S.*)
4731. CONNECTING SPINDLES to LOCKS, &c., J. Drewitt, Peckham.
4732. LUMINOUS PAINTS, &c., H. J. Haddan. —(*G. Schatta, Dresden.*)
4733. INTEGRAL EXTRACTION of FATTY BODIES, W. H. Beck.—(*C. Violett and A. Buisine, France.*)

5th October, 1882.

4734. FURNACES for CONSUMING SMOKE, F. Brown, Luton.
4735. SECONDARY BATTERIES, C. T. Kingzett, London.
4736. PREVENTING RADIATION of HEAT from STEAM BOILERS or PIPES, J. Roberts, Oldham, and G. Travis, Failsworth.
4737. FOUNTAIN PEN-HOLDERS, F. Benvenuti, Swansea.
4738. METERS, A. E. Porte, J. Lesware, and J. Chancellor, London.
4739. VENTILATORS, A. Gandebein, Brussels.
4740. CALL APPARATUS, M. Benson.—(*J. Stabler, U.S.*)
4741. BICYCLES, &c., H. Sutcliffe, Halifax.
4742. PLANTATION HOES, W. Edwards, Wolverhampton.
4743. FASTENINGS for DOORS, &c., H. Hancock, Kennington.
4744. CONVERTING CAST IRON into STEEL, J. Bond and H. J. Whiteley, Tow Law.
4745. GRAIN DRYERS, A. M. Clark.—(*H., G. E., and C. F. Cutler and B. T. Thompson, U.S.*)
4746. STARTING, &c., ROTARY MOTION, C. D. Abel.—(*F. Reuleaux, Berlin.*)
4747. PHOTOGRAPHIC ENGRAVINGS, F. Emery, Burslem.
4748. MUSICAL TOPS, F. Wirth. — (*M. Dannhorn, Germany.*)
4749. ZINC PLATES for PRINTING, J. H. Johnson.—(*J. A. Sylvestre, Paris.*)

6th October, 1882.

4750. BUSTS for SUPPORTING LADIES' COSTUMES, &c., A. W. and G. B. Childs, London.
4751. TANNING MATERIAL, W. R. Lake.—(*A. Badoil and H. Lienders, Paris.*)
4752. INTENSIFYING FLUORESCENT, &c., ELECTRIC LIGHTING, R. Kennedy, Glasgow.
4753. AIR COMPRESSING, &c., PUMPS, J. Davis, London.
4754. CENTRE CHANGE VALVES, R. Blakeborough, Brighouse.
4755. GAS ENGINES, E. G. Westfield, Liverpool.
4756. SECONDARY VOLTAIC BATTERIES, A. Khotinsky, London.
4757. APPARATUS for MIXING WATER with GAS, &c., E. de Pass.—(*E. Körting, Hanover.*)
4758. OBTAINING AMMONIA from FURNACE GASES, J. and J. Addie, Glasgow.
4759. MEASURING WATER, &c., W. and C. W. B. Hamer, Northwich.
4760. HOISTS for MILLS, &c., S. Jones, Warrington.
4761. SPINNING FRAMES, F. and A. Craven and W. Allan, Bradford.
4762. REVOLVING LAMPS, J. Trotter.—(*L. F. Lindberg, Stockholm.*)
4763. BURNER for GAS FIRES, F. R. Mosley, London.
4764. ELECTRICAL APPARATUS for the PROPULSION of BOATS, A. Reckenzaun, Leytonstone.
4765. BUSHING MATERIAL, W. Lake.—(*G. Senter, U.S.*)
4766. DOUBLE-BARREL SMALL-ARMS, D. Bentley and W Baker, jun., Aston.
4767. TAPPING BEER BARRELS, &c., H. D. English, Birmingham.

7th October, 1882.

4768. COVERING WIRES, J. J. C. Smith, New York.
4769. TREATING CARBONACEOUS MINERALS, A. Neilson and A. C. Thomson, Renfrew.
4770. COOLING, &c., LIQUIDS, C. Pieper.—(*H. Egells, Berlin.*)
4771. ELECTRIC LIGHT, O. G. Pritchard, Penge.
4772. COMPOUND for DYEING, W. Aykroyd, Bradford.
4773. GAS ENGINES, E. G. Wastfield, Liverpool.
4774. BOILER, H. C. Bull, Brooklyn, U.S.
4775. FEEDING PAPER to PRINTING, &c., MACHINES, F. Hoyer, Liverpool.
4776. ORGANS, T. Casson, Denbigh.
4777. ELECTRICAL COMMUNICATION APPARATUS, R. Tatham, Rochdale.
4778. TELEPHONES, H. B. T. Strangways, London.
4779. OBTAINING SYNCHRONOUS MOVEMENTS, F. Wolff.—(*P. la Cour, Denmark.*)
4780. ELECTRIC LAMPS, S. Walker & F. Olliver, Cardiff.
4781. WATCHES, J. A. Knott, Balsall Heath.
4782. ELEVATORS for GRAIN, W. S. Brice, Liverpool.
4783. OPENING, &c., WINDOW SASHES, G. Hurdle, Southampton.
4784. CARDING ENGINES, E. Edwards.—(*P. Poncin, Paris.*)
4785. TREATING LINSEED, &c., G. G. B. Casero, France.
4786. PRODUCING LIME LIGHT, E. G. Wood, London.
4787. MOULDING PIPES, &c., J. H. Johnson.—(*G. F. Lufbery, Paris.*)
4788. SCOURING HIDES, &c., W. Lake.—(*C. Holmes, U.S.*)
4789. TYPEFOUNDING, A. J. Boult.—(*H. J. Kolk, C. A. J. Gursch, and C. H. J. Klemm, Berlin.*)
4790. VELOCIPEDES, G. Quatremaine, Stratford-on-Avon.
4791. NEW KIND of GAME, E. Boizet, Paris.
4792. TREATING HIDES, &c., W. Maynard, New York.

9th October, 1882.

4793. ENVELOPES, &c., E. Sturge, Walworth.
4794. FILTERING APPARATUS, E. Edwards.—(*N. A. B. Chevallot, Paris.*)
4795. PREPARING FIBROUS SUBSTANCES for SPINNING, H. J. Haddan.—(*J. F. Gebhart, New Albany, U.S.*)
4796. BURNERS, J. N. Douglass, Dulwich.
4797. STEAM, &c., ENGINES, C. A. and R. C. Parsons and J. H. Kitson, Leeds.
4798. MACHINE for TOUSING, &c., HORSEHAIR, M. G. Daughters, London.
4799. CUTTING OUT CLOTH, J. M. Sellers, Keighley.
4800. GOVERNING WATER APPARATUS, G. Wightman, Retford.
4801. SPINNING, &c., COTTON, C. G. Bracewell and A. Pilkington, Barnoldswick.
4802. PREVENTING CASKS, &c., from BECOMING FOUL, W. H. Beach, Woodfield.
4803. GEARING for BICYLES, &c., W. Britain, London.
4804. PROPELLERS, R. Smith, Sherbrooke.
4805. ELASTIC TERRY WEB, J. Swann, Nottingham.
4806. HARVESTING MACHINES, J. Hornsby, J. Innocent, and G. T. Rutter, Grantham.
4807. SELF-LEVELLING SLEEPING BERTHS, W. R. Lake.—(*J. H. Milligan, Boston, U.S.*)
4808. CLARIFYING BEER, &c., C. Vaux, Doncaster.

Inventions Protected for Six Months on Deposit of Complete Specifications.

4688. NUT LOCKS, A. J. Boult, London.—A communication from W. Mack and J. B. Deeds, Terre Haute, U.S.—*2nd October*, 1882.
4728. SHARPENING the CALKS on HORSESHOES, W. R. Lake, London.—A communication from F. A. Roe, New York, U.S.—*4th October*, 1882.
4740. CALL APPARATUS, M. Benson, London.—A communication from A. P. Stabler, Sandy Spring, U.S.—*5th October*, 1882.

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

4001. MECHANICAL LOADER, &c., J. T. Lemaire, Belgium.—*4th October*, 1879.
4075. PIANOFORTES, &c., G. Green and C. Savage, London.—*8th October*, 1879.
4218. PRODUCING COLCOTHAR, &c., J. F. N. Macay, London.—*17th October*, 1879.
3986. TIRES for CABS, &c., W. I. Taylor, East Greenwich.—*3rd October*, 1879.
3989. VENEER CUTTING MACHINES, F. H. F. Engel, Hamburg.—*3rd October*, 1879.
4022. DRAW BENCHES, &c., A. and J. Stewart and J. Wotherspoon.—*6th October*, 1879.
4053. PURIFYING IRON, F. T. Reade, London—*7th October*, 1879.
4095. GLOBES, &c., of LIQUID AERATING MACHINES, H. M. Thomas.—*10th October*, 1879.
4321. STEREOTYPE PLATES, W. T. Smith, London.—*23rd October*, 1879.
4078. SULPHATE of ALUMINA, W., T., and J. Chadwick, Manchester, and J. W. Kynaston, Liverpool.—*9th October*, 1879.
4832. CAPSULES for BOTTLES, C. Cheswright, London.—*26th November*, 1879.
4021. LUBRICANTS, F. P. Warren, Southsea.—*6th October*, 1879.
4052. BLEACHING, &c., APPARATUS, J. Scharr, Bradford.—*7th October*, 1879.
4076. BINDING CUT CROPS into SHEAVES, W. McIntyre Cranston, London.—*8th October*, 1879.
4080. ASHES LIFTERS, R. B. Lindsay, Glasgow.—*9th October*, 1879.
4081. SPINNING, &c., COTTON, H. and T. Ashworth, Walsden.—*9th October*, 1879.
4117. UTILISING GASES of BLAST FURNACES, J. Alexander and A. K. McCosh, Lanark.—*11th October*, 1879.
4413. VELVETS, &c., T. Emmott, Oldham.—*29th October*, 1879.
4454. REVOLVING CANNON, &c., B. Hotchkiss, London.—*1st November*, 1879.
4041. GRINDING GLASS, W. W. Pilkington, St. Helens.—*7th October*, 1879.
4050. MEASURING LIQUIDS, &c., W. H. Howorth, Cleckheaton.—*7th October*, 1879.
4063. HAFTING of CUTLERY, H. Bramhall and E. Blaydes, Sheffield.—*8th October*, 1879.
4071. POST MARKING, &c., T. Leavitt, Boston, U.S.—*8th October*, 1879.
4079. ORNAMENTAL PILE FABRICS, J. S. Templeton, Glasgow.—*9th October*, 1879.
4289. SASH FASTENINGS, W. Macvitie, Birmingham.—*22nd October*, 1879.

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

3498. UTILISING COMPRESSED AIR, W. R. Lake, London.—*8th October*, 1875.
3468. COATING METALLIC SHEETS, T. H. Jones, Rhymney.—*6th October*, 1875.
3676. ATTACHING DOOR KNOBS to their SPINDLES, W. Macvitie, Erdington.—*22nd October*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition 27th October, 1882.

2558. GENERATING, &c., ELECTRICITY, J. S. Williams, London.—*30th May*, 1882.
2560. ELECTRIC LAMPS, S. Hallett, London. — *31st May*, 1882.

2567. Heating by Electricity, O. Rose, Manchester. —31*st May*, 1882.
2571. Making the Insulating Bodies of Electric Light Conducting Wires Non-Inflammable. W. A. Phillips, Homerton, and S. E. Phillips, Charlton.—31*st May*, 1882.
2573. Dynamo-electric Machine, S. Hallett, London. —31*st May*, 1882.
2578. Telephonic Instruments, S. P. Thompson, Bristol.—31*st May*, 1882.
2605. Implements for Cultivating Land, G. P. Blake, Exeter.—2*nd June*, 1882.
2607. Floorings for Bridges, W. H. Lindsay, London. —2*nd June*, 1882.
2620. Paring the Curls of Hat Brims, J. T. Grimshaw, Stockport.—3*rd June*, 1882.
2629. Intensifying Fluorescent, &c., Electric Lighting, R. Kennedy, Glasgow.—5*th June*, 1882.
2638. Paper Damping and Printing Machines, J. J. Allen, Halifax.—5*th June*, 1882.
2672. Looped Fabrics, W. R. Lake, London.—A communication from C. Young.—7*th June*, 1882.
2639. Mail Elevators, W. E. Gedge, London.—A communication from J. W. Pain.—8*th June*, 1882.
2736. Cooking Utensils, R. Clayton, Deepfields.—10*th June*, 1882.
2841. Steam Boilers, A. D. Barclay, Kilmarnock.—16*th June*, 1882.
2891. Corsets, &c., S. Dixon, Whitehill.—19*th June*, 1882.
3085. Excavating Earth for Sinking Tubing, W. E. Gedge, London.—A communication from C. H. Leach.—30*th June*, 1882.
3177. Horseshoes, W. R. Lake, London.—A communication from F. A. Roe.—5*th July*, 1882.
3199. Cardboard, &c., J. H. Johnson, London.—A communication from J. Müller.—6*th July*, 1882.
3323. Wine or Alcoholic Beverages, J. H. Loder, Leiden, Holland.—13*th July*, 1882.
3810. Looms and Dobbies for Weaving, J. and J. H. Shorrock, Darwen.—10*th August*, 1882.
3864. Malleable Iron, W. S. Sutherland, Birmingham.—14*th August*, 1882.
3878. Wheels for Wagons, &c., H. J. Barrett, Kingston-upon-Hull.—14*th August*, 1882.
3908. Producing, &c., Combustible Gases, W. S. Sutherland, Birmingham.—16*th August*, 1882.
3928. Steps or Ladders, C. A. Jones, Gloucester.—16*th August*, 1882.
4036. Apparatus for Winding Coils of Wire, W. B. Espeut, London.—23*rd August*, 1882.
4060. Machine for Painting, &c., W. H. R. Toye, London.—24*th August*, 1882.
4064. Regenerative Furnaces, C. A. W. Schön, Hamburg.—24*th August*, 1882.
4084. Arc Electric Lamps, P. R. Allen, London.—26*th August*, 1882.
4088. Regulating, &c., the Flow of Fluids, J. C. Stevenson, Liverpool.—26*th August*, 1882.
4229. Ventilating Railway, &c., Vehicles, J. Leather, Liverpool.—6*th September*, 1882.
4263. Mule-throstle Spinning, &c., Machinery, W. Lancaster, Accrington, and E. Slater, Burnley.—7*th September*, 1882.
4351. Utilising Steam, &c., as Motive Powers, J. M. X. Terlinden, Brussels.—12*th September*, 1882.
4633. Musical Instruments, H. J. Haddan, London.—Com. from W. F. Abbot.—29*th September*, 1882.
4688. Nut Locks, A. J. Boult, London.—Com. from W. Mack and J. B. Deeds.—2*nd October*, 1882.

Last day for filing opposition, 31*st October*, 1882.

2400. Preserving Sauces, C. Bourdon, Paris.—22*nd May*, 1882.
2635. Steam Boilers, &c., F. Brown, Luton.—5*th June*, 1882.
2636. Dynamo-electric, &c., Machines, A. L Fyfe, London, and J. Main, Brixton.—5*th June*, 1882.
2637. Horseshoes, &c., T. H. Heard, Sheffield.—5*th June*, 1882.
2640. Corrugating or Shaping Metal Sheets, G. M. Edwards, London.—5*th June*, 1882.
2642. Registering the Work Given by an Electric Circuit, W. E. Ayrton and J. Perry, London.—5*th June*, 1882.
2643. Secondary Batteries, H. Woodward, Shepherd's-bush.—6*th June*, 1882.
2650. Umbrellas. J. Wetter, New Wandsworth.—A communication from H. Papke.—6*th June*, 1882.
2653. Supporting Trousers when Out of Use, W. G. Stone, Bath.—6*th June*, 1882.
2655. Elevating Machinery, J. V. Hope, Wednesbnry.—6*th June*, 1882.
2656. Holding-up Carriage and other Windows, J. Harris, London.—6*th June*, 1882.
2661. Producing Electric Currents, J. Blyth, Glasgow, and D. B. Peebles, Bonnington.—7*th June*, 1882.
2666. Wicks, J. T. Reeve, London.—7*th June*, 1882.
2669. Antiseptic Preservative, &c., Compounds, J. Jeyes, Plaistow.—7*th June*, 1882.
2678. Railway Rails, &c., F. C. Winby, London.—7*th June*, 1882.
2692. Purifying Casks, &c., J. and B. Lamert, London.—8*th June*, 1882.
2693. Compressing Apparatus, C. S. Smith, Leicester. —8*th June*, 1882.
2696. Stills, F. Lennard, Shoreham.—8*th June*, 1882.
2707. Spinning, &c., Machinery, R. Scaife, Colne.—9*th June*, 1882.
2708. Treating Celestine or Sulphate of Strontia, &c., F. J. Bolton, London.—9*th June*, 1882.
2709. Treating Gases, F. J. Bolton and J. A. Wanklyn, London.—9*th June*, 1882.
2711. Rolls for Rolling Mills, J. Tinn, Bristol.—Com. from W. Harris and E. Evans.—9*th June*, 1882.
2713. Gunpowder, W. R. Lake, London.—A communication from N. Wiard.—9*th June*, 1882.
2725. Granulating or Reducing Apparatus, J. M. Cameron and H. J. Anderson, London.—9*th June*, 1882.
2731. Revolvers, E. G. Brewer, London.—A communication from J. E. Turbiaux.—10*th June*, 1882.
2732. Moving Targets, R. Morris, Blackheath.—10*th June*, 1882.
2741. Illuminating Conductors, G. Zanni, London. —10*th June*, 1882.
2781. Electric Lighting Apparatus, W. R. Lake, London.—Com. from C. F. de La Roche.—13*th June*, 1882.
2802. Type Printing Presses, J. Miller, Springburn. —14*th June*, 1882.
2816. Filter Press, J. Simpson and E. W. Parnell, Liverpool.—15*th June*, 1882.
2820. Iron and Furnace Linings, J. Beasley, Handsworth.—15*th June*, 1882.
2834. Water-closets, &c., A. M. Clark, London.—A communication from J. J. B. Frey.—15*th June*, 1882.
2844. Panels, Boards, Bobbins, &c., J. H. Browne, Cleobury Mortimer.—16*th June*, 1882.
2849. Presses for Expressing Oils or Liquids from Seeds, &c., J. H. Johnson, London.—A communication from P. D. and E. D. Brenot.—16*th June*, 1882.
2855. Adjusting Carriage Doors, S. A. Say, Peckham.—16*th June*, 1882.
2858. Safety Saddle-bars, R. S. Garden, London.—17*th June*, 1882.
2871. Dynamo-electric Machines, J. E. H. Gordon, London.—17*th June*, 1882.
2987. Steam Engines, R. Duncan, Glasgow.—23*rd June*, 1882.
2989. Composite Cartridge Cases, G. Kynoch, Witton. —23*rd June*, 1882.
3033. Producing Carbons, F. S. Isaac, London.—A communication from Sir J. Vogel.—27*th June*, 1882.
3063. Refining, &c., Saccharine and other Substances, D. MacEachran, Greenock.—29*th June*, 1882.
3068. Fluid Meters, T. R. and T. W. Harding, Leeds. —29*th June*, 1882.
3204. Generating, &c., Electric Currents, W. R. Lake, London.—A communication from E. Thomson.—6*th July*, 1882.
3368. Facilitating the Slicing of Bread, J. Erskine, Newton Stewart.—15*th July*, 1882.
3527. Coupling Clutches, E. J. Sterling, Brooklyn, U.S.—25*th July*, 1882.
3528. Secondary Batteries, C. E. Buell, New Haven, U.S.—25*th July*, 1882.
3623. Lamp Burners, H. W. Hayden, Waterbury, U.S.—31*st July*, 1882.
3626. Treating Textile Fibres with Aniline, W. J. S. Grawitz, France.—31*st July*, 1882.
3688. Door-knobs, W. Thomson, Crompton Fold.—2*nd August*, 1882.
3690. Horseshoes, J. R. Thomson, Buckden.—2*nd August*, 1882.
3712. Cores, Armatures, &c., of Electro-magnets, S. C. C. Currie, London.—4*th August*, 1882.
3964. Secondary or Storage Batteries, H. T. Barnett, London.—18*th August*, 1882.
3968. Knitting Machines, W. Harrison, Manchester. —18*th August*, 1882.
3969. Glazing or Fixing Sheets of Glass, J. Chaffin, Charlcombe.—19*th August*, 1882.
3975. Secondary Batteries, &c., J. E. T. Woods, Peckham-rye.—19*th August*, 1882.
3992. Rotary Engines, J. M. X. Terlinder, Brussels. —19*th August*, 1882.
3996. Dynamo, &c., Machines, T. J. Handford, London.—Com. from T. A. Edison.—21*st August*, 1882.
4247. Utilising Pneumatic Pressure as Motive Power, W. R. Lake, London.—A communication from G. V. Sheffield.—6*th September*, 1882.
4271. Automatic Pressure and Vacuum Brakes, J. C. Peache, Crewe.—8*th September*, 1882.
4295. Iron and Steel, W. W. Chipman, London.—9*th September*, 1882.
4303. Electrical Storage Batteries, E. Frankland, Reigate-hill.—9*th September*, 1882.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 6th October*, 1882.)

1679. Cleaning, &c., Rice and other Grain, M. Church, Washington, U.S.—6*th April*, 1882.
1704. Rowlocks, E. J. Robertson, Ipswich.—8*th April*, 1882.
1717. Gas Engines, J. A. Drake and R. Muirhead, Maidstone.—11*th April*, 1882.
1730. Red and Yellow Colouring Substances, J. Wetter, New Wandsworth.—12*th April*, 1882.
1732. Sectional Warping, &c., Machines, J. C. Sewell, E. Hulton, and S. J. Bethel, Manchester.—12*th April*, 1882.
1741. Filling and Closing Bottles, J. J. Varley, London.—12*th April*, 1882.
1767. Disengaging Boats from Ships' Davits, Hon. F. G. Crofton, Kingstown.—13*th April*, 1882.
1769. Secondary Batteries, J. H. Johnson, London. —13*th April*, 1882.
1785. Ventilating Apparatus, T. Rowan, London.—14*th April*, 1882.
1789. Treating Magmas from Wool Washing Liquors, W. H. Beck, London.—14*th April*, 1882.
1833. Lixiviating Vegetable and Animal Materials, C. Heckmann and E. Hausbrand, Berlin.—18*th April*, 1882.
1868. Stoppers for Bottles, J. Ballard, Nottingham. 21*st April*, 1882.
1901. Voltaic Batteries, A. R. Bennett, Glasgow.—21*st April*, 1882.
1967. Maximum and Minimum Thermometers, H. J. Haddan, London.—26*th April*, 1882.
1981. Charging Hand-printing Blocks with Colour, A. M. Clark, London.—26*th April*, 1882.
2017. Mosaics, H. J. Haddan, London.—28*th April*, 1882.
2018. Gear-cutting Machinery, H. J. Haddan, London.—28*th April*, 1882.
2057. Gas Engines, C. M. Sombart, Magdeburg.—1*st May*, 1882.
2175. Horseshoes, A. Vanderkerken and J. Mans, Brussels.—9*th May*, 1882.
2269. Harrows, R., J., and H. Wilder, Wallingford.—15*th May*, 1882.
2519. Air Exhausting Apparatus, W. H. Akester, Glasgow.—27*th May*, 1882.
2734. Governing the Feed of Electric Arc Lamps, J. Mathieson, Stratford.—10*th June*, 1882.
2936. Soap Sheets, G. F. Redfern, London.—20*th June*, 1882.
3100. Sewing Carpets or the like, W. R. Lake, London.—30*th June*, 1882.
3178. Bone Tooth Brush Handles and the like, W. R. Lake, London.—5*th July*, 1882.
3252. Bottles, H. Codd, London, and D. Rylands, Barnsley.—8*th July*, 1882.
3292. Steam Boiler Fire-boxes, W. R. Lake, London. —11*th July*, 1882.
3330. Electric Lighting, &c., Systems, S. Pitt, Sutton.—13*th July*, 1882.
3346. Sewing Machines, W. R. Lake, London.—14*th July*, 1882.
3348. Artificial Cream, Butter, and Cheese, H. J. Haddan, London.—14*th July*, 1882.
3434. Electric Meters, C. V. Boys, Wing.—19*th July*, 1882.
3436. Engine Power Meters, C. V. Boys, Wing.—19*th July*, 1882.
3446. Steam Engine Governors, H. J. Haddan, London.—20*th July*, 1882.
3512. Buoyant or Life-preserving Garments, F. W. Brewster, London.—25*th July*, 1882.
3555. Watchmen's Telltales, C. R. F. Schloesser, Manchester.—27*th July*, 1882.
3627. Weft Stop-motion for Looms, H. J. Haddan, London.—31*st July*, 1882.
3629. Weft Stop-motion for Looms, H. J. Haddan, London.—31*st July*, 1882.
3635. Flour or Meal Machinery, H. H. Lake, London.—31*st July*, 1882.
3644. Indicating Fire-damp in Mines, I. Kitsee, Cincinnati, U.S.—1*st August*, 1882.
3676. Sliding Grates, W. P. Thompson, London.—2*nd August*, 1882.

(*List of Letters Patent which passed the Great Seal on the 10th October*, 1882.)

1709. Steam and Hand Steering Gear, T. Britton, New Hendon.—11*th April*, 1882.
1712. Lamp Burners, W. Lighbody, London.—11*th April*, 1882.
1727. Automatic Current Director for Electric Machines, W. Fisher, Birmingham.—12*th April*, 1882.
1735. Piston Packing Rings, A. A. Rickaby, Sunderland.—12*th April*, 1882.
1743. Moulded or Compressed Fuel, &c , I. Lilley and F. Morris, Swansea.—12*th April*, 1882.
1744. Sewing Machines, A. Guillaume and A. Lambert, Fosses.—12*th April*, 1882.
1751. Window-cleaning Chairs or Fire-escapes, W. P. Thompson, London.—13*th April*, 1882.
1755. Ascertaining Gradients of Surfaces, P. Jensen, London.—13*th April*, 1882.
1757. Water Gauges, J. Thurlow and A. Sykes, Wakefield.—13*th April*, 1882.
1758. Billiard Marking, &c., Apparatus, P. Mara, Putney, and J. Winson, London.—13*th April*, 1882.
1760. Electric Current Producing Machines, J. B. Rogers, London.—13*th April*, 1882.
1779. Crushing Seeds, H. Holt, Hull.—14*th April*, 1882.
1792. Ventilators, A. W. L. Reddie, London.—14*th April*, 1882.
1800. Braces, C. D. Abel, London.—15*th April*, 1882.
1805. Locks, &c., for Bags, A. Budenberg and A. Timpè, Manchester.—15*th April*, 1882.
1807. Preparing Fabrics for Bleaching, &c., S. Fulda, Bow.—15*th April*, 1882.
1812. Tricycles, &c., W. Morgan, Birmingham.—17*th April*, 1882.
1822. Electric Lamps, A. S. Church, London.—17*th April*, 1882.
1854. Direct-acting Ram Hydraulic Lifts, J. S. Stevens and C. Major, Battersea.—18*th April*, 1882.
1867. Electric Arc Lamps, A. B. Brown, Edinburgh. —19*th April*, 1882.
1875. Secondary Batteries, D. G. Fitzgerald, Brixton, and C. H. W. Biggs and W. W. Beaumont, London. —19*th April*, 1882.
1882. Tightening-up and Straining Wire Mattresses, &c., E. Hoskins, Birmingham.—19*th April*, 1882.
1883. Printing Machinery, W. Conquest, London.—19*th April*, 1882.
1888. Marine Engines, J. F. and M. Rankin, Greenock.—20*th April*, 1882.
1897. Pump, A. Browne, London.—20*th April*, 1882.
2055. Boots and Shoes, J. Keats, Frankfort-on-the-Maine.—1*st May*, 1882.
2073. Catheters, T. and W. J. Nicholls, London.—2*nd May*, 1882.
2715. Treating Regulus or Matte, E. A. Parnell, Swansea.—9*th June*, 1882.
3039. Galvanic Batteries, C. P. Nézeraux, Paris.—28*th June*, 1882.
3189. Treating Blast Furnace Gases, W. Ferrie, Chapelhall.—6*th July*, 1882.
3271. Electrical Meters, T. J. Handford, London.—10*th July*, 1882.
3303. Secondary Voltaic Batteries, F. W. Durham, New Barnet, and P. Ward, Fulham.—12*th July*, 1882.
3355. Supplying Electricity for Light, &c., T. J. Handford, London.—14*th July*, 1882.
3367. Colour Printing Machines, E. de Pass, London —15*th July*, 1882.
3418. Electric Arc Lamps, S. Z. de Ferranti and A. Thompson, London.—18*th July*, 1882.
3489. Transforming Taffia and Rum into Brandy, H. A. Bonneville, London.—22*nd July*, 1882.
3587. Head Coverings, J. F. Watson, Anerley.—28*th July*, 1882.
3685. Dynamo-electric Machines, W. R. Lake, London.—2*nd August*, 1882.
3707. Compound Steam Engines, C. J. Galloway and J. H. Beckwith, Manchester.—4*th August*, 1882.
3717. Railway, &c., Axles, W. R. Lake, London.—4*th August*, 1882.
3881. Electric Lamps and Conductors, F. R. Welles, Antwerp.—15*th August*, 1882.
3959. Transom Adjusters and Locks, G. J. Dickson, Albany, U.S.—18*th August*, 1882.

List of Specifications published during the week ending October 7th, 1882.

747*, 6d.; 1303*, 4d.; 4987*, 4d.; 5434, 2d.; 864, 6d.; 979, 1s.; 983, 10d.; 984, 6d.; 994, 10d.; 1004, 4d.; 1005, 6d.; 1006, 6d.; 1006, 6d.; 1016, 2d.; 1017, 6d.; 1018, 2d.; 1019, 2d.; 1020, 6d.; 1021, 2d.; 1022, 8d.; 1023, 8d.; 1030, 4d.; 1033, 6d.; 1034, 4d.; 1035, 6d.; 1036, 6d.; 1037, 6d.; 1038, 2d.; 1039, 2d.; 1040, 1s. 4d.; 1041, 2d.; 1042, 2d.; 1043, 2d.; 1044, 6d.; 1045, 4d.; 1047, 2d.; 1048, 6d.; 1049, 2d.; 1050, 2d.; 1051, 6d.; 1052, 2d.; 1053, 6d.; 1054, 4d.; 1055, 6d.; 1056, 8d.; 1057, 4d.; 1058, 4d.; 1059, 6d.; 1060, 2d.; 1061, 2d.; 1062, 6d.; 1065, 6d.; 1068, 2d.; 1069, 2d.; 1070, 4d.; 1071, 8d.; 1074, 6d.; 1081, 2d.; 1082, 2d.; 1086, 2d.; 1087, 8d.; 1088, 6d.; 1093, 6d.; 1094, 6d.; 1095, 6d.; 1097, 2d.; 1101, 4d.; 1102, 2d.; 1105, 6d.; 1110, 2d.; 1111, 2d.; 1112, 6d.; 1115, 2d.; 1116, 2d.; 1121, 2d.; 1122, 2d.; 1132, 2d.; 1133, 6d.; 1139, 6d.; 1140, 2d.; 1147, 6d.; 1156, 2d.; 1157, 6d.; 1168, 6d.; 1186, 6d.; 1268, 6d.; 1289, 6d.; 1297, 2d.; 1342, 6d.; 1402, 4d.; 1453, 4d.; 1491, 6d.; 1579, 8d.; 1620, 4d.; 1745, 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.*

5434. Life-preserving Mattresses, *G. G. de L. Byron.*—13*th December*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to a mattress, which can also be used to support persons in water.

95. Electric Lamps, *W. J. Mackenzie, Glasgow.*—7*th January*, 1882. 6*d.*

The new features are in the support of the carbons, and the feeding by the action of springs, the carbon points protruding through ring holders to an extent which remains practically constant.

139. Railway Signalling Apparatus, *A. H. Perry, Croydon, and E. J. Houghton, Peckham.*—10*th January*, 1882. 6*d.*

Arranges for an electrical current to cause a bell or gong to sound at the required points, when the signalman acknowledges train on line.

700. Improvements in the Generation, Storage, and Utilisation of Electricity, &c., *J. S. Williams, Riverton, New Jersey, U.S., and London.*—13*th February*, 1882. 10*d.*

This relates to improvements in thermo-electric batteries and apparatus for the transmission of currents for lighting and other purposes, as well as their regulation, &c.

766. Improvements in the Generation, Storage, Distribution, &c., of Electricity, &c., *J. S. Williams, Riverton, New Jersey, U.S., and London.*—16*th February*, 1882. 4*d.*

This relates to improvements on the inventor's patent No. 700, 13th February, 1882, and consists mainly in the employment of reservoirs of electricity for purposes of regulation.

774. Improvements in Protecting Wires or Cables, &c., *J. C. Mewburn, London.*—17*th February*, 1882. —(*A communication from A. M. J. Jeune, Paris.*)—(*Not proceeded with.*) 2*d.*

This invention consists in substituting a braided, plaited, or woven metallic covering for the ordinary covering put on after the wires have been covered with insulating material.

815. Improvements in and Connected with Riveting and Rolling Apparatus, &c., *F. J. Rowan, Glasgow.*—20*th February*, 1882. 6*d.*

The object of the invention is to diminish manual labour and to obtain increased efficiency and expedition in rivetting iron plates, &c., used in building ships. To this end the parts of the inventor's apparatus carrying the rivetting die are made with an electro-magnet having two poles, the ends of which are placed against the plate and on each side of the rivet hole, and another electro-magnet with the resisting die or dolly attached to it is placed with the ends of its poles against the other side of the plate. The parts on opposite sides of the plate are arranged so that the positive pole of one magnet is opposite to a negative pole of the other, and so on. A commutator is provided for manipulating the current. The rivetting may be done by electro-magnetic power or by levers.

821. Improvements in Electric Telegraphs, &c., *C. N. Talbot, New York.*—20*th February*, 1882. 6*d.*

This relates to a series of signal-boxes located in various parts of a city, and furnished with a bell, electro-magnet, and circuit-breaking device, by which signals can be sent to a central station for the despatch of a messenger, and so arranged that this messenger will ascertain on arriving at the box who it is that requires him and what he is required for.

864. Furnaces for Burning Heavy Oils and other like Combustibles, *J. H. Johnson, London.*—22*nd February*, 1882.—(*A communication from La Société Nouvelle des Forges et Chantiers de la Mediterranée, Paris.*) 6*d.*

This relates to apparatus for burning heavy oils with a view to employing such fuel for heating boilers in torpedo boats. As applied to a tubular boiler with cylindrical furnace, the heavy oil is conducted into a reservoir under pressure and maintained as thin as possible by steam and a strainer. The oil passes by a pipe to a distributor, consisting of an outer tube enclosing a sliding inner tube. The distributor delivers the oil to inclined channels leading to the bars, which are formed with channels for the oil to pass down and be consumed. Air distributors or deflectors are arranged between the bars.

866. Improvements in Machinery for the Manufacture of Cables, &c., *J. C. Mewburn, London.*—22*nd February*, 1882.—(*A communication from La Société Alamagny et Oriol, Paris.*)—(*Not proceeded with.*) 2*d.*

This relates to machinery for facilitating the covering of wire or cables with lead.

879. An Improved Annunciator or Indicator Drop for Telephone Exchanges, &c., *M. Volk, Brighton.*—23*rd February*, 1882. 6*d.*

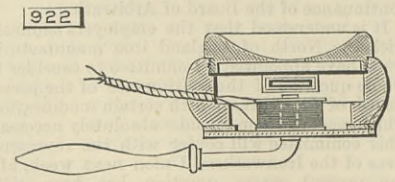
The inventor employs a frame provided with an electro-magnet, having an armature on which rests the indicator drop, so arranged as to fall into a vertical or horizontal position when the armature is attracted. On the back of the frame a pair of insulated studs are provided, to which the ends of the magnet wires are connected. By this construction the electrical connections are made by simply screwing the drop up into place, whereby the insulated studs make contact with terminal studs provided in the back of the indicator case, no connecting wires being required between the terminal wires and the coils of the magnet.

905. Improvements in Secondary Batteries, *J. W. Swan, Newcastle-upon-Tyne.*—24*th February*, 1882. 4*d.*

This relates to the economical production of finely divided lead for use in secondary batteries. The inventor takes sulphide of lead in a finely divided state and reduces it to metallic lead by means of hydrogen evolved in process of electro-chemical action or by chemical action alone. This finely divided lead is then applied to the pole plates of secondary cells. The invention also consists in the employment of plumbago for the construction of non-corrodible plates for secondary batteries.

922. Improvements in Apparatus for Transmitting and Receiving Audible Signals by means of Electricity, *A. F. St. George, London.*—25*th February*, 1882. 8*d.*

The inventor takes a soft iron bar circular—or other shape—in cross section, and upon its poles arranges a coil of insulated wire. Opposite the poles of this bar he adjusts a coil of insulated iron wire attached to a vibrating diaphragm of wood. Surrounding this latter coil, but preferably in contact with neither the coil nor the diaphragm, he sometimes arranges a second outer coil of insulated wire, and through this



he passes a constant local current from a battery. The figure shows one form of the inventor's apparatus. Another part of the invention relates to the employment of hollow bars of carbon, the vibration of the columns of air in which causes currents of electricity. Another part consists in embedding a wire in a solid material, so that the heat produced in the wire by the passage of a current expands it, such expansion producing molecular vibrations in the solid material.

963. Improvements in Apparatus for Prevention of Accidents by Railway, *C. N. Leroy, Paris.*—28*th February*, 1882. 6*d.*

This relates to a combination of levers and electric apparatus placed at certain intervals along a line and on the engine, which, should a train break down at any spot, will warn the drivers of other trains by the ringing of a bell on their engines that the line in front of them is blocked. It also relates to a carriage coupling which communicates electrically with the tender, and which, should any of the carriages break away, causes a bell to ring which alarms the driver. Also to a system of wedges with which each carriage is provided, and which, should carriages break away on an incline, are at once lowered and prevent their further movement. Also to a contrivance for warning the engine driver whether a signal is at "all clear" or otherwise, by a modification of the first-named improvement.

979. Washing Coal, *H. J. Allison, London.*—28*th February*, 1882.—(*A communication from E. Coppée, Belgium.*) 1s.

This consists, First, in a continuous automatic process for treating coal from the time it is submitted to the sorting and washing until it is discharged; Secondly, the arrangement of the apparatus for this purpose; Thirdly, the automatic transport of the coals, classed and washed at different points by means of a current of water; Fourthly, the employment of feldspar to serve as a bed to the cases for washing very fine coals; Fifthly, the employment of chains of perforated buckets and reservoirs to separate coal from the water it contains; Sixthly, the employment of towers and hoppers for drying and storing washed coals; Seventhly, the employment of pointed cases for the classification of very small coals, and the concentration of slimes; Eighthly, the employment of vibrating frames for draining coals; and Ninthly, the production of a mixed product in the washing cases when necessary to treat coals containing schists.

983. Scouring and Washing Wools, &c., *J. and W. McNaught, Rochdale.*—1*st March*, 1882. 10*d.*

This relates, First, to mechanism for propelling wool in and delivering it from the trough of wool washing machines, and consists in combining excentric toothed wheels with the shafts rotating the cranks for actuating the propelling and delivering forks, prongs, or toothed frames, so that the shafts will rotate at a slow speed when the teeth move forward and operate on the wool, and at a quick speed when moving backwards; Secondly, to mechanism for propelling wool in and delivering it from the trough when the latter is arranged so that the wool is delivered from it at about the level of the liquor therein; and Thirdly, to means for cleaning out the trough of mud and sediment when the liquid is discharged.

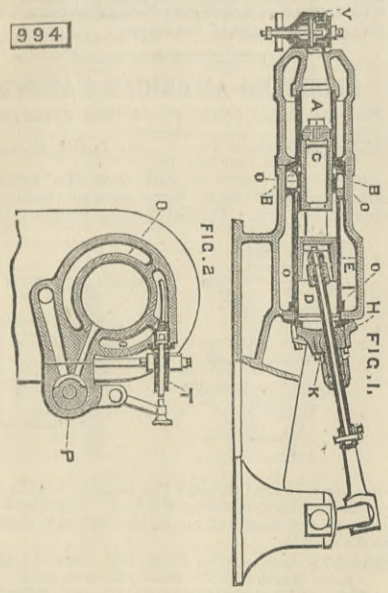
984. Hose Couplings, *J. C. Hudson, Blackfriars.*—1*st March*, 1882. 6*d.*

The coupling is in two parts, each secured to one of the pipes to be coupled, and one having an internal circular recess containing catch plates fitted with springs. The other part has an external circular groove to receive the catch-plates, which can be disengaged by means of a stud passing to the outside and fitted with a knob.

994. Gas Motor Engines, *J. Fielden, Gloucester.*—1*st March*, 1882. 10*d.*

This relates to improvements on patent No. 532, A.D. 1881, the object being to effect the more complete removal of the residual explosive mixture from the reservoir into which the charges are compressed by the acting stroke of the piston. A is the working cylinder to which the charge is supplied through annular port B, governed by the working piston C. To piston C, the piston E of the charging pump D is connected, and is driven from the crank shaft. The cover of the inner end of the cylinder has a slot to allow of the angular vibration of the connecting rod, and its outer surface is convexed, and over it works a sliding cover H, in the centre of which is a socket to receive a spherical boss on the stuffing-box K, through which connecting rod works. Ports are formed through the covers, and communicate with reservoir

O. P is a rotating air valve, with passages in it communicating with the external air, the reservoir, and the cylinder. T is a gas supply valve, fitted with a



perforated pipe to ensure a perfect mixing of the charge, and V is a valve to allow the products of combustion to be discharged from the cylinder.

1004. SHIPS' LOGS, *F. Webster, City-road.—2nd March*, 1882.—(*A communication from W. Webster, Captain of s.s. Albion.*) 4*d.*

The object is to provide means whereby a signal is given on board the vessel when the action of the revolving blades of the log is obstructed, and it consists in attaching the tow line to the axis of a detector, to which an adjustable amount of resistance is applied, and which when caused to revolve works an index or sounds a gong.

1005. BOILER TUBES OR FLUES, &c., *W. H. Wood, Cookley.—2nd March*, 1882. 6*d.*

The tubes or flues are made in lengths either concave or convex, and are joined together without flanges by making one large enough to overlap the other, or they may be joined by flanges at the ends rivetted or welded, or with a ring between them. Machinery is described consisting of rolls of suitable form to give the lengths the desired shape.

1006. DRAW-OFF COCKS, *S. B. Goslin, London.—2nd March*, 1882. 6*d.*

The object is to form draw-off cocks suited especially to domestic boilers and steam cylinders, for the purpose of preventing their exploding in consequence of the stoppage of the pipes, and it consists in constructing such cocks so that they at the same time form spring safety valves, which open automatically when the pressure in the boiler or cylinder is higher than it should be.

1007. DAMPER REGULATOR, *S. P. Wilding, London.—2nd March*, 1882.—(*A communication from V. H. Hallock, Brooklyn, U.S.*) 6*d.*

The regulator is designed to regulate the action of the dampers of boiler furnaces, and being controlled by the steam pressure its action is uniform, thus giving regularity of power and economy of fuel, and adding to the safety of the boiler. A plunger, weighted according to the pressure required, controls the dampers by chains passing over pulleys, such plunger working in a cylinder and being operated on by an adjoining water chamber connected directly to the steam pressure.

1016. MEASURING CLOTH, &c., *J. Darling, Glasgow.—3rd March*, 1882.—(*Not proceeded with.*) 2*d.*

The apparatus is applicable for measuring cloths and other webs in the rolled or folded as well as in the open state, and it consists of a thin tube, which can be readily inserted between the folds and secured to the inner end of the web and wound round to the outer end, causing a graduated cord to be unwound from a suitable box.

1017. INSULATING APPARATUS FOR OVERHEAD TELEGRAPH LINES, *J. S. Lewis, Birkenhead.—3rd March*, 1882. 6*d.*

The top of the insulator is screw shaped, and the wire is fastened by means of a shackle.

1018. VELOCIPEDES, *G. Singer and R. H. Lea, Coventry.—3rd March*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to means for driving tricycles so that both driving wheels may be propelled either backwards or forwards, and at the same time, and also in turning a corner each wheel will run independently of the other, and revolve at the required rate of speed without any attention on the part of the rider.

1019. FIRE-RESISTING BRICKS AND BLOCKS, *C. J. Mountford, Birmingham.—3rd March*, 1882.—(*Void.*) 2*d.*

The bricks are made by grinding and mixing in a mill asbestos and silicate of soda or potash with or without fire-clay, and then moulding the mixture into bricks which are burnt in ordinary kilns.

1020. APPARATUS FOR TRANSMITTING AND RECEIVING SOUND, *J. Rapieff, London.—3rd March*, 1882. 6*d.*

A number of contacts variously arranged in conjunction with coils are used.

1021. DOOR RODS AND SPRINGS, *L. Lenzberg, Euston-road.—3rd March*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to rods to carry curtains hung on doors to prevent draughts, and it consists in combining with such rods springs, which act on the door so as to cause it to close automatically after having been opened.

1022. ELEVATING APPARATUS FOR DISCHARGING GRAIN FROM SHIPS, &c., *W. Blythe, Liverpool.—3rd March*, 1882. 8*d.*

The object is to construct a portable elevator which may be arranged to act at the bottom of the bulk of grain, so that the latter by its own weight will fall towards the elevator, and it consists in providing a tube to be placed in the ship and receive the elevator, such tube being either fixed or portable; in the latter case it is fitted with an external thread and a pointed end so as to enable it to screw itself down to the bottom of the grain when caused to revolve. Within the tube a chain of buckets is inserted, and lifts the grain from the vessel up the tube, discharging it outside.

1023. INDICATING AND REGULATING THE CURRENT OF ELECTRIC GENERATORS, *T. J. Hanford, London.—(A communication from T. A. Edison, Menlo Park, New Jersey, U.S.—3rd March*, 1882. 8*d.*

A bell or indicator is placed in a shunt circuit, which is to give notice of alteration in the current. A further claim is for a safety plug to prevent injury to the machine, when, by the addition of lights, it is asked to work above its capacity.

1030. COLOURING MATTERS FOR DYEING AND PRINTING, *C. D. Abel, London.—3rd March*, 1882.—(*A communication from C. A. Martius, Berlin.*) 4*d.*

This consists in the production of red and brown azo-colours by combining anthrole or anthro-sulfo-acid with any one of the following diazo-compounds: First, diazo-benzole, diazotoluole, diazo-xylole, diazo-cumole A and B diazonaphthole, diazo-anisole; Secondly, the sulfo-acids of these diazo-compounds; Thirdly, diazoamidoazobenzole, diazoamidoazotoluole, diazoamidoazoxylole; and Fourthly, the mono and disulfo-acids of these diazo-compounds; and in the use of the colouring matters so obtained for dyeing and printing.

1033. SHAPING HEATED GLASS, *F. Wright and M. W. W. Mackie, Gray's Inn-road.—3rd March*, 1882. 6*d.*

This relates to shaping glass heated by blow-pipe or otherwise to forms which are usually those of solids of revolution, the object being to hold the glass treated in suitable positions for the operations to which it is subjected, without depending on manipulation. For this purpose the tubes or rods of glass are passed through hollow mandrils fitted to a pair of headstocks capable of sliding on a lathe bed, and between which is a slide rest with one or more heating flames and tools to work the glass as it is caused to revolve.

1034. GALVANIC CHAINS, *C. D. Abel, London.—(A communication from A. L. A. Kraehmer, Dresden.—3rd March*, 1882. 4*d.*

Zinc and copper plates are arranged on opposite sides of cloth, the couples being connected by silk cord.

1035. STOPPERING BOTTLES, *W. W. Macvay and R. Sykes, Castleford.—3rd March*, 1882. 6*d.*

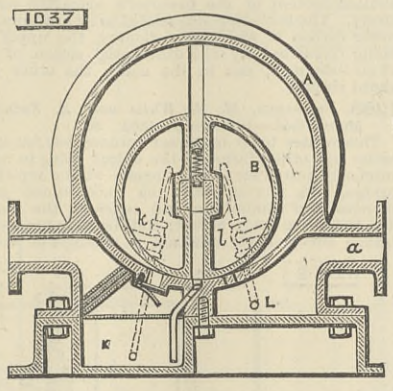
This relates to improvements on patent No. 738, A.D. 1878, in which a screw was formed inside the neck of the bottle to receive a cap or ferule, and it consists in cutting parts of the thread away from the neck and the cap or ferule, so that the latter may be dropped into the neck and secured by a partial turn, thus fastening the elastic washer inside the neck.

1036. MANUFACTURE OF CARBON, *H. Liepmann and P. S. Looker, London.—3rd March*, 1882. 6*d.*

The waste of vegetable ivory is utilised. The material is submitted to destructive distillation, then carbonised preferably by heat and the action of acids or caustic alkali.

1037. ROTARY AIR, GAS, OR VAPOUR PUMPS, *R. Skene, Lambeth.—3rd March*, 1882. 6*d.*

At the end of the revolving cylinder B of the pump, and within the outer cylinder A, at either or each end, is applied a pair of packing rings, which are pressed against the end of revolving cylinder, and work air-tight, compensating for wear. The construction of the pump is modified by the addition of a chamber K, in which is stored a liquid which is not mixable with the vapour, air, or gas, that the pump is exhaust-



ing or compressing, and which at the same time is a lubricant. The tube *k* leads from the bottom of this chamber to near the centre of the revolving cylinder. The pressure upon this liquid at the outlet port will force it into, and cause it to fill, the inside of the revolving cylinder B. The exhaustion or suction of the inlet port *a* is utilised to draw out the air from the interior of the revolving cylinder B, by means of the tube L, with a stop cock *l*, which is closed when the air has been completely withdrawn.

1038. PUMPS, *H. Gardner, London.—3rd March*, 1882.—(*A communication from H. Gillmore and J. Shaw, Canada.*)—(*Not proceeded with.*) 2*d.*

The object is to overcome the weight of a column of water in the discharge tube of a pump, by counterbalancing it with a like discharge tube, both tubes being hung to reciprocate perpendicularly, whereby water can be pumped with ease.

1039. STOVES AND GRATES, *G. Gore, Balsall Heath, and W. Morris, Blackheath.—3rd March*, 1882.—(*Not proceeded with.*) 2*d.*

This consists in supplying fresh fuel to the bottom of the fire from a reservoir forming part of a hopper behind the back of the grate.

1040. SAFETY VALVES, &c., *W. Brierley, Rochdale, and M. Mitchell, Bacup.—4th March*, 1882. 1*s.* 4*d.*

This relates, First, to safety valves weighted directly by weights or springs, and consists in forming the valve like a cylinder with the open end downwards and ground to fit the seating. In the centre of the steam pipe leading to the valve is a tube secured to arms fixed in the bore of the pipe, such tube extending down into the boiler and up into the cylindrical valve, and it has a disc to it near the valve seating; Secondly, to the combination and arrangement of a safety valve to be loaded by the pressure of a column of mercury, and consisting in securing the valve to a disc to which a diaphragm is attached, above which is a vessel covering the diaphragm and communicating by a column tube with a small reservoir of mercury at its upper end, which presses upon the mercury in the vessel, the lower end of the column tube in the vessel coming into a cup attached to the diaphragm plate; Thirdly, to means for lifting safety valves or their weighing levers when a given pressure is attained, and consisting of a piston actuated by steam and connected with the valve; Fourthly, to opening safety valves when the water level in the boiler becomes dangerously low; Fifthly, to means for relieving boilers for baths from excessive dangerous pressure; Sixthly, in obtaining any required length of mercury in column without having it in one long column by connecting together a number of syphons with a cistern at the lower part, and a cup fit for the upper part of each. Other improvements are described.

1041. HOSE COUPLINGS, *J. Westley, Chorley, Lancs.—4th March*, 1882.—(*Not proceeded with.*) 2*d.*

The two parts of the coupling are locked together by means of sliding bolts mounted in one part, and which when pushed inward project over a flange on the other part, the bolts being then locked to prevent them being pushed back by the pressure of the water or by other causes.

1042. WOOD PULP, *M. Jordan, Manchester, and A. Egestorff, Hanover.—4th March*, 1882.—(*Not proceeded with.*) 2*d.*

The wood is sliced or cut into chips or shavings, and then reduced to pulp by treating it with steam in a suitable vessel in presence of sulphide or bi-sulphide of lime.

1043. SHEARS, *T. Brown, Sheffield.—4th March*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to the application of a spring of V shape, and the two ends of which can be brought towards each other by means of a screw bolt to the bows of shears constructed as described in patent No. 2247, A.D. 1878, the object being to regulate the strength of the spring bow.

1044. TELEPHONE TRANSMITTERS, *R. and M. Theiler, Islington.—4th March*, 1882. 6*d.*

Instead of the ordinary diaphragm, fibrous or cellular substances are used, and instead of carbon, tellurium, molybdenum, or manganese is employed for contacts.

1045. STYLOGRAPHIC OR FOUNTAIN PENS, *J. D. Carter, Finsbury-square.—4th March*, 1882. 4*d.*

This consists in forming the points of stylographic or fountain pens of drilled jewels mounted in a setting of gold or other incorrodible metal, and fixed to the holder by screwing or other suitable means.

1047. FASTENINGS FOR WINDOW SASHES, *S. A. Clark, Croydon.—4th March*, 1882.—(*Not proceeded with.*) 2*d.*

On the sides of the lower sash two vertical axes are mounted, one on either side, and have handles at their lower ends, which serve to turn the axes when arms on them enter recesses in the side frames, and lock the sashes in position, and also to lift and lower the sashes when required to open or close the window.

1048. FILTER PRESSES, *S. H. Johnson, F.C.S., Stratford.—4th March*, 1882. 6*d.*

The object is to construct filter presses so that they are more efficient and capable of standing higher pressures than at present, and it consists, First, in forming the filtering diaphragms with projections on the filtering or drainage faces corresponding with similar projections on the adjoining diaphragms throughout the series of cells, the last diaphragm at each end of the series being similarly supported on the head and follower of the filter press when in operation. When the cells are screwed together with the cloths covering their surfaces, these projections bear against each other with the cloth between them, and form a continuous resisting stay to prevent the collapse of the plates; Secondly, when necessary to form the filtering faces in lead or tin, the diaphragms are formed of a core of iron or steel (with or without the projections described), on to which the lead or tin is cast.

1049. UMBRELLA SLIDES, *A. C. Henderson, London.—4th March*, 1882.—(*A communication from C. Grataloup and J. B. Leymarie, Paris.*)—(*Not proceeded with.*) 2*d.*

This relates to the slide to which the ends of the stretchers are secured, and it consists of a tubular slide with an upper rim having notches to receive the ends of the stretchers, which are secured by a wire as usual. Inside this slide is a second tube, having a cup, through apertures in which the stretchers pass. The tubes slide one on the other, so that free play is given to the stretchers, and when the umbrella is closed the inner tube is pushed upwards, and forces and secures the stretchers against the stick.

1050. STEAM PRESSURE REDUCING VALVES, *W. Wesissenbach, Zurich.—4th March*, 1882.—(*Not proceeded with.*) 2*d.*

The loading weight is placed directly over the valve which closes the steam passages, and is preferably in the form of a vertical cylinder enclosed in the valve chamber, while the valve is of conical or other suitable shape.

1051. ARMOUR PLATES, *J. D. Ellis, Sheffield.—4th March*, 1882. 6*d.*

This relates to improvements on patent No. 3629, A.D. 1880, and consists in forming plates of iron and steel combined, by the employment of a frame or edge piece or pieces (which separate the wrought iron plate and the steel plate, so as to form a space for molten steel), having a web or webs projecting into the space for the molten steel.

1052. VELOCIPEDE OR VEHICLE FOR LOCOMOTION BY MANUAL POWER, *T. H. Ward, Tipton.—4th March*, 1882.—(*Void.*) 2*d.*

The velocipede for two riders consists of an axle carrying a wheel, and a horizontal framing extending on either side the wheel, and beyond the periphery thereof on either side, and capable of oscillating on the axle. The frame carries at each end the saddles arranged at such a height that the feet of the riders can be brought in contact with the ground, and used to propel the vehicle.

1053. SUPPORTING AND DISENGAGING SHIPS' BOATS, *M. E. T. Bülow, Hamburg.—4th March*, 1882. 6*d.*

To support the boat two stands made of parallel rails are employed, and arranged so as to allow of the motion of sliding chocks between them, the chocks being kept in position by wedges swinging on shafts and operated by levers attached to the shafts. The lower ends of the boat lashings are attached to the stands, and the upper ends to a bar bent at the extremities to form hooks for holding the lashing rings. When the bar is turned by a lever the rings slip off, and the lashings fall down, leaving the boat free.

1054. TELEPHONE APPARATUS, *N. K. Cherrill, Shortlands, Kent.—4th March*, 1882.—(*Not proceeded with.*) 4*d.*

Suggests the use of spirals of wire in connection with or without diaphragms.

1055. MANUFACTURE OF SUGAR IN LUMPS, PIECES, OR BLOCKS, *H. H. Lake, London.—4th March*, 1882.—(*A communication from Lebaudy Frères, Paris.*) 6*d.*

The blocks or lumps are made in apparatus consisting of a pressure filter provided with tables having ribs and projections, such tables being placed one upon another, or side by side, in such a manner as to leave between two adjacent tables a series of spaces for the reception of the material to be moulded.

1056. COLLAPSIBLE OR FOLDING BOATS, *J. P. Wright, Redhill.—4th March*, 1882. 8*d.*

Each side of the boat is made in three pieces, with hinges uniting the two end pieces to the middle piece, the hinges being made of webbing, metal, or other suitable material. The bottom is made of waterproof flexible material connected to the lower edges of the sides, and at the bow and stern comes up and is secured inside between the same. The side pieces are kept apart by a central burden or bottom piece held in position by ribs at about the midships portion, and the bow and stern are similarly provided with burdens or bottom pieces. Seats are fitted to the inner sides, to which they serve as stiffeners.

1057. MANUFACTURE OF SUGAR, *C. Scheibler, Berlin.—4th March*, 1882. 4*d.*

This consists, First, in the process of separating strontian saccharate, precipitated while hot, after it has cooled down by the systematic lixiviation with water, or cold saturated strontian solution in the ordinary lixiviating apparatus or centrifugal extractor. Secondly, the rendering of the strontian saccharate, while yet warm and plastic, into the shape of bricks or other forms for the purpose of the lixiviation named in the first claim.

1058. PRODUCTION OF ALUMINIUM, *J. Morris, Uddingston, N.B.—4th March*, 1882. 4*d.*

This consists essentially in heating an intimate mixture of aluminia and carbon or carbonaceous matter to the temperature of ignition within a close vessel, and subjecting the mixture to the action of carbonic acid gas, whereby carbonic oxide is formed, and the alumina is reduced, in whole or in part, to metallic aluminium.

1059. KEYS OR PEGS OF VIOLINS, HARPS, &c., *J. Stuttaford, New Barnet.—4th March*, 1882. 6*d.*

The object is to facilitate the fixing of strings in the keys of violins, &c.; and it consists in boring a hole from the top button or wing down to the cross-hole through which the string is passed. The first hole has an internal thread, and receives a screw rod, the end of which nips the string in the cross-hole.

1060. TESTING BUTTER, *F. H. F. Engel, Hamburg.—4th March*, 1882.—(*A communication from W. Osten, Hamburg.*—(*Not proceeded with.*) 2*d.*

The apparatus consists of a cylindrical vessel with a cover having an upright cylindrical prolongation, the top of which is pressed into the opening of the prolongated part and forms a hopper. The vessel is heated, and the butter runs down into a glass vessel beneath, the sides of which are graduated, so that the proportion of fatty matter to water and other impurities may be readily seen when cool.

1061. TUNE BANDS OR MUSIC SHEETS FOR MECHANICAL ORGANS, &c., *A. J. Eli, London.—4th March*,, 1882.—(*Not proceeded with.*) 2*d.*

This consists in strengthening the tune bands or sheets of cartridge paper at the edges and between the holes and longitudinal slots by means of stitches of silk, cotton, or other material, such stitches being afterwards compressed and incorporated with the music sheets by hot pressing or rolling.

1062. BALLS USED IN SHOOTING FROM TRAPS, &c., *A. M. Clark, London.—4th March*, 1882.—(*A communication from P. J. and E. A. Jarre, Paris.*) 6*d.*

This consists in the use of balls of india-rubber inflated by a suitable gas, and weighted by the introduction of a solid substance in a pulverised or other condition, preferably of a liquid. Apparatus for inflating and weighting the balls is described.

1065. BLINDS OR SCREENS FOR WINDOWS, *J. Wetherilt, Mayfair.—6th March*, 1882. 6*d.*

The improvements are particularly applicable to blinds which screen the lower portion only of a window, the upper part being protected by roller or other blinds, and it consists in forming the blind or screen by a surrounding frame with bars, rods, tails, or laths, the upper and lower opposite sides being provided with studs to pass into slotted openings. The lower part acts as a hinge for the blind to turn on, so as to incline it to any desired extent, the upper part being supported by arms, which fold into the frame, and are notched at their free ends to fit over the upper part.

1068. PORTABLE LETTER-COPYING PRESS, *W. J. Brewer and J. R. Meihé, London.—6th March*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to a light portable copying press in which mechanical pressure is employed, in combination with an elastic air or water bag to equalise such pressure; and further, in the construction of the different parts so that they may form a seat, cushion, or buoyant life preserver.

1069. FIXING HEELS OF BOOTS, &c., *J. Nief, Paris.—6th March*, 1882.—(*Not proceeded with.*) 2*d.*

The object is to avoid the necessity of taking out the last when fixing the heel, and it consists in interposing between the sole and the heel a plate of leather, wood, metal, or other suitable material, which projects forward to about the centre of the sole, and is firmly secured to the heel. This plate is chamfered all round to form a groove between itself and the heel.

1070. IMITATING NIELLO ON METALLIC PANELS, &c., *F. Wirth, Frankfort-on-the-Main.—6th March*, 1882.—(*A communication from F. Beck, New York.*) 4*d.*

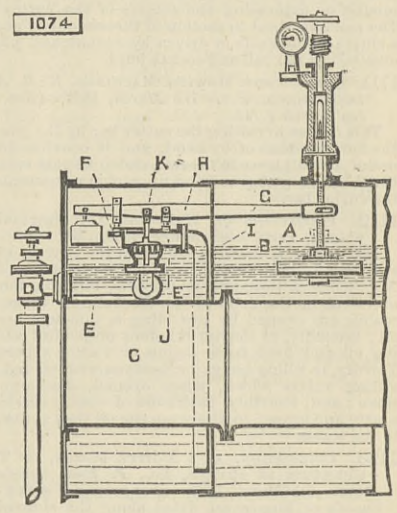
This consists in producing the desired design upon the panel or plate by means of photo-engraving or photo-etching, then coating the engraved surface with japan or other soft enamel, and drying the same, removing the surplus of the enamel by grinding or other means until the surface of the enamel is even with that of the metal, and finally plating the surface of the metal by electro deposition.

1071. FOLDING CHAIRS, *C. D. Abel, London.—6th March*, 1882.—(*A communication from C. Timme, Germany.*) 8*d.*

This relates to a folding chair which when opened shall have the jointed parts rigidly secured together, while the back and legs are enabled to be made of any desired curvature instead of requiring to be straight and parallel, as in such chairs of ordinary construction in which the seat is made to slide up the back.

1074. APPARATUS FOR FEEDING WATER TO STEAM BOILERS, *J. Ripley and T. Scholes, Bolton.—6th March*, 1882. 6*d.*

In the drawing A is the steam boiler, in which B is the working water level, C the flues, D the ordinary feed valve placed at the front of the boiler, connecting by the pipe E to the back-pressure valve F, or it may be coupled to an ordinary feed valve in any other position, which is frequently found at the top of the boiler; in such a case the pipe E will be vertical instead of horizontal, as shown. The back-pressure valve F is placed inside the boiler, upon which is mounted the lever G on the fulcrum H. The pipe I is connected to the outlet J on the feed or back-pres-



sure valve, and extends downwards into the water, to convey the feed water being supplied below the working water-line. The valve is loose from the spindle K, thus enabling it to perform its function as a back-pressure valve, only being lifted when forced by the action of the water, and closing again when the pressure is reduced below that in the boiler without affecting the lever G and float.

1081. WATER VELOCIPEDES, *A. Whittall, Kidderminster.—6th March*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to an aquatic velocipede, and consists in the combination of a pair of twin hulls braced together with a frame similar to that of a bicycle.

1082. HORSESHOE, &c., *J. J. Norman, East Greenwich.—6th March*, 1882.—(*Not proceeded with.*) 2*d.*

The shoe is cast in a mould and is preferably of white metal, the lower surface having a recess running round it to receive a composition that will wear well and yet prevent the horse from slipping.

1086. FURNACES OF STEAM BOILERS, *A. Mellor, Nottingham.—7th March*, 1882.—(*Not proceeded with.*) 2*d.*

All the draught space below the furnace is abolished, and the furnace bars are replaced by a platform, above which piping is arranged so as to cover the seating of the fire space. These pipes supply coal gas and an inflammable liquid such as paraffine, and they are covered with asbestos. A fan supplies air to the furnace.

1087. FELTING AND FINISHING HATS, &c., *R. Wallwork, Manchester.—7th March*, 1882. 8*d.*

This relates, First, to apparatus for felting hats, and is also applicable for washing and churning machines, and it consists of a series of discs secured at any desired angle on an axis with spaces between them. The shaft is supported in hanging arms, and is pressed towards the bottom of a ribbed trough by means of an adjustable weighted arm; the Second part of the invention relates to a machine in which the hats are finished by being placed on a block and rapidly rotated while sand-paper is held on the surface.

1088. STEAM-JACKETTED COPPERS OR BOILING PANS, *G. Inskipp and J. Mackenzie, London.—7th March*, 1882. 6*d.*

The object is to form the coppers or pans with the copper bottom of such form as to render it more capable of resisting the pressure of the steam in the jacket, and also to avoid the necessity of making more than one steam-tight joint between the copper or pan

and the jacket, and it consists in forming the copper bottom with the convex side upwards and the concave side towards the jacket. The discharge opening is at one side beyond the steam jacket, so that the only joint required to be made is round the circumference of the jacket.

1093. Marking out Lawn Tennis Courts, &c., *R. W. Ralph, and W. S. Underill, Newport, Salop.—7th March*, 1882. 6*d*.

The object is to form an apparatus for marking out lawn tennis courts, in which dry marking material, such as slacked lime or ground chalk, may be used, and it consists of a frame, a double roller with cross-pins or lifters, a canister for holding the marking material, and having a perforated trough along the bottom thereof, and a lifter arm projecting therefrom, and, lastly, a handle and chain.

1094. Holders for Electric Lamps, *E. H. Johnson, London.—7th March*, 1882. 6*d*.

Describes forms of sockets having a centre butt contact and a peripheral contact.

1095. Filter Presses, *W. G. Strype, Wicklow.—7th March*, 1882. 6*d*.

This relates to simplifying the construction of filter presses and obviating the liability of the filter-plates to fracture owing to the existence of central or cross grooves or channels and outlet holes for the discharge of the filtered liquid. The grooves are carried through the bottom or other sides of the filter plates, which, with the filter cloth, form the joint between the plates, instead of terminating them as at present in cross grooves.

1097. Joints and Couplings for Tubes and Pipes, *T. A. Bickley, Birmingham.—7th March*, 1882.—(*Not proceeded with*.) 2*d*.

The ends of the tubes are brought together and a short piece of tube slipped over the joint, the covering tube being contained in a cover of barrel form, with a hole through which lead or cement is poured.

1101. Metallic Packing for Pistons, &c., *G. Holcroft, Manchester, and J. Grundy, Ashton-under-Lyne.—7th March*, 1882. 4*d*.

The object is to make packing rings that will wear uniformly and press equally on all parts of their periphery, and it consists in making the rings excentric, the outer portion being concentric to the centre of the piston rod. The ring is cut or divided at the thinnest part so as to form a lap joint requiring no loose stop bits.

1102. Looms, *C. H. Clegg and A. Hoyle, Littleborough.—7th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to improvements on patent No. 650, A.D. 1874, and it consists in applying a pair of compressing rollers between the fell of the fabric and the cloth beam to act upon the fabric when woven, one or both of these rollers being driven at a greater or less speed than that at which the cloth travels, and a longitudinal motion imparted to them, so that fluff is prevented from adhering thereto.

1105. Chains, *W. Penman, Gateshead-on-Tyne.—7th March*, 1882. 6*d*.

The chain is cast in a series of three or more moulds, one set of links being cast in moulds made up of three sections and then placed up in moulds made up of four sections in which they are supported vertically, while connecting links are cast on or around them in a horizontal position.

1110. Reaping and Mowing Machines, *H. R. Allen, Indianapolis, U.S.—7th March*, 1882.—(*A communication from M. Cochran, Indianapolis, U.S.—(Not proceeded with.*) 2*d*.

On the main shaft is fixed conical gearing, covered by a case to which one end of an arm is attached, the other end, provided with a ball, being clasped in a socket on the shoe of the cutter bar. Connected to the shoe and passing up to the axle or gear case, is another arm to which a lever is attached for the purpose of raising or depressing the fingers of the cutter bar. The machine is set in motion or thrown out of gear by a clutch. The knife is driven by a crank and pitman enclosed in the ball-and-socket joint.

1111. Reaping and Mowing Machines, *H. R. Allen, Indianapolis, U.S.—7th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to raising the cutter bar by the power of the horse instead of by hand, and it consists in the use of a small lever to throw a clutch in gear which is fitted with a pulley to wind up a chain connected to the cutter bar.

1112. Protection of Harbours and Shipping, *J. Shields, Perth.—8th March*, 1882. 6*d*.

This relates to discharging oil on the surface of the sea, and relates partly to improvements on patent No. 3490, A.D. 1879, and it consists, First, in the use of valves at the ends of the discharging tubes, and which are opened by providing a sufficient head of oil; Secondly, in the use of hollow projectiles containing oil and fired from a gun or rocket apparatus; Thirdly, in filling buoys or beacons with oil and providing valves which, when opened, discharge the same; and, Fourthly, in the use of vessels carried on a wire and caused to discharge the oil they contain on to the water.

1115. Utilisation, as a Motive Power, of Tidal Currents in Rivers, &c., *F. Pool, Charleston, U.S.—8th March*, 1882.—(*Not proceeded with.*) 2*d*.

Shoots or flumes are fitted along the sides of the river, or attached to pontoons, and rise and fall with them, where a good strong current can be obtained. Upon suitable floating pontoons water-wheel turbines or other motors are placed, and the water from the shoots is conducted by channels to such motors, and as the pontoon and motor rise and fall with the tide, power can be obtained as long as there is sufficient current to raise the water to the top of the wheel.

1116. Cocks for Regulating the Flow of Water, &c., *A. Gutensohn, London.—8th March*, 1882.—(*Not proceeded with*.) 2*d*.

This consists of a screw spindle working through the outer end of a cylindrical case secured to the supply pipe, the inner end of which spindle acts on a rubber disc so as to close the supply pipe.

1121. Effecting the Separation of Solids and Liquids, *H. J. Smith, Glasgow.—8th March*, 1882.—(*Not proceeded with.*) 2*d*.

A central vessel is fixed to a revolving shaft, and is fitted with a number of close vessels arranged radially round it and into which the mixed solids and liquids are led to be separated by centrifugal action, and from which the solids are ejected by the same action, while the liquids are also drawn off without stopping the machine.

1122. Pottery, &c., *R. Boote, Burslem.—8th March*, 1882.—(*Not proceeded with.*) 2*d*.

A bed corresponding in shape to the article to be dressed is situate beneath a revolving spindle on which the article is mounted. Pieces of friable material are placed on the bed, and as the article revolves all irregularities are removed.

1132. Earthenware Pipes for the Conveyance of Gas, Water, &c., *G. Smith, Bradford.—8th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists essentially in embedding earthenware pipes completely in cement, mortar, or concrete.

1133. Stoppers for Bottles, &c., *A. Clark, Soho.—8th March*, 1882.—(*A communication from G. D. Dows, Boston, U.S.*) 6*d*.

This relates to an external stopper fitted with a valve opening inwards, and formed so that a liquid under pressure can be introduced through it into the bottle when the stopper is in place, and so that the pressure in the bottle will close the valve when the external pressure is removed; also to an improved device to allow the contents of the bottle to be withdrawn by the valve without removing the stopper.

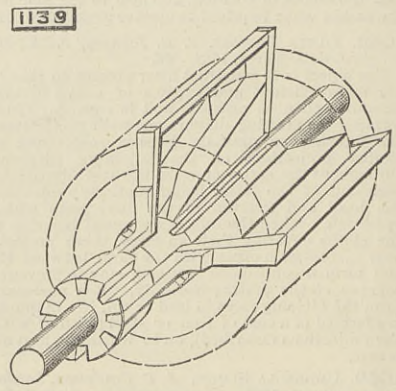
1140. Wagons, *W. Hornsby and R. Edwards, Grantham.—9th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in forming the hinged doors of wagons with corrugations, so as to stiffen them; and also in arranging the door fastening catch above the drawbar, both being encircled by the same small brackets at each end.

1139. Dynamo or Magneto-electric Machines, *T. J. Handford, London.—9th March*, 1882.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 6*d*.

The Pacinotti bobbin is formed of cores of bars, the

1139



alternate bars connected with commutator. The figure is a perspective view of the armatures.

1147. Attachment of Wheels to their Axles, &c., *J. Mackay, Liverpool.—9th March*, 1882. 6*d*.

This relates to the attachment of wheels to their axles, and the lubrication thereof, and it consists in forming a circumferential groove in the axle to receive a divided disc, which is held in position by a cap and screws, which attach it to the bush or axle-box. A recess is formed in the bush or axle-box, and receives a lubricant through a suitable passage.

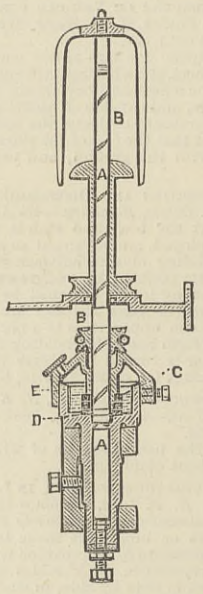
1156. Soda and Potash, *J. Macteer, Glasgow.—10th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to improve some of the processes in the manufacture of soda and potash, so as to separate impurities in a more expeditious and less costly manner than heretofore, and it also comprises the utilisation of a bye-product, and it consists in heating the vat liquors formed by the lixiviation of black ash in a boiler by steam at a pressure of from 70 lb. to 150 lb. per square inch, the steam being injected into the liquor or passed through pipes in the boiler.

1157. Spinning Machine Spindles, *R. B. Thompson, Dundee.—10th March*, 1882. 6*d*.

The object is to increase the steadiness of spindles and permit them to be driven at a higher speed, and in consequence of their small weight and diminished tendency to vibrate, to allow larger bobbins to be used; and it consists in the use of a dead spindle A

1157



on which the running spindle B revolves, the latter being tubular and supported at its bottom end instead of from the top of the dead spindle. The running spindle B has a ring C fixed to its lower end, and rests on a collar D attached to the dead spindle A, a small passage being provided to allow the lubricant to pass from the reservoir E to the interior of spindle B.

1168. Portable or Endless Travelling Railways, *J. C. Mewburn, London.—10th March*, 1882.—(*A communication from G. Fender, Buenos Ayres.*) 6*d*.

This relates to an arrangement of endless cables or chains which form a railway, to be continuously taken up and relaid in front of the wheels of road locomotives or other vehicles.

1186. Combination of Materials for the Manufacture of the Heels of Boots, &c., *W. E. Gedge, London.—11th March*, 1882.—(*A communication from L. Dourdet, France.*) 6*d*.

This consists in a leather top piece with an incrustation or inlay of metal, the object being to render heels more durable, and prevent them treading over on one side.

1204. Improvements in or Connected with the Construction and Working of Junction or Switch Apparatus, especially Applicable for use in Telegraph or Telephone Exchanges, &c., *W. E. Irish, Sunderland.—3rd March*, 1882. 8*d*.

This comprises an improved commutator consisting of a number of studs, each in connection with a different subscriber, arranged in an annular form, and a freely revolving arm pivotted in the centre of the ring of studs. By turning this arm to the stud corresponding to a certain subscriber's number, the attendant can place himself in communication with such subscriber. It also comprises an annunciator so constructed that the armature when attracted simply pushes the "drop" out of its normal position, thereby causing it to fall; and improved means of employing slippers, springs, and jacks for facilitating communication.

1289. Perambulators, *W. H. St. Aubin, Bloxwich.—17th March*, 1882. 6*d*.

This relates to apparatus to prevent perambulators running down inclines when released, and it consists in the use of spring bolts so connected with the handle by which the vehicle is propelled that when the same is released the bolts will be shot forward and come into suitable position to lock the wheels of the vehicle.

1297. Printed Fabrics, *J. Imray, London.—17th March*, 1882.—(*A communication from T. Grison, Paris.*) 2*d*.

This relates to the use of substitution colours instead of mordants for printing on dyed fabrics, such colours being composed of salts or solutions having for base iron, copper, tin, zinc, chromium, lead, aluminium, and other metals, and soluble salts of manganese, chlorates of soda or potassa, and other oxidating salts, with glucose, sugar, molasses, or other vehicles. With these bases are mixed aniline colours, yellow, violet, green, red, blue, or others, made up with the mucilages usually employed in printing.

1249. Improvements in Armatures for Magneto-Electric Machines, &c., *C. L. Levey and E. Lumley, New York and London.—15th March*, 1882. 6*d*.

This relates to improvements on the Gramme ring armature. The inventors form the body of the armature of a number of sheet metal plates alternating with plates of non-magnetic material, all the plates being in the shape of a wheel with central hubs. The shaft fits into central holes in these plates, and a key on it passes through a keyway formed in the central holes. Insulated wire is wound round the ring thus formed, each section or bobbin being separated by the

1249 FIG. 1

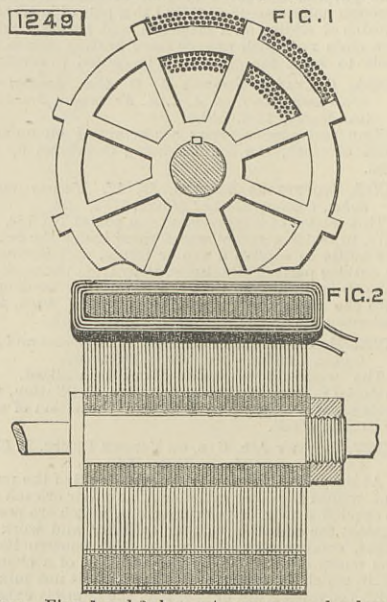


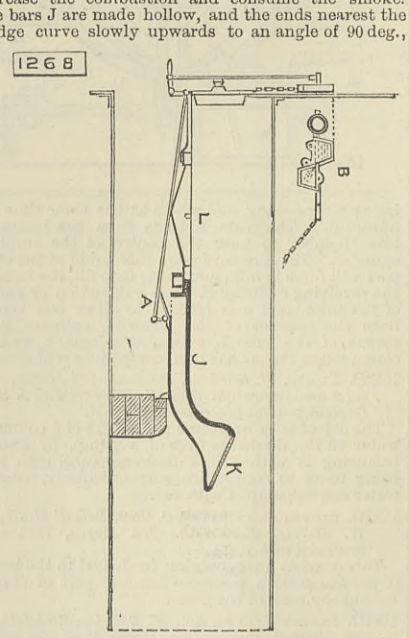
FIG. 2

spokes. Figs. 1 and 2 show a transverse and a longitudinal section of the inventor's armature respectively. The invention also relates to an arc lamp, the lower carbon of which is stationary, the upper one being regulated by the differential action of two electro-magnets, one in the main, the other in a shunt circuit.

1268. Furnaces, *M. H. Watts and E. Swindells, Macclesfield.—16th March*, 1882. 6*d*.

This relates to an improved furnace bar for steam boiler and other furnaces, the object being to admit intensely heated air to the furnace at the top of the bridge, and mixing with the unconsumed gases, increase the combustion and consume the smoke. The bars J are made hollow, and the ends nearest the bridge curve slowly upwards to an angle of 90 deg.,

1268



and to their ends are fitted loose finely perforated grids K. These bars J are fitted at the rear of the furnace, the front part of the grate surface being fitted with ordinary bars L. In cases of slow firing, a self-closing damper is attached by rods to an automatic mercurial balance box B, consisting of two chambers in which mercury flows from one to the other, and by overcoming a balance weight, causes the box to turn over and so close the damper A.

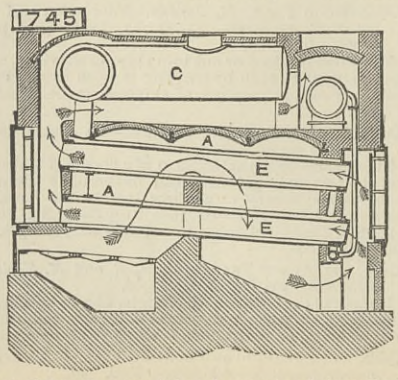
1342. Glass, *C. A. W. Schön, Hamburg.—20th March*, 1882.—(*A communication from G. Leuffgen, Berlin.*) 6*d*.

This relates to the construction of melting furnaces for continuous or intermittent working, and its object is to produce glass quite free from clay or other impurities, and to manufacture "cassin" glass, and it consists, in the First place, in substituting for the ordinary clay plug in the melting vessel a hollow metal plug cooled by a stream of water; Secondly, in forming the furnace with a central trough to receive the material, and one or two working troughs, the admission to which is over ridges at the end of the central trough; Thirdly, to a special form of "dip bonnet" for blow-pipe work, and consisting of a pipe descending obliquely into the melting vessel from the arched top thereof, and having an opening at top for observation, and a branch terminating in the working opening, through which the glass is taken out by the blow-pipe; Fourthly, to a modification of above for pot work; and Fifthly, in the use of a hollow cooled turntable, which can be raised and lowered as required, and a set of moulds upon it, into which the fluid glass is deposited and acted upon by a press.

1745. Steam Boilers, *R. H. Brandon, Paris.—12th April*, 1882.—(*A communication from C. Gamper, Russia.*)—(*Complete.*) 4*d*.

The invention consists essentially in the combina-

1745



tion of two or more tubes A, carrying internally the concentric fire tubes E, which can be easily removed for the purpose of removing scale or incrustation; with an upper boiler C, of any size and form, for the purposes of producing high-pressure steam, with a relatively large heating surface in proportion to the volume and weight of the boiler.

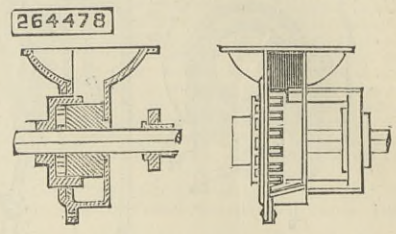
SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

264,478. Seeding Device, *John L. Riter, Brownsville, Ind.—Filed June 2nd*, 1882.

Brief.—The rosette is cast upon the cylindrical smooth gate and rotates in an annular recess in one side of the cup. Parallel feeding prongs upon the

264478

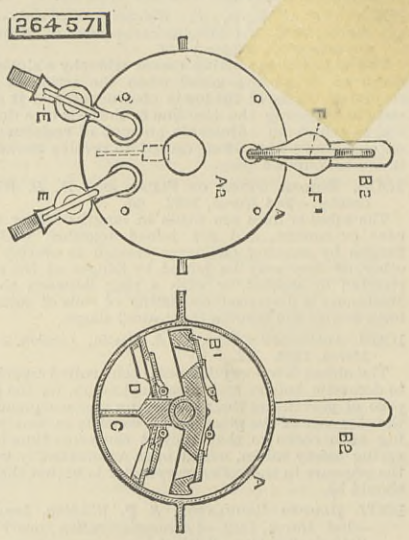


disc are projected through the rosette over the cylindrical gate for graduating the feed. Upper and lower cut offs are mounted upon the through shaft and move with it.

264,571. Oscillating Pump, *Carl Schlund and Peter Petry, Newark, N.J.—Filed July 11th*, 1882.

Claim.—The combination of a pump cylinder A, having an interior valved oscillating piston B^1, auxiliary inclined valve seats D, and valves D^1, a

264571



fixed transverse partition C, vertically below the journal bearing of the piston shaft, and a removable front head A^2, having suction pipes E E, one at each side of the fixed partition, and a discharge pipe F, communicating with the space above the piston, all substantially as set forth.

South Kensington Museum.—Visitors during the week ending Oct. 7th, 1882:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 11,871; mercantile marine, Indian section, and other collections, 4611. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 5 p.m., Museum, 1917; mercantile marine, Indian section, and other collections, 455. Total, 18,854.

Waterproof Paint.—Boil 7·5 kilos. linseed oil with 330 gr. resin, 330 gr. litharge, 50 gr. red lead, and 50 gr. umber, and 230 gr. zinc sulphate. A solution of 350 gr. potassium hydroxide and 350 gr. alum in 15 kilos. water is added gradually. For the preparation of the printing colour 5 kilos. chalk and 1 kilo. zinc white are treated with 50 gr. alum dissolved in 3 kilos. water, and mixed with a decoction of 750 gr. glue in 2 kilos. water. This is added to 2 to 2½ kilos. of the above varnish, and the mixture diluted with petroleum.

CONTENTS.

The Engineer, October 13th, 1882.