THE SUPPLY AND CONSUMPTION OF COAL.

No official statistics are available to determine the exact figures of the yield of our coal mines in the early days of the present century. The Custom House returns of the year 1801, however, furnish some clue. It appears that the quantities of all coals shipped from the port of Sunderland were recorded in 1801 at 624,804 tons, and that Newcastle sent to ports at home and abroad during the same year 482,593 chaldrons. From these items it may be fairly assumed that the output at that period was somewhere near 1,500,000 tons. The yield of 1881 is estimated at 150,000,000 tons. This enormous increase has been in sympathy with the necessity of supplying the growing wants of all nations. But this very necessity has aroused the energy of other nations in and out of Europe. Concurrently with the increase in this country endeavours have been made in various directions to emulate British enterprise. We propose to show whether these attempts have been successful or not, by briefly recording the results attained in the supply in the face of increased consumption.

The importation of coal into Russian ports has grown from year to year, and the quantities thus imported have during the whole period been almost exclusively of British origin. In the year 1831 this country shipped to Russia 31,379 tons of coal; twenty-five years later, *i.e.*, in 1856, the export had reached 236,010 tons. These shipments included Russian ports in the Baltic and the Black Sea. In another quarter of a century—1881—the export to the same ports stands recorded at 1,395,400 tons. The progressive increase during the last twenty-five years occurs as follows:—

	1856-60.	1861-65.	1866-70.	1871-75.	1876-80.
Tons	1,426,308 ...	2,376,663 ...	3,273,243 ...	4,102,504 ...	5,988,618

The foregoing eloquently demonstrates the rapid progress attained in the Russian empire in the use of steam power, for, concurrently with the increased consumption of British coal, the resources of the Russian mines have been gradually developed. For a very long time, in the absence of proper means of transportation, the riches of the earth remained undisturbed. The yield of Russian coal mines, we learn from official sources, was in the year 1870 confined to 817,000 tons. Since then the iron road has lent aid to a display of energy in the exploration of Russian coal mines. In the space of five years the yield had doubled, reaching in 1875, 1,750,000 tons. The results of 1879-80 show that in ten years the output had increased threefold and more. There were 154,034,320 poods in 1879 and 178,238,000 poods in 1880. Expressed in English tons, the output stands as follows:—1879, 2,475,500 tons; 1880, 2,864,500 tons.

Very little trustworthy information is obtainable to permit us to minutely enter into a narrative regarding the extent and the working of Russian mines. The approximate estimate is, that the coal regions situated in various parts of the empire embrace an aggregate from 25,000 to 30,000 square miles. English coal is, for the most part, exported to the Baltic, while a minor portion goes to Odessa and adjacent ports. English contractors have been in the habit of supplying, among others, the Kharkoff Railway Company. The annual consumption of that road is stated as 42,000 tons; one-half thereof coming from England, the remainder being supplied by the Russian mines at Donetz. The latter have managed to supplant the English coal, considerably underselling the British merchants. These facts have been recorded. But under authority of her Majesty's Consul at Odessa there is the following qualification:—"The Russian coal contains a very large proportion of sulphur, which tends to exercise a destructive influence on the boilers. Moreover, they are liable to spontaneous combustion; under the circumstances, therefore, it seems doubtful whether Russian coals prove virtually cheaper than English coals. Meanwhile, the most strenuous efforts are made in the construction of railways to open new avenues to reach the coal mines of the Donetz district, in view of dispensing, so far as possible, with coals from abroad.

From first to last the Scandinavian countries have been faithful customers at our coaling ports. The exports, both to Sweden and Norway, have increased in the ratio of the development which various branches of industry have attained, and commensurate to the extension of modern means of communication on land and at sea. Except in the southern provinces of Sweden, where a small yield is obtainable, no coal mines are worked, of any importance, in the kingdom of Sweden and Norway. The export of British coal during the period 1856 will be seen from the following summary of the number of tons shipped each quinquennial period:—

	1856-60.	1861-65.	1866-70.	1871-75.	1876-80.
Tons	1,466,593 ...	1,990,100 ...	2,628,935 ...	4,241,266 ...	5,873,339

The inhabitants of Denmark are more given to agricultural pursuits, industrial establishments not being so numerous, as the consumption of coal is confined to domestic uses, in addition to the requirements of an extensive network of railways and the steamboats on which the Danish Isles depend as a means of communication with the outer world. English coals have hitherto supplied, with few exceptions, the needs of Denmark. These supplies are summarised in the summary of twenty-five years' shipments as follows:—

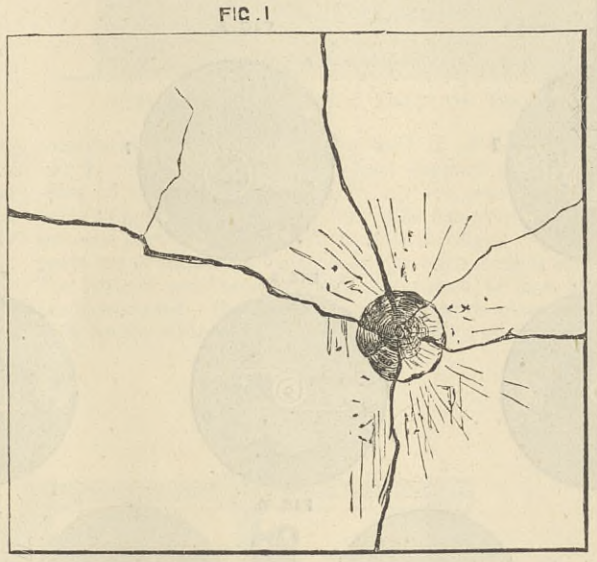
	1856-60.	1861-65.	1866-70.	1871-75.	1876-80.
Tons	2,211,442 ...	2,320,259 ...	2,989,032 ...	3,295,002 ...	3,904,707

It has been playfully observed that, prior to the events of 1866-70, Germany had no "geographical existence." There was an agglomeration of a number of States, and there were coal mines in Saxony, in Silesia, in Bavaria, and in the provinces of Rhenish Prussia. They were tolerably prosperous in serving local purposes, but as a whole the enterprise remained in a state of infancy. The German Empire, as at present constituted, has succeeded in attaining a rank among the councils of nations and greater vitality; in common with other improvements, the mining interests have been raised to a state of maturity. From a "Statistical Record" issued by the Imperial Government, we learn that, while in the year 1856 the yield of German coal mines barely reached 9,000,000 tons, the output in 1870 had been equal to 23,316,238 tons, and the production has so far advanced as to show a yield of 48,000,000 tons for the year 1880. It is necessary to observe that, to a large extent, this expansion is due to the newly-acquired territories of Alsace and Lorraine, which formerly belonged to France. The activity displayed in the exploration of the German coal mines has not, however, so far affected the demand for English coal.

THE ST. PETERSBURG ARMOUR-PLATE TRIALS.

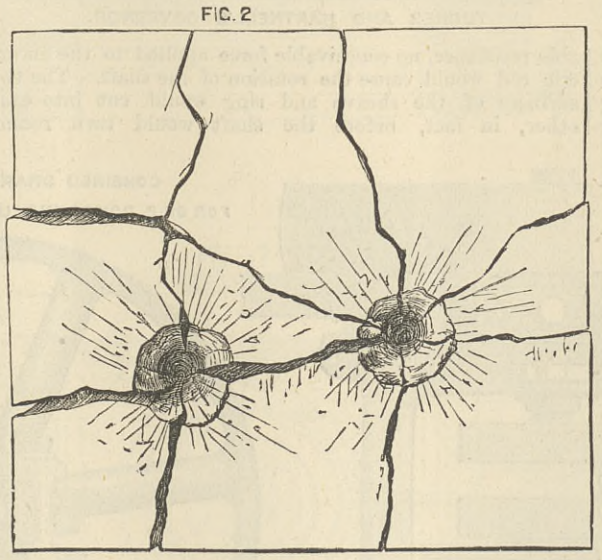
WE have already stated that an important trial of armour-plates was recently made at St. Petersburgh almost contemporaneously with the Spezzia experiments. We are now in a position to give particulars of these Russian experiments. They were made on Wilson compound—steel-faced—armour and Schneider's Creusot steel armour. The experiments were made 24th November, 1882, at Ochta, near St. Petersburgh, on two plates, each 8ft. long by 7ft. wide by 12in. thick; weight of each about 12¼ tons. The one plate was made of steel by Messrs. Schneider and Co., of the Creusot Works, France, and the other was made on Wilson's system, one-third steel, two-thirds iron, by Messrs. Chas. Cammell and Co., Limited. Both plates were backed by 12in. of timber placed horizontally, and two ¾in. iron plates supported by diagonal struts. The gun used was an 11in. Aboukoff breech-loader, the range 350ft. The projectile were of chilled cast iron shells, 615 lb. Russian—553½ lb. English—made at Perm in the Ural. The first shot was fired at Schneider's steel plate. The charge of powder was 146½ lb. Russian—132 lb. English. Velocity, 1506ft. The projectile was destroyed, but it broke the plate into five pieces, as shown in the sketch, the pieces being held on to the backing by the twelve bolts which fastened the plate to the target. The penetration was 13in. The effects are shown by Fig. 1.

FIG. 1



The second round was fired at Schneider's steel plate. The charge of powder was 90 lb. Russian—81 lb. English. The shot was broken up; there was penetration 16in. The plate was broken into nine separate pieces. The previous cracks were opened out, three new ones being produced, gaping 2in. to 3in., as shown in Fig. 2.

FIG. 2

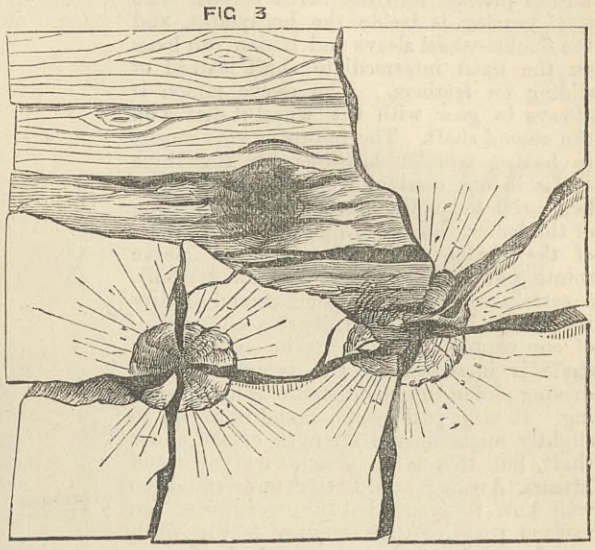


The third round was fired at Schneider's steel plate. Charge of powder was 90 lb. Russian—81 lb. English—with a steel shell Aboukoff make. Seven pieces of the plate remained hanging on to the shattered backing. One piece weighing about one ton was found 13ft. behind the target; ten pieces, weighing about three tons together, were scattered on the ground in front. The projectile was found 740 yards to the rear of the target, and was apparently uninjured. Previous cracks in remaining portion of plate further opened out, as shown in Fig. 3.

The fourth round was fired at Cammell's compound plate, with a charge of powder, 146½ lb. Russian—132 lb. English. Velocity, 1506ft. The projectile was destroyed. A few cracks produced on the steel face both concentric and radial, but they were of no importance. The front of the shot had splashed on the plate, and the head remained in, so that the penetration could not be ascertained, but, judging from the diameter of the piece wedged in the shot-hole, it was thought not to exceed 5in. This plate had only four bolts holding it to the target, one at each corner. Three of these were broken just behind the plate, and the lower right-hand bolt only remained as a fastening, as shown in Fig. 4.

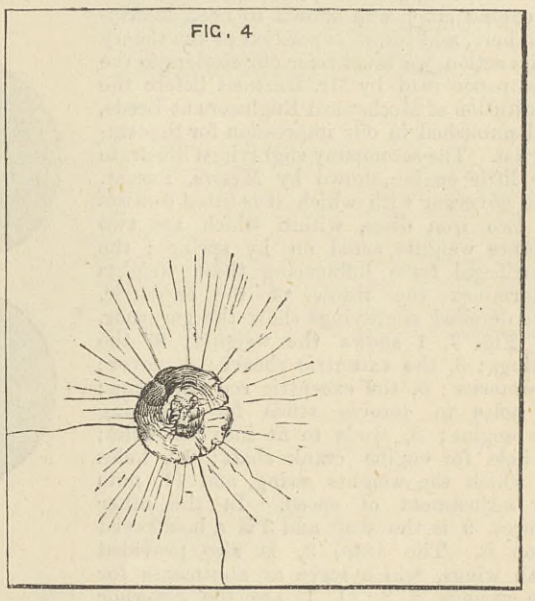
The fifth round was fired at Cammell's compound plate. The charge of powder was 90 lb. Russian—81 lb. English. The result on the face could not be seen as the remaining bolt had broken and let the plate fall on the

FIG 3



ground face downwards before the target. There were no cracks at the back of the plate, and only a slight bulge ¾in. in height in rear of the first impact, there being no perceptible bulge in rear of the second impact. The timber at the back was quite uninjured. Other bolts are to be sent out at once so as to complete the experiment.

FIG. 4



The total stored-up work in the first round at each plate is 8704 foot-tons, implying a power of perforating 16·3in. of wrought iron. This was, therefore, a severe test, the shot being a full match for 12in. of compound armour. It is a pity that the Cammell plate here, like that at Spezzia, should have been so insufficiently bolted.

THE SMITHFIELD CLUB SHOW.

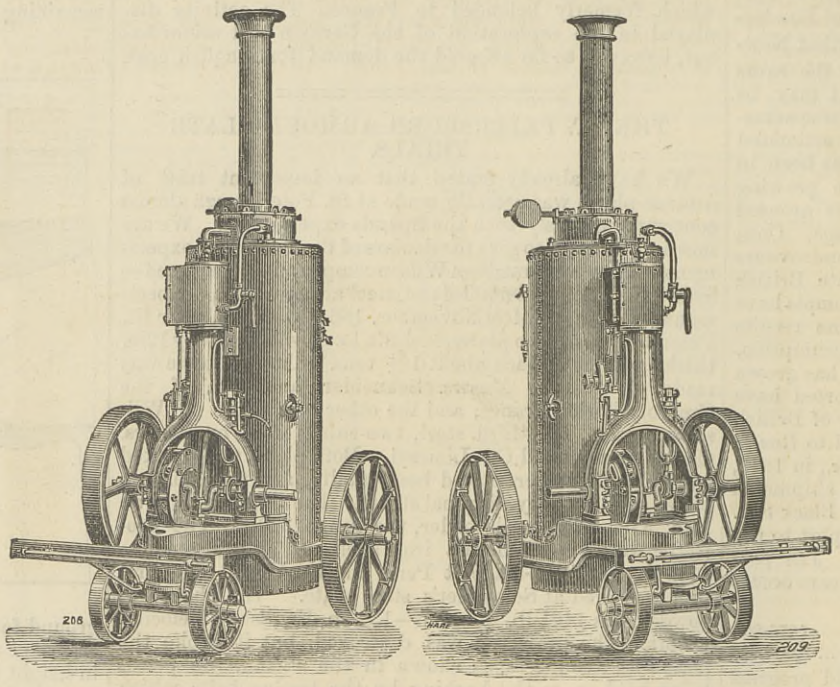
THE Smithfield Club Show opened on Monday under very favourable circumstances, the weather being fine and bright, while the attendance was unusually large. Possibly the fact that her Majesty the Queen opened the new Law Courts in the morning, and that there was in consequence an immense influx of visitors to see the ceremony, exercised a favourable influence, many who went to see the Queen in the morning going in the afternoon to see fat cattle at Islington. The display of machinery is much as it always is, not large, but on the whole, of excellent quality.

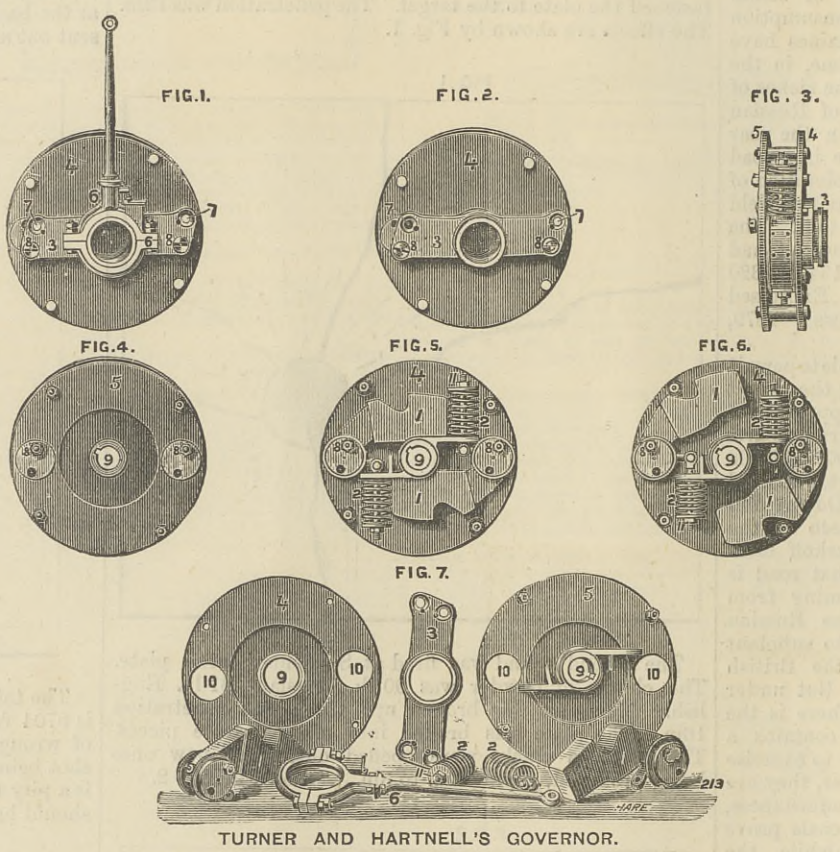
Steam Engines.—One of the leading firms, making, perhaps, more portable engines than any other firm in the trade, has adopted a very ingenious and original method of providing novelties for the Smithfield Club Show. About two years ago this firm showed an engine, the new thing about which was the fitting of a pan beneath the guide bars to catch waste oil. This year the novelty shown by the firm is an engine without this oil trap. Thus it will be seen the same thing acts one year by its introduction as a novelty, and another year it serves an equally good purpose by its absence. The circumstances are typical. The steam engines shown this year at the Agricultural Hall, Islington, are none of them new in design; there is not an original engine from one end of the building to the other. The consequence is that we are called upon to say very little about them; and we shall confine our attention to such novelties in detail as appear to us to be worthy of notice, merely premising that all the leading firms are adequately represented in much the same way as they are represented every year.

Messrs. Aveling and Porter, of Rochester, show a traction engine fitted with a new arrangement of gear, which we illustrate by the accompanying engraving, which will be readily understood. The castings extend the whole width of the horn-plates, and are tied together by a steel shaft and by a wrought iron cross-plate at the back and front. The bosses for the crank and intermediate shafts are round, and fit into round holes

drilled in the horn-plates; the bosses are bored for their seatings by a large boring machine. The crank shaft bearings are cylindrical in three pieces, and are held in position by excentric packing pieces. The first intermediate shaft is fixed by taper pins in the castings, thus forming a rigid stay for the horn-plates. The second intermediate shaft runs in gun-metal bushes pressed into the bored bosses. The steel gearing is inside the hornplates, and the double-wheel sleeve and pinion run loose on the fixed intermediate shaft instead of sliding on feathers. The sleeve pinion is always in gear with the wheel it drives on the second shaft. The improvements consist in having circular bearings for the three shafts in one casting, which is bored after being rivetted on the horn-plate at one setting of the boiler, thus ensuring perfect parallelism of the shafts. By substituting a sleeve rotating on a fixed spindle for a countershaft, a certain amount of compactness and solidity is secured; but it will hardly escape the notice of our readers that the strain on the crank shaft is increased by the removal of the driving pinion to some distance from a bearing. It may, perhaps, be found necessary to slightly augment the strength of the crank shaft, but this is a simple matter; and Messrs. Aveling and Porter understand too well how to proportion the strengths of the various parts of their engines to the work they have to do to make a mistake here.

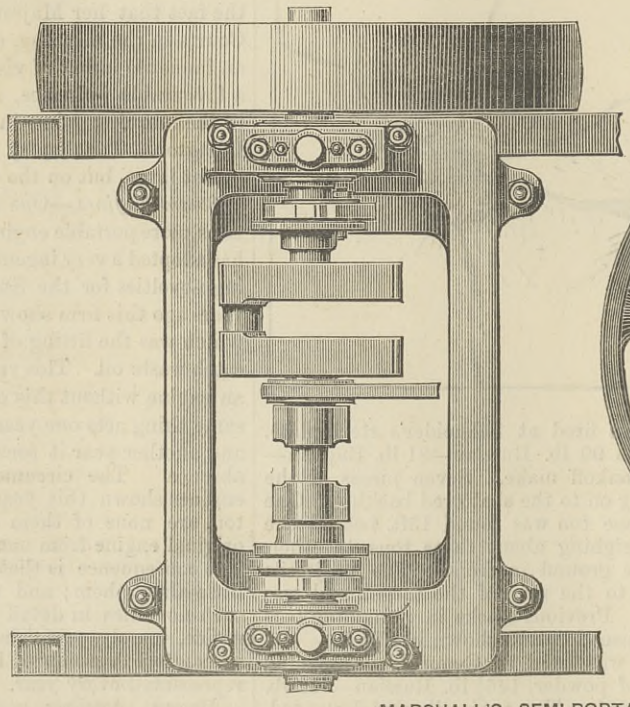
Not far from the stand of the Rochester firm is that of Messrs. E. R. and F. Turner, of Ipswich. The novelty they exhibit is a modified Gippeswyk engine, a vertical portable fitted with Turner and Hartnell's automatic expansion governor. The Hartnell governor, acting directly on the excentric of an engine is too well known to need description here, and for an exposition of the theory of its action we must refer our readers to the able paper read by Mr. Hartnell before the Institution of Mechanical Engineers at Leeds, and published in our impression for September 1st. The accompany engravings illustrate the little engine shown by Messrs. Turner. The governor with which it is fitted consists of two iron discs, within which are two balance weights acted on by springs; the centrifugal force influencing those weights determines the throw of the excentric. The detailed engravings show the governor. In Fig. 7, 1 shows the weights; 2, the springs; 3, the excentric sheave; 4, cover; 5, interior; 6, the excentric rod and ring; 7, holes to receive studs for reversing the engine; 8, studs to fit into the holes; 9, hole for engine crank shaft; 10, holes in which the weights swing, and 11, nuts for adjustment of speed. In the other figures, 9 is the shaft and 3 is a boss keyed upon it. The boss, 3, is also provided with wings, which serve as abutments for the springs, 2, 2; 1, 1, are the governor weights, and 8, 8, are bearings upon the weights; they are received into holes 10 in the flanges, 4, 4; 1, 1 are rods jointed to the weights; they pass through holes in the wings and are surrounded by the springs. The springs, 11, pressing against the discs on the ends of the bolts, 11, tend to draw the weights inwards towards the shaft; 6 is the excentric by which the valve of the engine is actuated; it is provided with two lugs, 3, 3. The excentric is connected with the weights by bolts passing through the journals of the weights, but in such a manner as to permit of the free movement of the weights. The bolts can be removed when it is required to set the engine to run in the reversed direction. The locking quadrant is, it will be seen, omitted. It has been found that it can be dispensed with in small engines rotating at a high velocity, the balance weights exerting sufficient control over the excentric to secure a proper action of the valve gear; but it is not supposed that type of governor will answer for large engines.





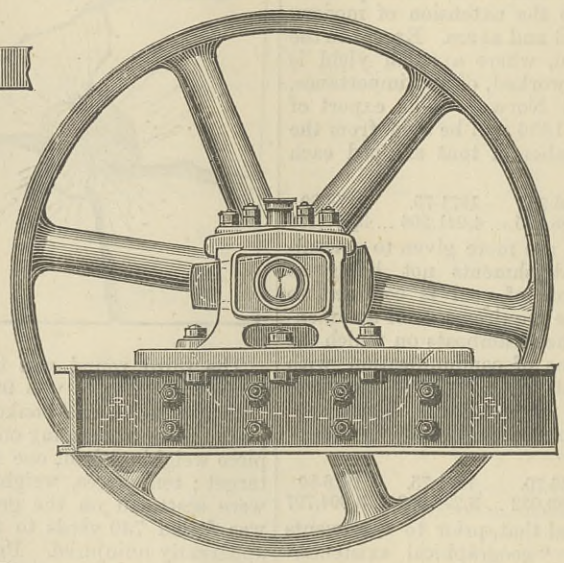
TURNER AND HARTNELL'S GOVERNOR.

At the opposite side of the hall is a horizontal engine shown by Messrs. Hornsby, of Grantham, which is also fitted with an automatic expansion gear. This gear may be readily overlooked, but it is an extremely elegant and ingenious device for getting rid of a well-known difficulty appertaining to that type of automatic expansion gear in which the travel of the valve and the point of cut-off is determined by the position of a die in a slotted link. It is well known that as the link moves the die always tends to shift along the incline made by the link, and an enormously powerful governor is required to control this motion. In practice the control is never perfectly effected in this way, and a dash pot is required to steady the die, which it does but indifferently. In Messrs. Hornsby's arrangement, the link connected with the die block is moved by an excentric, the partial rotation of which is effected by the governor. It is well known that an excentric makes an excellent driver, but that it is almost impossible to drive it. Thus while a moderate force will cause the rotation of a shaft fitted with an excentric which has to overcome a considerable resistance, no conceivable force applied to the excentric rod would cause the rotation of the shaft. The two surfaces of the sheave and ring would cut into each other, in fact, before the shaft would turn round.



MARSHALL'S SEMI-PORTABLE ENGINE.

COMBINED CRANK SHAFT CARRIAGE FOR 8H.P. COMPOUND UNDERNEATH ENGINE



Messrs. Hornsby have availed themselves of this fact, and we understand that the action of the new gear leaves nothing to be desired. We cannot as yet illustrate it, because the patents are not complete, but we shall probably illustrate it and a compound electric light semi-portable engine, to which it is to be fitted, similar to one shown at Islington, at no distant date.

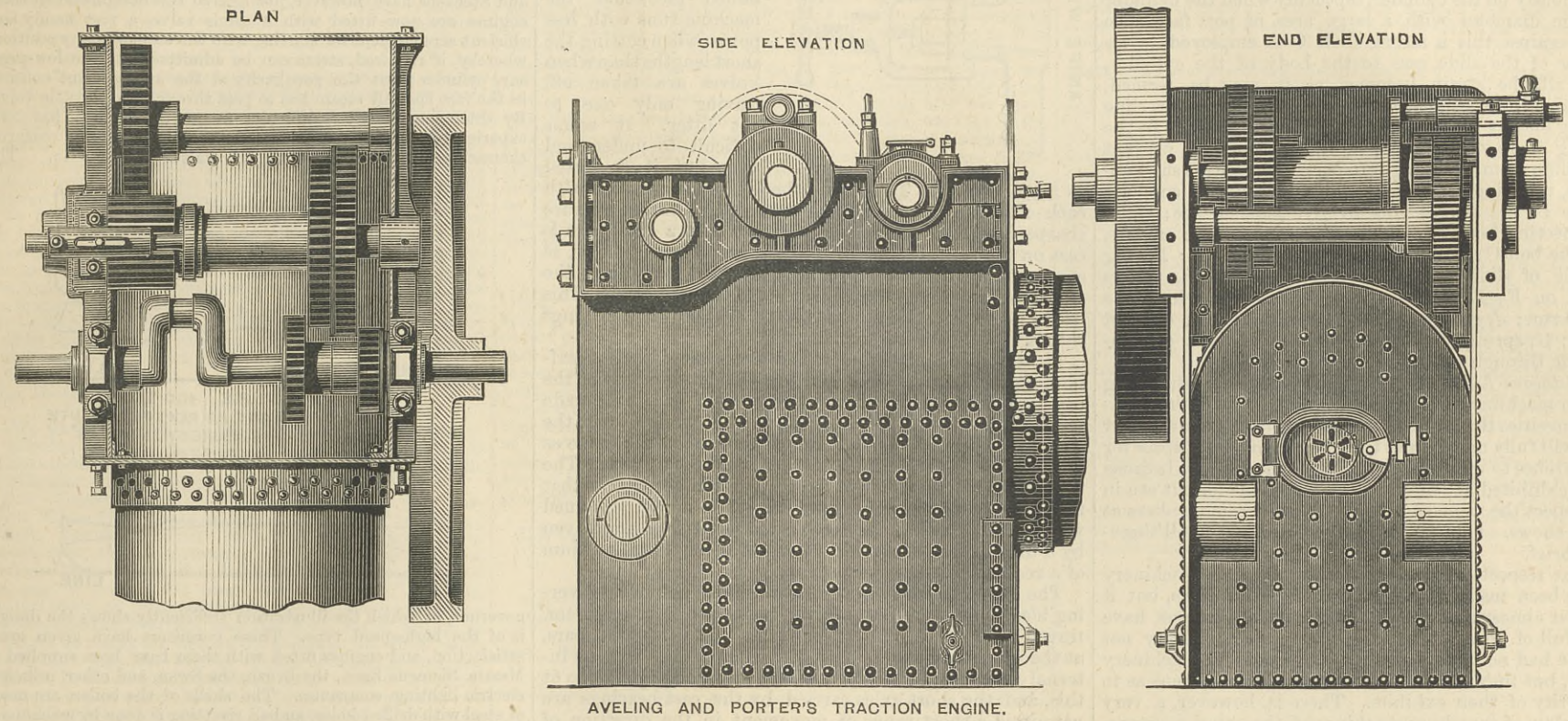
Messrs. Marshall, Sons, and Co., of Gainsborough, show an 8-horse power semi-portable for electric light work, almost identical with our engraving which appeared in The Engineer for June 30th. The only difference of importance is the arrangement of the main bearings. It is well known that engines of this type, with wrought iron cheek-plate frames, tend to buckle these frames in and out at each stroke of the engine, and to avoid this cross girders have to be introduced. Messrs. Marshall get over the whole difficulty very neatly by putting in a casting extending right across the engine, as shown in the accompanying engraving. Thus the two carriages are combined in one casting extending across the engine, and bolted between the two wrought iron side frames, with lugs cast on for the holding down bolts. The steel crank shaft has counterbalances worked out of the solid material, as seen in the engraving. All the compound underneath and separate fixed engines made now by the firm have their crank shaft carriages made in this manner, which forms a thoroughly substantial job. It may be worth while to state that so great is the demand now for steam engines, that for the last three months Messrs. Marshall, in spite of the enormous resources of their works at Gainsborough, employing some 1600 men, have not had a single engine in stock, and they are now laying down additional plant to meet the demand.

Messrs. Ruston and Proctor show a compound portable which deserves notice, principally because of some novelties in the construction of the boiler. The working pressure is 120lb., and the firm have long felt convinced that more facilities for inspection should be provided than exist at present. The portable engine as usually constructed has the manhole just over the fire-box, and the roof stays effectually prevent a boy from getting into the boiler, and even if they did not the longitudinal stays would. Messrs. Ruston and Proctor use a flush boiler, and dispense altogether with longitudinal stays, replacing them with gussets at the ends, and they put a manhole at the side, and nearer the crank shaft than usual. The result is that a small man can get into this boiler, and slice deposit off the tubes and chip it off the top of the fire-box, while it is even possible partially to inspect the bottom of the boiler by the aid of artificial light. Messrs. Ransomes, Head, and Jefferies, Ipswich, show a portable engine, with a somewhat similar arrangement. While we are dealing with this subject it may be well to point out that an improvement on the present system of lagging such boilers is extremely desirable. In a recent instance a boiler exploded, killing one man and wounding others, as the result of corrosion at the bottom of the barrel, the existence of which could not be detected because of the lagging. It would require no great effort of ingenuity so to construct lagging that the whole of the bottom portion might be made removable, on slackening a few nuts, and thus a very good examination might be made, say, twice a year. With the increased pressures now in use more care must be taken of boilers than will suffice with the moderate pressures of a few years back.

The only other engine calling for special notice is a compound "Class A," shown by Messrs. Richard Garrett and Sons, of Leiston. This was wanted to complete the compound engine series of this firm, which we are happy to see has given up the use of the term nominal horse-power. The engine is similar in type to those of the same firm already illustrated in our pages. The cylinders are 7in. and 10½in. diameter and 10in. stroke; the safety valves are loaded to 120 lb. The boiler is of the same size as that fitted to the equivalent of ordinary 6-horse power engines made by Messrs Garrett, but the engine easily indicates 27-horse power. We may point out that the Garrett compound portable is the only compound portable which we have ever had an opportunity of personally testing for consumption of fuel, and those interested will find full details of the trial we carried out, and the very excellent performance of the engine, in our impression for Nov. 26th, 1880. We may, perhaps, be permitted to point out, that independent trials of new types of engine are now more important than ever as a guarantee to the public of performance. While the Royal Agricultural Society made tests the purchaser had a guide, now he has none. We do not for a moment even hint that the results of private trials made by firms are not accurate; but inventors are apt to lean unconsciously on facts in their own favour, and it is indisputable that on the whole the advantage lies with the independent test. Several years have now elapsed since the Royal Agri-

cultural Society discharged its duty in this respect, and, so far as we are aware, in all this period particulars of only two independent tests of portable engines have been made public, the first being that to which we have just referred with Messrs. Garrett's engine, and the second being a test which we made with a single cylinder engine by Messrs. Davey Paxman and Co., of Colchester, at the Crystal Palace last year.

Mr. Church exhibited a new slide valve, which we illustrate. Mr. Church has for years been endeavouring to perfect circular slide valves with indifferent success. The valve he now exhibits is a distinct advance on his former efforts, and is, to say the least, full of promise. The details of construction adopted by Mr. Church will be readily understood by examination of the accompanying engraving. The slide S, Figs. 2, 3, 4, and 5, is circular, being a shallow cylinder with a flange at its lower edge, and a hole through its back cover. The face of the flange rubs over the cylinder facing, bringing each of the ports A alternately into communication with the slide case, and with the interior cavity of the slide, so that steam which is supplied to the slide case enters the port during one part of the movement, and exhaust steam during another part of the movement issues from the port into the interior cavity of the slide, and passes thence by the internal ports P to the discharge. The ports A are peculiarly shaped, taking a somewhat crescent form, their inner and outer edges being circular arcs, and struck with radii so suited to the inner and outer radii of the slide flange, that as the flange reaches the edge of the port a very small movement of the slide covers or uncovers, as the case may be, a large extent of the port. The cylinder facing in which the ports are formed has a raised surface on which the slide flange works, this surface being so shaped that at each reciprocation the slide passes over every part of it. Thus no ridge can be formed at either extreme of the stroke of the slide, because the flange of the slide overlaps and passes somewhat beyond the boundary of the raised surface of the facing. As the ports have a considerable width, and as the slide is of circular form, not having the continuous lateral support given to the sides of a rectangular slide, ribs *a a* are provided in the ports to prevent the edge of the slide flange from dipping into the port so as to catch against its edge. When the ports are of moderate width, a single central rib *a* suffices. For ports of considerable width, two, three, or more ribs *a* are introduced. Reciprocating movement is given to the slide by the slide rod R working through a stuffing-box in the front of the slide case in the usual way; but in order to provide for the turning movement of the slide, the rod is made to form a buckle or ring F which surrounds and embraces the circular body of the slide, leaving the slide free to turn within the buckle. In order to ensure the turning of the slide, not to and fro, but always a little round in one direction so that fresh portions of the rubbing surfaces are continually presented to each other, the following arrangement is adopted:—On the buckle of the slide rod are mounted two rollers E E, whose peripheries touch the circular exterior of the slide, and also touch two straight faces D D formed at the sides of the slide cases. The rollers E E being mounted at points in a diameter considerably inclined to the line of travel of the slide rod R, and there being a little looseness of fit within the buckle F, the first effort of the slide rod in each direction of its motion is to wedge one or other of the rollers E in between the periphery of the slide and the surface D. The slide rod then continuing its motion, the wedged-in roller E rolls along the surface D, and by its friction against the circular surface of the slide causes it to turn partly round within the buckle F as it travels along with it. When the slide rod R makes its return stroke the other of the two rollers E becomes in its turn wedged in, and gives a farther turn to the slide in the same direction as before. Thus the movement of the slide over the cylinder facing is a composite one, consisting of its to-and-fro movement rectilineally combined with a partial rotation around its axis. Every part of the slide face is thus in its turn brought to bear on every part of the raised surface of the cylinder facing, and the wear is thus so completely equalised that the surfaces which begin to work with the tool marks prominently apparent become, it is stated, after a few days of working, polished like mirrors, and continue so polished, as any ridge or groove that might tend to be formed during one stroke becomes at once obliterated during the next stroke. In order to relieve the slide from a large portion of the pressure bearing it against the facing, a piece B projects upwards from the middle of the cylinder facing, and spreads out at the top so as to present a surface on which bears a raised surface within the back of the slide. The



AVELING AND PORTER'S TRACTION ENGINE.

Fig. 1.

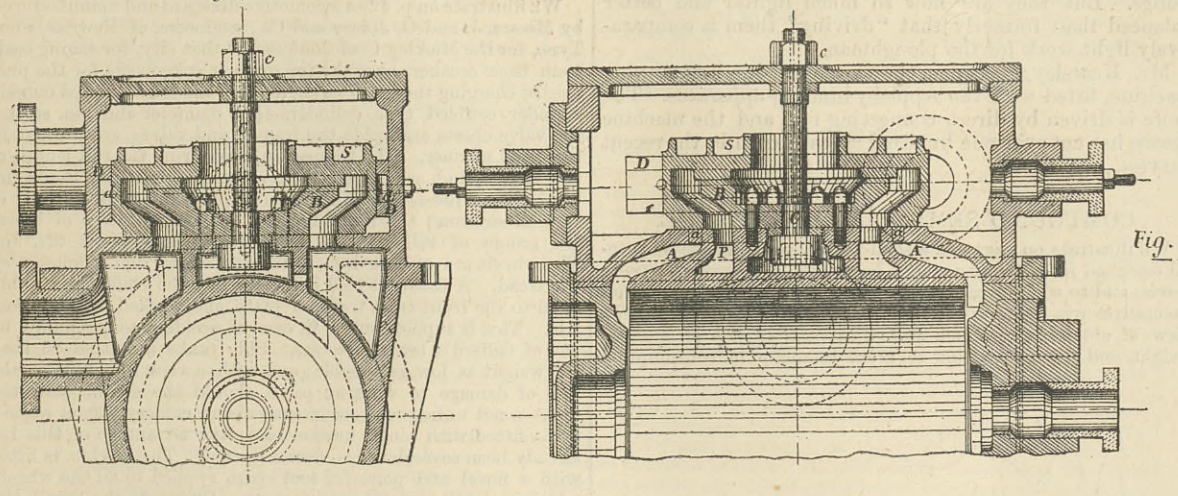


Fig. 2.

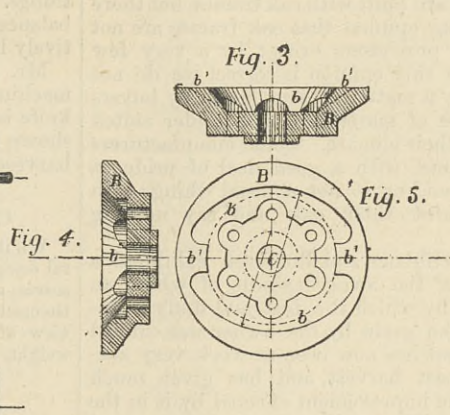


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

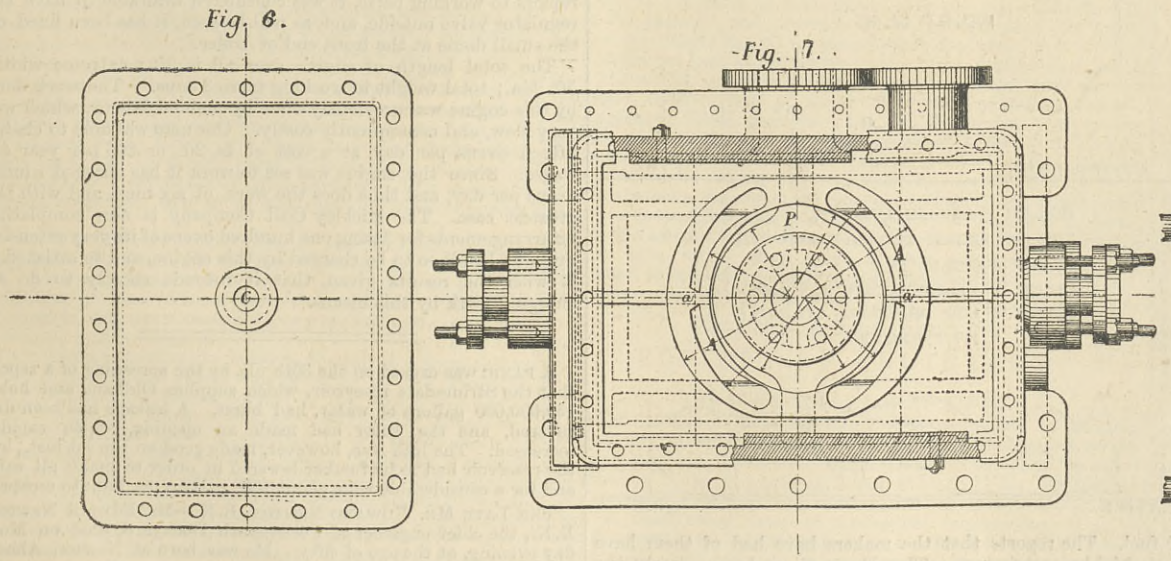


Fig. 7.

Fig. 8.

Fig. 9.

CHURCH'S SLIDE VALVE.

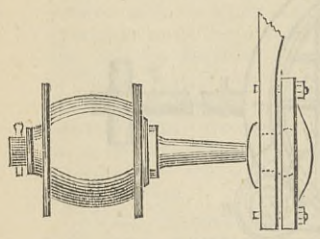
slide is thus relieved of the pressure on an area equivalent to that enclosed within the contour of the upper face B. This face has its rubbing parts shaped in crescent form with two widened parts b^1 b at the sides, so that the slide in travelling to and fro over it and at the same time turning partly round works over it with freedom and equalisation of wear corresponding with what occurs at the lower rubbing surfaces. Mr. Church holds that the pressure of the steam or working fluid within the slide case tends to act injuriously on the cylinder, especially when the cylinder is of large diameter with a large area of port face. To provide against this a strong bolt C is employed to tie the cover of the slide case to the body of the cylinder, so that all the strain becomes, as it may be termed, self-contained, the whole of the pressure within the slide case being met by the tensile strength of the bolt C. In the engraving A are steam ports; a, ribs in ports to prevent edge of slide from dropping into ports; B, central supporting piece, relieving pressure on slide; b, cavity in supporting piece B; b^1, lateral ribs to give side surface; C, tie bolt connecting body of cylinder to cover of slide case; c, nut for the bolt C; S, circular slide; R, slide rod; F, ring or buckle of slide rod, encompassing slide; E, rollers mounted on F; D, surfaces in slide case on which the rollers D run; d, groove to guide sides of F; P, exhaust passages; G, spring pressing on middle of slide; g, elongated hole through G to clear C.

Miscellaneous Exhibits.—Our hunt among the thrashing and other machinery was not any more fruitful in the discovery of novelties than it was amongst the steam engines. Our readers will fully understand that we cannot afford space for mere reference to machinery or implements simply because they are exhibited at Islington, or are well made, but are in every respect the same as exhibited by the same makers at previous shows. Our notice of the machinery will therefore be brief.

In some respects there is a smaller show of machinery than has been made at Islington in previous years, but it seems that almost all agricultural engineering firms have been so full of work during the past year that they not only have had no time to produce novelties and machinery for show, but they can afford to be a little indifferent as to the quantity of their exhibits. There is, however, a very good display of thrashing machines of the same construction as those exhibited at the Reading Show of the Royal Agricultural Society. It is noticeable that although all the makers of agricultural machinery used at one time to declare that thrashing machines did not pay to make for sale without engines, they are almost all of them now giving a great deal which they did not give from five to ten years ago, and are putting better work into the machines, or at least, they are doing so in those that they exhibit at Islington, and there is no reason to believe that there is much difference between those there exhibited and those sent out in the usual course of business, except in the finish and paint. It is noticeable, however, that nearly all the machines exhibited are built with oak frames, but there seems to be a prevailing opinion that oak frames are not invariably sent out to purchasers except by a very few firms. To what extent this opinion is correct we do not know, but it is probably a matter of stipulation by buyers that the frame shall be of material they consider suited to the requirements of their climate. Some manufacturers point to their oak frames with a good deal of pride, as though it had not been, or is not a usual thing with them, while others paint their oak and say nothing about it.

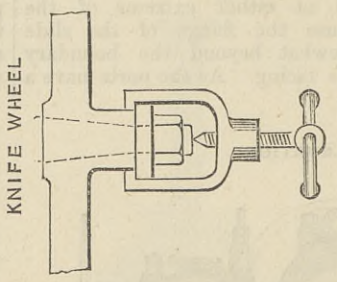
At Reading Messrs. Gibbons and Robinson exhibited a machine, to one end of the awner spindle of which an exhaust fan was fitted, by which the dust and fluffy material removed from the grain by the awner was carried away. This arrangement has now been at work very successfully during the past harvest, and has given much satisfaction owing to the improvement effected by it in the appearance of the grain. The weed seeds are also separated from the grain by a screen or sieve on its way to the dressing sieves, so they have less to do, and a better sample is the result.

Messrs. Nalder and Nalder exhibit one of their thrashers, in which the shakers and the riddles are driven by one crank shaft, and for which they were awarded a silver medal at Reading. Since then they have substituted wood spring connections for the india-rubber connections, by which the ends of the shaker-boxes are attached to the lower shoe and to the rockers, as described in our report of the Reading Show. The machine exhibited at Islington has the attached elevator made by Messrs. Nalder, and in the adjustment of the small idle pulleys which guide the strap driving this elevator an improvement has been made. The short spindles carrying the pulleys are provided with a ball, and held in a socket partly formed in the bracket carrying them, and partly in a hollow cap held thereon by two screws, by which the ball is pinched in any position desired, as shown in the annexed illustration.



Messrs. Barrows and Stewart show a machine with the concave arranged so that it may be rapidly set back from the drum a large distance to permit the rotation of the drum when a pair of separate special beaters are attached for thrashing beans. The drums are usually fitted with eight beaters, and the two extra for thrashing beans are placed opposite each other, and are considerably thicker than the other beaters. This machine is fitted with chilled cast iron bearings in all parts, except the drum. These are very cheap, and the spindles are turned slightly taper to fit the taper of the bearings, which is enforced by the necessity of tapering the chills to get them out of the casting, which probably lasts as long as the machine.

Among the miscellaneous machinery which, though not exhibited for the first time, has not been noticed by us, is a large five concave knife machine for cutting up the whole of the straw as it comes from the thrashing machine. It is made to cut three lengths by change wheels, either $\frac{3}{16}$in., $\frac{3}{8}$in., or $\frac{5}{8}$in. It is self-feeding, and is a machine which will cut an enormous quantity of fodder, or by taking off knives, will cut litter. It is stated as a practically ascertained fact that the machine runs with less power when cutting the short lengths than when knives are taken off, leaving only one to cut litter. It seems difficult to understand this, but it is stated as a proved fact. Two knife wheels are usually sent with each machine, to save time when the knives require sharpening; and for taking off the wheel a small rim is cast on the front of the wheel boss, and a bridle screw, as shown in the annexed sketch, is provided for pulling the wheel off when the nut which holds it is removed. This needs no explanation, but it is one of those simple things that save time and prevent damage.



Messrs. Richard Hornsby and Sons show their sheaf-binding reaping machine, which is the development of the machine they exhibited at Derby. It is a well-made machine, in which the details are well worked out, the string binding attachment being very much the same as that exhibited at Derby and then described by us. The machine is fitted with two speeds for the cutters, so that the slow speed may be used and less power consumed when cutting a clean dry crop; and the knives are driven by a direct connecting rod instead of through the medium of a rocking bar, as in some machines.

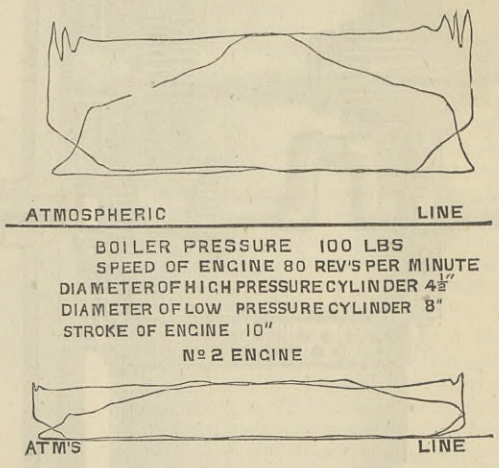
The Reading Ironworks Company show a new self-delivering horse rake with twenty-four very large teeth and 54in. travelling wheels. The axle is formed of a pair of flat bars, at the ends of which are fixed cast iron bearings with an internal conical cup. The inner boss of the wheels is made to fit this, and the short axles carried by the cast bearings are permitted a short range of movement in the direction of their length. The inner ends of these axles are attached to levers actuated by the driver's foot. When the teeth are full of crop the depression of the foot lever pulls the bosses of the wheels into the conical cup, and the truss axle and frame carrying the teeth are caused to revolve with the wheels so as to deposit the row of crop.

Messrs. Ransomes, Sims, and Head exhibit, amongst other things, a very well made three-furrow plough, as now used very extensively in England, especially for turning over stubble lands after harvest. These ploughs are now finding their way into English farms where only a few years ago farmers would not look at such new-fangled things. But they are now so much lighter and better balanced than formerly that "driving" them is comparatively light work for the ploughman.

Mr. Kearsley, of Ripon, shows a sheaf-binding reaping machine, fitted with the Appleby binding apparatus. The knife is driven by direct connecting rod, and the machine shown has cut over one hundred acres of corn in the recent harvest.

COMPOUND SEMI-PORTABLE ENGINE.

We illustrate on page 432 a semi-portable engine, one of several designed for a locality where both fuel and water are very scarce, and to which locality the cost of transport of the engines themselves was very heavy; they are, therefore, designed with a view of obtaining as much power as possible out of a given weight, and also with a view to great economy in consumption of fuel. The reports that the makers have had of them have been highly satisfactory. The illustration shows clearly the general design of these engines, which is compact and neat; but a few lines of explanation may be of interest. The high-pressure cylinder is 4½in. diameter and the low-pressure cylinder 8in. The stroke is 12in. Messrs. Wallis and Steevens have found the most convenient and efficient way for jacketting their cylinder is to make the main casting of the cylinder a shell only and fit this outer casing with cylinder barrels. One great advantage of this system—which we may say is in extensive use—is that the cylinder barrels can be made of much harder metal than the rest of the cylinder, and thereby wear well. These engines are arranged for working either with or without expansion valves, but in either case the excentrics are so constructed that the engines can be reversed without any difficulty in a couple of minutes. The arrangement is very solid and compact, no cranked rods are used and the valve spindles are steel. The steam after passing out of the low-pressure cylinder traverses one of the firm's patent water heaters. These heaters have now been before the public a long time, and have been in all cases well spoken of. The cylinders are fitted with stop valves and an auxiliary starting valve for admitting steam direct into the low-pressure cylinder, so as to start the engine on any centre without turning the fly-wheel. The small starting valve was fitted with a suitable spring, so that it always remained closed unless the lever was pressed. Messrs. Wallis and Steevens have, however, just altered this design, and all their engines are now fitted with a single valve, a very handy and efficient arrangement for starting with the cranks in any position, whereby, if required, steam can be admitted into the low-pressure cylinder; but the peculiarity of the arrangement consists in the fact that all steam has to pass through the throttle valve. By this arrangement a difficulty is got over which has been experienced with compound engines. They can never over-run themselves, whatever position the valves are left in. The governor, of which the illustration sufficiently shows the design, is of the high-speed type. These governors have given great satisfaction, and engines fitted with them have been supplied to Messrs. Siemens Bros., the Brush, the Swan, and other principal electric lighting companies. The shells of the boilers are made of steel with drilled holes, and all rivetting is done by machinery. The fire-boxes are made of the best copper plate attached with best copper rivets and stays. The size of the fire-box is large compared with the size of the boiler, as it is used for burning wood and refuse. The ash-pan and fore pedestal are both made of wrought iron. These engines are of ample strength in every part to stand a working pressure of 120 lb., at which they are intended to be run; they are of good material and accurately fitted throughout. The work is done to a system of templates and gauges, so that all wearing parts are interchangeable, and can therefore at any time be easily renewed.



TANK LOCOMOTIVE ENGINE.

We illustrate on p. 429 a locomotive designed and manufactured by Messrs. J. and G. Joicey and Co., engineers, of Newcastle-on-Tyne, for the Mickley Coal Company of that city, for taking coals from their crushers over the top of their coke ovens for the purpose of charging them. The engine is of the four-wheeled outside cylinder coupled type, cylinders 4½in. diameter and 9in. stroke, the valve chests are inside the frames, and valves are worked in the usual manner. The frames are inside, run the full length of the engine, and are well stayed by cross transoms; the boiler barrel, outer fire-box, and front tube plate are made entirely of Low Moor iron; the inner fire-box of copper, tubes of brass; the gauge of rails is 3ft. 6in.; the wheel base is 2ft. 9in. The wheels are of cast iron, with steel tires 20in. diameter on the tread. A constant feed is supplied to the boiler by a pump fixed to the front cross transom plate, and worked by an excentric. This is supplemented, in case of accident to the pump, by one of Giffard's brass injectors. Side tanks are fitted to keep the weight as low as possible; and with a view to minimise the risk of damage to working parts, should the engine leave the rails—a not unfrequent occurrence about colliery wagon ways—it is fitted with single motion bars; the advantage of this has already been several times demonstrated. The engine is fitted with a novel and powerful foot brake applied to all the wheels, which is simple and very satisfactory. Owing to the small size of the boiler, and the difficulty of getting inside to do any repairs to working parts, it was considered desirable to have the regulator valve outside, and, as will be seen, it has been fixed on the small dome at the front end of boiler.

The total length of engine over all is 9ft.; extreme width, 5ft. 3in.; total weight in working trim, 3 tons. The work done by this engine was previously done by manual labour, which was very slow, and consequently costly. One man was able to charge fifteen ovens per day, at a cost of 4s. 2d., or £65 per year for wages. Since the engine was set to work it has charged ninety ovens per day, and thus does the work of six men, and with the greatest ease. The Mickley Coal Company is now completing its arrangements for fitting one hundred ovens of its very extensive range at Prudhoe to be charged by this engine, and so satisfied is it with the results given, that it intends shortly to do all charging work by this means.

A panic was caused on the 30th ult. by the spreading of a report that the Strinesdale reservoir, which supplies Oldham, and holds 150,000,000 gallons of water, had burst. A leakage had been discovered, and the water had made an opening, which rapidly increased. The leak was, however, made good on the 1st inst., but the reservoir had to be further lowered in order to make all safe, and for a considerable time about 1000 gallons per minute escaped.

The Late Mr. Edward Newton, R.N.—Mr. Edward Newton, R.N., the chief engineer of Portsmouth Dockyard, died on Monday evening, at the age of fifty. He was born at Newton Abbot, Devonshire, and gained his practical engineering education at the Swindon Locomotive Works. He entered the Navy in 1853 as a second-class assistant engineer, and became engineer in 1859, and chief engineer in 1866. After serving with distinction afloat, during which period he received a medal, he became first assistant to the chief engineer at Portsmouth about fifteen years ago, and was promoted to the superintendence of the steam department of the yard in 1872. He died from an abscess in the brain, partly owing, it is supposed, to the great shock which he suffered at the explosion on board the Thunderer in July, 1876. He was at the time superintending the trial of the engines, and was in the act of going down the engine-room hatch when the boiler burst. Mr. Newman was sent for treatment to Haslar Hospital, but on the hopelessness of his case being manifest, he was brought back to his official residence in the dockyard, where he died. He will be interred with full naval honours at Haslar to-day, the *Times* says.

LETTERS TO THE EDITOR.

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

HYDRAULIC BALANCE LIFTS.

SIR,—Your correspondent, Mr. Barr, casts doubt, and I think with good reason, on the advantage to be gained by the use of the hydraulic balance lift.

It must be remembered that the sole object of the device is to be able to dispense with the chain and balance weight which are generally used with direct-acting hydraulic lifts. Now, it must be admitted that if any great advantage in the form of diminished risk of accident can be attained by so doing, it may be justifiable to use gear such as was illustrated in your impression of the 24th ult., despite its obvious disadvantages as compared with the old arrangement. But if it can be shown that the sole function of that gear is to abolish a danger which is purely imaginary, I hold that it is bad practice to adopt it.

As a matter of fact, the use of a chain need not be attended by any danger whatever. It is very certain that if in a direct-acting hydraulic lift the chain broke, the cage could not fall; it would either descend slowly or remain stationary. The heavy chain itself might, by falling on the top of the cage, do some damage; but this can be prevented by making the roof of the cage of strong boiler-plate, as is now usually done. There consequently seems to me to be no good reason for abolishing the chain and substituting for it the hydraulic balancing arrangement, with all its drawbacks of extra first cost, additional working parts, extra glands to keep tight, and general complication as regards pumping arrangements; and I cannot think that any engineer would adopt the principle on its merits alone, or for his own use.

BARROW TURNER, A.M.I.C.E.

London, December 4th.

SIR,—We have to thank Mr. Barr and yourself for the opportunity, afforded by the publication of his letter, of replying to some of the objections which would be sure to be made to hydraulic balance lifts upon a merely superficial acquaintance with them.

The first objection is to "all the apparatus;" and your correspondent thinks the balance weights and chains, or ropes, &c., more simple. But this is not so. With the balance weight system there needs must be a very strong attachment of cage to ram, a massive frame to the cage, and again another strong attachment of chain to cage to prevent the whole parting company. Further, there is the chain or rope—sometimes two for safety—the overhead wheels, spindles, bearings, and frame, all strong enough to carry a weight of nearly six tons in the case of a lift which raises 12 cwt. only 70ft. high, the balance weights of about 2½ tons, and their guides. In the hydraulic balance lift the whole of the above list is cut out, and replaced by two cylinders with rams, and two valves, all of which are made with less metal than the balance-weight alone of the old system.

Cost is the second objection. If Mr. Barr will apply to the makers, Messrs. Smith and Stevens, he will find that they are prepared to erect the hydraulic balance lift for less than the cost of the old system. Mr. Barr, in his letter, and you in your notice in previous issue, incidentally recommend the use of wire ropes, and you allude to their successful use in collieries. Now at the pit bank, room is never of consequence, and winding drums and pit head wheels are made from 6ft. up to 20ft. diameter, and a rope may then be successfully adopted. On the other hand, in a lift well the space is always limited, and such wheels as are possible simply kill the ropes in a very short time. It is notorious among lift makers that wire ropes in lifts will not last, and the small knot of persons who still advocate them will not risk their theory upon a single rope, but put in from four to six, each strong enough to do the whole work.

Mr. Barr next states that with a rope balance a smaller ram and cylinder may be used, and less water taken from the accumulator. Taking a hydraulic balance lift for raising 12 cwt. 70ft., a 5in. ram is used, weighing 43 cwt., and the cage weighs 12 cwt.; total weight with load is 67 cwt. Following Mr. Barr's argument, we may balance the cage and ram by dead weights, and reduce the area of the ram proportionately to the remaining 12 cwt. of load. The ram would thus be 2¼in. diameter, and would most certainly collapse. In short, it would not be possible to reduce the diameter of ram much below the 5in. All that could be done on the old system would be, keeping the size of ram practically the same, to reduce the accumulator pressure to something like 200 lb. to the square inch, which is, of course, out of the question.

Mr. Barr states that the friction of the balance cylinders "is" greater than that of the old balance weights, &c. As probably he did not mean quite that, it would, perhaps, be unfair to ask him where he saw a hydraulic balance lift, and how he knows. The best results obtained with the old system average 78 per cent. of efficiency on the upward journey, and the hydraulic balance produces precisely the same result.

Speaking of the old arrangement, Mr. Barr says: "If a balance weight falls off, the cage cannot come down farther than the water is allowed to escape by the valve." Of a total weight of 67 cwt., Mr. Barr would balance 55 cwt., and use water pressure for 12 cwt. The danger is that the rope or chain will break, and allow the support of the whole to be thrown on the water, increasing its pressure five and a-half times. If the cylinder had an original factor of safety of 10, it is now strained beyond half its maximum breaking strength, and in view of the certain irregularities of metal and cores, who would care to test pipes to such a limit? Some portion of the cylinder would almost certainly burst, and all control would be gone. What if the cage came away from the ram, as in some well-known fatal accidents? It is in this very respect that the hydraulic balance has such an immense advantage, for in it there is no part whose failure will throw increased strains upon any other part, and having no parts in tension, no amount of wear can lead to a severance of vital portions. This cannot be said of any suspended lift, or of any ram lift with suspended balance.

Upon the low-pressure modification of the hydraulic balance, Mr. Barr again falls foul of the cost which he is "certain" is greater. Contract prices, however, again show him to be in error. The reduction of size of main ram and cylinder, removal of balance weights, &c., save enough to pay for the extra cylinders, and sometimes a little to spare.

Mr. Barr thinks returning the water to the top of a house rather ridiculous; but here he misses the principle of the hydraulic balance, which is to return a portion of the water used to the source of supply. In many towns, especially in the Lancashire and Yorkshire district, water is supplied in the public main at pressure ranging from 100ft. to 300ft. head. Assuming a balance lift, taking water at 160ft. head, and returning half the quantity to the main, it is clear that it might just as easily return the whole water against half the head, or into a tank 80ft. high; and as the water is then available for all household purposes, the lift is worked quite free of cost. This certainly pays "Paul," but instead of "robbing Peter," it pays him also.

JOHN S. STEVENS,
34, Freke-road, Lavender-hill, C. J. MAJOR,
December 2nd.

THE INSTITUTE OF PATENT AGENTS.

SIR,—I have read attentively your report on the inaugural meeting of the above Institution in THE ENGINEER of the 1st inst., and whilst fully recognising the importance of patent agents practising their profession under judicious regulations for ensuring its improved status and respectability, I opine that it is impolitic and savours somewhat of arrogance for a small body of professed prominent patent agents to combine and, by framing arbitrary regulations, exclude from their association many practical, efficient, and strictly honourable men who are practising as patent agents—maybe in a small way, but who cannot literally fulfil the conditions laid down for their admission as "Fellows" of the Institute. To such a loss of caste is incurred, and so far the Institute of Patent Agents, as now launched, is a mistake.

What is really needed to raise the status of the profession, and insure justice to all, is that patent agents should only be admitted to and practise their profession under the examination and supervision of the Government, whereby any unqualified or dishonourable member would be properly excluded. MEM. INST. M.E.

Chancery-lane, December 6th.

SIR,—I have read with much interest your report of the inaugural meeting of the Institute of Patent Agents, but am disappointed not to find in the president's address any definition of the functions of a patent agent. This omission is the more surprising as it is well known that the terms with which we are most familiar are precisely those of whose meaning we have the most vague and indistinct conceptions. I should like, therefore, to ask the president or any other gentleman officially connected with the Institute one or two questions for my own information and that of the public, viz.:—Is a patent agent—under the articles of association—a person who himself performs, on behalf of others, the professional duties necessary in applying for, obtaining, and maintaining letters patent for inventions; or is he a person who simply conducts an office and employs a staff of assistants to prepare for him specifications, reports, opinions, &c., to be issued in his name and over his signature? P. A.

THE GILCHRIST PROCESS.

SIR,—In the very interesting article you have given on our process in your issue of the 1st inst., the figures relating to the annual output of basic steel are incorrectly given. It should have been stated that during the month of October last English works—represented by one firm—made of basic steel 9578 tons, and continental works 38,139, making a total of 47,717 tons made by English and continental works during the month, or showing that basic steel was actually being made in England and abroad at the rate of 572,604 tons per annum. Adding to this actual output the estimated output of the thirty-four converters now building to work the process, viz., 624,000 per annum, we have a within-sight production of basic steel of 1,196,600 tons per annum.

PERCY GILCHRIST.

172, Palace-chambers, Westminster, S.W.,
December 6th.

THE PRESSURE OF FLUIDS IN MOTION.

SIR,—Mr. Pinnington objects to my "assertions." A mathematician could not fail to recognise the truth of my demonstration. He further states that $\frac{W v^2}{g} = 2W$. This is an absurdity, for eliminating W, the equation becomes $\frac{v^2}{g} = 2$—*i.e.*, a variable equivalent to a constant. Cannot Mr. Pinnington see that a greater pressure must be applied to a plane resisting the effects of impact of a fluid whose velocity is due to any head, than if resisting statical pressure due to the same head? H. T. T.

5th December.

BOULTON'S FIRE-DOOR RING.

SIR,—Replying to the letter in your issue of the 17th ult. from Messrs. Copley and Co., of Middlesbrough, respecting my improved fire-door ring, I beg to say that if they will devote a few moments to the perusal of the paragraph in THE ENGINEER of the 10th, they will see that the ring requires neither chasing nor the fire-hole tapping; it also dispenses with the aid of a powerful drilling machine in fixing it. Now this ring can be fixed by any mechanic of ordinary ability, as the ring is finished when it leaves the rolls; and I beg to suggest that if Messrs. Copley were to give this ring a trial, they would find it considerably to their advantage in every repect, and far superior to the one they are now using.

Ashton-under-Lyne, JAMES W. BOULTON.
November 22nd.

THE INGOT SOAKING PROCESS.

SIR,—Thursday last will certainly be a red-letter day in the annals of the Tredegar Iron and Steel Company, Limited. On that day the problem of rolling off an ingot straight from the Bessemer pit was, by the aid of the soaking-pit process, satisfactorily solved. The Tredegar Steel Works are only things of yesterday, but they are already many strides in advance of any other steel works in South Wales—I had almost said in England. It may interest some of your readers if I give them a short account of the new process. The *modus operandi* in all other steel works in Wales is as follows: The molten steel is poured from the converter into moulds, and when the metal is sufficiently chilled the ingots are removed and put into stock. They are then taken as required to the balling furnaces and reheated, an expensive, and, as proved by the Tredegar Company, unnecessary process, and from the reheating furnace to the cogging rolls, again to the reheating furnace, and thence to the finishing rolls. By the new process the ingot is taken from the mould immediately the metal has been sufficiently chilled—to allow it to adhere and retain the form of an ingot—and placed in a brick-lined pit large enough to contain the ingot, and allow the gases which exude from it to envelope it. A plate is then placed over the pit, which thereby keeps the gases in, and prevents the air getting near the ingot. After remaining in the pit for some twenty-five minutes, it is found that the initial heat of the centre of the ingot, which, when taken from the mould, is still in a molten state, has spread itself all over the ingot, and the piece of metal which, when put into the pit, only appeared to be cherry-red hot, has by its own recuperative powers, and apart from any extraneous aid, become a glowing white mass, and is passed direct through the cogging and finishing rolls; the metal which was run from the converter only forty minutes before appearing in the form of a rail 90ft long. Great praise is due to the indefatigable general manager, Mr. James Colquhoun, and to the assistant general manager, Mr. Colquhoun, jun., for the avidity with which they grasp at and adopt any invention calculated to increase production and minimise cost. M. L.

Tredegar, November 27th.

SOCIETY OF ENGINEERS.

THE STRENGTH OF BOILER FLUES.

AT the meeting of the Society of Engineers, held on Monday evening last, December 4th, in the Society's hall, Victoria-street, Westminster, Mr. Jabez Church, president, in the chair, a paper was read on "The Strength of Boiler Flues," by Mr. W. Martin. The author said that in the construction of steam boilers, more than in most other cases of mechanical engineering, it is of special importance that the principles involved should be clearly established, since cases of failure may produce such wide-spread and disastrous effects. This being so of boilers in general is so particularly with regard to long cylindrical flues, which, unless specially strengthened, are, as a rule, much the weakest part of the boiler. In fact, the majority of cases in which Lancashire and similar boilers fail from inherent structural weakness are cases of flue collapse. It may be shown also that there is no part of the boiler in which faulty construction may produce such a reduction of strength as in the flue. Moreover, unless dangerous, almost collapsing, pressures are used, it is extremely difficult, owing to the smallness of distortion, &c., to detect any weakness in such structures by testing. This makes the construction of the flue a matter of peculiar importance. Notwithstanding this, however, and the interesting nature of the problem, the knowledge available with regard to it is not of the fullest, and the application of the formula in use may be made to produce somewhat anomalous results. The solution of the problem of flue strength, like most others of mechanical engineering, must of course come ultimately from experiment. Theoretical considerations, can, however, do a little towards it, and that little is worth notice, because it makes the problem clearer, and the formula, when obtained, of wider application. By considering each circumferential strip of a cylinder sustaining external pressure, as in a condition analogous to that of a long column, it is possible by the application of the theory of such columns to show that the strength depends upon the moment of inertia of the longitudinal section, and upon the modulus of elasticity of the material. This enables comparisons to be made between flues of different materials, or different qualities of the same material, and also between flues differing in section. If the theoretical formula for wrought iron columns be compared with that obtained by Hodgkinson, it is found that whereas the first makes the strength depend upon $\frac{d^4}{l^2}$, in the latter case the corresponding rate is $\frac{d^{3\cdot76}}{l^2}$, not very much different. Now, making the corresponding comparison for flues of thickness t, the terms are t^3 and $t^{2\cdot19}$, showing a greater divergence. A recent examination, however, by Professor Unwin, of the basis of the formula in the case of flues has resulted in an increase of the index 2·19. With regard to the experimental determination of the strength of flues, the only series of experiments which have been extensive and systematically made are those made by Sir William Fairbairn twenty-four years ago. These experiments were of very great importance, especially considering the ignorance prevailing at the time upon the subject. They, moreover, immediately suggested simple and effective methods of strengthening flues, both old and new. Notwithstanding all this, however, the subjects of the experiments were too dissimilar in size and construction to working boiler flues, for the formula obtained to be thoroughly trustworthy. In addition to being small, they were under totally different conditions, especially in regard to longitudinal stress, and almost all the experiments which were comparable as being with similarly constructed tubes, were upon one thickness of material. The results of this series of experiments, indeed, cannot be considered final; and it is much to be wished that these could be supplemented by further systematic experimental inquiry, in which should be included experiments to determine the strength of elliptical flues, the increase of strength due to introduction of "Galloway" tubes, &c.

DYNAMO-ELECTRIC DANGERS.

I'M a keen amateur electrician;
I like to give people a start;
So went to the new exhibition
Of Electrical Science and Art.
British, Gallic, Italian, Germanic,
Yankee notions, moreover, and means
For all sorts of arrangements galvanic,
And of dynamo-electric machines.

Now it can't be too often repeated,
That if people don't take proper care,
Circuit wires, apt at times to get heated,
Wax red-hot now and then—so beware!
Where the lights to which gas are as rushlights
Were by night turning darkness to day—
Siemens, Edison, Jablockhoff, Brush Lights—
I wandered, exploring my way.

Apparatus, a little short-sighted,
As I stooped on, betwixt wire and wire,
In connection my watch-chain, ignited,
In a wink set my waistcoat on fire.
Then the stem of a lamp, which, to work it,
Had a wire laid below to the fore,
I grasped, and completed the circuit,
Intervening, in person, through floor.

Dash my buttons, just didn't I holloa!
That is, try all I could to cry out;
But a feeble moan only would follow
My fruitless endeavours to shout.
And my muscles were paralysed nearly,
All throughout me; my heart was oppressed,
And my lungs acted on so severely,
I had scarce any breath in my chest.

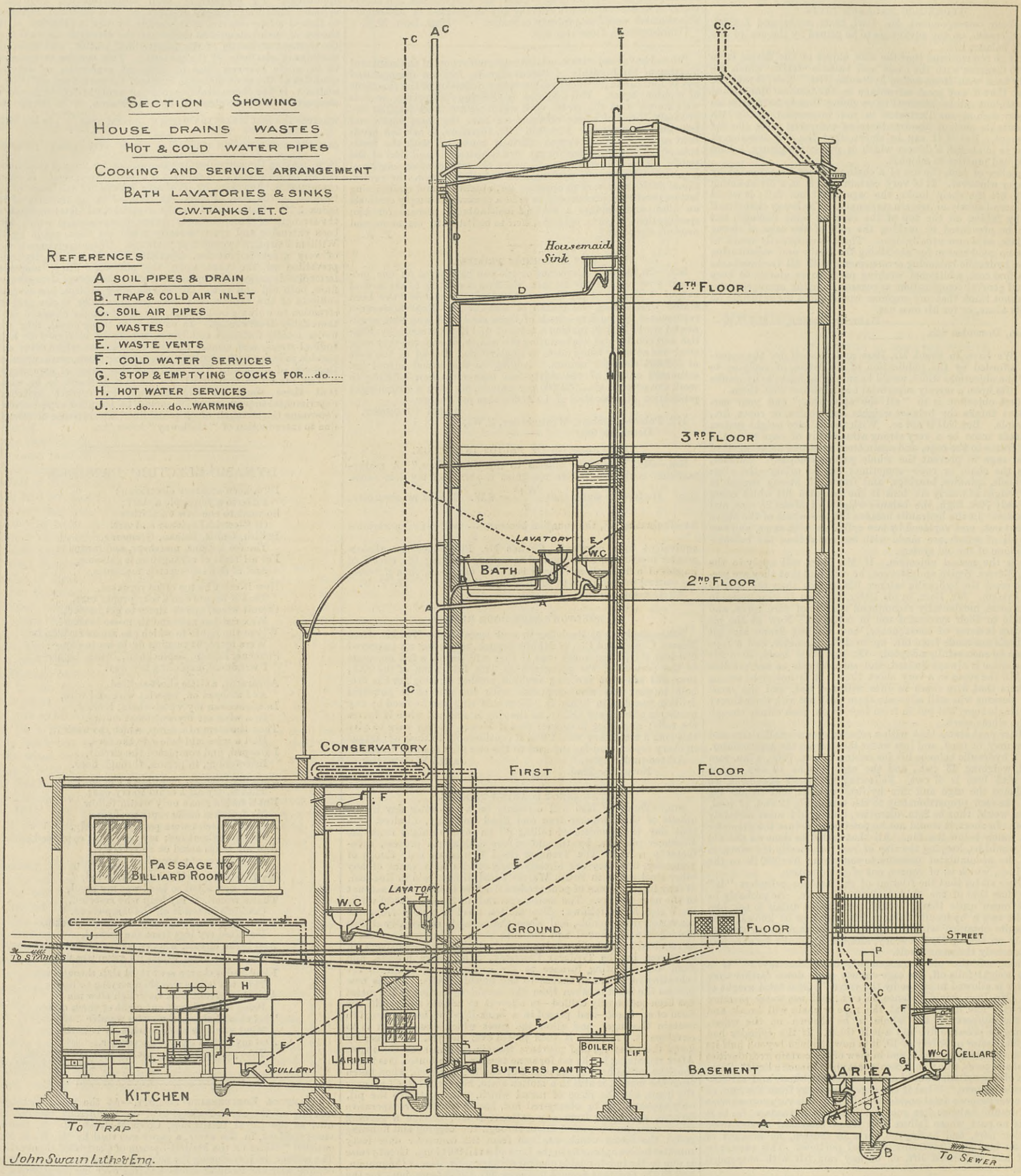
My face was convulsed and distorted,
And contracted so hard was my hand,
That a friend, to my help who resorted,
Couldn't loosen it off the lamp-stand.
But to strike him a happy thought chancing,
He lifted my legs from the ground,
And broke circuit, whence sparks of flame glancing,
Burnt my hand whilst its gripe was unbound.

I had had a charge sent right slap through me
That ten lamps was then serving to light;
And the current that very nigh slew me
Being stopped, put out eight of them quite.
'Mid electrical works ye who wander
Mind you how their machinery behaves,
And my pitiful story well ponder,
That you mayn't be shocked into your graves.

—*Punch's Almanack*

LIVERPOOL ENGINEERING SOCIETY.—At the usual fortnightly meeting of the above Society, held on Wednesday evening, 22nd ult., at the Royal Institution, Colquitt-street, Mr. N. Bramall, vice-president, in the chair, a paper was read by Mr. W. E. Mills, entitled "Notes on the Mallett System of Controlled Combustion." The author, in introducing the subject, stated that the question of dealing with the cloud of smoke hanging over our large cities, and the immense waste of heat which its presence testified to, had been attempted in many ways from time to time. All engineers were familiar with the different kinds of smoke consumers and fuel economisers which were before the public, but none of which altogether achieved the end aimed at, viz., the consumption of the smoke generated by the fuel in the furnace. Mr. Mallett, of Denver, Colorado, U.S.A., who had studied the subject, saw that the difficulty with all the smoke consumers was the impossibility of entirely burning all the atoms of carbons set free in the act of combustion. He conceived the idea that if by any means the fuel could be burnt in such a manner as not to produce any smoke at all, and so preserve all the heat which would be otherwise wasted, a great step would be gained. He effected this in the following manner:—A combustion chamber is fitted behind the boiler furnace, communicating with it by a perforated septum wall. The fire-bars were made hollow, and so arranged that cold air from the exterior could pass through them into the combustion chamber. The open ends of these fire-bars could be closed by a slide worked by a lever, which also actuated the apertures in the ash-pit doors. When coal was first put on the fire the latter openings were closed. The gases given off from the fuel passed into the combustion chamber through the apertures in the septum wall, and meeting there with the oxygen conveyed through the fire-bars, were entirely consumed. The inventor claims that by his method, no smoke being produced, all chimneys may be done away with, and a saving of about 45 per cent. in fuel effected. The necessary draught is provided by a fan which draws the heated gases, the ultimate products of combustion, through a condenser, in which they are cooled down, and then discharged into the open air. The application of the system to stationary, marine, and locomotive boilers was next described, with the various principles involved. A discussion followed, and a vote of thanks was accorded to the author.

ARRANGEMENT OF HOUSE SANITARY APPLIANCES.



THE engraving above illustrates an arrangement of sanitary appliances as designed by Mr. F. Botting, of 29, Mount-street, Grosvenor-square, for dwelling houses. At B in the lower part of the building is an air-tight inspection chamber, as already illustrated in our pages. Through the mica inlet valve over it at P fresh air descends, and passes along the drain and up the soil pipes and vent A. It will be seen that the drain is free from any other traps except at the water-closets and gulleys, but these do not impede the flow of air. The soil traps are all ventilated into a separate pipe and the waste traps, the pipe for which is shown in the centre division wall.

All the wastes discharge over a gulley and the cistern overflows into the open air. The water-closets have outlets also, though these are not shown. The cold-water pipe and tanks are all inside the house so as to prevent freezing, and as a further safeguard, a tap is fixed in the area for emptying the pipes when the cisterns are full. The hot-water service pipes are connected with an accumulator, shown at H, in the kitchen; this prevents the necessity of any men being employed upstairs during repairs. The cold service is attached direct to the boiler, and the accumulator H being so near no safety valve is required, as although this supply may choke also, the argument is that it would be observed by the diminution of the supply. The old system is, however, retained, a tank at the top being employed as shown, as it forms an airing closet, which would otherwise need a special coil attached to the pipes. For the hot-water warming pipes a boiler is, for convenience, shown in the pantry. It is proposed to use gas here, as the quantity of heat required is less, because it is constant and can be easily regulated.

No service hot closets are shown, but two are needed, one in the kitchen and one outside the dining-room near the lift, which in large houses is worked by a small ram, the waste water passing, if necessary, into a tank in the scullery or elsewhere for washing purposes.

GOESCHENEN STATION, ST. GOTHARD RAILWAY.

OUR supplement this week illustrates Goeschenen Station at the Swiss end of the St. Gothard tunnel. It very clearly shows the character of the scenery. The station has been referred to more than once in the account which has appeared in our pages of an engineer's trip over the St. Gothard Railway.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—William Tottenham, chief engineer, to the Himalaya; Charles E. Stewart, chief engineer, to the Indus, additional for service in the Royalist; William H. Moon, Harry Taylor, John Keast, engineers, to the Himilaya; John W. Pleming, assistant engineer, to the Himalaya; and Richard G. Hannan, engineer, to the Asia, additional, for the Dwarf.

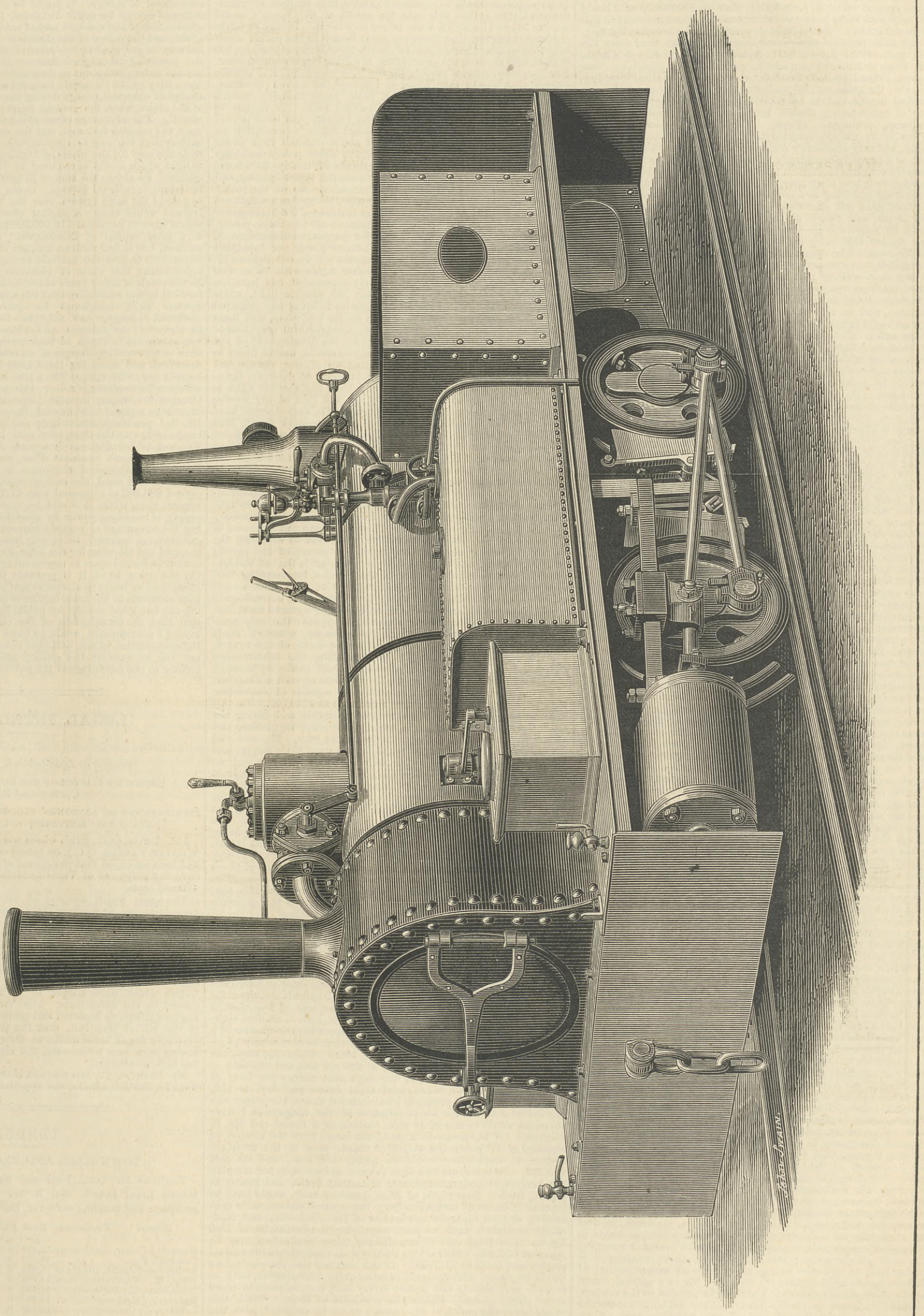
CITY AND GUILDS OF LONDON INSTITUTE. — Dr. C. W. Siemens, D.C.L., F.R.S., has consented to distribute the prizes and certificates gained by the successful candidates of the Metropolitan centres at the recent technological examinations, as well as by the students of the City and Guilds of London Technical College, Finsbury, and of the City and Guilds of London Technical Art School, Kennington. The distribution will take place on Thursday evening, December 14th, at 7 o'clock, at Goldsmith's Hall, Foster-lane, E.C.

THE LONDON ASSOCIATION OF FOREMEN ENGINEERS.—The regular monthly meeting of this Association was held at Cannon-street Hotel on Saturday, the 2nd inst., the past president, Mr. Joseph Newton, C.E., presiding, when, after the transaction of formal business and the election of Mr. E. Parrott, of Cawnpore, as an ordinary member, a paper was read by Mr. Edward Gibbon Swann, J.P., president of the Inventors' Syndicate Club, on "Inventors and Inventions." Introducing the subject by some preliminary remarks as to the utility and fitness of the patent laws, in which he expressed as his own conviction that the total abolition of such laws was to be desired, or else that they should be assimilated to the like laws prevalent in the United States, the reader proceeded to argue that inventors, as a class and individually, have ever been benefactors of society and of communities. He reviewed succinctly the history of all those great inventions which have resulted in complete revolutions, both of thought, of industries, and of knowledge, as having contributed to the progress and development of civilisation throughout the world, and especially so in those nations and communities which had attained a pre-eminence both as to power and as to practical skill. He contended that whereas the invention of printing had exercised a pre-eminently beneficent influence, even the inventions of destructive implements in war had brought about analogous results by discouraging the frequency and abridging the duration of wars. He further argued that mechanical inventions especially had contributed immensely to the development of the practical sciences, citing the fact that without the perfecting of the microscope, for instance, physiology, which depends so much upon microscopic anatomy, would still be a merely metaphysical branch of teaching. An interesting discussion followed the reading of this paper—chiefly, however, in corroboration of the reader's statements, and the proceedings concluded with a vote of thanks to Mr. Swann.

TANK LOCOMOTIVE FOR THE MICKLEY COAL COMPANY.

MESSRS. J. AND G. JOICEY AND CO., NEWCASTLE-ON-TYNE, ENGINEERS.

(*For description see page 426.*)



ELECTRIC LIGHTING.

By Dr. C. W. Siemens.*

Having received the honour of being elected chairman of the Council of the Society of Arts for the ensuing year, the duty devolves upon me of opening the coming session with some introductory remarks.

Amongst the practical questions that now chiefly occupy public attention are those of electric lighting and of the transmission of force by electricity. These together form a subject which has occupied my attention and that of my brothers for a great number of years, and upon which I may consequently be expected to dwell on the present occasion, considering that at Southampton I could deal only with some purely scientific considerations involved in this important subject. I need hardly remind you that electric lighting, viewed as a physical experiment, has been known to us since the early part of the present century, and that many attempts have, from time to time, been made to promote its application. Two principal difficulties have stood in the way of its practical introduction, viz., the great cost of producing an electric current so long as chemical means had to be resorted to, and the mechanical difficulty of constructing electric lamps capable of sustaining, with steadiness, prolonged effects. The dynamo machine, which enables us to convert mechanical into electrical force, purely and simply, has very effectually disposed of the former difficulty, inasmuch as a properly-conceived and well-constructed machine of this character converts more than 90 per cent. of the mechanical force imparted to it into electricity, 90 per cent. again of which may be reconverted into force at a moderate distance. The margin of loss, therefore, does not exceed 20 per cent., excluding purely mechanical losses, and this is quite capable of being reduced to some extent by improved modes of construction; but it results from these figures that no great step in advance can be looked for in this direction. The dynamo machine presents the great advantage of simplicity over steam or other power-transmitting engines; it has but one working part, namely, a shaft which, revolving in a pair of bearings, carries a coil or coils of wire admitting of perfect balancing. Frictional resistance is thus reduced to an absolute minimum, and no allowance has to be made for loss by condensation, or badly fitting pistons, stuffing-boxes, or valves, or for the jerking action due to oscillating weights. The materials composing the machine, namely, soft iron and copper wire, undergo no deterioration or change by continuous working, and the depreciation of value is therefore a minimum, except where currents of exceptionally high potential are used, which appear to render the copper wire brittle. The essential points to be attended to in the conception of the dynamo machine are the prevention of induced currents in the iron, and place the wire in such position as to make the whole of it effective for the production of outward current. These principles, which have been clearly established by the labours of comparatively few workers in applied science, admit of being carried out in an almost infinite variety of constructive forms, for each of which may be claimed some real or imaginary merits regarding questions of convenience or cost of production. For many years after the principles involved in the construction of dynamo machines had been made known, little general interest was manifested in their favour, and few were the forms of construction offered for public use. The essential features involved in the dynamo machine, the Siemens armature (1856), the Pacinotti ring (1861), and the self-exciting principle (1867), were published by their authors for the pure scientific interest attached to them, without being made subject matter of letters patent, which circumstance appears to have had the contrary effect of what might have been expected, in that it has retarded the introduction of this class of electrical machine, because no person or firm had a sufficient commercial interest to undertake the large expenditure which must necessarily be incurred in reducing a first conception into a practical shape. Great credit is due to Monsieur Gramme for taking the initiative in the practical introduction of dynamo machines embodying those principles, but when five years ago I ventured to predict for the dynamo-electric current a great practical future, as a means of transmitting power to a distance, those views were still looked upon as more or less chimerical. A few striking examples of what could be practically effected by the dynamo-electric current, such as the illumination of the Place de l'Opera, Paris, the occasional exhibition of powerful arc lights, and their adoption for military and lighthouse purposes, but especially the gradual accomplishment of the much desired lamp by incandescence in vacuum, gave rise to a somewhat sudden reversion of public feeling; and you may remember the scare at the Stock Exchange, affecting the value of gas shares, which ensued in 1878, when the accomplishment of the subdivision of the electric light by incandescent wire was first announced, somewhat prematurely, through the Atlantic cable. From this time forward electric lighting has been attracting more and more public attention, until the brilliant displays at the exhibition of Paris, and at the Crystal Palace last year, served to excite public interest to an extraordinary degree. New companies for the purpose of introducing electric light and power have been announced almost daily, whose claim to public attention as investments was based in some cases upon only very slight modifications of well-known forms of dynamo machines, of arc regulators, or of incandescent carbon lights, the merits of which rested rather upon anticipations than upon any scientific or practical proof. These arrangements were supposed to be of such superlative merit that gas and other illuminants must soon be matters simply of history, and hence arose the depression in gas shares already alluded to. It should be borne in mind, however, that any great technical advance is necessarily the work of time and of serious labour, and that when accomplished, it is generally found that so far from injuring existing industries, it calls additional ones into existence to supply new demands, and thus gives rise to an increase in the sum total of our resources. It is therefore reasonable to expect that side by side with the introduction of the new illuminant, gas lighting will go on improving and extending, although the advantage of electric light for many applications, such as the lighting of public halls and warehouses, of our drawing-rooms and dining-rooms, our passenger steamers, our docks and harbours, are so evident, that its advent may be looked upon as a matter of certainty. Attention has been very properly called to the great divergence in the opinions expressed by scientific men regarding the area that each lighting district should comprise, the capital required to light such an area, and the amount of electric tension that should be allowed in the conductors. In the case of gas supply, the works are necessarily situated in the outskirts of the town, on account of the nuisance this manufacture occasions to the immediate neighbourhood; and therefore gas supply must range over a large area. It would be possible, no doubt, to deal with electricity on a similar basis, to establish electrical mains in the shape of copper rods of great thickness, with branches diverging from it in all directions; but the question to be considered is whether such an initiative course is desirable on account either of relative expense or of facility of working. My own opinion, based upon some practical experience and thought devoted to the subject, is decidedly adverse to such a plan. In my evidence before the Parliamentary Committee, I limited the desirable area of an electric district in densely populated towns to a quarter of a square mile, and estimated the cost of the necessary establishment of engines, dynamo machines, and conductors, at £100,000, while other witnesses held that areas from one to four square miles could be worked advantageously from one centre, and at a cost not exceeding materially the figure I had given. These discrepancies do not necessarily imply wide difference in the estimated cost of each machine or electric light, inasmuch as such estimates are necessarily based upon various assumptions regarding the number of houses and of public buildings comprised in such a district, and the amount of light to be apportioned to each, but I still maintain my preference for small districts.

* Address delivered before the Society of Arts.

By way of illustration, let us take the parish of St. James's, near at hand, a district not more densely populated than other equal areas within the metropolis, although comprising, perhaps, a greater number of public buildings. Its population, according to the preliminary report of the census taken on the 4th April, 1881, was 29,865, it contains 3018 inhabited houses, and its area is 784,000 square yards, or slightly above a quarter of a square mile, and it has six and a-half miles length of large streets.

To light a comfortable house of moderate dimensions in all its parts, to the exclusion of gas, oil, or candles, would require about 100 incandescent lights of from 15 to 18-candle power each, that being, for instance, the number of Swan lights employed by Sir William Thomson in lighting his house at Glasgow University. 11-horse power would be required to excite this number of incandescent lights, and at this rate the parish of St. James's would require $3018 \times 11 = 33{,}200$-horse power to work it. It may be fairly objected, however, that there are many houses in the parish much below the standard here referred to, but on the other hand there are 600 of them with shops on the ground floor, involving larger requirements. Nor does this estimate provide for the large consumption of electric energy that would take place in lighting the eleven churches, eighteen club-houses, nine concert halls, three theatres, besides numerous hotels, restaurants, and lecture hails. A theatre of moderate dimensions, such as the Savoy Theatre, has been proved by experience to require 1200 incandescent lights, representing an expenditure of 133-horse power; and about one-half that power would have to be set side for each of the other public buildings here mentioned, constituting an aggregate of nearly 2926-horse power; nor does this general estimate comprise street lighting, and to light the six and a-half miles of principal streets of the parish with electric light, would require, per mile, thirty-five arc lights of 350-candle power each. This, taken at the rate of 0·8-horse power per light, represents a further requirement of 182-horse power, making a total of 3108-horse power, for purposes independent of house lighting, being equivalent to 1-horse power per inhabited house, and bringing the total requirements up to 109 lights=12-horse power per house. I do not, however, agree with those who expect that gas-lighting will be entirely superseded, but have, on the contrary, always maintained that the electric light, while possessing great and peculiar advantages for lighting our principal rooms, halls, warehouses, &c., owing to its brilliancy, and more particularly to its non-interference with the healthful condition of the atmosphere, will leave ample room for the development of the former, which is susceptible of great improvement, and is likely to hold its own for the ordinary lighting up of our streets and dwellings. Assuming, therefore, that the bulk of domestic lighting remains to the gas companies, and that the electric light is introduced into private houses only, at the rate of say twelve incandescent lights per house, the parish of St. James would have to be provided with electric energy sufficient to work $(9+12)\ 3018 = 63{,}378$ lights $= 7042$-horse power effective. This is equal to about one-fourth the total lighting power required, taking into account that the total number of lights that have to be provided for a house are not at all used at one and the same time. No allowance is made in this estimate for the transmission of power, which, in course of time, will form a very large application of electric energy; but considering that power will be required mostly in the daytime, when light is not needed, a material increase in the plant will not be necessary for that purpose. In order to minimise the length and thickness of the electrical conductor, it would be important to establish the source of power, as nearly as may be, in the centre of the parish, and the position that suggests itself to my mind is that of Golden-square. If the unoccupied area of this square, representing 2500 square yards, was evcavated to a depth of 25ft., and then arched over so as to re-establish the present level, a suitable covered space would be provided for the boilers, engines, and dynamo machines, without causing obstruction or public annoyance; the only erection above the surface would be the chimney, which, if made monumental in form, might be placed in the centre of the square, and be combined with shafts for ventilating the subterranean chamber, care being taken of course to avoid smoke by insuring perfect combustion of the fuel used. The cost of such a chamber, of engine power, and of dynamo machines, capable of converting that power into electric energy, I estimate at £140,000. To this expense would have to be added that of providing and laying the conductors, together with the switches, current regulators, and arrangements for testing the insulation of the wire. The cost and dimensions of the conductors would depend upon their length, and the electro-motive force to be allowed. The latter would no doubt be limited, by the authorities, to the point at which contact of the two conductors with the human frame would not produce injurious effects, or say to 200 volts, except for street lighting, for which purpose a higher tension is admissible. In considering the proper size of conductor to be used in any given installation, two principal factors have to be taken into account—first, the charge for interest and depreciation on the original cost of a unit length of the conductor; and, secondly, the cost of the electrical energy lost through the resistance of a unit of length. The sum of these two, which may be regarded as the cost of conveyance of electricity, is clearly least, as Sir William Thomson pointed out some time ago, when the two components are equal. This, then, is the principle on which the size of a conductor should be determined.

From the experience of large installations, I consider that electricity can, roughly speaking, be produced in London at a cost of about 1s. per 10,000 watts for an hour. Hence, assuming that each set of four incandescent lamps in series—such as Swan's, but for which may be substituted a smaller number of higher resistance and higher luminosity—requires 200 volts electro-motive force, and 60 watts for their efficient working, the total current required for 64,000 such lights is 19,200 ampères, and the cost of the electric energy lost by this current in passing through $\frac{1}{10}$th of an ohm resistance, is £16 per hour. The resistance of a copper bar one-quarter of a mile in length, and one square inch in section, is very nearly $\frac{1}{100}$th of an ohm, and the weight is about $2\frac{1}{3}$ tons. Assuming, then, the price of insulated copper conductor at £90 per ton, and the rate of interest and depreciation at $7\frac{1}{2}$ per cent., the charge per hour of the above conductor, when used eight hours per day, is $1\frac{1}{2}$d. Hence, following the principle I have stated above, the proper size of conductor to use for an installation of the magnitude I have supposed would be one of 48·29in. section, or a round rod 8in. in diameter. If the mean distance of the lamps from the station be assumed as 350 yards, the weight of copper used in the complete system of conductors would be nearly 168 tons, and its cost £15,120. To this must be added the cost of iron pipes for carrying the conductors underground, and of testing boxes, and labour in placing them. Four pipes, of 10in. diameter each, would have to proceed in different directions from the central station, each containing sixteen separate conductors of 1in. diameter, and separately insulated, each of them supplying a sub-district of 1000 lights. The total cost of establishing these conductors may be taken at £37,000, which brings up the total expenditure for central station and leads to £177,000. It was assumed that the conductors would be placed underground, it being quite inadmissible, both as regards permanency and public safety and convenience, to place them above ground, within the precincts of towns. With this expenditure the parish of St. James's could be supplied with the electric light to the extent of about 25 per cent. of the total illuminating power required. To provide a larger percentage of electric energy would increase the cost of establishment proportionately and that of conductor nearly in the square ratio of the increase of the district, unless the loss of energy by resistance were allowed to augment instead. The statement that a conductor of such a size would be required to supply a single parish with electricity might surprise many of the uninitiated who had heard of the suggested transmission of the energy of waterfalls over long distances by electrical means. In answering this question it had to be admitted that the transmission of electric energy of such potential—200 volts—as is admissible in private dwellings would involve conductors of impracticable dimensions, and in order to transmit electrical energy to such distances, it would be necessary to resort in the first place to an electric current of high tension. By increasing the tension from 200 to 1200 volts the conductors might be reduced to one-sixth their area, and if we were content to lose a larger proportion of the energy obtained cheaply from a waterfall, we might effect a still greater reduction. A current of such high potential could not be introduced into houses for lighting purposes, but it could be passed through the coils of a secondary dynamo machine, to give motion to another primary machine, producing currents of low potential to be distributed for general consumption. Or secondary batteries might be used to effect the conversion of currents of high into those of low potential, whichever means might be found the cheaper in first cost, in maintenance, and most economical of energy. It might be advisable to have several such relays of energy for great distances, the result of which would be a reduction of the size and cost of conductor at the expense of final effect, and the policy of the electrical engineer would, in such cases, have to be governed by the relative cost of the conductor, and of the power at its original source. If secondary batteries should become more permanent in their action than they are at the present time, they might be largely resorted to by consumers, to receive a charge of electrical energy during the day-time, or the small hours of the night, when the central engine would be otherwise unemployed. The advantage of resorting to these means would depend upon the relative first cost, and the cost of working the secondary battery and the engine respectively. Working out on a similar scale the cost for the whole of London, and considering the amount of light which would be required in the richer and in the poorer districts, we obtain the sum of £14,000,000, without any allowance for lamps or internal fittings. Going still further afield I find that to extend the same system over the towns of Great Britain and Ireland would absorb a capital exceeding £64,000,000, to which would have to be added £16,000,000 for lamps and internal fittings, or a total capital of £80,000,000. Some might live to see this realised, but to find such an amount of capital, and, what was more important, to find the manufacturing appliances to produce work representing this value of machinery and wire, must necessarily be the result of many years of technical development. I am, therefore led to the conclusion that the applications now being made by electric light companies for provisional orders to supply electrical energy, not only to the towns of England, but to those of our colonies and abroad, show that their ambition was somewhat in excess of their power of performance. Turning then to the working charges of an establishment such as that above described, and assuming the 64,000 lights to be working for six hours a day, with coal at 20s. a ton, and the consumption 2 lb. per effective horse-power per hour, this would come to about £18,000. Charges for wages, interest, depreciation, general management, &c., make a grand total annual charge of £41,000, or at the rate of 12s. 9½d. per incandescent lamp per annum. The cost of renewing lamps brings up the charge for each lamp to 21s. 9½d. for a year. The cost of burning gas in a good Argand burner, which would produce the same luminous effect, would be 29s., so that there is an evident balance of cheapness in favour of electric lighting. On the other hand, the cost of establishing gasworks would not exceed £80,000 as compared with £177,000 for electricity, so that it appears that, while it would be more costly to establish a given supply of luminous power by electricity than by gas, the former has the advantage as regards current cost of production. These calculations, however, being only based upon the present prices of gas, and not allowing for the large dividends paid by gas companies, cannot be looked upon as representing a permanent state of things. On the other hand, it is probable that electric lighting would be cheapened by resort to a larger extent to arc lights, and also by future improvements in the manufacture of incandescent lamps. Considering the two great sources for public lighting, I come to the conclusion that the introduction of the electric light, even to the full extent I contemplate, would go hand in hand with an increase in the consumption of gas, and that the consequent competition could not fail to improve the quality and cheapen the supply of both greatly to the advantage of the public.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Sittings at Lincoln's-inn, Nov. 26th, 1882.

(*Before the* Master of the Rolls *and Lords Justices* Cotton *and* Bowen.)

INFRINGEMENT OF RANSOMES' PLOUGH TRADE MARKS—RANSOMES, HEAD, AND JEFFERIES, *v.* GRAHAM AND JOSLIN.

Mr. Aston, Q.C., (with whom were Mr. Davey, Q.C., and Mr. William Barber, Q.C.), on behalf of the plaintiffs, stated that it had been arranged that the appeal of the defendants in this case from the judgment of Vice-Chancellor Bacon should be dismissed without costs.

The case, which was one of considerable importance to the manufacturing and agricultural community, raised the question whether Messrs. Ransome, the well-known manufacturers of ploughs, were entitled to the exclusive use of, and to register as their trade-marks, certain combinations of letters which they had stamped upon particular parts of their ploughs for the purpose of denoting that ploughs so marked were of their manufacture; the right of the plaintiffs to claim as trade-marks combinations of letters which were alleged to be merely pattern marks being denied by the defendants. The Vice-Chancellor decided in last Easter sittings, as reported and commented upon in The Engineer of the 5th of May last, that the plaintiffs were entitled to the exclusive use of these marks as their trade-marks, and the appeal having been now withdrawn, the right claimed by the plaintiffs has been established.

Mr. Rigby, Q.C., Mr. Cozens Hardy, Q.C., and Mr. Carpmael were for the defendants, the appellants.

TENDERS.

TOWN HALL AND EXCAVATIONS, &c.

Tenders for Town Hall and Excavations, &c., for the Eastbourne Local Board. Mr. E. W. C. F. Schmidt, A.R.I.B.A., architect, and building surveyor, Eastbourne.

Names.	Residences.	Town Hall. £	s.	d.	Excavations. £	s.	d.	Totals. £	s.	d.
Huggett & Coster, Eastbourne		15,550	0	0	1,840	0	0	17,390	0	0
Cornwell, E.,	,,	15,280	0	0	1,900	0	0	17,180	0	0
Redford and Potter, Horsham		15,363	0	0	1,583	0	0	16,946	0	0
Hook, W., Westbourne Park		14,990	0	0	1,290	0	0	16,280	0	0
Tomkinson, C., Eastbourne		14,400	0	0	1,237	0	0	15,637	0	0
Harper, J., Hackney		14,260	0	0	1,280	0	0	15,540	0	0
Longley, J., Crawley		14,259	0	0	1,236	0	0	15,495	0	0
Peerless, J., Eastbourne		14,045	0	0	1,365	0	0	15,410	0	0
Jones, Wm., Gloucester		13,984	0	0	1,386	0	0	15,370	0	0
Climpson, R., Eastbourne		13,750	0	0	1,450	0	0	15,200	0	0
Skinner, J. A.,	,,	13,718	0	0	1,404	0	0	15,122	0	0
Gregar, Wm, Stratford		13,978	0	0	1,140	0	0	15,118	0	0
Booth & Sons, New Broad-st.		13,850	0	0	1,150	0	0	15,000	0	0
Smith & Son, South Norwood		13,437	0	0	1,377	0	0	14,814	0	0
Martin, Wells, & Co., Aldershot		13,350	0	0	1,450	0	0	14,800	0	0
Priestly and Gurney, Camden Town		13,080	0	0	1,700	0	0	14,780	0	0
Deacon & Co., Lower Norwood		13,430	0	0	1,344	0	0	14,774	0	0
*Dore, A., Eastbourne		12,983	0	0	1,498	11	0	14,481	16	0
Peters, P., Horsham		13,134	0	0	1,343	0	0	14,476	0	0
Grimwood and Son, Sudbury		13,297	0	0	1,147	0	0	14,444	0	0
Matthews, A., Dover		12,446	18	0	1,229	6	4	13,676	4	4

* Accepted.

RAILWAY MATTERS.

A GOOD deal of 5ft. gauge railway is being laid in the United States.

A FURTHER section of the Canada Pacific Railway has been opened, the lines extending to Swift Current Creek, 520 miles west of Winnipeg.

THE London and North-Western Railway Company will shortly be widening that part of their line which runs from Lawley-street Birmingham, to Aston.

A BILL has been prepared bearing the names of several Home Rulers, and will be introduced next session, to provide for the purchase of the Irish railways on or after 1st January, 1884.

MESSRS. HARPER AND ROCK, of Oamaru, New Zealand, have patented an arrangement of gas engine for driving tram-cars which will probably be brought into use on the proposed tramway there. The gas, which will probably have to be compressed oil gas, is to be stored in chambers under the seats of the cars.

ABOUT 9171 miles of railway have been completed in the United States this year, against 6649 miles reported at the corresponding time in 1881, 5342 miles in 1880, 3150 miles in 1879, 1947 miles in 1878, 1945 miles in 1877, 2102 miles in 1876, 1150 miles in 1875, 1686 miles in 1874, 3350 miles in 1873, and 6311 miles in 1872.

A SATISFACTORY trial trip on the new line of tramway which has just been laid by the Dudley, Sedgley, and Wolverhampton Tramway Company between Wolverhampton and Dudley, a distance of six miles, was made on Monday. The car started from Wolverhampton and proceed to Sedgley, which is about midway. The line will not be opened for public use until March 1st.

THE Lancashire and Yorkshire Railway Company commenced running its own engines and carriages into Sheffield—Victoria—Station on the 1st December, and the Manchester, Sheffield, and Lincolnshire began direct communication with Bradford, Huddersfield, and Halifax. The advantage to Sheffield is a highly improved service of trains to the three towns mentioned, with the distance done by four expresses each way in seventy-seven and eighty minutes.

IT appears from a paper lately read by M. Fousset, before the Société des Ingénieurs Civils, Paris, that in 1880 there were 1656 kilometres of narrow-gauge railway opened in Sweden and Norway; 647 kilometres opened, or in progress, in New Zealand; and 132 in the Island of Réunion. In Brazil there were, in 1881, no less that 5374 kilometres opened, 4748 kilometres being of 1 metre gauge, which has been definitely adopted as the best.

THE Austrian Railroad Club, which consists of railroad employés, and had at its opening for the season last month 739 active and 53 subscribing members, directs a railroad school in Vienna, to the expense of which nearly all the Austrian railroads contribute. The *Railroad Gazette* says, there will be classes in political economy, traffic geography, statistics, and the study of merchandise, bookkeeping, and the technology of railroads, held between 5 and 7 p.m., four days in the week.

THE Public Works Department of the Birmingham Corporation have under consideration notices of intended applications to the Board of Trade, by the promoters of as many as five local tramway companies, for powers to contruct tramways in this district. One of the proposals is for a tramway from Birmingham to Edgbaston, but a meeting of owners of property along the lines of route and others interested has been held, and resolutions passed to oppose the scheme. Towards an opposition fund £300 was raised before the meeting broke up.

THE opening of the Norwich extension of the Lynn and Fakenham Railway took place on Saturday. A special express from the King's-cross Station of the Great Northern Railway to Norwich brought down the directors and a number of their friends, and passed over the main line of the Great Northern Railway until the point near Peterborough, at which a system of lines about to be amalgamated with the Lynn and Fakenham undertaking commences. From the junction with these lines the special passed on to Lynn, and thence it ran over the Lynn and Fakenham properly so-called.

AN accident occurred at Chard on the London and South-Western Railway, on Saturday night, owing to a train which was leaving the station being turned on to a siding, whence, having struck the engine-shed, it fell over into a field. The driver and stoker had a narrow escape, and the engine was considerably damaged and embedded in the earth. This is as reported by a daily contemporary, but it seems to suggest almost too much thoughtlessness on the part of the signal or switchman, too much inattention on the part of the driver, and a curious arrangement of siding and engine shed.

A VIGOROUS opposition is being organised in the ward of Farringdon Without to the proposed tramway over Blackfriars Bridge and across Ludgate-circus, one of the most unsuitable places in all London. It is, the *City Press* says, not a traders' question only, but one which affects all who come into the City by that route. Those who are at all acquainted with the already congested state of the traffic at this point, where the great streams of vehicles between Blackfriars and Farringdon-street and Ludgate-hill and Fleet-street cross each other, know that a tramway there would cause an obstruction that would be utterly unbearable.

ENGINEERS on railway work in some European countries, as much as in the new unsettled lands, need to be capable of doing good steady work with a rifle or revolver. Not long ago a party of five Englishmen, belonging to the staff of the contractors for the bridges of the Batoom branch, were fired upon out of the woods on both sides of the line, and three of them were severely wounded. The object of the attack was, it is supposed, to rob the Englishmen of a large sum of money which they were carrying to pay the workmen up the line; but owing to the energetic conduct of one of the party, who had with him a Winchester rifle, the Circassian cutthroats made off without their expected booty.

COLONEL YOLLAND has held an inquiry at Coalville as to the condition of a level crossing on the Leicester and Burton branch of the Midland Railway where a fatal accident recently occurred. Mr. Needham, superintendent of the line, Mr. Loveday, chief inspector, and other officials, represented the Midland Company, and Mr. Clement E. Stretton represented the inhabitants. The evidence showed that the crossing was imperfectly protected. It was crossed by 2000 foot-passengers and 300 trains a day. Colonel Yolland said that it was deplorable that the Legislature ever allowed the Leicester and Burton line to be constructed with level crossings close by the side of a level crossing of an existing railway. Such level crossings ought never to have existed; but the Legislature had not given the Board of Trade power in cases of that kind. It was simply a question of pressure upon the company. Had the Board of Trade power, he should not hesitate to ask them to issue a compulsory order.

THE Federal Department of Posts and Railways, which has a controlling voice over the rates charged by Swiss railways, has, according to the Geneva correspondent of the *Times*, just inflicted a severe check on French railways interests. In 1878, the Paris, Lyons, and Mediterranean Company concluded with the Swiss Western, the Central, and the Jura-Berne Companies a working arrangement, comprising a common tariff, and moderate through rates on all goods consigned from western and central Switzerland to Marseilles, and *vice versâ*. When the St. Gothard Railway was opened the Posts and Railways Department requested the Swiss Western Company to rescind this arrangement. The company refused, and the Federal Council has ordered the suppression of the common tariff from February next. The effect of this measure will be to stop all direct traffic relations between Swiss railways and the south of France, and to compel Swiss consignors to forward all their goods for Mediterranean ports by the St. Gothard to Genoa. The Swiss Western Company has protested, and will appeal to the Federal Assembly against the order of the Federal Council.

NOTES AND MEMORANDA.

THE motto adopted by Mr. James Nasmyth, of steam hammer celebrity, was *non arte sed marte*—"not by art, but by the hammer."

IT is estimated that there passed through the booms of the St. John River, N.B., this season about 126,000,000ft. of logs in 42,000 joints of, say, 3000ft. each.

THE *Metallarbeiter* calls attention to a discovery affecting the utilisation of the coal tar and ammonia developed in blast furnaces, by processes more or less similar to those in use in the manufacture of gas. Those who know the important position occupied in gas companies' budgets by the proceeds arising from the sale of such products, will readily appreciate the value which such a discovery would possess for the iron trade if the description of its merits is correct.

AT a recent meeting of the Paris Academy of Sciences a paper was read on the "Results of Experiments Made at the Exhibition of Electricity on Incandescent Lamps," by MM. Allard and others. In general and for the spherical mean intensity of 1·20 Carcel, only about 12 to 13 Carcels per horse-power of arc, or 10 Carcels per horse-power of mechanical work, can be counted on, from incandescent lamps. Electric candles give 40 Carcels per horse-power of arc, regulators nearly 100, so that, generally, the economic values of the three systems are nearly as 1, 3, and 7.

IN the last sitting of the Syndicate d'Electricité M. Jablochkoff described a new element which he has invented, and which consists of sodium for the electro-positive plate, the negative being, as usual, carbon. *Nature* says, M. Jablochkoff does not use any exciting liquid, but merely sends into his elements by the instrumentality of an aspirator, a current of air saturated with moisture. He says that soda is dissolved and falls to the bottom of the box where his elements are kept so that it may be easily collected and sold at a high price, being pure except for a small quantity of carbonate and of nitrate. According to his statement the electromotive force of this element is about 4 volts.

NUMEROUS methods have been invented for converting the chloride of potassium into the more useful, and hence more valuable carbonate. The latest is that of Wittgen and Cuno, in which zinc oxide, or its hydrate or carbonate, is added to a concentrated solution of potassium chloride, which is then subjected to the action of carbonic acid gas. A double carbonate of potassium and zinc is thrown down as a precipitate, while the zinc chloride remains in solution. The former is decomposed into its constituents by means of hot water, and the solution of carbonate of potash evaporated down. The zinc chloride solution still contains some potassium chloride and zinc dissolved as a bicarbonate. Upon evaporation of this solution, the carbonate of zinc separates first, and afterward the double chloride of potassium and zinc. The latter, the *Scientific American* says, is separated into the two separate salts by dissolving and crystallising.

THE population of Prussia increased between 1816 and 1864 from 10,350,000 to 19,260,000, while, up to 1875, inclusive, it had mounted up to 21,500,000, or 105 per cent. in sixty years time. From 1875 to 1880 the population of all the German States has been increasing at about 525,000 per annum. At the last census, in December, 1880, the number of inhabitants was 45,250,000, which, if maintained at the same rate, would be 60,000,000 in 1900. The increase, as compared with that of France, is very remarkable, the French population during the last five years showing an increase of only 389,000; while the increase of the German population during the same period was 2,000,000, the birth-rate in the latter country being 3·91 per 100, whereas in France it is only 2·47. There is also this great difference between the two, that in France the increase has been almost entirely in the large towns, whereas in Germany the increase is general throughout the country as well as the towns. The number of emigrants that have left Germany during the last sixty years is over 3,500,000, of whom the greater part have taken their departure within the last thirty years, the United States having absorbed, in 1881, no less than 248,323. Dr. Friederich Kappe estimates the amount taken away by each emigrant at not less than 450 marks, or £22 10s., so that the capital transferred to the United States during last year amounted directly to £5,587,267.

DURING a recent stay on the summit of the Pic du Midi, 9590ft., MM. Muntz and Aubin examined the air and aqueous meteors repeatedly, with reference to the presence of ammonia and to atmospheric nitrification. The ammonia of the air seemed to be in much the same proportion as that found in the air on low ground; but that of the rain-water, snow, and fog was considerably less than on low ground, for which various reasons are adduced—the greater rarefaction of the air traversed, absence of nitrate of ammonia, dryness of snow preventing condensation of ammonia, fogs being formed where found, without descent. In all the observations of rain, fog, and snow, for nitrates, an almost complete absence of these latter was ascertained. In this connection the authors had an examination made of the record of thunderstorms kept at the observatory—nitrates being formed in the air by electrical action. Of the 184 thunderstorms observed from 1873 to 1882, only twenty-three had been produced at a height above 7700ft.—where the original station of Plantade is situated—in the latter the summit of the Pic was surrounded by clouds whence the discharges came. It may be said in general, that in the Pyrenean region the violent electric phenomena of thunderstorms never exceed a height of 10,000ft.—3000 metres—and that, consequently, the formation of nitrates under the influence of electricity is below this limit. Atmospheric nitrification seems to be chiefly produced in the zone between the sea level and the mean height of clouds.

A NEW process of coke burning, with the recovery of the volatile products of the coal used, has been devised by Mr. John Jameson, of the firm of Jameson and Schaeffer, Newcastle, and the process may be seen in operation daily at the chemical works of Messrs. Hugh Lee Pattinson and Co., the Felling, where it is in successful operation. Mr. Jameson's method of working consists in drawing away gases and vapours from the bottom of the coke-oven by slight but steady suction, and condensing these products in a series of cooling pipes. The apparatus can be applied to the coke ovens now in common use at a cost of about £20 per oven. The bottom of the oven is perforated, and into it is introduced the end of a suction pipe. Here it communicates with the condensing pipes, from which, at intervals, the liquid products are drawn off, whilst the incondensable gas is, for the present, allowed to escape. The suction pipe is, at the Felling Works, operated by a blower driven by a small steam engine, the minus pressure being represented by a column of half-an-inch of water. In making the ordinary hard coke of commerce, the coal with which the oven is charged is ignited at the top, and burns downwards. With the gradually increasing heat the coal begins to agglomerate. The gases and vapours emitted rise to the intensely heated surface of the charge, where the ammoniacal products are decomposed and altogether lost, whilst the carbon of the hydrocarbon gas is burnt and wasted, the pitchy hydrocarbons of the coal being more fluid than volatile, set in the charge, and become valuable constituents in the coke, affecting, as they do to so important a degree, its density and hardness. By means of Mr. Jameson's apparatus a considerable quantity of these pitchy constituents of the coal could be withdrawn from the oven, but the result would be to leave the coke in a comparatively soft and porous state. The object aimed at is to extract such valuable elements, mineral oil and ammonia, of the charge as may be taken without adversely affecting the market value of the coke, and therefore this process is not proceeded with. The suction is so managed as to cause no actual passage of air through the charge. By Mr. Jameson's method of working, the volatile matters formed at the lowest heat are at once drawn away through the cooler stratum of coal, whilst the least volatile constitutents of the charge are left to maintain the mercantile value of the coke.

MISCELLANEA.

MESSRS. THWAITES BROTHERS, of the Vulcan Ironworks, Bradford, have been awarded a gold medal for their steam hammer, and silver medals for their blower and air compressor, at the Bradford Technical School Exhibition.

"PUNCH'S ALMANACK" for 1883 contains several amusing references to electrical applications. "Punch's" electrical fun is free from the absurdities which characterise the letters sometimes published by daily contemporaries.

THE *Novoe Vremya* states that the Russian Admiralty propose to build several vessels of the type of the English cruiser Leander and others; the whole of the hull to be of steel, with a length of 300ft., a width of 46ft., and a tonnage of 3746.

MR. JOHN SPENCER has purchased the Globe Tube Works, which were for many years conducted by the late firm of Whitehouse and Co., Limited. These works were established in 1847. Mr. Spencer's London address will remain the same.

WE have a copy of "The City Diary," which is an octavo size, contains the week on a page, is interleaved with blotting-paper, and is one of the handiest general diaries published. The printed information accompanying it relates, of course, chiefly to City affairs.

IT was stated at the meeting of the Preston Town Council on the 30th ult. that the new dock at Preston would be 30 acres in extent, or three times the size of the Lancashire and Yorkshire Dock at Fleetwood. A special meeting of the Council is called for next week to approve the scheme.

THE Berlin correspondent of the *Times* says it is believed the War-office there is seriously thinking of substituting some new pattern of repeating rifle for the breech-loader now in use in the German army; and that several battalions will soon be experimentally armed with the more destructive weapon.

AT the opening sessional meeting of the Institute of Civil Engineers of Ireland, on Wednesday last, a paper on "Magneto and Dynamo-electric Machines" was read by Mr. J. Angelo Fahie, C.E., which was illustrated by some experiments and numerous diagrams, the lecture hall being illuminated by a number of incandescent electric lamps.

THE Suez Canal Works Committee met again on the 1st inst., and agreed that the idea of constructing a second canal could only be realised when the traffic receipts exceeded 100,000,000f. The committee then adjourned for a month, to study the different proposals which have been put forward. Meanwhile it was decided that it should be suggested to the board of directors that the machinery should forthwith be ordered, which would be necessary, whatever scheme was ultimately adopted.

THE *American Manufacturer* says:—"An immense new factory is being built in Toronto by Mr. John Abell, of the Woodbridge Agricultural Works, who some time ago decided on removing his business to Toronto. The new factory will be devoted exclusively to the manufacture of thrashing machines, portable engines, and mill machinery, and which, when completed, will it is expected give employment to about 400 mechanics. The main building, which fronts on Queen-street, opposite Beaconsfield-avenue, will be 300ft. in length and three stories high, with basement."

THE representatives of the Northumberland miners gave notice to the coalowners on Friday, the 1st inst., that the present sliding scale arrangement must terminate at the end of December. The men have for some time been dissatisfied with the scale, and have asked for more favourable terms. The makers have offered the men an improved scale, which would give an advance of 2½ per cent to underground workers and 2 per cent. to above-ground men. The men were asked to vote for its acceptance or refusal, and the voting was concluded on Saturday last. The result is, that the men reject the terms offered by the masters.

THE committee which was formed a short time since to arrange for establishing a technical school at Middlesbrough held a meeting on Monday last in the Royal Exchange Board-room. Amongst those present were Mr. B. Samuelson, M.P., Sir J. W. Pease, M.P., Mr. J. Wilson, M.P., Mr. I. L. Bell, F.R.S., &c. &c. The chair was taken by Mr. E. W. Richards. A good deal of information was laid before the meeting as to the working of science schools at Oldham, Crewe, and Wigan, and there was a lengthy discussion. A sub-committee was appointed to visit technical and science schools, with a view to obtaining the fullest information as to their mangagement.

SINCE the commencement of the present session the meeting-room of the Society of Arts has been lighted by means of electricity. A Siemens dynamo is employed, driven by an 8-horse power Crossley gas engine. Nearly the whole cost of these was defrayed by subscriptions from a few past and present members of the Society's Council. The lamps used are those of Edison, and there are at present fifty of them in the room. The chandeliers now in use have been lent by Messrs. Verity, who are constructing chandeliers to be permanently fitted, now that the number of lights to be used has been decided upon. Temporary fittings have been put up in the Council-room, and the result having been proved satisfactory, it is in contemplation to arrange for the lighting by electricity of this and other parts of the building.

SOME important arrangements for the further assistance of vessels navigating the dangerous waters off the coast of Nova Scotia are announced by the hydrographer to the Admiralty. An automatic signal buoy, coloured black, sounding a 10in. whistle, and therefore capable of being heard at a considerable distance, has been recently placed half a mile south and half west from Blonde Rock, which, as all mariners who have sailed in those seas know, rises south of Seal Island. The buoy is moored in twelve fathoms of water. Another buoy, coloured red, has been moored one-third of a mile west of Lurcher shoal, on the east side of the entrance to the Bay of Fundy. It marks a depth of thirteen fathoms. Another bell buoy has been moored in ten fathoms of water, about half a mile S.S.E. from Fourché Head, on the south-east coast of Cape Breton Island.

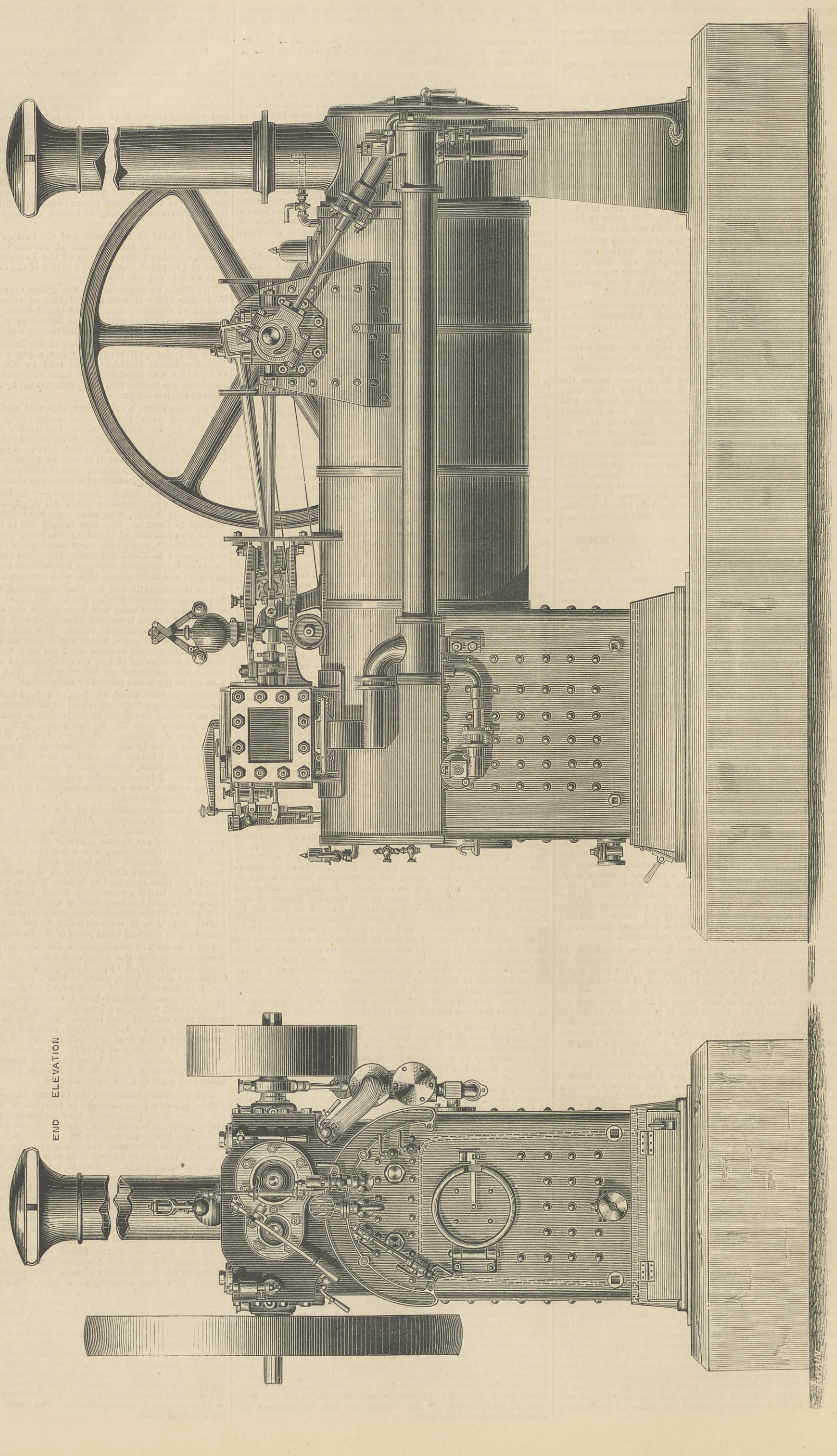
THE seven-foot heading of the Channel Tunnel at Sangatte, near Calais, has now been advanced to upwards of half a mile, and is, the *Times* says, progressing very satisfactorily. The Beaumont boring machine is cutting at the rate of one metre an hour. The face of the heading is said to be perfectly dry, and is following a course halfway between the gault and the greensand, the inclination of the gallery having been raised slightly to avoid driving into the softer gault. "Several faults of a few metres vertical displacement have been cut into, but no water of any great importance was met with in this broken ground. The quantity of water which found its way into the heading averaged every minute one litre per metre of heading driven, but this has been considerably reduced. The machine is cutting the ground so rapidly as to overtax the means at present available for removing the dirt, which is being done by manual labour."

AT the instance of the Board of Trade, some experiments were made on Monday at Aberdeen Harbour entrance, with a view of testing the practicability of using oil as a means of reducing the danger to vessels entering in a gale. The occasion was most favourable. A stiff south-easter was blowing, the sea was running high, the waves dashed over the piers, and it was next to impossible for any vessel to cross the bar in safety. Captain Brice, representing the Board of Trade, and the leading harbour officials, were present. Some improvements had been made in the pumping apparatus since the last experiment, a larger hose being supplied, and seal oil being used instead of coarser oil. When the pumping commenced the waves were dashing wildly against the piers. After twenty minutes, the *Times* reports, the crests disappeared, the breakers assumed a rolling motion, and the entrance was rendered comparatively safe. Two hundred and eighty gallons of oil were used in the experiment. The result will be reported to the Board of Trade.

COMPOUND SEMI-PORTABLE ENGINE.

MESSRS. WALLIS, AND STEVENS, BASINGSTOKE, ENGINEERS.

(*For description see page 4-6.*)



END ELEVATION

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*** *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.*

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L. AND P. (Rouen).—*The Bowling Ironworks Company, Bowling, Yorkshire.*

J. B. (Kingsbridge).—*We have twice replied to your question by post, and our letters have been both returned through the dead-letter office.*

C. T.—*You can get the printed rules of the Designs-office, we believe, upon application to Mr. H. Reader Lack, Great Seal Patent-office, Southampton-buildings, London, or through a bookseller.*

EXPRESS.—*Both your questions have been answered in our pages. The fastest train in England for a certain distance is the Flying Dutchman, which runs from Paddington to Swindon at the average velocity of fifty-three miles an hour.*

GOVERNMENT GUN-METAL BORINGS.

(To the Editor of The Engineer.)

SIR,—I shall be much obliged to any correspondent who will inform me where I can procure the above-mentioned borings.

Hartlepool, December 5th. BRASS FOUNDER.

WEIGHING AND REGISTERING WEIGHT OF WHEAT.

(To the Editor of The Engineer.)

SIR,—I shall feel obliged to any of your readers who will recommend me the best automatic machine for registering the exact weight of wheat—to be used in connection with a grain elevator.

Clifton, November 30th. MILWAUKEE.

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MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, Dec. 12th, at 8 p.m.: Paper to be discussed, "The Sinking of two Shafts at Marsden for the Whitburn Coal Company," by Mr. John Daglish, M. Inst. C.E.

SOCIETY OF TELEGRAPH ENGINEERS AND ELECTRICIANS.—Thursday, Dec. 14th, at 8 p.m., the following paper will be read:—"The Application and Extension of Telephonic Communication in Japan," by Mr. Thomas J. Larkin, Member.

SOCIETY OF ARTS.—Monday, Dec. 11th, at 8 p.m.: Cantor Lecture, "Dynamo-Electric Machinery," by Professor Sylvanus P. Thompson, D.Sc. Lecture II., "The Dynamo in Practice." Wednesday, Dec. 13th, at 8 p.m.: Fifth ordinary meeting, "Electrical Exhibitions," by Mr. W. H. Preece, F.R.S. Mr. W. Spottiswoode, LL.D., F.R.S, will preside.

THE ENGINEER.

DECEMBER 8, 1882.

THE PROGRESS OF ELECTRIC LIGHTING.

ON Tuesday an influential deputation waited on Mr. Chamberlain at the Board of Trade. The members of this deputation represented the principal corporations in England and Scotland, and their object was to urge the Board of Trade to use its powers under the Electric Lighting Act, 1882, in the permissive sense. It is not too much to say that this Act is not fully understood now by those whom it most concerns, and it is even doubtful if it was quite comprehended by Parliament when passing it. The section of the Act to which the deputation took exception was apparently the 4th Section, which says in effect that the Board of Trade may from time to time grant a provisional order to any local authority, company, or person for supplying electricity for any public or private purpose within any given area, without—in the case of a company —requiring the previous consent of the local authority, and for such period as the Board of Trade may think proper. This appears to have frightened the corporations of the principal towns in the kingdom. Mr. Littler, Q.C., who introduced the deputation, explained that the corporations were not desirous of admitting the companies other than as their agents. It was probable that great improvements would be made in electric lighting, and it was therefore very undesirable that corporations should be bound for any length of time, as, if they were, they would soon find that they were using an older and inferior system. The corporations were not averse to the electric light, but they wanted a discretion in the matter. Were they to be compelled to supply the electric light after having got their order, the effect on some corporations would be very serious, and on others would be absolutely fatal to their making any endeavour to obtain a supply.

Mr. Chamberlain's reply was virtually a statement that the Board of Trade had only to administer the law, and he explained that what Parliament felt was this—that in the case of electricity there was a great danger that corporations and local authorities, through a desire to spare the ratepayers from anything in the nature of a speculative expenditure, would be disposed to delay experiments which might be necessary with this new agent of electricity, and its development would be most seriously retarded. Parliament, therefore, he thought, did intend that such a condition should be laid down by the Board of Trade as would prevent that evil; and it endeavoured to guard against the danger by the imperative conditions which it had attached to the granting of provisional orders and licences; and so the deputation was dismissed, having achieved nothing.

There is, we think, reason to believe that the members of the deputation hardly yet fully comprehend the nature of the Act to the operation of which they object. As a matter of fact, it will be by no means easy for any company to obtain powers to supply electricity against the will of a corporation. For while according to Section 3 the Board of Trade may *license* any local authority, or any company or person to supply electricity for any public or private purposes, within any area, yet it can only do so subject to the following provisions: — The consent of the local authority for the district is required to the application for a licence, which consent may be given either *with* or *without* conditions. No licence can be granted if such consent is withheld; and the period of licence is not to exceed seven years, but is subject to conditional renewal. If the consent be withheld, the company can go for a provisional order; but the order must be submitted to Parliament for confirmation, and if a petition be presented against such order, it will be referred to a select committee and dealt with in all respects like an opposed private Bill. Under such circumstances it really does not appear probable that any company would feel disposed to fight a great corporation. Mr. Chamberlain explained to the deputation that if an application were made by the company, the Board of Trade would hear everything that the corporation had to urge against the grant to the company, even though the corporation stated that it was not itself prepared to enter upon the new field of supply; in fact, they would hear any general objections to a company going into the district, and no licence would be granted until all the representations of the local authority had been heard against it. The policy of allowing companies to occupy a district—with the safeguards taken—was perfectly legitimate; and it was impossible for them to obtain more than a fair and reasonable profit. Then as to the breaking up of the streets, there was an express provision in the Act which would enable corporations to insist upon the insertion of a clause in the provisional order giving the corporation the power of breaking up the streets for, and at the expense of, the private undertakers who might undertake the supply of electricity.

There is some reason to think that corporations have really very little to fear at present. It does not appear that there is any company as yet in a position to give them trouble, or to undertake lighting operations on a large scale. Mr. G. H. Stayton, C.E., has just prepared for the vestry of Chelsea one of the most valuable reports on electric lighting yet published. Much of this report is taken up with an explanation of the Electric Lighting Bill, to which we need not further refer. Mr. Stayton prepared a set of twenty questions, which he sent to the most important electrical firms, and to these questions he received replies from the Metropolitan Brush Company, Edison, Jablochkoff, Swan, Ferranti-Thompson, and Ince, Pilson-Joel, and Siemens Brothers and Co. It it impossible to read these replies without seeing that we are as yet a long way from great extensions of the system. The answers do not harmonise, and show in almost every line that the answerers tread on uncertain ground. Only three companies would contract to light any portion of Chelsea, namely, Brush; Jablochkoff; and Ferranti, Thompson, and Ince; but none of the firms were prepared to give terms, except Jablochkoff, which would undertake the work under certain conditions for 1½d. per lamp per hour, each lamp equal really, not nominally, to 378 candles. It is known that Dr. Siemens has recently stated that enormous difficulty will be encountered in lighting any extensive area from one centre. Mr. Stayton's tenth question runs, "What is the probable size of the electric conductors, and the mode of laying the same?" The Metropolitan Brush Company proposes leads ½in. to ¾in. diameter, laid in iron pipes; Pilsen-Joel states that ½in. leads will suffice; Messrs. Siemens require conductors 1in. diameter; and Jablochkoff states that a seven strand 16 B.W.G. cable will distribute the light over an area of twenty miles in circumference. This last is the only definite reply made, for Messrs. Siemens do not say how many "wires," 1in. in diameter, they would use. Someone must be wrong in this matter of the dimensions of conductors if someone else is right, and we confess that we cannot resist the conclusion that Dr. Siemens is in error.

Question eleven ran—"Do you consider that one central station would be sufficient for the district?" The replies are suggestive. We give them complete. According to the Brush Company, "The number of stations in a district would depend on the size of the area of supply. In this case one central station might be sufficient." Edison replies, "From an economical point of view, no. The cost of conductors would be excessive." Jablochkoff says, "One centre will be sufficient if Jablochkoff lights only be used. More if the demand for incandescents predominates." Swan says, "We do not advise one central station. It depends greatly on the amount of light required. We should prefer to subdivide into several stations, so that the principal mains should not extend over 700 yards in length." Ferranti and Co. say, "One central station would do for the entire district." Pilsen-Joel says, "This would depend on its size. There is no reason why one large station should not supply the whole of an ordinary area, as electricity can be made to travel several miles." Finally Messrs. Siemens say: "We do not think one central station would be sufficient." As to the scale of charges to be made, there is no information supplied. All the companies and firms are vague and indefinite to a degree. They do not know what they ought to charge, having no experience to guide them. The only exception is the Jablochkoff Company. Its reply is: "Difficult to answer, except that, judging from past experience, the price of candles having already decreased from 7s. to 2s. per dozen, it is not only possible, but probable, that farther reductions could be made; and if 500 private Jablochkoff lights were supplied, the price of the light to the parish *might* be reduced to one halfpenny per hour." So far as this report goes, it is difficult to resist the conclusion that the Jablochkoff Company is really the only one which has much practical experience, or is in a condition to deal with the question of lighting a large area in a business-like way.

There is a great deal of interest touched on by Mr. Stayton, the consideration of which now would extend this article to undue limits. We must stop for the moment by stating that his estimate for a complete installation for Chelsea is no less than £375,000, the expenditure of which is, of course, out of the question. To bring matters into a more practical form, however, he has prepared an estimate for lighting six miles of streets. According to this, the cost of land, buildings, and offices for two stations would be £15,000; engines and dynamos—2200-horse power—£28,000; fixing and installing, £3000; conductors—8¼ miles—£25,000; services and meters—1400—£5500; preliminary expenses and contingencies, £8500; total, £85,000. In return for this would be provided 21,000 incandescent lamps for 1400 houses, shops, and public buildings, and 120 arc lamps for the streets.

THE FORMATION OF ALLOYS BY PRESSURE.

IN a recent part of the German Chemical Society's "Journal" there is an interesting paper by W. Spring, who refers to other papers of his, read in 1878 and 1880, before the Academy of Sciences of Belgium, in which he had shown that different substances, when in a state of powder, subjected to a pressure of several thousand atmospheres, become so intimately mixed and mingled that the block formed closely resembles a mass which has been subjected to fusion. Bodies possessing different allotropic conditions, such as sulphur, pass from one state into another, but only in case they are in the state of least density; elastic and prismatic sulphur, for example, pass over into the state of octahedral sulphur. Again, the yellow mercury iodide goes over into the red crystalline, the latter possessing the greatest density. It has been shown by his researches that when a mixture of a number of solid substances is pressed together, a chemical reaction takes place, provided the density of the compound produced is greater than that of the constituents; a mixture, for example, of sulphur and copper passes over very easily into copper sulphide.

If we consider these facts side by side with others long well known, as that gases by pressure may be converted into liquids, and that solid bodies when subjected to pressure have their melting points changed, we arrive at the general statement that *matter possesses those properties, or conditions, which correspond with the volume that the matter is driven by circumstances to assume.* To make this statement more effective, it appeared to Mr. Spring that he could give it a more pointed and certain signification by applying it to the formation of alloys of a readily fusible kind. For in case no alloys were formed, even when the metals are intimately mixed with each other, the point of fusion of the substances employed should not change; if, on the other hand, an alloy should be formed, the point of fusion must fall. Accordingly, a coarse powder of filings of bismuth, cadmium, and tin, in such proportions that they correspond with the ratio of the metals met with in Wood's alloy, was submitted to a pressure of 7500 atmospheres. Wood's alloy, it is known, melts at 65 deg. The block formed by the pressure was once more reduced to powder with the file, and again subjected to the same pressure. In this way he obtained a block of metal the physical properties of which completely corresponded with those of Wood's alloy as regards density, colour, hardness, brittleness, and fracture, and when heated to 70 deg. in warm water the alloy melted. In the next experiment a mixture of lead, bismuth, and tin, in the proportion met with in Rose's alloy, was employed, and subjected to the same pressure. This alloy melts, as is well known, at 95 deg. After being twice pressed, a block of metal was obtained which fused in boiling water. In conclusion, a mixture of filings of zinc and copper was submitted to the pressure. After the first pressure, a kind of conglomerate of the two metals was obtained. By filing this and submitting it five or six times to the same treatment, a block was at last obtained which exactly resembled brass, only the colour was slightly darker. As the density of brass is about the same as that of the two metals constituting it, it is easy to understand why the brass is so difficult to obtain by pressure, and it affords an admirable proof of the accuracy of the law referred to above. Spring refers at the end of his paper to an experiment of Romna, who

endeavoured to produce a fine micrometer wire for his telescope out of a platinum wire in the following manner:—The wire, covered with silver by the galvanic method, was passed through a draw-plate, with the hope that after treating the wire with nitric acid the silver shell would be removed and the desired fine platinum wire would be obtained. It was, however, noticed by Romna that not alone the silver, but the whole metal dissolved in the nitric acid. It is evident, he writes, that by the pressure of drawing the wire the platinum and the silver had formed an alloy—silver containing 10 per cent. of platinum alloyed with it is completely soluble in nitric acid.

The result arrived at by Romna does not accord at first sight with that obtained by Dr. Wm. Hyde Wollaston, who, in 1813, published his paper in the "Philosophical Transactions" on "A Method of Drawing Extremely Fine Wires." Wollaston procured a wire of platinum, the diameter of which did not exceed the $\frac{1}{30000}$in., by placing the wire in a small cylinder of silver and reducing the wire to the utmost practicable tenuity in the ordinary way by drawing it through a draw-plate, and then removing the shell of silver with nitric acid. Steel wires of exceeding fineness can be produced in a similar manner, the silver being dissolved by the action of mercury. Romna arrived at a different conclusion from Wollaston in consequence, it appears to us, of the different way in which the silver was applied to the platinum. He covered the platinum wire with silver by the galvanic method, whilst Wollaston enclosed his in a little cylinder of silver, and the association, in the first case, is infinitely more complete than in the other case if the metals do not actually alloy to some extent during the operation. We remember an experiment which illustrates the case in point. We were some years ago desirous of coating a glass retort over the bottom on the outside with copper, to allow of the retort being used with safety for the boiling and distillation of commercial specimens of benzol. To coat it, the outside of the retort was first covered with metallic silver deposited from a solution by Liebig's method with silver nitrate, ammonia, grape sugar, and alcohol; a bright, mirror-like, lustrous coating was obtained. The retort was then immersed in copper sulphate, and connection made with the silver film and the cell. Immediately the connection was made and the copper began to deposit, the silver became salmon colour, pink, rose colour, and in a few seconds the full hue of the copper showed itself. The copper had alloyed with the silver while deposition was going on.

THE STRENGTH OF BOILER FLUES.

A paper on the strength of boiler flues, by Mr. W. Martin, was read before the Society of Engineers on Monday night. The paper was in some respects peculiar. It supplied very little, if any, new information, but it collected and put into a convenient shape much that is not as readily accessible as is perhaps desirable. It was not, however, the author's object to supply information. His purpose was to call prominent attention to the circumstance that little or no knowledge, derived from actual experiment, is in existence at this moment concerning the strength of the flues of Lancashire and Cornish boilers. In the words of his own abstract of his paper, the only systematic series of experiments which have been made at all, were made by Sir William Fairbairn twenty-four years ago, and the formula deduced by him from these experiments is still the one in use by engineers. The trustworthiness of this formula is not, however, beyond question; and its application to different cases can be made to produce somewhat anomalous results. It cannot be denied that the results obtained by Sir William Fairbairn, considered with regard to the ignorance upon the subject prevailing at the time, were of the highest importance; and they immediately suggested simple methods of effectively strengthening flues, both old and new. Nevertheless, the experimental tubes used were very unlike actual flues in construction; they were very small, and were submitted to pressure in a totally different way from that in which flues undergo strains; and since, moreover, almost all the comparable experiments were with tubes of the same thickness, it is evident that the result deduced from them cannot be regarded as final. It is much to be desired that this subject could receive a new experimental investigation, and in such a case the experiments should be with objects corresponding in shape and conditions of strain, though not necessarily in size, to actual flues. Now we have no intention to dispute the soundness of Mr. Martin's views as thus expressed, or the value of his suggestions. It is, of course, desirable that something more should be known than is known on the subject; but we may point out that any experiments made with cold water pressure would be entirely misleading, and that to carry them out in the only way that would be really useful would be very costly. What that way is we shall explain further on. Before doing so it is necessary to show why the ordinary method of testing would be useless.

It will, we think, be conceded that any experiment or series of experiments in physical science carried out under one set of conditions, can give but vague and insufficient information as to what would take place under another set of conditions. Thus, for example, to argue that because a steamship in a calm sea attained a velocity of 15 knots an hour, she could maintain a similar speed while crossing the Atlantic in the winter, would be simply fatuous. The only method at present practised for testing boiler flues consists in submitting them to cold-water pressure until they give way. To deduce from experiments such as these the behaviour of similar flues when at work in a boiler is not more reasonable than would be the line of argument concerning the probable speed of a steamship which we have just considered. A powerful indirect confirmation of the truth of this was supplied on Monday night in the course of the discussion on Mr. Martin's paper. Professor Unwin said that he had carefully investigated Fairbairn's experiments, and had improved on his well-known formula by strict mathematical reasoning, and he had obtained particulars of one case of collapse, in which the results exactly coincided with his theory. "But," he went on to say, "there is a skeleton in every cupboard, and I am fain to admit that my skeleton is especially large and grissly. I have obtained particulars from Mr. Lavington Fletcher of about two dozen collapses, and not one of them agreed with my formula, the flues giving way with pressures from 50 to 80 per cent. less than I calculated." In one word, the strength of a boiler flue is in all cases less when in work than that of a similar flue tested cold with a force pump. The reason is that the flue is, when steam is up, exposed to various strains which have no existence when the force pump is used. One of the most important of these is that due to expansion caused by heat. Let us take, for example, the case of a flue 30ft. long, $\frac{1}{2}$in. thick, and 3ft. in diameter. If we suppose the pressure of the steam to be 70 lb., then its temperature will be 324 deg., but the metal of the flue will be hotter than this. At the inside next the fire its temperature cannot be much less than 500 deg., while next the water it will probably be 350 deg. Here, then, we have one set of circumferential strains set up. But at a ring seam the whole of the inside lap will probably attain a temperature of 500 deg., while the whole of the outside lap will be 350 deg. The inner plates must stretch the outer, and when the boiler cools again, unless the elasticity of the outer plate is sufficient to bring it back to its original diameter, there will be a leak at the ring seam. This is no fanciful idea. It is well known that the ring seams of thick flues are a constant source of trouble unless the iron and the workmanship are alike admirable. But the flue is exposed to much worse strains than these. The top is, while steam is being got up at all events, at least 200 deg. hotter than the bottom. In a length of 30ft. the top of the flue will expand until the top is nearly half an inch longer than the bottom. If it is free to do this the middle of the length of the tube will rise, and the tube will be cambered upwards; but if the ends of the boiler are firmly tied in with gusset stays, it will not be free to rise, and a very heavy longitudinal strain will be brought to bear on the plates and seams. Furthermore, we know that no boilers are at work the surfaces of the flues and furnaces of which are quite clean; on the contrary, they always have a coating of scale on them of greater or less thickness. The result of this is that the flues must be of necessity very much hotter than they would be otherwise; and, in point of fact, no one knows how hot a furnace crown is when a boiler is at work. But it is very well known that as the temperature of iron is augmented its stiffness greatly diminishes, and inasmuch as flues are never circular, they depend for their strength very much on their stiffness, and if this be impaired the flue is weakened. This point is not so fully understood as it ought to be. We may regard any section of the circumference of a flue as an arch, built up of practically incompressible voussoirs. If these voussoirs were united in such a manner that they could not move on each other, then we should have a rigid arch, which could only fail by the compression of the material of which it was made; but if the arch was not so tied together, then it would remain free from deformation only so long as the line of pressures fell between the extrados and the intrados of the arch—that is to say, within the thickness of the plate. Now the comparatively thin plate of a flue can be bent, and if any of our readers will take the trouble to get out on his drawing board a section of the circumference of a flue, he will see that the bending in or out of that section is precisely analogous to causing the rotation of voussoirs on their inner or outward edges. In other words, the fact that the iron can be bent is analogous to the use of a weak or flexible cement to unite voussoirs. This being the case it becomes evident that the more readily the iron can be bent the weaker is the arch. This would not be true if the flue were a perfect cylinder, for then the line of pressures must fall in the thickness of the plate. But it is easy to see that in the case of, say, a 3ft. flue, $\frac{3}{8}$in. thick, a deformation to the extent of but $\frac{3}{8}$in. would throw the line of pressures within or without the plate. All flues with lap joints are out of truth, and were it not for the stiffness which the lap imparts, and the fact that the thickness being doubled at the lap the line of strain still falls within the metal, such flues would be much weaker than they are. If our readers have followed us thus far, they will see that the heating of a flue by depriving it of its stiffness has just the same effect as the weakening, let us say, of the mortar in a brick arch; and it must be clearly understood that this has nothing at all to do with the ultimate strength of the iron. That may or may not be greater at the temperature really attained by the flue than it is at any lower heat. If, then, it can be shown that iron is less able to resist bending strains when hot than when cold, it follows that comparatively moderate increases in temperature may much weaken a flue. It is probable that at a temperature of about 800 deg., the stiffness of plate iron, in other words the resistance which it can offer to bending strains, is reduced by one-half; and if this be so we have at once an hypothesis which will explain many cases of collapse now regarded as mysterious. A moderate thickness of scale will permit the temperature of a furnace crown to rise much above that of the water. The overheating may not be sufficient to leave any mark on the iron, nor may it suffice to reduce the tensile strength of the metal to any appreciable extent, but it it will take the stiffness out of it, and then a collapse may ensue. It is only necessary to establish the soundness of these propositions—(1) that the flue should not be quite cylindrical, and (2) that it is easier to bend a bar of iron when it is hot than when it is cold, and we do not think this can be disputed.

If, then, we desire to obtain any definite information concerning the strength of boiler flues, they must be tested under conditions similar, as far as possible, to those which obtain in practice. In the United States and on the Continent, in a few cases tests have been made by filling up the boiler as full as it will hold with cold water, and then lighting a small fire in the furnace; the water will then rapidly expand, and while still nearly cold will put on the requisite pressure. Such testing requires to be very carefully done or the boiler may be irreparably injured, and the system has the disadvantage that the test is still a cold water test. The method of experimenting on boiler flues which we advocate is, so far as we know, new. The flue must be fitted in a boiler shell having a very much higher bursting pressure than the collapsing pressure of the flue. Let this shell be filled up with cold water within a few inches of the top, and let the fires be lighted and hard pushed, just as they would be in practice in getting up steam, and as soon as the water has reached 212 deg. let the force pump be put on, and the flue tested to destruction, the fires being left burning all the time. The boiler being in a suitable building, with no one in it, no accident would occur when the boiling water began to run out. A large force pump should be used, competent to run up the pressure to the required point in a couple of minutes at most, and to crush the flue, even after ring seams had been started. It would occupy more space than we can spare to describe minutely all the precautions which would be necessary to secure accurate results. They will suggest themselves, we venture to think, to any one who has had fair experience in testing boilers In this way, and in this way only, can flues be tested under nearly the same conditions in which they are strained in boilers; and if the experiment is ever carried out, we can promise that the result will be found interesting, if not startling.

THE MANCHESTER CORPORATION AND THE PROPOSED SHIP CANAL.

The Manchester Corporation have taken an important step in connection with the proposed ship canal, which will undoubtedly help forward the project materially when it comes before Parliament, and largely tend ultimately towards the successful realisation of the scheme. For some time past the question has been under consideration whether it would not be advisable that the administration of the canal should be vested in a public trust rather than in the hands of private individuals, and in accordance with a resolution passed at a recent meeting of the General Purposes' Committee, the mayor took steps to convene a conference of mayors and other representatives of municipal authorities, with the view of ascertaining the feeling generally on this point throughout the district affected by the proposed canal. The composition of the body which is to administer the canal, should it be made, and the course which the corporate and other bodies should take with regard to the present Bill of the promoters, will be amongst the questions brought before the conference; but the important point on which the views of the various authorities will have to be sought is how far, if at all, they would be prepared to subscribe to the capital of the canal, on trust from the public funds under their control, supposing parliamentary sanction to such a step can be obtained. This conference will, it is expected, be held in the course of the next week or two, but in the meantime the Parliamentary Subcommittee of the Manchester City Council have taken definite action, and have prepared a report in which they not only urge that the hearty and strenuous support of the Corporation should be given to the canal project, but add the following important resolutions:—"That the undertaking and administration of the canal should be so constituted as to be a trust for the benefit of the public in general." "That, subject to satisfactory provisions being introduced into the Bill, it is in the opinion of the committee desirable that Manchester and other municipal bodies in the neighbourhood of the proposed ship canal should be authorised to contribute to the cost of the undertaking, and to take part in supervising the execution of the works, and also in the general management of the canal to such an extent and in such manner as may be sanctioned by Parliament." The sanction of the General Purposes' Committee has now been given to this report, and with the project taken in hand not merely by private individuals for personal gain, but as a public trust for the general good, any opposition which might otherwise have been brought to bear against the scheme when Parliamentary powers are sought for its accomplishment will be deprived of half its weight. To such a course as that proposed by the Manchester Corporation we believe the present promoters of the canal will raise no demur. Their object is simply to accomplish the construction of the canal, and whether this is attained by a private company or a public trust, they will be satisfied so long as the work is really done. Since the adoption of the Parliamentary Committee's report, which was agreed to with only three dissentients, the action of the General Purposes Committee has been subjected to some adverse criticism as tending to commit the Corporation to the canal scheme to an extent further than it was either desirable or prudent such a public body should go. This, however, appears to have had little weight with the great majority of members of the City Council, and at a general meeting held on Wednesday, the recommendations contained in the report were finally adopted by forty-six members voting in their favour, as against only six members opposing. This decisive majority will practically place the action of the Manchester Corporation beyond further controversy, and in the step they have taken there is every probability they will receive the co-operation of the local authorities in the district, the Salford Corporation, at a meeting also held on Wednesday, unanimously passing a resolution expressing its "concurrence in, and approval of, the projected ship canal, whereby the navigation of the rivers Mersey and Irwell will be so improved as to enable vessels of large tonnage to come direct to the borough," the only objection raised to the resolution being that the wording of it was scarcely strong enough to meet the views of some of the members.

THE ELECTRIC LIGHT AT THE NEW LAW COURTS.

On Monday last the Strand and its approaches presented a spectacle that will not soon be forgotten. The cause was the formal opening by the Queen of the new Law Courts. The ceremony was unique in more ways than one. We shall refer here to but one of the features that cause this building to be regarded with considerable interest. It is well known that more or less successful attempts have been made to light the House of Commons by means of electricity. The Law Courts, however, seem to be the first of our great public buildings in which a real test of the capabilities of the light is to be made. When the building was designed it must have been quite evident to the designer that artificial methods of lighting would necessarily be extensively used. The system of incandescent electric lighting was unknown then; the system of arc lighting, again, was, if not unknown, looked upon as suited only for laboratory work, or illumination of lighthouses. Before the building was finished, incandescent lighting had flashed into prominence, and as it possesses many advantages over gas lighting, the First Commissioner of Works—Mr. Shaw Lefevre, M.P.—determined to give it a thorough trial. The contract was some time since settled with the Swan Company, but it was not till about three weeks

before the opening day that orders were given to proceed. We have watched the work almost daily, and must congratulate the firm of Messrs. Crompton and Co. upon their success in accomplishing a heavy task. It seemed almost an impossibility that the work could be done in the time, and the light be ready for exhibition on the opening day; but method and perseverance work wonders, and in this case were crowned with complete success. Temporary arrangements were made where the permanent fittings could not be placed, and on Monday the effect was witnessed by not far short of one hundred thousand spectators. We understand that it is eventually intended to light the whole of the buildings with Swan incandescent lamps. At present the arrangements are as follows:—Along the west front of the building the travelling cranes, employed to move the weights, stones, &c., used during the building operations, have not been removed, and there still cumber the ground huge heaps of the rubbish accumulated during the years the work has been going on. In the midst of this rubbish a space has been cleared, and a shed erected containing on the one side a Marshall and Sons' 20-horse power engine, on the other six dynamo machines. A line of 4in. steel shafting, with the necessary fast and loose pulleys, &c., is used between the engine and dynamos. The dynamos are of the Bürgin type, as manufactured by Messrs. R. E. Crompton and Co. at Chelmsford. One or two of these machines are modifications of the ordinary Bürgin, and contain important improvements. These improvements we shall describe in detail at a future time. The leading wires from the machines are led from a switch board in the machine-room by an arched passage to another switch board in the building, from which they are taken to the positions required by the various circuits. The main wires are heavily insulated, and to further guard against too great a current, fusible plugs are freely used, both in the main and branch circuits. On Monday the Great Hall was lighted by five Crompton arc lamps of an improved pattern, three more arc lamps illuminating the quadrangle. It is intended to place in the Great Hall twelve or sixteen standards of handsome design worked out in wrought iron, each standard carrying sixteen 40-candle power Swan lamps The five lights lighted on Monday were of 3000-candle power nominal, and it must be admitted gave a magnificent light. The incandescent lamps were to be seen in the approaches to the Great Hall, in the cross and bar corridors, in the east and west spiral staircases, in the two Courts of Appeal, and in the adjoining courts. The fittings in the various courts, &c., have been specially designed by Messrs. Crompton, and constructed by Messrs. Winfield, of Birmingham, and although these fittings are but temporary, they are sufficiently suggestive of the form the permanent fittings—to be worked out in hammered iron—will take. Upwards of four miles of main wires have been laid within the buildings, and three hundred sets of fittings fixed In many parts the building lends itself to the fixing of the wires, so that no trace of them can be seen, but in others they are visible. We understand that the light will be run constantly from the commencement of January, and that in connection with the incandescent lights a test of the Fitzgerald-Crompton secondary battery will be made. The steam engines and machines for the permanent lighting will be placed in the crypt underneath the Great Hall, and no doubt will be worth the attention of all interested in electric lighting.

THOMAS-GILCHRIST PROCESS.

THERE has been much discussion this week upon the iron exchanges in the Midlands, touching the relative merits of steel and iron and the progress of the Bessemer-basic method. The twenty-five converters now being erected upon the Continent and the nine in England will, when at work and added to the converters now in operation, bring up the production to 1,196,600 tons per annum. Such an augmentation upon the current yearly continental and home make, which reaches 572,604 tons, should be encouraging to the patentees, while it certainly gives much additional value to the poorer iron-yielding ores wherever they are found. Already the tap-cinder of the ironworks is worth more money; and in the United States accumulations are being stored at a figure which it would never before have been thought such bye-products would realise. On 'Change in Wolverhampton on Wednesday, Mr. Alfred Hickman, blast furnace proprietor, who has taken up the system there with spirit, stated that he was about to erect two more furnaces at Spring Vale, close to the land selected for the works at which the Staffordshire Company will make basic-Bessemer steel. Mr. Joseph G. Wright, the chief proprietor of the Monmoor Ironworks, in the same town, who had taken part in the discusssion last week upon the paper which Mr. Gilchrist read at Dudley, confirmed on 'Change his statement at the formal discussion, that the cost of puddled bar in Staffordshire made from pig at 42s. per ton was 80s., and held that whatever might be the cost of the raw ingot, it would require 5s. 6d. a ton to be spent upon it before it was brought into an equally forward state with the puddled bar for subsequent manufacture. This computation leaves the difference in favour of crude steel from the same class of pig at 4s. 8d. per ton, assuming Mr. Gilchrist to be correct in his estimate of 69s. 8d. as the cost of the ingot; and reduces Mr. Gilchrist's estimate in favour of steel by only 7d. per ton. But Mr. Wright is not, at the present stage of his knowledge of the capability of basic ingot iron, prepared to admit that that material would be equal to the puddled bar in all-round value. The operations of the Staffordshire Steel and Ingot Iron Company will supply the ironmasters of the country with the precise statistical facts which they seek before they can make up their minds upon the merits of ingot iron as a raw material not for rails and ship-plates and sheets alone, but also for the general run of sorts demanded by the merchant. Meanwhile it is interesting to note that by the formation of "The Dephosphorising and Basic Patents Company, Limited," with a capital of £30,000, for the purpose of purchasing "letters patent granted respectively to Messrs. Sidney Gilchrist-Thomas, G. J. Snelus, E. Riley, P. C. Gilchrist, and H. C. G. Harmet, for inventions relating to the manufacture, purification, and dephosphorisation of iron and steel, and the manufacture of furnace lining and lining material," the several patentees of the Thomas-Gilchrist process would seem to be adjusting in a business-like fashion the ratio of their respective claims to the emoluments of the combined invention.

REPAIRS TO MACHINERY AT SEA.

M. RUDOLFH DE HEIDENSTAM, chief engineer of the Greek service steamer Makedoma, sends us a description of an almost unique repair which was effected on board a steamer which broke down in Greek waters, and which he, with other engineers, was invited to inspect at Syra. It appears that the steamship Sandringham, of Glasgow, was on a voyage in October from London with a general cargo for Syra, Galatz, and Ibrail. On the afternoon of the 31st, when going full speed, making about 59 revolutions—the steamer being then about fifteen miles N.E. of Cape Malea—the engines suddenly gave a loud crack as if something had burst, and then brought up. The chief engineer, Mr. Watson, hurried into the engine-room, and taking a lamp, examined the engines, shafting, &c., all over without finding any cause for the accident. He next lifted the valve casing, but here again everything was found to be in order. The low-pressure cylinder cover was then taken off, and on the starboard side of the cylinder a hole was discovered about 3ft. square, the pieces of metal belonging to which were found lying on top of the piston. The weather being squally, with a high beam sea, no time was to be lost, and the happy idea seems to have presented itself to the mind of the chief engineer to make a wooden patch, which he proceeded to do by first getting a piece of wood 2in. thick by 6in. broad, which he put between the jacket and the cylinder face, bedding it close at both ends, and holding it by means of countersunk screws through the cylinder face. Six such pieces were put in and secured in this way, and then some hard wood was used to make the recess still remaining flush with the working face of the cylinder, the hard wood last spoken of being screwed to the 6in. pieces first mentioned. Only seven hours were taken up in making this ingenious repair, and the cover being again put on, the engines were tried with about 45 lb. of steam, and were allowed to work at half speed until the steamer was brought safely into the harbour of Syra early on the morning of November 3rd. The engines were at Syra thoroughly repaired, there being some excellent engineering shops on the island, and great interest appears to have been excited by Mr. Watson's wooden patch.

THE COAL TRADE.

A SERIOUS reaction has already taken place in the coal trade. The anticipations that the advance of 10 per cent. in miners' wages would lead to a permanent increase in the price of coal have proved altogether illusory. The advance was made on the 1st of November, and the coalowners generally raised their rates by 1s. per ton—from 9s. to 10s. per ton. But already the London and provincial markets are over-stocked with coal which cannot be sold; and Yorkshire and Derbyshire coalowners are obliged to accept 1s. 6d. per ton less than they were getting immediately before the 10 per cent was conceded. This leaves them practically with 6d. per ton less for their coal, while they have to pay 10 per cent. more for the getting of it. Nor is this all. North-country coal is placed on the London markets at 3s. 6d. to 4s. per ton less than immediately before the advance of 10 per cent. Yorkshire and Derbyshire coalowners are utterly unable to compete against such reductions, and the consequence is that the output of coal in these districts is now being restricted by the lessening of labour. In one leading colliery, which sends the largest tonnage of Silkstone house fuel to London, only three days per week are now being worked. Already a movement is on foot to repeal the 10 per cent. and bring wages back to the old level. Lancashire is taking the lead, and the coalowners of Yorkshire, Derbyshire, Durham, and Northumberland are also moving in the matter. There seems every prospect that the concession of 10 per cent. to the colliers will be very short-lived. It may interest London consumers to learn that the merchants have fixed their share of the reduction at 1s. per ton.

LITERATURE.

The Marine Steam Engine: A Treatise for the Use of Engineering Students and Officers of the Royal Navy. By RICHARD SENNETT, Chief Engineer, Royal Navy, M.I.N.A., &c. London: Longmans, Green, and Co. 1882.

THE continual improvement in the design and construction of steam engines of different kinds places our books in the category of gazetteers which are out of date as soon as published. In some branches of mechanical engineering this is especially the case, so that at comparatively frequent intervals when we find that practice has left our text-books behind, we feel forced to admit the truth of Mark Twain's remark that "the information the ancients didn't have was very voluminous." Without making any reflections on the information possessed by the older engineers on marine engines, we may admit that there was, until recently, room for a considerable volume on this subject. We may at once say that Mr. Sennett's book as nearly occupies this room as one book can do. The work has been written chiefly with the object of providing a text-book for the use of students in marine engineering, and of naval officers desirous of obtaining a general knowledge of the machinery of ships. The author says he has experienced great difficulty in recommending any suitable text-book to the students in her Majesty's dockyard, Devonport, in which he is first assistant to the Chief Engineer. This experience is not peculiar to Mr. Sennett; it is one very frequently felt by ourselves, though it, no doubt, most often occurs to one who has occupied the position of instructor and lecturer in marine engineering. No one book could be recommended, and though this one of Mr. Sennett's may be admitted to go very much farther in satisfying all the requirements of a student of marine engineering than any that has gone before it, it will still be found necessary to recommend to students some other books to supply information on subjects not treated in this.

The author has divided his subject into six chief parts; Part I. is introductory, and treats briefly of the modern history of the marine engine, of work and efficiency, the nature and properties of heat, and, as he puts it, the addition of heat to water. Part II. is on the boiler, and treats of combustion of coal and economy of fuel, the arrangement and efficiency of boilers, their fittings and mountings, and their corrosion and preservation. Part III. is entitled "The Steam," and deals with its efficiency as used in the engine, the methods of increasing the expansive efficiency of steam, compound engines, and condensation of steam. Part IV. is on "The Mechanism," and deals with regulating and expansion valves and gear, slide valves and fittings, and starting and reversing gear, cylinders and their fittings, condensers and fittings, rotary motion, and details of compound engines. Part V. is on "The Propeller," under the heads propulsion, coefficients, and curves of performance, paddle wheels, and screw propellers; while Part VI. is general, and treats of the indicator and diagrams, pumping and water-tight and fire arrangements, auxiliary machinery and fittings, care and management of machinery and materials used in construction. An appendix deals with theoretical indicator diagrams of compound engines, geometrical representations of the twisting moments on crank shafts, effects of the inertia of the reciprocating parts of engines, and examination questions.

From this description of the contents it will be seen that the author first deals with heat, how it is obtained, how and in what apparatus it is employed in the generation of steam, how it is used and the details of the engines by which it is used, the practical efficiency of the steam generator, of the steam itself as the medium by which heat is converted into work, the efficiency with which the engine uses that steam, and the efficiency of the propellers worked by the engine, being at the same time discussed. After going carefully through the whole book with the object of finding faults, we must say that on the whole we have failed.

At the end of the brief but clear chapter in explanation of the "addition of heat to water," a diagram is given to illustrate the three stages in the evaporation of water, the diagram consisting of three vertical cylinders containing a piston, and the first a small quantity of water supposed to to be raised to the boiling point under the pressure due to the weight of the piston. This is to represent the addition, to use the author's words, of sensible heat; the second cylinder has a smaller quantity of water and some steam, the piston being raised to about half the height of the cylinder; this is said to show the addition of latent heat. The third shows no water, but it is full of steam, and the piston is at the top, and this is to illustrate total heat. Now, this may be said to be a little misleading, inasmuch as in cylinder No. 2 the latent heat has not been added, for the water is only partly evaporated, and heat will become latent until this has taken place, so that cylinder No. 2 is not wanted. It ought to be clearly understood that the term "latent heat" is only a convenient expression, the heat said to become "latent" really having been expended in doing work by separating the molecules of water, so that strictly speaking the heat has ceased to exist, and we have another form of energy in its stead. In the chapter on boilers, the author devotes more attention to those questions which appeal to the experienced engineer than to the student, though the latter will only require assistance from special treatises for information on details of construction, the apportionment of areas, and the determination of strains. It is impossible, perhaps, for one theoretically and practically acquainted with his subject, as the author seems to be, to treat a subject without unintentionally assuming a certain familiarity on the part of his readers with the elementary, theoretical, and practical questions involved, especially when, as in the book before us, the author directs himself specially to the most recent practice in his subject. Thus, although this chapter is thoroughly satisfactory to the marine engineer, it leaves the student in the dark on some of those questions which would immediately occur to him as soon as he attempted to make a working design for a boiler.

In the chapter on the efficiency of steam, the various causes of loss of efficiency, as by condensation at different ranges of expansion, condensation due to the performance of work, and the fall of temperature due to fall in pressure on exhaust into the receiver, and afterwards into the condenser, are treated at length, and by his frequent reference to the experiments made by Isherwood, he shows the value of the very complete and extensive investigations made by that accomplished engineer; and while proving the greater efficiency of steam used in the modern compound engine, admits that it is not fair to compare compound engines working with 60 lb. steam with simple expansive engines working with 30 lb. steam. In that part of the book which deals with "The Mechanism" the author illustrates his explanations in every case with diagrams made from working drawings, and in no case does he resort to the misleading diagrams of which we have had to complain in some text-books. The student sees nothing in the whole book which he will have to unlearn. On the other hand it is questionable, from the students' point of view, whether the author's arrangement of the order of description of the parts of engines and their functions is the best. From the statement of contents given above, which follows the order of their treatment in the book, it will be seen that he commences with the regulating and expansion valves and gear, because these first deal with the steam. The experienced engineer will be quite satisfied with this; but it would have been better for the student, or those students not under the teaching of the author by lecture, that a general description of a complete engine and the functions of its parts should have been first given, for until the student knows the relative functions of the parts he cannot understand the value of those parts, or of the special information conveyed respecting them. The author has not, however, given a single complete illustration of a marine engine. This is a loss to the student, but not to the practiced engineer, for the latter has full information on general arrangements from his own experience, and from the practice of others as continually placed before them with all modern improvements in our pages.

In the chapter on materials used in construction, several pages are used on matters of metallurgical rather than mechanical interest, thus occupying space which in a future edition will be much better filled with information and drawings, the need of which we have referred to.

There being nothing more in the book which admits of fault-finding, and as we cannot deal with its whole contents, we must refer our readers to the volume itself, and we can confidently recommend it as most satisfactorily occupying a place which has long remained unfilled, and as one which reflects much credit on the printers and publishers, although the index might have been more complete.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending Dec. 2nd, 1882:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 8219; mercantile marine, Indian section, and other collections, 3143. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 4 p.m., Museum, 1188; mercantile marine, Indian section, and other collections, 757. Total, 13,307.

SEWAGE DISCHARGE.—The Royal Commission on Metropolitan Sewage Discharge met on Tuesday and Wednesday, at No. 11 Committee-room, House of Commons. Present:—Sir P. Benson Maxwell—in the chair—Sir John Coode, Colonel C. B. Ewart, C.B., R.E., Professor A. W. Williamson, F.R.S., Dr. De Chaumont F.R.S., Dr. Stevenson, Mr. James Abernethy, F.R.S.E., Dr. W. Pole, F.R.S., secretary. Further evidence was given on the par of the complainants.

ELECTRICAL ACCUMULATORS OR SECONDARY BATTERIES.

By Professor Oliver Lodge.

No. IX.

The coatings of both plates being now fully formed, the one all peroxide, the other all metallic lead, the gas which is liberated against their surfaces is no longer absorbed, but begins to rise in considerable quantities, at the same time that by making the plates into a gas-battery the free gas adds distinctly to the electro-motive force of the cell. The fulness of the cell can therefore be told in these two ways—a greater escape of gas and a higher opposition electro-motive force than usual.

The proper or "ohmic" resistance of the cell is now a minimum, however, for three reasons—because the conducting surfaces, the front surface of the peroxide and the front of the reduced lead, are as near as they can possibly be; because the acid in the solution is as concentrated as it can become, that which had been absorbed by the lead having been restored; and because the cell will have been warmed by the charging current. The cell is therefore in all respects at its very best, and it can give a tremendously powerful current for a few seconds if called upon.

But suppose it is not called upon for a current, but simply allowed to stand idle for a time, what will happen to it? First, of course, it will cool, and thereby slightly increase its resistance; but, more important than this, the gas which is clinging mechanically to the surface of the plates will collect in bubbles and gradually rise, thus lowering the electro-motive force from its abnormal value. The gas which first escapes, however, will be the oxygen; a large quantity of hydrogen will remain half alloyed with the lead plate, more especially perhaps if it is amalgamated, and accordingly the electro-motive force, though it loses its abnormal value, retains a perfectly satisfactory one.

No further change of importance need be expected to be noticed after the lapse of several minutes or even an hour; but if the cell is set aside for a day or two a more serious change sets in. The front surface of the lead loses some of its hydrogen and is liable to be corroded slowly by the acid, a slight scum of insulating sulphate being produced; and these changes, though they go on with extreme slowness in a good cell with its terminals properly insulated, yet are exceedingly weakening when they do occur, because they lower the electro-motive force and increase the internal resistance at the same time. A plate well saturated with hydrogen, however, will resist the formation of any such scum for a considerable time, and I see no reason why it should form in any quantity for a week or so, provided there is no leakage between its terminals. I apprehend, however, that a temporary short-circuiting of the full cell before setting aside, whether for the purpose of testing or for other purposes, would have a detrimental effect by diminishing the store of hydrogen; and that a cell so treated would not bear standing idle quite so well as a perfectly full one.

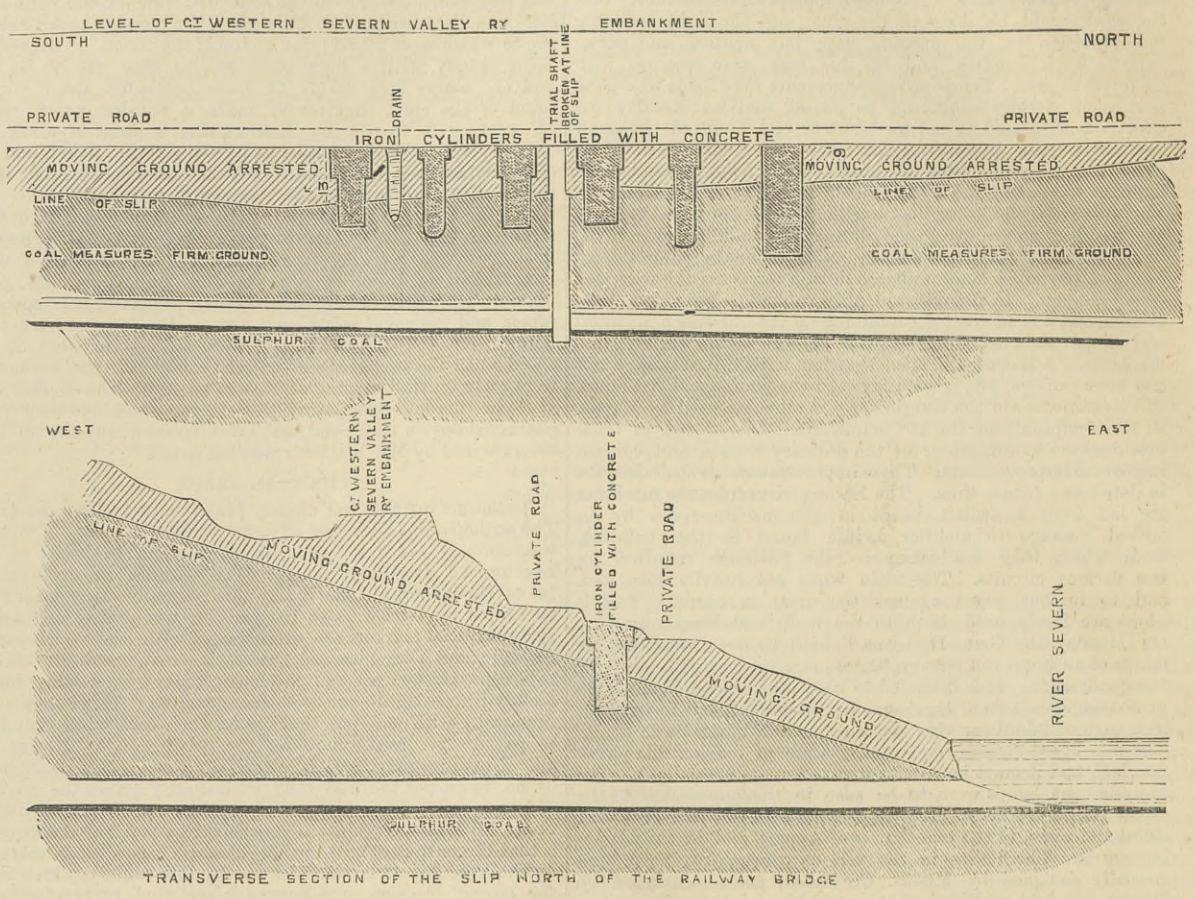
The main part of the change which occurs during standing seems to take place at the + plate. Here the peroxide is in contact with and supported by a plate of metallic lead, and the peroxide is sufficiently porous to allow some of the acid liquid to penetrate to the junction of the two substances; hence there is here a complete battery, and accordingly a certain amount of local action sets in, some of the lead becoming oxidised and sulphated, while some of the peroxide gets partially reduced. If this action goes on to any general extent it is most disastrous, for the effect is to establish a non-conducting film or layer, of sulphate and lower oxides, between the lead plate and the rest of its peroxide coating; and it may sometimes happen that the coating is thus completely detached from the plate so as to become quite useless. But suppose it only gets detached in patches, the internal resistance will thus be increased, and the storage capacity will be diminished almost by the total amount so detached, but the electro-motive force would not be likely to be diminished until the effect of the local action had extended itself through the whole *thickness* of the peroxide. After a long time it probably would so extend itself, and thus the peroxide would get reduced by mere standing without any current having been demanded from the cell.

Messrs. Gladstone and Tribe have called attention to this local action, and pointed out one reason why it goes on more slowly than might at first sight have been expected, viz., that the crust of sulphate formed on the lead protects it by its insulating power, and only permits deeper portions to be acted on by reason of its porosity. Another reason why the action is not at all rapid is that the surrounding mass only permits a very insignificant amount of circulation in the liquid, so that it soon gets exhausted of its acid, and is only slowly replenished by diffusion. Still the local action does go on more or less rapidly, and it is, so far as I know, the main cause of the loss of power of the cell while standing. Moreover the differences noticed among different cells seem to depend very greatly on the facilities which some seem to offer to this action, and to the consequent greater or less detachment of the peroxide coating. Why the coatings detach themselves in some cases more readily than in others is by no means clear; but it may happen that a too rapid evolution of gas, caused by a too powerful charging current, might mechanically effect a separation between the plate and its coatings. It must be remembered, however, that the coatings may easily become electrically detached by an insulating film—especially in patches—and yet their mechanical adherence may remain almost unimpaired.

The naturally occurring cure for these evils would be either to support the peroxide on carbon, or other such non-attackable substance, or else to use no support at all, but to make the plate wholly of peroxide. But though the use of carbon would do away with local action, scarcely any form of carbon can resist the action of nascent oxygen, and accordingly its surface crumbles during charging, and the powder makes a worse barrier than ever to good conductive connection between the plate and its coatings; in fact, the coatings are liable in time simply to drop off. The use of peroxide alone looks hopeful, but when the cell is discharged and the peroxide reduced, the plate will no longer be a conductor, and it does not appear probable that such a cell could ever be charged up again. Moreover the difficulties of making good and permanent contact with such non-metallic substances are considerable, and their use would therefore be very inconvenient.

Liverpool. O. J. L.

LANDSLIP AT JACKFIELD, SHROPSHIRE.



TRANSVERSE SECTION OF THE SLIP NORTH OF THE RAILWAY BRIDGE

STOPPING A LANDSLIP IN SHROPSHIRE.

The narrow gorge of the river Severn, about three miles in length, extending from Coalbrookdale to Coalport, has, from time immemorial, been the subject of landslips of greater or less extent, and of slow or rapid progress. The deep V-shaped valley has been cut through the soft coal measures, and the *débris* or talus from their subaërial degradation to a large extent obscures the actual escarpment. Six or seven slips are taking place at the present time within a distance of a mile and a-half. It is the exception for the coal measures to break away *en masse*, and the slips are for the most part the result of the downward movement of the surface talus over the scarped face of the coal measures.

Such a slip has existed for many years a little to the south of the New Jackfield Church, and was much increased by the formation of the embankments of the Severn Valley Railway. It caused the destruction of several cottages, and has been a constant source of expense to the Great Western Railway Company in the maintenance of its line, as well as to the parish and the neighbouring proprietors in the repair and renewal of roads. The landslip at this point has gradually approached the river Severn both on the Jackfield and the Madeley banks, and its bed has thereby been contracted to less than half its original width.

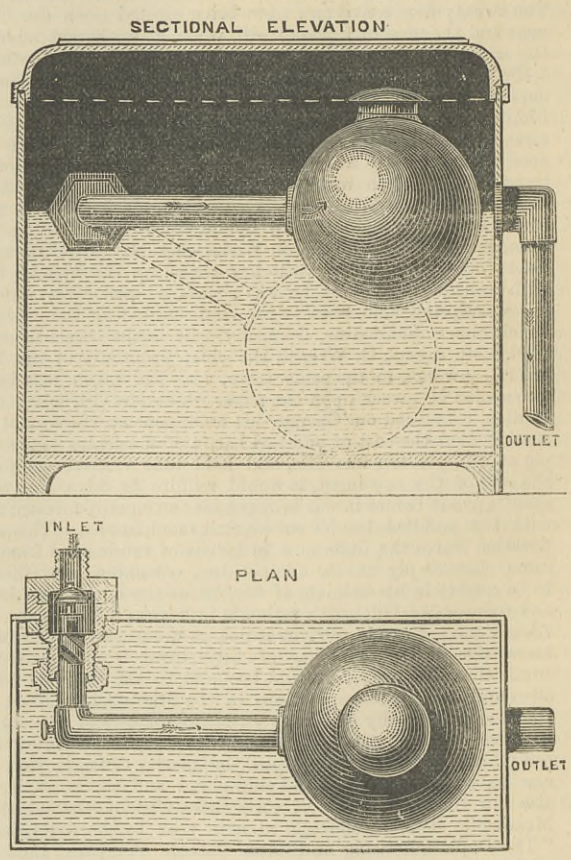
A proposal was made about a year and a-half ago to stop the landslips by means of a retaining wall, but this had to be abandoned on the ground of expense. As the approach to the New Benthall Encaustic Tile Works was seriously endangered, Messrs. Maw about a year ago experimented on a method of arresting the slips, and as this has now been carried out to a successful issue at a very small cost, and is of a novel character, we give a description of Messrs. Maw's operations, which has been drawn up for us by Mr. G. Maw.

Mr. Maw writes:—"The landslip we had to deal with extended for a distance of 190 yards on the side of the valley between the river Severn and the Great Western Severn Valley Railway. The slope of the valley side at this point is about 20 deg. The depth of the slip was unknown, and no record has been kept of its rate of movement. The movement was not continuous along the length of 190 yards, as the foundations of a timber bridge under the adjacent railway appear to have arrested it for a short distance, and the movement was divided into two separate slips, one to the north and the other to the south of the Jackfield Pile Bridge, separated by a length of about 35 yards of stable ground.

"Our first effort was to ascertain the depth to which the movement was taking place, which was done by the sinking of a small shaft carefully bricked 16 yards deep. Within a few days of its completion the forward movement of the top of the shaft to a depth of 10½ft. over the lower part of the shaft in stable ground was apparent, and the rate of the movement, registered by a self-acting scale designed for the purpose, was found to average about 70in. a year. Abandoning the idea of a line of continuous support, our endeavour was to break up the line of slip by inserting strong supports at intervals, which would prop the moving mass in its entirety, or divide it into sections too narrow to move forward separately. The accompanying sections indicate the position of the supports, which consist of iron cylinders placed at intervals of 20ft., from 4ft. to 6ft. in diameter and from 12ft. to 20ft. in length, sunk from 7ft. to 12ft. into the solid ground below the line of movement, and reaching to within a few feet of the surface; these were filled with concrete, and the concrete brought up to the ground level. The interspaces being but 15ft., it is obvious that separate sections of the slip 20ft. wide could not squeeze in between them, and that the arrest of the slips would depend on the collective stability of the supports. In the slips to the north of the railway bridge the four central columns were first inserted as an experiment, and although these only afforded actual support to 22 yards in the middle of the slip nearly 100 yards in length, their effect was to arrest the movement of the entire length of the slip. The total cost of our operations on the two slips was under £280, including the cutting of two deep drains and the sinking of the preliminary trial shaft. The iron cylinders used for enclosing the concrete were old boiler shells."

THE LANCASTER STEAM TRAP.

We illustrate herewith a new patent high-pressure steam trap, manufactured by Messrs. Lancaster and Tonge, Pendleton, Manchester. It is claimed to possess the advantage over all others, that by the loose valve combined with the cam motion, all sticking is absolutely avoided. Its action is as follows:—When open, the ball has dropped to the dotted line shown, and all the condensed water in the pipes flows out through the ball in the direction of the arrows. On steam entering, it drives the water



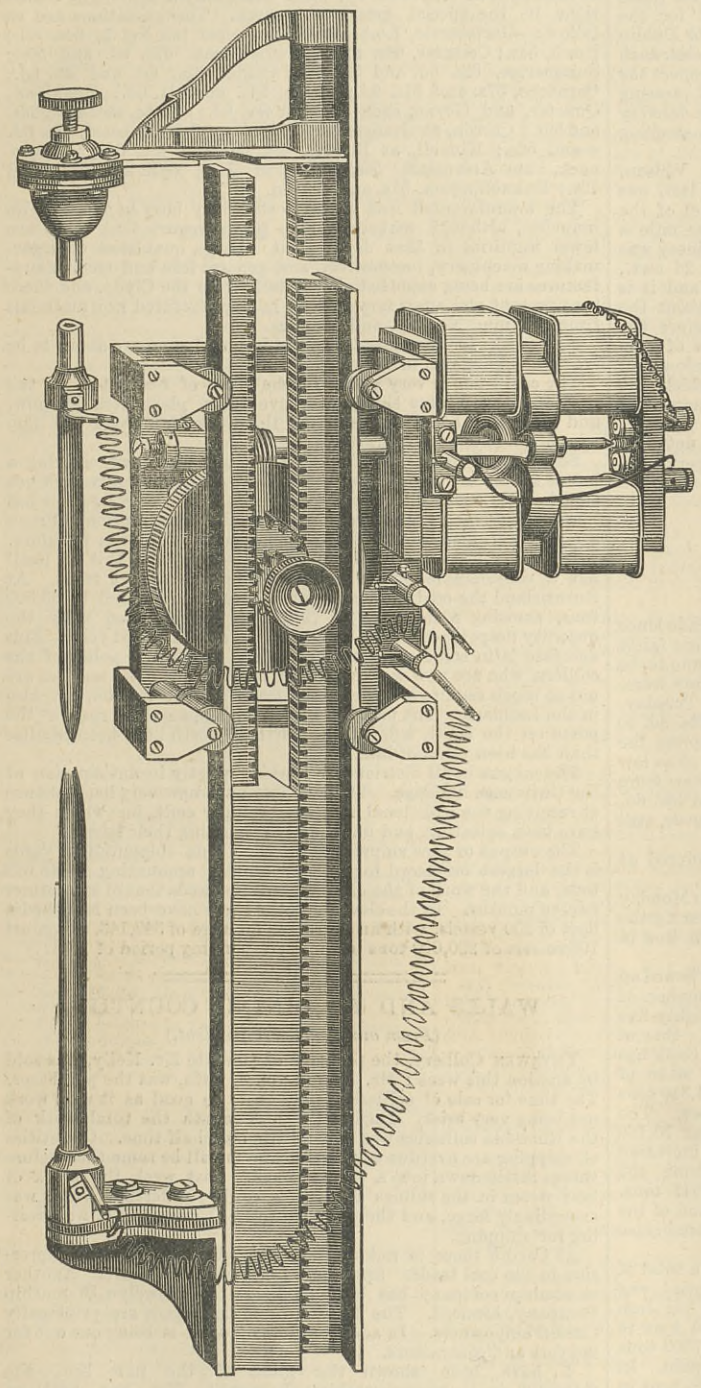
out of the ball, and the ball rising by its own buoyancy closes the valve. When the steam in the ball condenses, it forms a vacuum, and the water from the trap entering through a small hole in the ball, fills it, and the ball sinking, opens the valve, rising again when the steam enters. Messrs. Marshall, Son, and Co., Gainsborough, have, we understand, decided to use them with all their engines.

Diaries for 1883.—We have received from Messrs. Letts, Son, and Co., a number of their diaries for 1883. These as usual are compiled and arranged with information and space to suit the special requirements of different professions, and for domestic and general requirements. They comprise diaries of several forms and sizes, including folio, quarto, octavo, and pocket diary sizes, with and without interleaved blotting paper, and with different numbers of days per page. Referring to the pocket-book diaries, it may be suggested that a pocket diary 3¾in. or 4in. wide and 6in. or 6½in. long, with three days on a page, and with no space occupied with the usual diary information, would make a thin convenient pocket-book, most useful to a large number of business and professional men who do not care much about lists of bankers, customs, and other such things, but want a book, which being thin, takes less room than a book half the area, but double the thickness.

ON A NEW ARC LAMP.*

By PROFESSOR G. FORBES.

THIS arc lamp was designed specially as a lighthouse lamp, with the light fixed at one point, and suitable for currents of great quantity. The carbons are supported on racks, which are worked by two pinions, one being double the diameter of the other. These pinions are both on the same axis, together with a third and large-sized toothed wheel. All these are insulated from each other. In this toothed wheel a worm screw acts, and by its rotation in one direction or the other causes the carbons to approach or recede. This toothed wheel can be released from the two pinions by means of a nut on the axis, so that the carbons can be rapidly separated or brought together. The other end of the worm screw forms the axis of a Gramme ring, wound with one layer of insulated No. 10 wire, and the outer surface of the wire is laid bare, so as to act as a Gramme commutator, contact being made with two brass rollers instead of brushes. The ring is fed by these rollers by a shunt on one of the wires leading to the lamp. The Gramme ring is surrounded by two field magnets, one of which is on the main circuit, and, when acting on the Gramme ring, tends to separate the carbons; the other field magnet is on a shunt on the arc, and made with very thin wire, and when acting on the Gramme ring tends to make the carbons approach. On sending a current through the lamp, the carbons are at first in contact. The field



magnet through which the main current passes then acts on the ring—through whose coils a powerful current is always passing—and separates the carbons so as to strike the arc. If the arc becomes too long the shunt field-magnet becomes the most powerful, and acting on the ring causes the carbons to approach. If the current happens to increase in intensity the resistance of the arc immediately diminishes, and the field magnet on the arc circuit becomes more powerful and separates the carbons. This is essential in a lighthouse lamp to prevent flickering and sputtering, but the variable resistance of the arc has hitherto received far too little attention. I have had experiments made on an arc of fixed length—4 mm.—and with carbons 13 mm. diameter. By varying the strength of current and measuring the resistance, I found that the charge in the one was proportional to the charge in the other, and I found the following formula to satisfy all currents between 15 + 30 Ampères :—

$$R = 0{\cdot}7 + (30 - C) \times 0{\cdot}93,$$

where R is the resistance of the arc in ohms, and C is the current in Ampères. The support of this lamp may receive a slight movement up or down to counteract the effect of an irregular consumption of the carbons. The body of the lamp is not in the circuit, so that a shock cannot be got by handling it. The lamp is not patented.

THE INSTITUTION OF CIVIL ENGINEERS.

AMERICAN PRACTICE IN WARMING BUILDINGS BY STEAM.

AT the third meeting of this session held on Tuesday, the 28th of November, Sir F. J. Bramwell, vice-president, in the chair, the paper read was on "American Practice in Warming Buildings by Steam," by the late Mr. Robert Briggs, M. Inst. C.E., of Philadelphia, United States.

Originating about 1840 with the late Mr. Joseph Nason, the application of steam to the warming of buildings in the United States extended very rapidly, the apparatus being constructed of small and comparatively inexpensive wrought iron welded tubes, which combined a large extent of heating surface with great strength, and with facility for transmitting heat in any direction from a central source. For securing durable steam-tight joints, the tube ends were made with tapering screw threads, and a paste of white and red lead was applied in screwing up. The couplings or sockets were made of cast iron, and were tapped taper to fit the tube ends, excepting only the straight couplings, for connecting tubes in the same straight line, which were of wrought iron and tapped parallel. A table was given of the standard dimensions for the tubes, throughout the range of sizes in use, and a scale for all the dimensions of the corresponding cast iron couplings. The steam was supplied either by boilers of the horizontal tubular or Seguin type, or else by the Babcock and Wilcox water-tube circulating boiler with horizontal steam drum overhead—either kind was practically safe from disastrous explosion. The steam circulating through the warming apparatus was either live steam direct from the boiler, or exhaust steam; the two were frequently used in combination, the latter being rarely employed alone. When using live steam, the circulation was either closed throughout from communication with the atmosphere, or was open to it at certain places. In the former case the distribution of the heat was effected either by separate supply and return mains, or else by a single main for both supply and return, either with or without a longitudinal partition inside it for separating the outward current of steam supply from the return current of condensed water. In open circulation a supply main conveyed the steam to the radiating surfaces, whence a return main, suitably trapped for preserving the steam pressure, conducted the condensed water either into an open tank for feeding the boiler, or into a drain. These two systems were most generally combined in any extensive warming apparatus. The steam stop-valves, known as "globe" valves, were disc or poppet valves, worked by a screwed spindle; this construction was introduced by the author in 1849, and was immediately followed by all makers.

In respect to the radiating surfaces for diffusing the heat, three distinct classes of apparatus were in use. Firstly, apparatus for warming rooms by direct radiation from surfaces exposed in the rooms themselves. Secondly, apparatus for indirect warming by currents of air; the heated surfaces were placed in a chamber, through which a supply of air passed on its way into the room. In neither of these two methods was the warming accompanied by any systematic ventilation. Thirdly, apparatus for both warming and ventilating, arranged so that the warming should take effect upon the whole of the air admitted for ventilation. The temperature comfortable to Americans in cold weather was about 70 deg. Fah. on the Atlantic coast, rising to 80 deg. or 85 deg. for inland localities. In warming by direct radiation, the practice for many years was to arrange the steam pipes in lines or groups along the bottom of the outside walls or under the windows. But the most recent practice, for rooms in mills, was to suspend the direct radiating pipes in rows overhead. Although the heat would here apparently be expended in the top of the room, yet very satisfactory results were thereby obtained, both in equability of warming and in efficiency of radiating surface. The radiators for warming by direct radiation consisted usually of so-called "coils," composed of ¾in. and 1in. steam pipes, arranged in parallel lines and coupled to branch tees or heads. Sometimes short lengths of pipe were coupled by return bends, doubling backwards and forwards in several replications one above another, and forming "return bend coils;" when several of these sections were connected by branch tees into a compact mass of tubing, the whole was known as a "box coil." In vertical pipe coils a number of short upright 1in. tubes were screwed into a hollow cast iron base or box; and were either connected together in pairs by return bends at the top, or else each tube stood singly with its top closed, and had a hoop iron partition extending up inside it to nearly the top. For getting rid of the air, a trap was provided, having an outlet controlled by metallic rods; as soon as all the air had escaped and the rods became heated by the unmixed steam, their expansion closed the outlet. For indirect radiating surfaces, the box coils were the forms most used. The chambers containing them were made either of brickwork, or often of galvanised sheet iron; the coils were suspended freely within the chambers, which were themselves attached to the the walls containing air inlet flues.

Where systematic ventilation was carried out in conjunction with warming, these indirect radiators and chambers were employed. The warming could be most effectually controlled by so arranging the chamber containing the radiator, that the whole or any part of the fresh air entering could be made either to pass through the radiator and be warmed, or to "by-pass" it and escape heating. The warmed and unwarmed currents were then mingled in a flue, whence a supply of fresh air suitably tempered flowed into the room, the occupant of which could thus regulate the temperature as comfort might require, while obtaining a constant supply of a definite quantity of fresh air. Where a blowing fan was employed for impelling a current of air through a building, a large auxiliary coil, placed at the entrance of the flue leading from the fan into the building, would be an improvement for extensive apparatus, and would save about 10 per cent. of surface, while supplying a constant volume of fresh air raised to any temperature between 50 deg. and 120 deg. An example of warming on an extensive scale was afforded by a large office building in New York, containing nearly 2,000,000 cubic feet; and by the State Lunatic Asylum at Indianapolis, containing more than 2,500,000 cubic feet. Both of these buildings were heated by steam. But such instances failed to convey any idea of the very general prevalence of warming by steam in the commercial cities of America. There appeared indeed no limit to the future extension of systematic steam supply for warming and for motive power. In an appendix were enumerated the commonly accepted data which formed the basis for computing the efficiency of the warming surfaces, the size of the mains, and the proportions of the various details; and tables were given of the formulæ and figures most generally useful for working out the practical dimensions suited to any particular application.

* Paper read at the British Association.

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

(*From our own Correspondent.*)

ORDERS for manufactured iron do not increase with the nearer approach of the holiday season. Merchants and consumers who have orders of much size to place, and as to which immediate exception is not a necessity, seem, wherever possible, to be delaying the placing of them until the holidays are over. The reports brought on to 'Change in Birmingham to-day—Thursday—and in Wolverhampton yesterday were confirmatory of this statement; and the result of this policy by buyers is that some makers of merchant sections are putting their mills on short time. Happily, however, there is little fear that the majority of the works will not keep running with steady activity right up to Christmas.

The best—thin—sheet makers were those who gave most cheering accounts. Certain of these stated that inquiries from merchants alike on home and foreign account had, during the past fortnight, decidedly improved, and additional productive plant is being laid down by one of the chief firms in the district.

Tin-plates, which go largely hand-in-hand with best sheets, are only quiet, yet makers—at any rate, nominally—stand to their former quotations. These are, for Messrs. Baldwin's qualities, to actual consumers:—Charcoals 25s. per box, and cokes 23s., delivered at outports. The production of these manufactures in this district is unmistakeably on the decline.

Galvanisers did not place many orders to-day for black sheets, yet most of them keep steadily employed. Sheets required by such consumers were again quoted on the basis of £9 5s. for doubles and £10 5s. for lattens as the minimum.

The orders on the markets for plates did not indicate briskness, yet they were a decided improvement upon a few months ago. Constructive engineers were prominent among the buyers who were offering to place contracts. Some of the offers by these consumers related to large lots. It was not in all cases easy for sellers and buyers to come to terms, but makers preferred to humour customers a little rather than allow the orders to go to other districts. £8 10s. was asked for ordinary girder plates, and £9 for superior descriptions.

The bar trade was without much alteration on the week, and the prices which I then quoted still rule. It was noticeable, however, that the competition between the first and second-class houses keeps very keen. Some of the latter were offering branded smithy bars at £7 per ton, which they pronounced were equal in all respects to bars for which the list houses are demanding at the present time £7 10s. Yet, in spite of pronouncements such as these, old customers of the list houses declined to have them.

Quietness prevailed in regard to the demand for hoops, and the American inquiries are decidedly under the average for this time of the year. Cooperage qualities were quoted at £7 to £7 5s. per ton, and nail hoops at £6 10s. per ton at works. The call for gas strip is unusually dull for the month of December, and makers, though quoting £6 15s., will not refuse orders at from 2s. 6d. to 5s. less.

No change of importance was noticeable as to pigs. Inquiries were more numerous, but these related more to future wants than to immediate consumptive necessities. The native all-mine makers quoted £6 to £6 7s. 6d., but it was not easy to obtain the figure. Wigan hematites were quoted 65s., and best South Wales and Barrow hematites 67s. 6d. to 70s. For Derbyshire and Northampton pigs 50s. was asked, and 62s. 6d. for South Yorkshire—Thorncliffe. The Kirkless Hall—Wigan—brand was 52s. 6d.

The contract for the iron roofing which is to be erected by the London and North-Western Railway Company, for the enlargement of their New-street passenger station in Birmingham, has fallen to the Bridge and Roofing Company, Limited, of Darlaston. The contract comprises some 700 tons of cast and wrought iron-work, which is required to be manufactured and fixed in nine months' time, and the area to be covered measures 16,000 square yards and is of irregular shape. The main portion of the roof will be connected by two arched spans of 60ft., and the remainder by a series of roofs of ridge-and-furrow section. It was the Darlaston Bridge and Roofing Company which successfully carried out some time ago the erection of the immense roof over the Lime-street Station, Liverpool, of the London and North-Western Company.

Nearly all forms of machinery and machine tools, together with lifts and pumps, keep in demand. Boiler-making is more active than at this time for a few years past. Roofing and bridge and landing-stage and tank work is affording plenty of employment to the rivetters; but activity in the open yards is interrupted by the weather. Few heavy chain-makers have cause for complaint; while anvils and vices are selling well by the best firms.

The South Staffordshire Mines' Drainage Commissioners on Wednesday gave formal sanction to the scheme already reported of vesting the executive in a triumvirate, consisting of Mr. Walter Williams, chairman of the commission; Mr. Walter Bassano, and Mr. Edmund Howl. The chairman's address to the arbitrators on November 11th was severely criticised by several members, reference being made to it as "a charge to the grand jury." That address was in favour of the abolition of graduation of mines drainage rates, on account of the pressing necessity for funds felt by the commission.

The colliers in the Cannock Chase district have now begun the series of meetings which it was recently determined should be held throughout the coal-field upon the question of wages and organisation. At the gatherings which have, up to the present, been held, the men have manifested their willingness to aid in starting a union.

A fire occurred at the Oxford Tool Works, Smethwick, of Messrs. Tangye, Limited, during the early hours of Friday last. The fire originated in the lower storey, in which the machinery which drives the gearing in the works was situated. This machinery was much damaged by the water from the fire engine. The total damage, estimated at about £1000, is covered by insurance, and only a portion of the works has had to stand for a few days.

The South Staffordshire and East Worcestershire Institute of Mining Engineers resumed their discussion on Monday upon the lime process of getting coal. At the same meeting a discussion took place on a paper read at the last meeting on Messrs. Tangye's Wilson gas producer. Mr. Johnson, sen., spoke highly of the producer from an economical point of view, and there was a general belief that for firing boilers the best possible results were obtainable. The gas generated was cheap, and kept up a uniform heat along the whole surface of the boiler.

The South Staffordshire and East Worcestershire Trades' Council have passed a resolution condemning the action of the nailmasters in refusing to meet the operatives in the trade to discuss the question of arbitration. Upon the subject of female labour, the Council have resolved that in their opinion the matter calls for legislative interference, and the secretary was instructed to bring the subject under the notice of the Parliamentary Committee of the Trades' Union.

The Town Council of Birmingham on Tuesday approved a recommendation of the Finance Committee, asking that they might be allowed to advance a total of £257,131 to the following authorities:—The Birmingham, Tame, and Rea District Drainage Board, £215,500; the Board of Guardians, £30,600; and the School Board, £11,031. The loans are let out at about ¼ per cent. less rate of interest than it is calculated the authorities would have to pay if they went into the open market.

A deputation from the Royal Agricultural Society has just visited Shrewsbury, to inspect the proposed site for the holding of the show in 1884. The sites were shown to them by the Corporation—one being the Race-course, and the other at Old Heath, which was the site selected in 1872. The Corporation explained that the Race-course would be the more convenient position for the town, and the deputation expressed themselves as fairly satisfied with it, providing that it was enlarged for the occasion by the addition to it of some meadow land adjoining.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—The almost complete stagnation of business in the iron market, to which I have referred in previous reports, continues, and during the past week there has been practically little or nothing doing. Buyers are still holding back for lower prices, but makers, although business cannot be done at present rates, show a degree of firmness which does not seem to have been expected. Here and there weak sellers are to be found who, if good orders were offered, would be prepared with some substantial concession to the buyer; but makers as a rule are not pressing sales, and prices nominally may be said to be without change.

At Manchester on Tuesday there was again an exceedingly quiet market. Inquiries either for pig or manufactured iron were of the most limited description, and orders were only given out as a rule for small parcels to cover pressing requirements. For Lancashire pig iron makers were still asking 49s. for forge and 50s. for foundry less 2½ delivered equal to Manchester, and although no orders are

being booked at these figures sellers are very firm, and show no present anxiety to secure business. For district brands prices were also unchanged, Lincolnshire being quoted at 49s. to 50s., and Derbyshire at about 50s. to 51s. less 2½ delivered here, but for the last week or two there has been really no business done on the basis of these figures. Some of the makers would, I hear, be open to offers, and where any transactions are reported they are for odd lots at considerably under the quoted rates. A sale of Derbyshire forge iron, which I heard of, was at a figure as low as 47s. 6d. per ton. Middlesbrough makers appear to be pushing in this district, and north-country brands have been offered here during the week at low prices—50s. 4d. per ton net cash delivered equal to Manchester is the price which I have seen quoted.

In the finished iron trade there has been very little business stirring, but the inactivity in this section of the market can scarcely be said to be due in any great measure to the American collapse. This certainly has had the effect of checking shipments, but still moderate American inquiries for hoops, and sheets, and bars have been coming forward, and there is a disposition to regard the stoppage of ironworks in the United States as tending rather to help makers here than otherwise. The absence of business at present is due to the prevailing impression that prices will have to come down; but although some of the local makers are in want of orders, there is a strong determination to hold to present rates. For bars delivered into the Manchester district the minimum quotation remains at £6 10s., although no doubt good specifications could be placed at under this figure; hoops average £7 2s. 6d., and sheets £8 10s. to £8 12s. 6d. per ton.

Although some branches of engineering, such as locomotive building and tool making, as I have noticed in previous reports, continue very busily employed, taking the trade generally I find a somewhat despondent view with regard to the prospects for the future entertained in not a few quarters. There is not much indication of any large amount of general engineering work coming in, and at some of the establishments the number of hands employed is being gradually reduced.

Amongst the special tools in hand at Messrs. Craven's works referred to in my last week's "Notes," and of which a few additional particulars may be of interest, I may mention a powerful planing machine, designed for marine work, and constructed to plane 25ft. long, 10ft. wide, and 10ft. high, and arranged with a cross-cutting motion to plane at right angles to the table, which is somewhat of a novelty in this class of tool. This motion is driven by independent gearing to that actuating the motion which traverses the table, and when at work the cross slide is self-acting vertically on the face of the standards, and capable of planing an object 10ft. square at the ends. The weight of the machine is 75 tons, and it is constructed of exceptional character for dealing with the large engine blocks in the heavy class of stationary engine work now turned out. Two of these machines, I understand, have recently been made for Lancashire engineering firms.

After preliminary preparations extending over a period of something like twelve months, the British Electric Light Company, which has entered into arrangements for lighting the Manchester Royal Exchange by means of electricity, brought the new system into permanent operation for the first time on Friday last. The new pattern Brockie arc lamp constructed on the compensating principle was also introduced for the first time for public illuminating purposes, and nine of these lamps, each of 3000 nominal candle power, are employed for lighting the large central hall. For the side corridors and offices the British incandescent lamps are used, and of these there are about 300 arranged in circuits of 75. The main entrance to the building is at present lighted by one Brockie arc lamp, but two additional lamps are to be added. The generating station is in the basement under the Exchange, and the Gramme machines are driven by a 20-horse power Watt's engine. Mr. Emmerson, of Stockport, has had the supervision of the lighting arrangements, which have been carried out from the design of the Hon. R. Brougham, the company's engineer. This is the most important step in the direction of electric lighting in Manchester, and it is to be hoped it will prove more successful than the attempt made by the same company some time back at Liverpool. There has certainly been no unnecessary haste in completing the arrangements, but even yet some of the details of working do not seem to be altogether satisfactory. The arc lamps give good results in the central hall, but in the corridors, where the incandescent lamps are not so effective, some alteration of the arrangements will probably be necessary, and in the meantime the gas fittings being left intact suggest a very prominent precaution against any risk of failure necessitating a return to the old system.

The coal trade continues very quiet for the season of the year. Colliery proprietors certainly are rather better off for orders than they were at the commencement of last month, but all classes of round coal move off very indifferently, and where the pits are not working short time, which in many cases does not exceed four days a week, stocks are accumulating. In the Manchester district prices are being maintained, but in West Lancashire there has been a pretty general giving way of 6d. to 9d. per ton on round coal from the full extent of the November advance, and the average prices at the pit mouth are about 10s. to 10s. 6d. for best coal, 8s. to 8s. 6d. for seconds, and 6s. to 7s. for common round coals. Engine fuel is without material change, burgy fetching 4s. 9d. to 5s., and good slack 3s. 6d. to 3s. 9d. per ton at the pit.

Shipping is only quiet, and delivered at the high level, Liverpool, or the Garston Dock, steam coal does not average more than 8s. to 8s. 6d., and seconds house coal 9s. to 9s. 6d. per ton.

Barrow.—There is no change for me to note in the hematite pig iron trade this week. The demand is quiet, and all classes of iron are having but a small sale. I am told, however, that makers are keeping up the output, and that owing to the heavy deliveries made there is no increase in the stocks. Bessemer iron is being consumed very largely by the steel makers of the district, and forge iron will no doubt soon be bought more largely, as there is an increased inquiry for forward delivery of the lower numbers of hematite. Makers are of opinion that there will not be much alteration in trade until about March of next year, when on both home and foreign account they anticipate a good business. The quotation of mixed samples of Bessemer is from 56s. to 57s. per ton net, three months' delivery, and No. 3 forge, 54s. to 55s. It has come to my knowledge that on colonial and continental account the inquiries of steel rails are very large. Shipbuilders, I am told, are well supplied with orders. Iron ore is in good request at from 13s. to 14s. per ton at mines. Coal is in good demand at unchanged prices for domestic and manufacturing purposes, although little is done on shipping account.

Messrs. Caird and Purdie, shipbuilders, Barrow-in-Furness, are making great extensions at their graving dock shipyard. They are not only enlarging their premises with a view to being able to construct larger tonnage shipping, but are preparing the plans for the erection of a marine engineering and boilermaking department, and for this purpose they have taken into partnership Mr. J. W. Burns, who is well known in the latter branch of the business. The scheme of extension includes the enclosure of a graving dock 500ft. long, and a fitting-out dock of the same length 150ft in width.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

One of the leading collieries in the South Yorkshire district, which sends the largest tonnage of Silkstone coal to the London markets, is now working only three days a week. This is the result of the relapse in the London and provincial markets, which has caused a glut of coals and consequent weakening of the prices. The miners, who are making efforts to artificially restrict the output, are thus finding themselves immediately affected by a natural restriction following the lessened demand.

The Claycross Colliery Company has resumed the work of getting coal at the Parkhouse Colliery at Danesmoor, where forty-five lives were lost by the explosion last month. On Saturday 300 Belgian lamps arrived at the colliery, where they will be used in the future. No naked lights have been permitted in any part of the mine since the explosion. The distinctive character of the Derbyshire coalfield for safety has been rudely dispelled by the lamentable disaster, and colliers who left the fiery Barnsley seam of South Yorkshire for the safer workings of Derbyshire are not likely for some time to be so certain of their immunity from peril as they were.

At the Butterley Company's pit, near the Grange, part of the upcast shaft fell in on Monday, causing an interruption to the ventilation. The men had commenced work at both pits, but the managers found it necessary for work to be ceased. No one was injured.

It is no secret that the American trade has suddenly and seriously fallen off. How much the collapse has affected Sheffield will not be shown till the return of exports to the United States is published for the quarter ending December 31st. I know for a fact that steel rails, which formed a portion of the exports, are scarcely being sent at all, and that several of the steel houses are also adversely affected. The cutlery establishments have not felt the change so severely. Fortunately the days are passed when America was the key to the Sheffield trade, and languor across the Atlantic meant depression and suffering here. Experience has taught our manufacturers to find fresh markets elsewhere.

The Irish trade is puzzling. The manager of a leading silver and electro-plated establishment, doing perhaps the largest home trade in the country, tells me that the Irish demand for the luxurious class of goods is remarkably brisk, the call for Dublin being exceptionally heavy. Manufacturers of useful articles, such as edge tools, files, saws, cutlery, and general hardware, report the very opposite. As a rule good houses are very chary of pressing for orders in the present state of Ireland. Cash before delivery acts as a deterrent to speculation, and does not encourage stocking even for Christmas.

The accident at the Carlisle Steel Works—Messrs. Wilson, Hawksworth, Ellison, and Co.—briefly referred to in my last, was much more serious than at first reported. The fly-wheel of the rolling mill, revolving at a speed of one and a-quarter mile a minute, suddenly snapped, with the result that the machinery was almost completely destroyed. Pieces of iron, weighing 26 cwt., were hurled through the roof into an adjoining yard, and it is estimated that 100 tons of broken metal are strewed about the mill. It is believed that three months will elapse before the rolling mill will again be in operation; but the resources of Carlisle Works are so complete that even this breakdown of machinery—perhaps the biggest thing of the kind which has ever occurred in Sheffield—will not be permitted to materially interfere with their business.

Electric lighting is being rapidly adopted in Sheffield, not only by engineering and other establishments, but in the drapery, provision, and other trades.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

Business has been almost at a standstill in the iron trade since my last report. The ironmasters' returns for November are fairly satisfactory, and good inland deliveries of pig iron continue to be made. Prices are nevertheless decidedly weaker than they were. At the Cleveland iron market held at Middlesbrough on Tuesday, merchants' quotations for No. 3 G.M.B. ranged from 42s. 9d. to 43s. per ton. Some of those who appeared anxious to depress the market are said to have disposed of one or two small lots at as low a figure as 42s. 6d. per ton. A good many makers are now more inclined to sell than they were, and on Tuesday accepted 43s. 6d. for No. 3 for a few lots. The leading smelters are, however, still firm, and will not take less than 44s. per ton.

Warrants are unsaleable, although No. 3 quality is offered at 42s. 6d. f.o.b.

The stock of Cleveland iron in Messrs. Connals' stores on Monday night was 100,811 tons, being a reduction of only 50 tons during the week. The same firm now hold 611,825 tons of Scotch iron in their Glasgow stores.

The Cleveland ironmasters' returns for November were issued on Monday last. They show that there is the same number of furnaces at work as in October, namely, 121. Of these eighty-five are working on Cleveland and thirty-six on hematite pig. One of Messrs. Bolckow, Vaughan, and Co.'s furnaces at South Bank has been changed from hematite to Cleveland iron. The make of Cleveland pig iron by the whole district amounted to 154,340 tons for the month, being 1814 tons less than in October. The output of spiegel, hematite, and basic pig iron was 70,186 tons, being a decrease of 3891 tons. Makers' stocks increased 2344 tons, but makers' stores decreased 1913 tons during the month. The stock in the warrant stores decreased 2047 tons. The total quantity of pig iron in stocks and stores at the end of the month was 237,446 tons, being a net reduction of 1616 tons since October 31st.

The shipments of pig iron for November only reached a total of 67,298 tons, but the quantity of manufactured iron shipped was qnite up to the average, being 29,436 tons. Of the pig iron 24,215 tons went to Scotland; 6373 tons to Wales; 4405 tons to Newcastle; 5998 tons to France; 2655 tons to Belgium; 7509 tons to Germany; 7980 tons to Holland; and 4162 tons to Spain. In October 99,645 tons of pig iron were exported, and 100,838 tons in September.

Business is very slack in the finished iron trade and prices are less than a week ago. Some makers have a difficulty in obtaining specifications to keep their mills going fully, and it is not unlikely that one or two of the plate mills may be stopped for a time on this account. Ship plates are now £6 10s. to £6 15s. per ton; angles are £5 17s. 6d.; common bars, £6 2s. 6d.; best bars, £6 12s. 6d.; and best best bars, £7 12s. 6d. per ton, all free on trucks at makers' works less 2½ per cent. discount. Prices of manufactured iron may, therefore, be said to be about 2s. 6d. per ton below what they were when Sir J. W. Pease gave his award.

The miners at Messrs. B. Samuelson and Co.'s Slapwath mines, Guisbrough, are about to take a ballot, to determine whether or not they shall continue to work under the award made by Mr. Buchanan, of Guisbrough. It will be remembered that two or three months ago Messrs. Samuelson and Co. had a dispute with their men with regard to the system of working by cubic measurement, and the matter was referred to the above gentleman. The men have worked loyally under the award, which expires next week. They are now expressing themselves dissatisfied, alleging that the management have continued to calculate the wages on the old system.

Messrs. Bell Bros. are about to apply the electric light on a large scale at the South Brancepeth Colliery, near Spennymoor. A powerful engine has been put down which will work two large dynamo machines. It is intended to light the whole of the colliery works above ground, viz., the screens, workshops, stables, engine houses, the brickworks, &c. Wires will probably also be carried down each of the two shafts to light the bottom of the shaft and certain places underground.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The Glasgow warrant market continued very dull to the close of last week, the feeling being also very despondent on Monday, when prices fell to 48s. 1d. cash. A number of holders, discouraged by the continued downfall in quotations, began to dispose of their warrants, and this tended still further to depress the market. But on Tuesday an improvement took place, chiefly the result of the hope held out by President Arthur in his message, that the import duties into the United States may be reduced. There were also considerable purchases of a speculative nature on the part of bears, and the two things together had for the time a good effect. The shipments of pig iron during the past week have been quite satisfactory, comparing most favourably with the corresponding week of 1881. It is somewhat remarkable that the shipments to America are keeping up so well, seeing that very unsatisfactory reports have been in circulation with reference to the demand for Scotch pig iron on the other side of the Atlantic. The home inquiry for crude iron by consumers is good, although not so pressing as of late. Upwards of 4000 tons of pigs were withdrawn from Messrs. Connal and Co.'s warrant stores in the course of the past week, this being the largest decrease in the stocks for a long time.

Business was done in the warrant market on Friday forenoon at 48s. 10d. to 48s. 9d. cash, and 49s. one month, the afternoon quotations being 48s. 8½d. to 48s. 5d. cash, and 48s. 8d. one month. The market was very flat on Monday, with business in the forenoon at 48s. 4½d. to 48s. 1d. cash, and 48s. 4½d. one month. In the afternoon transactions were effected at 48s. 2d. to 48s. 3½d. cash, and 48s. 5½d. one month. Tuesday's market showed some improvement, business being done in the morning at 48s. 6d. to 48s. 9½d. cash, and 49s. one month; and in the afternoon at 48s. 8d. to 48s. 9d. cash, and 49s. one month.

Notwithstanding the weakness of the warrant market, the prices of makers' iron keep well up, there being only a few slight reductions in the special brands this week. The quotations are as follow:—Gartsherrie, f.o.b. at Glasgow, per ton No. 1, 64s. 6d.; No. 3, 54s.; Coltness, 68s. and 56s.; Langloan, 67s. 9d. and 56s.; Summerlee, 63s. 6d. and 53s. 6d.; Calder, 62s. 6d. and 52s. 6d.; Carnbroe, 57s. and 51s. 6d.; Clyde, 54s. and 51s. 6d.; Monkland, Quarter, and Govan, each 50s. and 48s. 6d.; Shotts, at Leith, 66s. and 56s.; Carron, at Grangemouth, 53s.—specially selected, 57s. 6d. —and 52s.; Kinneil, at Bo'ness, 49s. 6d. and 48s. 6d.; Glengarnock, at Ardrossan, 56s. 6d. and 51s.; Eglinton, 51s. and 49s.; Dalmellington, 51s. and 49s. 6d.

The manufactured iron trade is still very busy in most of its branches, although makers of ship plates report that there are fewer inquiries in that department. Large quantities of sugar-making machinery, locomotives, and general iron and steel manufactures are being exported almost daily from the Clyde, and there is at present also a fair import trade in manufactured iron materials from Belgium, Norway, and America.

New works for the manufacture of iron and steel are about to be erected at Langloan in Lanarkshire.

The coal trade is very active in the West of Scotland. In the past week very large shipments have taken place from Glasgow, and the orders being implemented this week for abroad are likewise of an extensive character.

Some large coalmasters report that they are now receiving a better supply of wagons from the railway companies, although not sufficient to meet all their requirements. The cold weather has likewise increased the demand for domestic consumption. Prices are very well maintained. The shipping trade is quiet in Fifeshire. The Baltic ports are now closed for the season, and this of itself has a considerable effect in diminishing the export trade. At Burntisland the coal shipments for November amounted to 63,500 tons, showing a decrease of 7900 tons as compared with the quantity despatched in the corresponding month of last year. This decrease is in some measure due to the restrictive policy of the colliers, who are now working longer hours, when their services are not so much required. The inland trade in Fife is good, and also in the Lothians. The past week's foreign shipments of coals at the ports on the south side of the Firth of Forth have been smaller than has been usual of late.

The miners in all districts are working quietly in anticipation of the Christmas holidays. Those of Fife have now very little chance of receiving the additional increase of 5 per cent. for which they have been agitating, and until lately restricting their labour.

The output of new shipping from the Clyde shipbuilding yards is the largest on record for any one month, amounting to 48,072 tons, and the work of the eleven months exceeds that of any former twelve months. In the eleven months there have been launched a fleet of 250 vessels, with an aggregate tonnage of 342,143, as against 195 vessels of 290,000 tons in the corresponding period of 1881.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

Ynyswen Colliery, the property of the late Mr. Kelly, was sold by auction this week; Mr. Howell Jones, Cefn, was the purchaser. The time for sale of collieries is not quite so good as it was, work not being very brisk. During the last month the total work of the Rhondda collieries was only a little over half time. Quantities of shipping are overdue at present, and it will be some time before things settle down into a regular track. Last week the stock of best steam in the sidings at Nixon's colliery, Merthyr Vale, was exceedingly large, and the principal cause, I understand, was waiting for shipping.

At Cardiff there is not much anxiety about the existing depression in the coal trade. Speculative movements are rife. Another steamship company has been floated — the Llewelyn Steamship Company, Limited. The directors and managers are principally Cardiff shipowners. In addition, lots of work is being cut out for lawyers and contractors.

I have been shown the plans of the new line, the "Cardiff and Monmouthshire Valleys." The line will be in connection with the Bute Docks, and have that great desideratum, ample shunting ground. It will extend about eleven miles to Risca, with connections linking it to the London and North-Western, Brecon, &c., and not only serve an undeveloped coal district soon to be in work, but existing collieries, with the large Monmouthshire ironworks. The line is a very feasible one in a speculative sense, and has been carefully surveyed and mapped. Gradients, for example, 1 in 200; nothing against the collar anywhere; and one or two small tunnels in the old red sandstone—about the best stone to tunnel through, limestone being about the worst, and the hard Pennant next.

The total coal sent from Wales during the last week amounted to 192,599, and of all the ports that of Newport, in degree, was the busiest. I am glad to learn also that the threatened strike of the trimmers has been averted. Newport too stands particularly well for 1883 placements, good contracts having been secured.

I have no change of account to report in connection with iron and steel industries. As stated previously the larger works have considerable orders yet to execute, and one in particular will keep all busy until the spring. Some good cargoes left this week; 2260 tons of rails for Melbourne, 1500 to Boston, 1289 to Aarhuus, and 300 tons to Barranguilla. Pig and manufactured iron are not in strong request. Makers are firm in prices, but I have heard of some slight reduction offered from current prices to bring about business.

Jevons and Wood, tin-plate manufacturers, of Briton Ferry, have failed; liabilities, £300,000. Some of the Welsh coal proprietors suffer severely. Nothing is yet known of the likelihood or not of a resumption of business.

The contract for the construction of the Roath Dock work, the new Bute Dock, Cardiff, has been let to Messrs. Nelson, of Carlisle. The contractors are well known from their engagements in the North, especially in connection with the London and North-Western, and also for the North-Eastern Company.

It is announced that a treaty of alliance has been formed between the Marquis of Bute and the Taff Vale and Rhymney Railways.

A salt well has been discovered on Amherst Island, Canada, and proposals were recently afloat to erect machinery for working it, as the yield of salt is said to be profitably large.

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.

28th November, 1882.

5642. FORKS or TONGS, H. J. Allison.—(*R. W. Turner, Boston, U.S.*)
5643. MASHING APPARATUS, J. A. L. and W. V. Biden.—(*N. Pigeon, New York.*)
5644. SECONDARY BATTERIES, J. Lea, London.
5645. PRIMARY VOLTAIC BATTERIES, G. André, Dorking.
5646. FIRE-LIGHTERS, F. K. de Stasicki.—(*F. A. Christ and J. Weiler, Vienna.*)
5647. MOULDING CLAY, W. Crawford, Glasgow.
5648. DRAWING, &c., WIRE, H. Roberts, Pittsburgh.
5649. ZINC-COATED WIRE, H. Roberts, Pittsburgh.
5650. CHAIRS, H. J. Haddan.—(*E. Schmidt, Leipzig.*)
5651. COMPOSITION USED as a REMEDY for WHOOPING COUGH, P. F. Vanderssteenstraaten, London.
5652. FASTENING TOGETHER the ENDS of BELTS, H. Tetlow, Miles Platting, & J. Holding, Lower Broughton.
5653. LOOM PICKERS, H. Tetlow, Miles Platting, and J. Holding, Lower Broughton.
5654. HOLDERS for OPERA GLASSES, A. J. Boult.—(*W. Mack, Terre Haute, U.S.*)
5655. PNEUMATIC GRAIN ELEVATORS, A. J. Boult.—(*L. Smith, Kansas, U.S.*)
5656. STEAM BOILER with RAPID CIRCULATION, H. Matheson, Barnes.
5657. HEEL PARING MACHINES, F. Cutlan, Leicester.
5658. SECURING BUTTONS upon LEATHER, W. R. Lake.—(*J. Mathison, Massachusetts.*)
5659. ORNAMENTAL SHEARING of PILED FABRICS, C. D. Abel.—(*E. de Montagnac et Fils, Paris.*)
5660. UTILISING CARBONIC ACID GAS as a MOTOR, W. R. Lake.—(*A. Gateau, Chicago.*)
5661. AUTOMATICALLY WINDING UP CLOCKWORK, W. R. Lake.—(*N. Silberberg, Roumania.*)
5662. RAISING, &c., CARRIAGE WINDOWS, E. Clennett, West Hartlepool.
5663. COMMUNICATING BETWEEN RAILWAY PASSENGERS and GUARD, W. Sharpe, Rastrick.
5664. SUGAR-CANE SHREDDERS, J. H. Johnson.—(*J. Parker, New York.*)
5665. TWISTED RIBS for GUN BARRELS, W. James, Birmingham.
5666. LETTER BALANCES, W. Hiscock, London.

29th November, 1882.

5667. CUTTING TUBES, S. Coodby, sen., Wolverhampton.
5668. LOOMS for WEAVING, J. F. Brown, Glasgow.
5669. MEASURING, &c., ELECTRIC CURRENTS, J. Blyth, Glasgow.
5670. MOULDING, &c., DOUGH into LOAVES, J. Melvin, Glasgow.
5671. OBTAINING COLOURING MATTERS, C. D. Ekman, London.
5672. REGULATING APPARATUS for STEAM ENGINES, A. Budenberg.—(*C. F. Budenberg, Buckau-Magdeburg.*)
5673. ELECTRIC CABLES, A. Boult.—(*R. Waring, U.S.*)
5674. GLAZING PAPER, S. Wells, London.
5675. MOWING MACHINES, R. Davison, Manchester, and F. H. Hallard, Leigh.
5676. CAPSTANS, J. Downs, Kingston-upon-Hull.
5677. REGULATING PRODUCTION of ELECTRICITY, H. Wilde, Manchester.
5678. FEEDING CALVES, J. Hudson, Norton Woodseats.
5679. SHIPS of WAR, J. D. Barker, Haberfield Hall.
5680. STEPS of STAIRS, H. Doulton, Lambeth.
5681. BEVELLING CARDS, &c., J. D. Weiste.—(*A. Fomm, Leipsic.*)
5682. SCREENS for SCREENING SEEDS, R. Boby and T. Stevens, Bury St. Edmunds.
5683. MACHINE for RECEIVING MONEY, H. T. Davis, London.
5684. FIXING SWORDS in THEIR SHEATHS, P. Jensen.—(*A. Coppel, Germany.*)
5685. BRICKS, F. Smith, London.
5686. GLASS FURNACES, J. H. Johnson.—(*A. Duchet, Paris.*)
5687. HARROWS, J. Howard and E. Bousfield, Bedford.
5688. SCREENS for SEPARATING GRAIN, H. Coleman & A. Morton, Chelmsford, & T. Stidolph, Woodbridge.
5689. COUPLINGS for RAILWAY WAGONS, C. Roberts, Wakefield.
5690. TRAMWAYS, H. H. M. Smith.—(*A. Hallidie, U.S.*)
5691. WEAVING LOOMS, P. I. Garin-Moroy, France.

30th November, 1882.

5692. COLOURING MATTERS, I. Levinstein, Manchester.
5693. TELEGRAPHING from RAILWAY TRAINS in MOTION, W. L. Hunt.—(*R. M. Hunter, Philadelphia.*)
5694. COMBINED FURNACE and STEAM ENGINE, V. W. Blanchard, New York.
5695. GENERATING ELECTRICITY, V. W. Blanchard, U.S.
5696. COLOURING MATTERS, J. Imray.—(*La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis and Messrs. Roussin & Rosenstiehl, Paris.*)
5697. MOULDS for CASTING PIPES, J. and F. Chambers, Stanton Ironworks.
5698. DYEING ANILINE COLOURS, L. Heppenstall, jun., Milnsbridge.
5699. ADJUSTABLE SORTING SIEVE, G. W. von Nawrocki.—(*L. Hirschfeldt, Teterow.*)
5700. PREVENTING FLUCTUATION of GAS in GAS ENGINES, C. G. Beechey, Liverpool.
5701. SECURING NUTS on BOLTS, S. Watkins, Wolverhampton.
5702. TELEPHONIC RECEIVERS, T. Torrey, London.
5703. SEWING MACHINES, M. Gandy, Liverpool.
5704. ARTIFICIAL STONE, H. J. Allison.—(*W. Matt and M. Mehrbach, New York.*)
5705. MODERATOR LAMPS, G. E. Ménage, London.
5706. BREAK APPARATUS for YARN WINDING FRAMES, B. M. Knox, Kilbirnie.
5707. PERAMBULATOR WHEELS, J. Simpson and S. T. Fawcett, Leeds.
5708. PAPER PULP, &c., P. Jensen.—(*T. P. Aktiebolag, Sweden.*)
5709. FASTENING DEVICES for BUTTONS, A. J. Boult.—(*J. Weidenmann and C. de Quillfeldt, New York.*)
5710. LOCKING LEVERS for PREVENTING ACCIDENTAL DISCHARGE of FIRE-ARMS, J. Needham, Hammersmith.
5711. ELECTRIC CURRENT CONDUCTORS, W. R. Lake.—(*F. K. Fitch, New York.*)
5712. DREDGING APPARATUS, G. E. Vaughan.—(*S. Meinesz, Brussels.*)
5713. DISTILLATION of COAL, W. J. Cooper, London.
5714. LUMINOUS PAPER, W. C. Horne, Old Charlton.
5715. MAGNETIC WEARING APPAREL, W. R. Lake.—(*S. A. B. Wilson, Boston, U.S.*)
5716. WAGONS, &c., W, P. Wilson, Brockley.
5717. DISTILLATION of COAL, G. E. Davis, Manchester.
5718. COMBINED PRINTING or ENDORSING STAMP and INKING PAD and PENCIL, G. K. Cooke, Paris.

1st December, 1882.

5719. NICKEL PLATING, D. Appleton and G. W. Horsfield, Manchester.
5720. RAILWAY SLEEPERS, J. C. Bunten and A. Russell, Glasgow.
5721. STRAINING PULP, R. Brodie, Leith.
5722. VELOCIPEDES, M. D. Rucker, jun., and H. S. Jackson, London.
5723. ATTRITION MILLS, T. L. Sturtevant, U.S.
5724. RAILWAY CLIPS and WASHERS, E. G. Sheward, Richmond, and W. E. Jones, London.
5725. TUBE STOPPERS, D. J. Morgan, Cardiff.
5726. WINNING COAL, E. Warre & T. W. Salmon, Eton.
5727. RAISING RAILWAY WAGONS, G. Taylor, Penarth.
5728. PLOUGHS, H. J. Haddan.—(*F. Unterilp, Germany.*)
5729. STEAM FIRE-ENGINES, G. Witte, Berlin.
5730. SURVEYING, &c., LAND, A. J. Boult.—(*L. Cerebotania, Germany.*)
5731. PIANOFORTE ACTIONS, T. C. Dauncey, Stroud.
5732. COMBINED EQUILIBRIUM and STOP VALVE, P. Gibbons and A. S. F. Robinson, Wantage.
5733. STYLOGRAPHIC FOUNTAIN PENS, M. H. Kerner, London.
5734. METALLIC ALLOYS, G. A. Dick, London.
5735. GENERATING POWER, S. Broadbent and S. Broadbent, jun., Tong.
5736. PASSENGER INDICATORS, J. Dinsmore, Liverpool.
5737. OIL STOVES, J. F. Farwig, London.
5738. POTTERY KILNS, J. Broadhurst, Fenton.
5739. BOOTS and SHOES, H. E. Randall, Northampton.
5740. ROPE ATTACHMENTS, C. Kortüm, Wolverhampton.
5741. OIL CANS, J. Robinson, Bradford, and G. Robinson, Sheffield.
5742. ELECTRIC TELEPHONIC APPARATUS, S. P. Thompson, Bristol, and J. D. Husbands, London.
5743. WIND MOTORS, A. M. Clark.—(*A. Dumont, Paris.*)

2nd December, 1882.

5744. REGULATING ELECTRIC CURRENTS, J. T. King.—(*J. R. Finney, Pittsburgh.*)
5745. FIRE-ESCAPES, H. J. Allison.—(*D. A. Burr, U.S.*)
5746. TREATING FLUX, &c., H. Kenyon, Altrincham.
5747. GENERATING ELECTRIC ENERGY, A. J. Boult.—(*B. Faquant, Springfield, U.S.*)
5748. CLOCKS, E. Wulff and J. Moser, London.
5749. CHAINS, &c., W. E. Gedge.—(*E. Armelin, France.*)
5750. REGULATING CUT-OFF of STEAM-ENGINE CYLINDERS, L. Gooder, Wakefield.
5751. MAKING BEVERAGES, C. D. Abel.—(*B. Harrass, Germany.*)
5752. SELF-ACTING HORSE RAKES, G. Brown, Reading.
5753. PREPARING WARPS of JUTE, C. R. Malcolm and G. Malcolm, jun., Dundee.
5754. ELECTRICAL SWITCH for ELECTRIC LAMPS, G. W. Bayley, Walsall.
5755. FENCING, G. Greig, Edinburgh, & J. Leck, Brora.
5756. BRICKS, &c., W. Foot, Wellington.
5757. PRESERVING INSULATED ELECTRIC CONDUCTORS, E. T. Truman, London.
5758. RESERVOIR PENHOLDERS, J. E. Cousté, London.
5759. SMALL FIRE-ARMS, T. Gilbert, Londcn.
5760. BRICKS, J. H. Johnson.—(*J. Darrigan, Vagnotte.*)
5761. REFRIGERATING APPARATUS, W. R. Lake.—(*R. A. Messervey, Medford, U.S.*)
5762. BRUSHES, W. Thomson, Glasgow.
5763. PROTECTING FUNNELS of SHIPS AGAINST SHOT, P. Jensen.—(*F. von Stockhausen, Dresden.*)

4th December, 1882.

5764. FURNACES, J. C. Brentnall, Timperley.
5765. TREATING ANIMAL and VEGETABLE SUBSTANCES, W. C. Clennel.—(*C. A. Sanceau, Virsailles.*)
5766. TREATING MATERIALS USED in PURIFYING COAL GAS, J. Walker, Leeds.
5767. ACCUMULATORS, W. A. Barlow.—(*Messrs. L, Encausse and Canésie, Paris.*)
5768. STEAM ENGINES, C. Ridealgh, Sunderland.
5769. ELECTRO-MAGNETS, E. G. Brewer.—(*A. L. Bonnefils, Paris.*)
5770. SHRAPNEL SHELLS, M. Delmard, Plumstead.
5771. SCREW PROPULSION, A. Clark.—(*J. Gartner, U.S.*)
5772. FIRE-PROOF CEILINGS, R. W. Hitchins, London.
5773. PIPES, W. H. Sharman, London.
5774. VESSELS for HOLDING COMPRESSED GASES, S. J. Coxeter, London.
5775. RAISING, &c., SHIPS' BOATS, E. J. Harland, G. W. Wolff, W. H. Wilson, & W. J. Pirrie, Queen's Island.

Inventions Protected for Six Months on Deposit of Complete Specifications.

5654. HOLDERS for OPERA GLASSES, A. J. Boult, London.—A communication from W. Mack, Terre Haute, U.S.—28*th November*, 1882.
5655. PNEUMATIC GRAIN ELEVATORS, A. J. Boult, London.—A communication from L. Smith, Kansas, U.S.—28*th November*, 1882.
5673. ELECTRIC CABLES, A. J. Boult, London.—A communication from R. S. Waring, Pittsburgh.—29*th November*, 1882.
5691. WEAVING LOOMS, P. I. Garin-Moroy, France.—29*th November*, 1882.
5694. COMBINED FURNACE and STEAM ENGINE, V. W. Blanchard, New York.—30*th November*, 1882.
5695. GENERATING ELECTRICITY, V. W. Blanchard, New York.—30*th November*, 1882.
5723. ATTRITION MILLS, T. L. Sturtevant, Framlingham, U.S.—1*st December*, 1882.

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

4845. DISCHARGING GRAIN from SHIPS, G. F. Lyster, Liverpool.—27*th November*, 1879.
4873. EMERY ROLLERS, J. Hayes, Oldham.—28*th November*, 1879.
4901. GAS GOVERNORS, C. E. Hearson, London.—29*th November*, 1879.
4909. LUBRICATING CYLINDERS, J. J. Royle, Manchester.—1*st December*, 1879.
4912. PORTABLE STEAM CRANES, G. Russell, Motherwell.—1*st December*, 1879.
5267. GAS LAMPS, W. T. Sugg, London.—24*th December*, 1879.
31. BREAK-DOWN GUNS, F. Beesley, London.—3*rd January*, 1880.
4913. REGISTER STOVES, R. H. Griffin, London.—1*st December*, 1879.
4918. WHITE LEAD, W. R. Lake, London.—1*st December*, 1879.
5103. HEATING APPARATUS, J. T. C. Thomas, London.—12*th December*, 1879.
5137. THRASHING MACHINES, J. H. Johnson, London.—15*th December*, 1879.
4001. MECHANICAL LOADER, J. T. Lemaire, Belgium.—4*th October*, 1879.
4963. ANNEALING OVENS, W. Wilmsmann, Hagen.—4*th December*, 1879.
5045. DIPPING AZIMUTH COMPASSES, J. Imray, London.—9*th December*, 1879.
5157. MAGNETO-ELECTRIC MACHINES, H. F. Joel, London.—16*th December*, 1879.
4944. GAITERS, J. Imray, London.—3*rd December*, 1879.
4947. SELF-ACTING STOP GEAR, A. Paget, Loughborough.—3*rd December*, 1879.
4965. RAILWAY SIGNALLING, S. A. Croft and R. Lomax, Manchester.—4*th December*, 1879.
4986. CHINA CLAY, G. F. Orange, Saint Austell.—5*th December*, 1879.
5012. PREPARING COTTON FIBRES, T. H. Rushton and B. A. Dobson, Bolton.—6*th December*, 1879.
5210. OPENING CABRIAGE HEADS, A. Wood, Folkestone.—20*th December*, 1871.

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

4164. SASH PULLEYS, J. F. Meakin, London.—2*nd December*, 1875.
4137. LAMP STOVES, E. A. Rippingille, Birmingham.—29*th November*, 1875.
4208. TREATING INDIGO, C. H. Underwood, Manchester.—6*th December*, 1875.
305. GATES for RAILWAY CROSSINGS, A. M. Clark, London.—26*th January*, 1876.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 22*nd December*, 1882.

3373. SAWING METALS, J. H. Johnson, London.—A communication from H. Tuyssuzian—15*th July*, 1882.
3537. MACHINES for CUTTING METAL WASHERS, &c., W. P. Thompson.—A communication from E. Salomon and E. Armant.—25*th July*, 1882.
3554. VENTILATORS, J. L. Thomasson, Worcester.—26*th July*, 1882.
3557. TELEPHONIC APPARATUS, J. Munro, Surrey, and B. Warwick, London.—27*th July*, 1882.
3558. VELOCIPEDES, J. S. Orton, Birmingham.—27*th July*, 1882.
3564. FURNACES for KILNS, B. Finch, London.—27*th July*, 1882.
3565. ADJUSTING VENTILATORS, H. Morris, Manchester.—27*th July*, 1882.
3569. TEXTILE FABRICS, W. W. Blackett, Leeds.—27*th July*, 1882.
3577. CAUSTIC SODA, A. J. Boult, London.—A communication from H. Herberts.—27*th July*, 1882.
3583. ELECTRIC LAMPS, W. T. Henley, Plaistow.—28*th July*, 1882.
3585. FACILITATING REFERENCE to DICTIONARIES, &c., A. Gerken, London.—28*th July*, 1882.
3596. HATS, R. Wallwork, Manchester.—29*th July*, 1822.
3597. AWNINGS for HAMMOCKS, &c., O. Seydel, Birmingham.—29*th July*, 1882.
3600. TRICYCLES, &c., J. P. Dalby, Leeds.—29*th July*, 1882.
3608. OBTAINING SULPHUR from SULPHIDE of HYDROGEN, C. F. Claus, London.—29*th July*, 1882.
3610. OBTAINING PRODUCTS from BLAST FURNACES, J. Alexander and A. K. McCosh, Lanark.—31*st July*, 1882.
3613. STOVES, A. C. Henderson, London.—Com. from Besson and Company.—31*st July*, 1882.
3615. LOOMS for WEAVING, J. Hopkinson, Birstal.—31*st July*, 1882.
3616. GALVANIC BATTERIES, J. R. Rogers, London.—31*st July*, 1882.
3663. STEAM TRAPS, H. Lancaster, Pendleton.—2*nd August*, 1882.
3719. FOLDING SEATS, W. H. Avis, Polegate.—4*th August*, 1882.
3751. ELECTRICAL SIGNALLING APPARATUS, W. R. Lake, London.—A communication from G. W. and A. D. Blodgett.—5*th August*, 1882.
3778. WASHING MACHINE, C. C. Greenway, Grafton.—8*th August*, 1882.
3784. GENERATORS for the PRODUCTION of GAS from COAL, &c., J. Noble. Consett.—9*th August*, 1882.
3792. PRODUCTION of DISSTILLATES from KIMMERIDGE SHALE, E. K. Mitting, Rye.—9*th August*, 1882.
3816. STOVES, H. J. Haddan, London.—A communication from D. McBride Graham.—10*th August*, 1882.
3980. INSULATION of WIRES, J. H. Johnson, London.—Com. from J. M. Hirsch.—19*th August*, 1882.
3985. GRINDING MILLS, W. Wingfield-Bonnyn, London.—19*th August*, 1882.
4023. BOOK COVERS, R. Birdsall, Northampton.—22*nd August*, 1882.
4192. ELECTRO-HYDRAULIC METER, R. Hammond and L. Goldenberg, London.—2*nd September*, 1882.
4593. INDEPENDENT CAR-WHEELS, H. J. Allison, London.—A communication from G. W. Fairman, W. H. Gray, and W. R. Austin.—27*th September*, 1882.
4627. CIGARETTES, O. W. T. Barnsdale, Nottingham.—29*th September*, 1882.
4846. EXPLOSIVES for FIRE-ARMS, R. Hannan, Glasgow.—12*th October*, 1882.
4863. REFLECTORS, A. M. Clark, London.—A communication from P. Costes.—12*th October*, 1882.
5088. MOULDING APPARATUS, J. and T. A. Boyd, Shettleston.—25*th October*, 1882.
5143. ADJUSTING the BRASSES of LOCOMOTIVE CONNECTING RODS, W. L. Hunt, London.—30*th October*, 1882.
5221. PURIFIERS for COAL GAS, C. C. Walker, Lilleshall, and W. T. Walker, London.—1*st November*, 1882.
5232. BREAKING, &c., FLAX, J. Shinn, Philadelphia.—2*nd November*, 1882.
5246. METALLIC WAGONS, R. Hudson, Gildersome.—3*rd November*, 1882.
5282. COMPOUND MARINE STEAM ENGINES, J. McFarlane, Dundee.—6*th November*, 1882.
5315. INSULATING COMPOUNDS, J. Wetter, London.—A communication from R. S. Waring and J. B. Hyde.—7*th November*, 1882.
5344. REGENERATIVE GAS FURNACES, W. Hackney, Swansea, and J. W. Wailes, Wednesbury.—9*th November*, 1882.
5366. BLEACHING FIBRES, J. A. Graham, London.—10*th November*, 1882.
5368. BOILER for DIGESTING, &c., CHEMICAL OPERATIONS, J. A. Graham, London.—10*th November*, 1882.
5419. MARKING in CARD PLAYING, G. F. Redfern, London.—Com. from M. Klein.—14*th November*, 1882.
5420. CAPS for the RIBS of UMBRELLAS, C. A. Allison, London.—A communication from Messieurs Guyon and Dyroff.—14*th November*, 1882.
5426. LAMPS for RAILWAYS, J. Thomas, London..—14*th November*, 1882.
5654. HOLDERS for OPERA GLASSES, A. J. Boult, London.—Com. from W. Mack.—28*th November*, 1882.
5655. PNEUMATIC GRAIN ELEVATORS, A. J. Boult, London.—Com. from L. Smith.—28*th November*, 1882.

(*Last day for filing opposition*, 26*th December*, 1882.)

3611. REGULATING the SUPPLY of GAS, A. Haley and A. C. Savage, London.—31*st July*, 1882.
3618. DISCHARGING OIL on AGITATED WATER, J. Gordon, jun., Dundee.—31*st July*, 1882.
3645. ANTIFRICTION BEARINGS for SHAFTS, W. P. Thompson, Liverpool.—A communication from E. Salomon and E. Armant.—1*st August*, 1882.
3646. OBTAINING PRODUCTS of DRY DESTRUCTIVE DISTILLATION from SOLID MATTERS, G. F. Redfern, London.—Com. from H. Wurtz.—1*st August*, 1882.
3647. PACKING for STUFFING BOXES, J. Brown, London.—1*st August*, 1882.
3648. FASTENING for LACES for BOOTS, &c., G. F. Redfern, London.—A communication from E. C. C. Henderson and T. A. McDonald.—1*st August*, 1882.
3651. PREVENTING INCRUSTATION in STEAM BOILERS, W. E. Gedge, London.—A communication from J. Boissié.—1*st August*, 1882.
3652. DRIVING BELT STRAP FASTENERS, W. H. Chase, London.—1*st August*, 1882.
3653. PERMANENT WAY for RAILWAYS, &c., A. Vogt and A. Figge, London.—1*st August*, 1882.
3657. EMBROIDERING APPARATUS, W. R. Lake, London.—Com. from F. H. Chilton.—1*st August*, 1882.
3660. MUSICAL INSTRUMENTS, P. Ehrlich, Gohlis.—2*nd August*, 1882.
3675. CLEANING WOOL, W. P. Thompson, Liverpool.—Com. from A. Frayssé.—2*nd August*, 1882.
3679. PERMANENT WAY of RAILWAYS, L. A. Groth, London.—A communication from F. Schauman.—2*nd August*, 1882.
3780. ROTARY ENGINES, A. Kissam, London.—9*th August*, 1882.
3888. TRANSPORTING LOADS on INCLINED ROADS, A. J. Boult, London.—A communication from F. Bouquet.—11*th August*, 1882.
4161. FILE for HOLDING PAPERS, P. Lawrence, London.—Com. from W. R. Clough.—31*st August*, 1882.
4308. AUTOMATIC SMOKE CONSUMER, J. Butler, Nottingham.—11*th September*, 1882.
4472. WORKING TKAM-CARS, C. Hinksman, London.—20*th September*, 1882.
4586. LOCOMOTIVE BRAKES, W. M. Lendrum, Blatherwicke.—A communication from S. C. Sloan.—27*th September*, 1882.
4717. DISC DYNAMO, &c., MACHINES, J. Gordon and J. Gray, London.—4*th October*, 1882.
4962. COCKS or VALVES, J. N. Sperryn, Brixton Hill.—18*th October*, 1882.
4978. FEED PUMPS, A. W. Robertson, West Ham.—19*th October*, 1882.
5182. TELEGRAPH PRINTING APPARATUS, J. Imray, London.—A communication from A. A. Knudson.—31*st October*, 1882.
5298. RUNNING METALS SIMULTANEOUSLY into SEVERAL MOULDS, F. Asthöwer, Annen.—6*th November*, 1882.
5388. MANUFACTURE of INDIA-RUBBER, &c., A. Parkes, Bexlsy.—11*th November*, 1882.
5411. FURNACES, W. Felton, Wildcn.—13*th November*, 1882.
5412. BISULPHITE of SODA, E. Carey and F. Hurter, Widnes.—13*th November*, 1882.
5416. LUBRICATOR ATTACHMENTS, P. M. Justice, London.—A communication from R. J. Hoffman.—14*th November*, 1882.
5468. WHEELS of CARRIAGES, &c., W. J. Fraser, London.—17*th November*, 1882.
5494. INDICATING MONEY APPARATUS, S. H. and J. C Boswell, Norwich.—18*th November*, 1882.
5673. ELECTRIC WIRES and CABLES, A. J. Boult, London.—A communication from R. S. Waring.—29*th November*, 1882.
5691. LOOMS for WEAVING, P. I. Glarin-Moroy, France.—29*th November*, 1882.
5694. COMBINED FURNACE and STEAM ENGINE, V. W. Blanchard, New York.—30*th November*, 1882.
5695. GENERATING, &c., ELECTRICITY, V. W. Blanchard, New York.—30*th November*, 1882.
5723. ATTRITION MILLS, T. L. Sturtevant, Framingham, U.S.—1*st December*, 1882.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 1st December*, 1882.)

2099. COMBINED SOFA with BED, C. Klemetsen, Norway.—4*th May*, 1882.
2598. LOADING, &c., APPARATUS, W. Cooper and J. Holdsworth, Hull.—2*nd June*, 1882.
2603. VALVES or COCKS, J. Hitch, Battersea.—2*nd June*, 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.
2638. PAPER-DAMPING MACHINES, J. J. Allen, Halifax.—5*th June*, 1882.
2639. FOLDING CHAIRS, J. Hayes, London.—5*th June*, 1882.
2642. REGISTERING CONTRIVANCES, W. E. Ayrton and J. Perry, London.—5*th June*, 1882.
2650. UMBRELLAS, J. Wetter, New Wandsworth.—6*th June*, 1882.
2653. SUPPORTING TROUSERS WHEN OUT of USE, W. G. Stone, Bath.—6*th June*, 1882.
2658. SECONDARY BATTERIES, A. Muirhead, London.—6*th June*, 1882.
2666. WICKS, J. T. Reeve, London.—7*th June*, 1882.
2693. COMPRESSING LIME, C. S. Smith, Leicester—8*th June*, 1882.
2694. DYNAMO, &c., MACHINES, W. R. Lake, London—8*th June*, 1882.
2725. GRANULATING APPARATUS, J. M. Cameron and H. J. Anderson, London.—9*th June*, 1882.
2727. GENERATING STEAM APPARATUS, H. Aydon and E. Field, London.—10*th June*, 1882.
2732. MOVING TARGETS, R. Morris, Blackheath.—10*th June*, 1882.
2746. BREECH-LOADING FOWLING PIECES, L. Gye, London.—10*th June*, 1882.
2767. GRINDING MILLS, P. M. Justice, London.—13*th June*, 1882.
2768. RAILWAY CARS, &c., P. M. Justice, London.—13*th June*, 1882.
2829. WATER SUPPLY APPARATUS, R. R. McKee, Kirkcaldy.—15*th June*, 1882.
2871. DYNAMO-ELECTRIC MACHINES, J. E. H. Gordon, London.—17*th June*, 1882.
2889. APPARATUS for the STAGES of THEATRES, C. D. Abel, London.—19*th June*, 1882.
3016. ASCERTAINING the INITIAL STABILITY of SHIPS, A. Taylor, Newcastle-upon-Tyne.—26*th June*, 1882.
3321. STACKING HAY, E. R. Salwey, Ifield Court.—12*th July*, 1882.
3581. FRICTIONAL CLUTCHES, H. Fisher, Nottingham, and J. S. Walker, Wigan.—28*th July*, 1882.
3614. ILLUMINATING GRATINGS, T. Hyatt, London.—31*st July*, 1882.
3964. SECONDARY BATTERIES, H. T. Barnett, London.—18*th August*, 1882.
3968. HOSIERY MACHINES, W. Harrison, Manchester.—18*th August*, 1882.
4064. REGENERATIVE FURNACES, C. A. W. Schön, Hamburg.—24*th August*, 1882.
4073. ELECTRIC BELL ALARM, P. M. Justice, London.—25*th August*, 1882.
4229. VENTILATING RAILWAY, &c., VEHICLES, J. Leather, Liverpool.—6*th September*, 1882.
4273. CASTING METALS, H. Woodward, London.—8*th September*, 1882.
4561. SECONDARY BATTERIES, F. C. Hills, Deptford.—25*th September*, 1882.
4728. SHARPENING the CALKS on HORSESHOES, W. R. Lake, London.—4*th October*, 1882.
4804. PROPELLERS for NAVIGABLE VESSELS, R. Smith, Sherbrooke.—9*th October*, 1882.
4857. PRODUCER GAS FURNACES, C. D. Abel, London.—12*th October*, 1882.

(*List of Letters Patent which passed the Great Seal on the 5th December*, 1882.)

2656. HOLDING UP CARRIAGE WINDOWS, J. Harris, London.—6*th June*, 1882.
2661. PRODUCING ELECTRIC CURRENTS, J. Blyth, Glasgow, and D. B. Peebles, Bonnington.—7*th June*, 1882.
2671. CENTRIFUGAL GOVERNORS, W. P. Thompson, London.—7*th June*, 1882.
2672. LOOPED FABRICS, W. R. Lake, London.—7*th June*, 1882.
2685. FEEDING BOTTLES, G. Falconnier, Nyon.—8*th June*, 1882.
2692. PURIFYING CASKS, J. La and B. La Mert, London.—8*th June*, 1882.
2696. STILLS for DISTILLING TAR, F. Lennard, Shoreham.—8*th June*, 1882.
2698. AXLE BEARINGS, W. J. Brewer, London.—8*th June*, 1882.
2701. EXHAUSTING APPARATUS, A. R. Leask, London.—8*th June*, 1882.
2706. ORES, J. M. Stuart, London, and J. Elliott, Reigate.—9*th June*, 1882.
2707. SPINNING, &c., COTTON, R. Scaife, Colne.—9*th June*, 1882.
2716. TRAM-CARS, T. E. Knightley, London.—9*th June*, 1882.
2718. BOILER FURNACES, &c., T. Ogden, Burnley.—9*th June*, 1882.
2723. ELECTRIC LAMPS, C. G. Gumpel, London.—9*th June*, 1882.
2735. COMPRESSED AIR MACHINES, S. Mason, Birmingham.—10*th June*, 1882.
2736. NEGRO POTS, &c., R. Clayton, Deepfields.—10*th June*, 1882.
2741. ILLUMINATING CONDUCTORS, G. Zanni, London.—10*th June*, 1882.
2742. LANTERNS for LAMPS, W. E. Heavens, London.—10*th June*, 1882.
2749. CAPSULES for BOTTLES, C. Cheswright, London.—12*th June*, 1882.
2756. VOLTAIC BATTERIES, C. G. Gumpel, London.—12*th June*, 1882.
2777. MATCHES, W. T. Evans, Manchester.—13*th June*, 1882.
2786. MEASURING, &c., PRESSURE, A. M. Clark, London.—13*th June*, 1882.
2807. SECONDARY BATTERIES, L. Epstein, London.—14*th June*, 1882.
2815. VENTILATING AIR, A. B. Brown, Edinburgh.—15*th June*, 1882.
2820. IRON, J. Beasley, Handsworth.—15*th June*, 1882.
2823. GENERATING ELECTRIC ENERGY, C. Westphal, Berlin.—15*th June*, 1882.
2830. ELECTRO-MOTERS, W. E. Ayrton and J. Perry, London.—15*th June*, 1882.
2833. BREECH-LOADING FIRE-ARMS, J. Robertson, London.—15*th June*, 1882.
2852. WEAVING SACKS, &c., W., A., A., A., E. and J. Briggs, Whitworth.—16*th June*, 1882.
2867. GAS REGULATORS, A. J. Boult, London.—17*th June*, 1882.
2893. ARTIFICIAL TEETH, E. Reading, London.—19*th June*, 1882.

2895. Explosive Materials, W. R. Lake, London.—19*th June*, 1882.
3007. Regulation of Speed in Machinery driven by Electricity, F. Jenkin, Edinburgh.—24*th June*, 1882.
3015. Edge Mills, B. J. B. Mills, London.—26*th June*, 1882.
3029. Glass Furnaces, E. de Pass, London.—27*th June*, 1882.
3055. Cartridges, H. E. Newton, London.—28*th June*, 1882.
3068. Fluid Meters, T. R. and T. W. Harding, Leeds.—29*th June*, 1882.
3089. Breech-loading Fire-arms, H. A. A. Thorn, London.—30*th June*, 1882.
3106. Propellers for Steam Vessels, R. Bell, Liverpool.—1*st June*, 1882.
3176. Insulating Compounds, M. Mackay, London.—5*th July*, 1882.
3323. Manufacture of Wine, &c., J. H. Loder, Leiden.—13*th July*, 1882.
3802. Secondary Batteries, C. T. Kingzett, London.—9*th August*, 1882.
3877. Breech-loading Fire-arms, W. Rogers, London.—14*th August*, 1882.
3927. Rope Tramways, H. H. M. Smith, London.—16*th August*, 1882.
3956. Artificial Stone, J. H. Johnson, London.—18*th August*, 1882.
4001. Rotary Engines, A. W. L. Reddie, London.—21*st August*, 1882.
4028. Cleansing Filters, E. Perrett, London.—22*nd August*, 1882.
4179. Ventilators, R. H. Brandon, Paris.—1*st September*, 1882.
4279. Loom Shuttles, J. Riley and A. Orrell, Bradford.—8*th September*, 1882.
4421. Telegraphic Apparatus, A. C. Brown and H. A. C. Saunders, London.—16*th September*, 1882.
4431. Secondary Voltaic Batteries, A. Watt, Liverpool.—18*th September*, 1882.
4635. Stoppers for Bottles, &c., N. Thompson, London.—29*th September*, 1882.

List of Specifications published during the week ending December 2nd, 1882.

1717, 8d.; 1813, 6d.; 1832, 6d.; 1837, 6d.; 1868, 6d.; 1886, 6d.; 1950, 6d.; 1954, 8d.; 1957, 6d.; 1959, 2d.; 1971, 6d.; 1977, 4d.; 1985, 6d.; 1992, 6d.; 1994, 2d.; 2002, 6d.; 2005, 2d.; 2008, 8d.; 2010, 1s.; 2012, 2d.; 2013, 2d.; 2015, 2d.; 2019, 6d.; 2023, 2d.; 2024, 6d.; 2027, 6d.; 2028, 2d.; 2029, 4d.; 2030, 6d.; 2031, 2d.; 2032, 10d.; 2033, 6d.; 2036, 2d.; 2040, 6d.; 2044, 6d.; 2045, 2d.; 2046, 6d.; 2050, 2d.; 2051, 6d.; 2052, 6d.; 2053, 2d.; 2055, 8d.; 2056, 6d.; 2059, 6d.; 2060, 6d.; 2061, 6d.; 2062, 6d.; 2063, 8d.; 2064, 6d.; 2065, 2d.; 2066, 2d.; 2067, 4d.; 2068, 4d.; 2069, 4d.; 2070, 6d.; 2071, 6d.; 2072, 6d.; 2073, 4d.; 2074, 6d.; 2075, 8d.; 2076, 4d.; 2077, 6d.; 2078, 2d.; 2079, 6d.; 2080, 1s. 2d.; 2081, 2d.; 2082, 8d.; 2084, 2d.; 2085, 6d.; 2086, 4d.; 2087, 4d.; 2088, 2d.; 2089, 2d.; 2090, 6d.; 2091, 2d.; 2092, 8d.; 2093, 2d.; 2094, 6d.; 2096, 2d.; 2097, 6d.; 2098, 6d.; 2100, 6d.; 2102, 8d.; 2103, 6d.; 2104, 2d.; 2105, 2d.; 2106, 6d.; 2107, 6d.; 2108, 2d.; 2109, 6d.; 2110, 4d.; 2111, 4d.; 2112, 2d.; 2113, 2d.; 2114, 2d.; 2115, 2d.; 2116, 6d.; 2117, 6d.; 2118, 2d.; 2122, 6d.; 2123, 4d.; 2124, 6d.; 2125, 2d.; 2128, 6d.; 2129, 6d.; 2130, 6d.; 2132, 4d.; 2134, 6d.; 2135, 4d.; 2140, 6d.; 2144, 6d.; 2186, 6d.; 2205, 4d.; 2239, 4d.; 2252, 6d.; 2261, 6d.; 2265, 6d.; 2565, 6d.; 2630, 6d.; 3156, 6d.; 3282, 6d.; 3762, 6d.; 3872, 6d.; 3882, 6d.; 3896, 2d.; 3904, 2d.; 3920, 6d.; 3962, 2d.; 4095, 6d.; 4133, 6d.; 4141, 6d.; 4155, 8d.; 4249, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

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

1717. Gas Engines, *J. A. Drake and R. Muirhead, Maidstone.*—11*th April*, 1882. 8*d.*

This consists in the use of an auxiliary piston in the explosion cylinder, the function of which is to expel the residual gases and draw in a fresh charge of combustible mixture simultaneously and at every revolution of the crank shaft. A special construction of piston and other improvements are described.

1813. Traps for Catching Rats, Mice, &c., *E. A. Brydges, Berlin.*—17*th April*, 1882.—(*A communication from E. d'Aubigny, Vienna.*) 6*d.*

This consists of a spring bridge placed at each end of a case open at both ends, so that the weight of the animal in entering will lower the bridge, and when it moves off the bridge the latter will rise and close the opening.

1832. Regulating Automatic Lubricator for Steam Cylinders, *W. A. Barlow, London.*—17*th April*, 1882.—(*A communication from F. Holtschmidt, Dusseldorf.*) 6*d.*

The oil cup has two ports in the base one being for the escape of water, and is fitted with a screw valve, and the other to conduct the oil is also fitted with a valve, and in it, and projecting into the cup, is secured a tube, round which a second tube capable of being raised and lowered is screwed. Steam rises through the screwed tubes above the oil, where it condenses, and passes through the oil to its exit, the oil being at the same time caused to rise and pass down the inner tube to the steam pipe.

1837. Steam Boilers, *J. Imray, London.*—18*th April*, 1882.—(*A communication from J. P. Bordone, Paris.*) 6*d.*

The boiler consists of a fire-box, a body, and a heater made separate, but connected by tubes, the parts being so arranged that the water circulates from the coolest to the hottest part in a direction opposite to that taken by the products of combustion.

1868. Gas Engines, *H. A. Dufrené, Paris.*—(*A communication from Messrs. L. Benier and A. Lamart, France.*)—19*th April*, 1882. 6*d.*

A vertical cylinder is used closed at top and open at bottom, and the piston is connected to a beam oscillating below the cylinder, and which works the driving shaft above it by a connecting rod. The slide valve is formed so as to introduce the gaseous mixture into the cylinder through several parallel openings, and two passages lead the gas into the cylinder from the slide valve.

1886. Showing the Illuminating Power of Gas Burners, *C. W. Morley, Regent's Park.*—20*th April*, 1882. 6*d.*

The invention consists of two self-acting machines, each having for its motor air rising from gas flames which revolves wheels in opposite directions for advertising uses, and to act upon the flames for the purpose of illustrating by one machine the advantages of the union of flames and by another machine of illustrating the improvements caused by capping superior over inferior burners.

1950. Coke Ovens, *R. de Soldenhoff, Merthyr Tydfil.*—25*th April*, 1882. 6*d.*

This relates to means for restoring heat to coke ovens which would otherwise be lost, and consists in causing the air to be supplied to the same to circulate between rows of refractory bricks arranged in a space between the bottom of the gas flues and the top of the foundation arch.

1954. Heating, Pickling, and Swilling Metal Plates and Metal Goods, *H. F. Taylor, Glamorganshire.*—25*th April*, 1882. 8*d.*

The object is to obtain the combined motion of the cradles containing the articles to be treated and the movement of the baths or vats by the use of one engine, and it consists in mounting the baths upon trunnions, so that they may oscillate thereon when pressure is applied to the sides, such pressure being exerted by the cradles or the beam from which they are suspended, as the latter rise and fall.

1957. Turning, Directing, and Steering Steamships, &c., *A. W. L. Reddie, London.*—25*th April*, 1882.—(*A communication from J. Ericsson, New York.*) 6*d.*

The object is to more effectively direct and turn vessels either while under headway or when they have no headway, as, for instance, in case of disablement of the ordinary propeller, and it relates to the use of one or more screw propellers in a transverse passage in the hull of the vessel near the stern or bow thereof, and through which currents of water are caused to flow by the propellers in such a manner as to turn or change the direction of the vessel as required.

1959. Ornamental Surfaces for Decorating Purposes, *J. Noad, East Ham, and H. Salomon, Gresham-street.*—25*th April*, 1882.—(*Void.*) 2*d.*

The materials used for the preparation of surfaces or plates with plain or decorated surfaces are silica or fine sand, clay or brick earth, China clay, ground glass, sulphur, and boracic acid.

1961. Preventing the Running Away of Horses, *H. H. Lake, London.*—25*th April*, 1882.—(*A communication from R. J. La Grange, Philadelphia.*)—(*Not proceeded with.*) 2*d.*

In order to check a horse as soon as he begins to run away, a blind or shade is arranged so that it can readily be lowered over the horse's eyes.

1962. Copying Presses, *E. Behrens, East Greenwich.*—25*th April*, 1882. 4*d.*

The press consists of two tray-shaped plates between which the book is placed, and the top one forced downwards by an excentric lever carried in bearings formed on the under plate.

1965. Head Coverings known as South Westers, *C. E. Naish, Birmingham.*—26*th April*, 1882.—(*A communication from W. Cotaas, Norway.*) 4*d.*

This consists in the combination with the crown and brim of a hood capable of being drawn and fastened round the head and face. Attached to the edge of the hood is a cape to cover the shoulders and chest of the wearer.

1966. Apparatus to be Applied to Furnaces for the Prevention of Smoke, *W. Begg, Sale.*—26*th April*, 1882. 6*d.*

This relates to the special construction of a perforated bridge, in combination with a self-acting damper applied to the ashpit, for admitting the requisite quantity of air at the proper temperature to the furnace.

1967. Maximum and Minimum Thermometers, *H. J. Haddan, Kensington.*—26*th April*, 1882.—(*A communication from H. Kappeller, jun., Vienna.*) 6*d.*

The thermometer consists of a vertical glass tube with a bulb at top and one at the bottom, the tube containing alcohol about up to the middle of the upper bulb. The continuity of the liquid is broken near the middle of the tube by a short column of mercury above which is a steel pin fused into a small glass tube, from which glass threads extend to the walls of main tube, so as to producee lastic pressure. Below the mercury is a secondsteel indicator.

1968. Combined Steam Engine and Boiler, *E. Edwards, London.*—26*th April*, 1882.—(*A communication from H. C. Hoffmeister, Austria.*) 6*d.*

The boiler consists of a horizontal flat upper chamber, to the bottom of which a number of curved tubes are attached and hang down into a fire beneath. The supply of air to the furnace is automatically regulated by causing the steam in the boiler to act upon an elastic diaphragm, the movement of which is caused to open or close the door through which the fuel is supplied. The engine is mounted upon the top of the boiler. A condenser is provided, consisting of two concentric cylinders with an annular passage, through which the steam passes, the condenser being arranged in a vessel containing water. A governor driven by the engine controls a throttle valve.

1969. Explosive Compound, *C. W. Siemens, Westminster.*—26*th April*, 1882.—(*A communication from Dr. C. Himly and L. von Frützschler-Falkenstein, Germany.*) 4*d.*

This consists, First, in the manufacture of explosive compounds, consisting of saltpetre, chlorate of potash, and a solid hydrocarbon, mixed together and treated with a solvent; and, Secondly, in manufacturing such compounds by mixing together saltpetre, chlorate of potash, and a solution of a solid hydrocarbon, and evaporating the solvent, thereby producing a protective varnish on the explosive.

1971. Racks or Appliances for Holding Umbrellas, Pipes, &c., *C. J. Appleton and S. H. Ogden, Manchester.*—26*th April*, 1882. 6*d.*

This consists in the use of vulcanised caoutchouc holders shaped to grasp the article to be held, and fixed in suitable metal, wood, or other frames.

1972. Railway Carriage Roof Lamps, *H. Defries, Houndsditch.*—26*th April*, 1882. 6*d.*

This consists in the use of a draught tube or chimney made of two or more sections of glass divided vertically, and set so as to permit of expansion and contraction, and suspended over the wick holder so as to leave the latter exposed to the cooling effect of the inward draught. A metal tube or chimney is placed over the divided glass one. The lower part of the frame carrying the sections of glass tube forms a cone, and if desired a reflector.

1973. Press for Moulding Seggars, &c., *W. E. Gedge, Strand.*—26*th April*, 1882.—(*A communication from A. Pothier, Paris.*) 6*d.*

This relates to an improved press for moulding seggars of all shapes and sizes, applicable also to the moulding of other ceramic ware, and which is characterised essentially by the combination of a three-screw press with a seggar mould.

1974. Barns and Shelters with Rising and Falling Roofs, *J. Henson, Derby.*—26*th April*, 1882. 8*d.*

This consists in making the roofs in sections, capable of being raised and lowered by means of suitable chains and drums actuated by suitable gear, the different sections being connected by loose sheets, so as to keep out wet when they are raised to different heights.

1975. Ventilators and Chimney Cowls, *T. E. Bladon, Birmingham.*—26*th April*, 1882. 6*d.*

The case of the ventilator consists of a tube having within it a concentric tube of about half its diameter, and containing a central pivot on which turn two sets of vanes inclined in opposite directions, one set working in the inner tube, and the other set between the latter and the outer tube. Fresh air passes between the two tubes (causing the vanes to revolve) and enters the apartment to be ventilated, whilst the vitiated air passes out through the centre tube. The vanes may be caused to rotate by steam or other power.

1976. Opening Preserved Meat and other Tins, &c., *T. H. George, Norfolk.*—26*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This consists in a fixed and a movable jaw operated by a handle, and serving together to cut the metal of the tin.

1977. Valves, *J. Baldwin, Keighley.*—26*th April*, 1882. 4*d.*

The object is to form valves so that the seating and cover can be removed, and new ones substituted whilst the pressure is in the pipe communicating with the valve, and it consists in placing a hollow plug with an opening in it in the bottom part of the valve casing, in which a corresponding opening is formed. By turning the plug the opening is closed, when the cover and the valve seating can be removed at the top.

1979. Urinals, *J. Beresford, Birmingham.*—26*th April*, 1882. 8*d.*

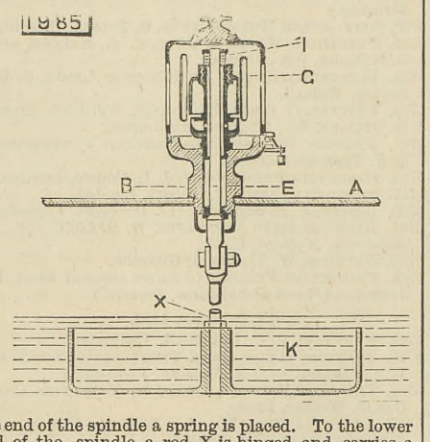
This relates to urinals in which the basin turns over on a joint so as to be raised against the wall when not in use, and it consists in arranging them so that a stream of water is made to flow over the whole of the interior surface of the basin when depressed, and cut off when it is raised.

1984. Refrigerating and Freezing, *J. Chambers, New Zealand.*—27*th April*, 1882. 6*d.*

This consists, First, in removing moisture from air by cooling it down so as to be able to remove the greater part of same in the form of water, and, when required, further reducing the temperature, so as to freeze any remaining moisture; Secondly, in air-refrigerating and freezing apparatus, the combination of groups of pipes with depositing chambers to extract moisture from the air, which is caused to pass through them in either direction, and in one or more of such groups; Thirdly, in air-refrigerating apparatus, the use of groups of U-shaped pipes enclosed in casings, the two ends of each pipe in a group being secured in one tube plate, so as to open into the moisture-depositing chamber at opposite sides of the division plate in such chamber; and Fourthly, in the use of a blowing or exhausting fan, in combination with the refrigerating apparatus described.

1985. Low-water Alarm Apparatus, *J. W. Kenyon, Manchester.*—27*th April*, 1882. 6*d.*

A is the shell of a steam generator in which is screwed the piece B, fitted with a valve seating at its base, against which a shoulder on spindle E acts as a valve, the spindle passing upwards through the end of a steam whistle G, between the top of which and



the end of the spindle a spring is placed. To the lower end of the spindle a rod X is hinged and carries a dish K, which is ordinarily submerged. When the water falls, the weight of the dish, and the water it contains, causes the valve to open and the whistle to be sounded. A cover is locked in position over the whistle.

1987. Burners for Petroleum Lamps, &c., *B. Sawdon, Hull.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to lamps in which the oil flows down to a bottom plate, and it consists in fitting two depending arms to a branch pipe from the reservoir, and perforating the branch pipe on the under side midway between the two arms. The latter carry a short tube between them, and at the lower ends a flat ring plate, from which a circular plate or disc is carried by studs and distance pins.

1990. Water Wheels, *H. J. Haddan, Kensington.*—27*th April*, 1882.—(*A communication from E. C. Masson, France.*)—(*Not proceeded with.*) 2*d.*

This consists in fixing the arms round a hexagonal hub, so that each spoke is parallel to one side of the hexagon and bolted to the latter, the six spokes around the hub forming together two triangles. Also in providing ventilation for the buckets by placing near the circumference of the wheel a valve on each blade, and which opens only towards the inside of the bucket, so as to prevent the formation of a vacuum after the bucket has reached its lowest point and begins to rise out of the water.

1992. Internal Stoppers for Bottles, *I. Burdin, Knottingley, Yorkshire.*—27*th April*, 1882. 6*d.*

The object is to cause internal stoppers to leave their seats when forced downwards with but slight pressure, and it consists in forming a number of grooves on the exterior of the stopper, so that when slightly pressed downwards it will leave the rubber ring surrounding it, and allow the pressure to escape by the grooves and the stopper to fall inside the bottle.

1994. Mechanical Telegraphs for Use on Board Ship, &c., *W. Chadburn, Liverpool.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates, First, in the use of a pliable metallic ribbons, tape, or band, with a clip at each end to connect the ends of wires or rods forming the communicating medium between the transmitting and receiving instrument; and, Secondly, to an arrangement of sending and receiving "steering telegraph," by which a single set of instruments is used as an ordinary steering telegraph with reply and tell-tale, and as a "docking" telegraph with reply.

1995. Heating and Rolling Metals, *H. H. Andrew, Sheffield.*—27*th April*, 1882. 6*d.*

This consists in the method of heating metal during its passage between the sets of rolls, by passing it through a bath of heated lead or its equivalent arranged between the rolls.

1996. Moleskin Cloth, *H. W. and H. King, Yorkshire.*—27*th April*, 1882. 2*d.*

An ordinary loom with the required number of shafts is employed, and the cloth woven preferably with the weft more upon the face than the back, by floating the weft under one and over two warp threads, then under two and over four warp threads three times in succession, then under one and over two warp threads, and repeat. The piece is backed with lighter cards than usual, the face is dressed and slightly raised, then sheared and cropped.

1997. Horological Candlestick, *R. R. Gubbins, New Cross, and A. Thümling, Soho.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

A spring plunger raises the candle as it is burned away, and in rising acts through suitable gearing to rotate a figured globe surrounding the candle, a pointer being fixed to the candlestick.

1998. Vessels for Containing Oil, &c., *J. Robinson, Bradford.*—27*th April*, 1882. 6*d.*

This consists in fitting a pump within the can or vessel, by actuating which the oil can be removed. A filter is fitted within the can.

1999. Accumulating and Storing Electric Currents, *J. B. Rogers, Holborn Viaduct.*—27*th April*, 1882. 6*d.*

Describes the combination of large with small accumulators. The lamps to be run from the small receivers, which are charged from the large receivers, which again have been charged from the machine.

2002. Excavating or Tunnelling Machines, *T. R. Crampton, Westminster.*—27*th April*, 1882. 6*d.*

This relates to machinery adapted to work in chalk or other like substance, and consists of disc cutters mounted on a face plate or arms, so as to roll in concentric circles over the work. The main axis is driven by an hydraulic motor, and carries the plate or arms on which the cutters are set with their planes inclined at a small angle to the working face, those near the periphery being set in one direction, and those near the centre in the opposite direction.

2001. Manhole Covers for Drains, &c., *T. Dyer, Camden Town.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates principally to the joint of manhole covers, and it consists in the insertion of an india-rubber tube or ring round the outer edge of the cover, the weight of which keeps the joint air-tight.

2003. Preventing the Fouling of Empty Ale Casks, *E. Caddick, Burton-on-Trent.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This consists in applying an india-rubber ball to the bung or tap-hole inside the barrel, such ball being acted upon by a stretched elastic cord, so as to force it against the hole and close the same until the bung or tap is inserted.

2004. Brooches and other Dress Fastenings, &c., *J. G. Rollason, Birmingham.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

As applied to a brooch the invention consists in forming the body of two shells, on the edge of one of which are projections to form the knuckles of the pin joint, and another projection opposite them to form the catch. The two shells are joined together by projections on one being passed through holes in the other and then turned back.

2005. Metallic Handles of Smoothing Irons, &c., *C. J. Gibbs, Smethwick, and A. Spooner, West Bromwich, Stafford.*—27*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to the mode of connecting the tubular grip or barrel of sad irons, kettles, and other articles, to the side pieces or legs.

2006. Ventilating Greenhouses, &c., *M. Willshaw, near Nottingham.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This consists in heating the cold air introduced into the greenhouse by causing it to pass in contact with the stove or heating pipe before issuing into the building. A "ridge roll" is fitted at the top of the building, and can be regulated so as to control the amount of heated air passing out.

2007. Sorting Potatoes, *C. D. Abel, London.*—28*th April*, 1882.—(*A communication from C. F. A. Gramke, Germany.*) 6*d.*

A frame carries sorting screens of varying fineness and is caused to oscillate on a pivot. A hopper is placed at the upper end, and from the lower side of the screens a number of flaps are suspended, and beneath them an endless belt travels and has projections which press the flaps against the screen, so as to force out potatoes that may stick in the meshes.

2008. Caloric and Gas Power Engines, *F. C. Glaser, Berlin.*—28*th April*, 1882.—(*A communication from K. Teichmann, Stuttgart.*)—(*Not proceeded with.*) 8*d.*

This relates to an engine in which atmospheric air is used as the working fluid, being drawn from the compression cylinder of the engine and forced into the container and mixed with combustible gas drawn in at the same time. From the container the gas streams into the working cylinder, where it takes fire and is brought to higher pressure by heat. In the working cylinder the gas acts by expansion.

2010. Shoes, *D., P., and N. Fraser, Arbroath, N.B.*—28*th April*, 1882. 1*s.*

This relates to shoes having soles formed of jute, esparto, or other fibrous material, plaited and bound together, and having uppers of canvas or other suitable material, and it consists in the use of improved and novel machinery for manufacturing the same.

2011. Diminishing the Liability of Corrosion of Screw Propeller Blades, *D. Johnston, Govan, N.B.*—28*th April*, 1882. 6*d.*

This consists in coating the parts of propeller blades which are most likely to corrode with tin or other suitable metal or alloy. Improved apparatus for cleansing the blades preparatory to coating them is described.

2012. Raising, Forcing, Aerating, Cooling, and Rousing Beer, *J. Forbes, Coventry, and J. Hamilton, Smethwick.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

In the ordinary vats is placed a copper tube with its bottom enlarged and perforated, and its top forming a bend. A short distance from the bottom a pipe is inserted, turning upwards in the tube and connected with an air pump. A modified form of tube is described, and the invention further relates to the means for working the ordinary bladed propellers or rousers, and also to the use of a reciprocating tube aërator, cooler, and distributor.

2013. Washing Machines, *J. Mitchell, Newcastle-on-Tyne.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to means for making washing machines, constructed as described in patent No. 4975, A.D. 1880, self-acting, by providing steam generators, the steam from which acts on the cylinder of the machine, and causes it to revolve.

2014. Treating Rice, &c., for Manufacture of Starch, &c., *J. T. Armstrong, Newcastle-under-Lyme.*—28*th April*, 1882. 4*d.*

The steeping, mashing, or converting the grain is carried on *in vacuo*.

2015. Opening and Closing of Window Sashes, &c., *G. Hurdle and W. Davies, Southampton.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This consists in the use of a coiled spring and a cog-wheel, whose teeth gear with a ratchet on the sash. As the sash is opened it compresses the spring, and when the sash is released the spring closes the same.

2016. Fasteners for Gloves, &c., *W. J. Walden, Kingsland.*—28*th April*, 1882. 4*d.*

This relates to a fastener consisting of two cups, one of which can enter the other, and be retained therein, by reason of a certain spring it possesses.

2017. Mosaics, *H. J. Haddan, Kensington.*—28*th April*, 1882.—(*A communication from G. Stanley, Massachusetts.*) 4*d.*

This relates to the utilisation of waste scraps from the manufacture of stained glass windows, or other articles, and it consists in placing such scraps on a bed composed of a mixture of clay and fine sand, spaces being left between the different pieces. The whole is dried, and molten lead or type metal poured on the back, so as to fill up the spaces and join all the pieces together.

2018. Gear-cutting Machinery, *H. J. Haddan, Kensington.*—28*th April*, 1882.—(*A communication from A. H. Brainard, Massachusetts.*) 6*d.*

This relates to gear-cutters in which the necessary divisions are made by means of a worm and worm wheel, and it consists in the combination of the latter with a vertically adjustable worm carrying bracket adjustable on the standard of the machine; also in the combination of the worm and wheel and an annular rim screwed on the wheel and gearing with the worm; also of a dividing shaft carrying a toothed wheel, a recessed plate, crank lever, pawl, hinged crank, latch, and button, all for setting the wheel to the position for cutting the side of bevel teeth. Other combinations are described for setting the cutter as required.

2019. Gas-burners for Heating Purposes, *F. Fletcher, Warrington.*—28*th April*, 1882. 6*d.*

This consists of a burner for heating purposes having slits for the outlet of combined gas and air, and slits having such a width that the lighting back of the flame into the body of the burner is prevented.

2020. Improvements in Apparatus for Obtaining Electric Light, *J. C. Asten, Lower Norwood.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

The inventor proposes to make the positive carbon hollow, in which the negative carbon is inserted, a non-conducting clay separating the two.

2021. CLEANING WOOL AND OTHER FIBROUS ANIMAL AND VEGETABLE MATERIALS, &c., *E. Mansfield, Finsbury Park.*—28*th April*, 1882. 6*d.*

This consists in the method and apparatus for cleaning dirty cotton waste and other fibrous materials by treating it with an alkaline solution, and to a beating or kicking operation for dissolving, loosening, and rubbing off the dirt; then removing the surplus moisture, then rinsing the material in water, then removing the moisture by exhaustion and heat, and then, if required, disentangling and softening the material.

2022. ATTACHING DOOR KNOBS, &c., TO SPINDLES, *J. H. Welch, Birmingham, and B. W. Spittle, Wednesbury.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

Inside the mount of the knob a steel tong is placed, so as to bite into the corner of the square of the spindle. To disengage the knob the tong is forced back by inserting an instrument into a hole in the mouth, and so disengaging the tong from serrations or teeth on the spindle.

2023. SELF-COMPENSATING PRESSURE REGULATING APPARATUS FOR FLUIDS OR VAPOURS, *J. C. Stevenson, Liverpool.*—28*th April*, 1882.—(*Not proceeded with.*) 2*d.*

The flow of fluid takes place through a double valve or opening controlled by apparatus subject to the action of the fluid in the main or receptacle whose pressure is to be regulated.

2024. EXHAUSTING OR DRAWING GAS FROM A MAIN, &c., AND DELIVERING IT AT A GIVEN PRESSURE, *T. Thorp, Whitefield, and T. G. Marsh, Oldham.*—28*th April*, 1882. 6*d.*

A tank with a receiving chamber connected to the gas supply and a pressure or delivery chamber, to which the delivery pipe is connected, is employed, and in the receiving chamber a drum with closed sides and spiral-shaped fans revolves in water. A division separates the two chambers except at the bottom, and the drum is perforated so as to put them in communication. A V-shaped vessel is employed to secure a uniform desired pressure, one leg communicating with the atmosphere and the other with the delivery side of the tank.

2027. RAILWAY FOG SIGNAL APPARATUS, *T. Whittingham, Rugeley.*—28*th April*, 1882. 6*d.*

The object is to enable signalmen to place fog signals on to, and remove them from the rails without leaving their boxes, and it consists in a suitable arrangement of mechanism operated by a signal lever.

2028. SUGAR, *W. R. Lake, London.*—28*th April*, 1882. —(*A communication from L. May, Austria.*)—(*Not proceeded with.*) 2*d.*

This relates to the formation of cubes directly from the sugar liquor by the use of moulds.

2029. TREATING WOVEN FABRICS, SKINS, AND LEATHER, &c., *D. T. Gardner, London.*—28*th April*, 1882.—(*A communication from N. Hardinn, St. Petersburg.*) 4*d.*

This relates to the use of acetic alumina acid for waterproofing cloth and fabrics generally.

2030. IMPROVEMENTS IN ELECTRICAL SWITCHES, &c., *Hon. R. Brougham, Regent-street.*—28*th April*, 1882. 6*d.*

The object of this invention is to prevent sparking between the ultimate contact points of the lever and metal plates to which the conductors lead. In passing from one contact plate to the other, the end of the lever on reaching No. 2 contact plate does not immediately make good contact, bnt eventually does so by jamming tight against it.

2031. BEAM-END SPINDLES AND PULLEYS, *G. Golland, Nottingham.*—29*th April*, 1882.—(*Not proceeded with.*) 2*d.*

Each spindle is placed in a mould, and a compound metal composed of spelter and iron cast round it, and when cool it is turned up to the form of pulley required.

2032. LOCKS, *A. M. Clark, London.*—29*th April*, 1882.—(*A communication from A. Parise, Paris.*) 10*d.*

This relates principally to the arrangement of the tumblers under the control of the key.

2033. SECURING THE BLADES OF KNIVES, &c., IN THEIR HANDLES, *M. Merichenski, Poplar.*—29*th April*, 1882. 6*d.*

This consists in forming the tang of the blade split so as to form a spring, and having projections at the ends to engage with enlargements at the bottom of the hole in the handle to receive the tang.

2034. APPARATUS FOR RAISING BEER, WINE, SPIRITS, &c., *J. J. Harrop, Manchester.*—29*th April*, 1882. 6*d.*

This relates to raising liquor to a point of delivery by means of air or gas, or mixed gases, of suitable pressure, admitted into an intermediate container or vessel which is supplied from the storage casks during the intervals between the times of delivery.

2036. APPARATUS FOR WASHING CLOTHES, *T. Body, Cornwall.*—29*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to a suitable apparatus, by means of which water is forced through the clothes to be washed under the action of air.

2038. WEAVING FANCY FABRICS, *J. Hamilton, Strathaven, N.B.*—29*th April*, 1882. 6*d.*

This consists partly in producing patterns on fancy fabrics by means of pattern or figuring warp threads, shifted or crossed from side to side of the splits of body warp by means of additional or pattern jacquard harness or heddles operated in conjunction with the ordinary harness or heddles.

2040. COMBING WOOL, *J. W. Harding, Leeds.*—29*th April*, 1882.—(*A communication from S. Pegler, Roubaix, France.*) 6*d.*

This relates to improvements on patent No. 2346, dated 13th June, 1879. According to this present invention, the inventor applies boxes made of drawn or laminated metal, and by preference of such metals as are good conductors of heat.

2041. MANUFACTURE OF BOOTS, &c., *T. J. Handford, London.*—29*th April*, 1882.—(*A communication from H. C. Gros, Wurtemberg.*) 6*d.*

This refers principally to apparatus for sewing the welts to the soles, and sewing "sew rounds" as well as stitching the outer soles to the welts, in which a circular awl and needle working around a common axis, or a circular needle alone, are or is employed, and to means to be used in connection with the said manufacture.

2043. BITS FOR HORSES, *I. Henson and E. Hall, Derby.*—29*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to a bit in which the mouthpiece is able to turn in the side cheeks, and which is provided at its ends with arms to receive an additional rein.

2044. IMPROVEMENTS IN DYNAMO-ELECTRICAL MACHINES, *Hon. R. Brougham, Regent-street.*—29*th April*, 1882. 6*d.*

The inventor winds the armatures of Gramme continuous current machines, or those employing a ring armature wound with wire, with strips of copper which take the place of each coil, the ends of the strip being led out to form connections with the commutator. The strip taking the place of one coil is insulated from the next strip. Finally, all the strips are bound tighter over with uninsulated iron wire to hold them to the ring.

2045. IMPLEMENT FOR DISTRIBUTING AND SIFTING POWDERS, LIQUIDS, &c., *C. B. Wellin, London.*—29*th April*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to the construction of scoops or implements for powdered substances, such as condiments, &c.

2046. WINDLASSES, &c., *A. B. Brown, Edinburgh.*—1*st May*, 1882. 6*d.*

The object is to combine hydraulic cylinders with the parts of windlasses or other hoisting or hauling machines in an improved manner, and so as whilst making in each case a simple and compact machine, to obtain a practically continuous motion.

2048. VAGINAL SYRINGES, *E. de Pass, London.*—1*st May*, 1882,—(*A communication from P. Lawrence, New York.*) 4*d.*

This syringe consists of a bulb and a nozzle made of soft rubber in one piece.

2049. AUTOMATIC FIRE-EXTINGUISHERS, *J. R. Brown, Rhode Island, U.S.*—1*st May*, 1882.—(*Complete.*) 6*d.*

The devices are operated by the action of the heat caused by a fire, and will distribute the fire-extinguishing fluid at once on the fire without any external aid.

2050. ROTARY MOTORS, *E. A. Brydges, Berlin.*—1*st May*, 1882.—(*A communication from A. Sieckenius, Gleiwitz, Prussia.*—(*Not proceeded with.*) 2*d.*

This relates especially, First, to the attainment of a precise action of the expansion gear; Secondly, to the construction of the drum or piston; Thirdly, to the packing of the said drum or piston and the rings of the same, and also to the slide, and to the closing of the said slide by means of an air buffer or spiral springs.

2051. MACHINERY FOR WASHING WOOL, &c., *T. J. Mullings, London, and W. Whiteley, near Huddersfield.*—1*st May*, 1882. 6*d.*

This consists in the employment of two travelling endless aprons, working in contact with each other for receiving the fibre from the nipping or delivery rollers of wool washing machines, which carry it forward over the machine and drop it into the feeding end, where it is again dropped back by the reciprocatory forks to the other end of the machine, and this is done as many times as is required to cleanse the wool.

2052. IMPROVEMENTS IN ELECTRICAL GENERATORS, &c., *T. J. Handford, Southampton-buildings.*—1*st May*, 1882.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 6*d.*

This relates, First, to a dynamo machine of low resistance and great strength. This is accomplished by the use of discs of copper for the armature, which are connected to develope a continuous current, the

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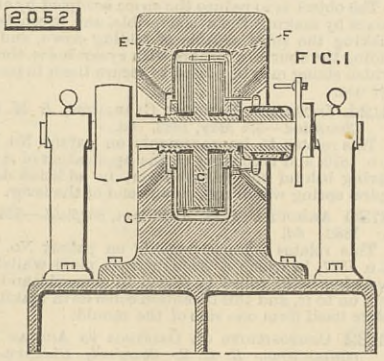

FIG. 1

tension of which is due to the electro-motive force of a number of discs. Fig. 1 shows a vertical cross section of such a machine taken along the line of the armature shaft, E E being the discs, C iron core. The

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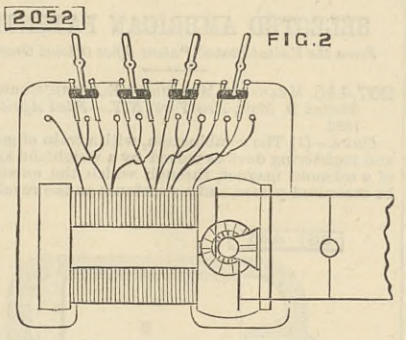
FIG. 2



discs are insulated from one another; Secondly, the invention relates to a means for regulating the generative capacity of dynamo machines shown in Fig. 2. By this means the current passing through more or less of the field coils can be reversed.

2053. DOOR FASTENINGS FOR RAILWAY CARRIAGES, &c., *P. M. Justice, London.*—1*st May* 1882.—(*A communication from J. W. Krepps, New York.*)—(*Not proceeded with.*) 2*d.*

This relates to that kind of door fasteners employed for railway and other carriages or vehicles, consisting of a pair of hooked catches in the door which are opened self-actingly to receive the bolt on the sliding door by the bevelled point of the bolt, and close into notches in the sides of the head of the bolt to secure the same by gravitation of one of the catches, and of a bar employed for opening the catches and also for fastening them.

2055. MANUFACTURE OF BOOTS and SHOES, *J. Keats, near Stoke-upon-Trent.*—1*st May*, 1882. 8*d.*

This relates, First, to a novel mode of manufacturing welts for boots and shoes; and Secondly, to an improved mode of preparing the soles of boots and shoes for the purpose of giving elasticity to the shank which forms the "waist" of the boot or shoe.

2056. DISTRIBUTION OF SEWAGE, &c., FOR IRRIGATING LAND, *J. H. Shipway, Birmingham.*—1*st May*, 1882. 6*d.*

This relates to the means for controlling the distribution of sewage, liquid manure, and water for irrigating land, consisting in the combination of horizontal and vertical pipes and controlling valves.

2057. GAS ENGINES, *C. M. Sombart, Germany.*—1*st May*, 1882. 8*d.*

This consists partly of an oblique arrangement of the compression cylinder behind the motor cylinder, in such a manner as to admit of the application of both the connecting rods to one common crank pin, and to obtain an ideal advance of the crank of the motor cylinder in relation to that of the compression cylinder.

2058. GAS ENGINES, *A. N. Porteous, Edinburgh.*—1*st May*, 1882. 6*d.*

This relates to the construction of gas engines in which the air admitted at one end of the cylinder is compressed in a chamber formed in the interior of a piston, or formed with two or more pistons, and afterwards mixed with gas and the mixture exploded at the other end of the cylinder.

2059. CUTTING PAPER, *H. J. Haddan, Kensington.*——1*st May*, 1882.—(*A communication from T. Broussier, Bruxelles.*) 6*d.*

This consists chiefly in mounting several cutter shafts on the same machine, in order to use it for cutting paper of different length and width.

2060. OPERATING FOG HORNS, *A. L. Wharton, Great Grimsby.*—1*st May*, 1882. 6*d.*

This relates to improvements on patent No. 4593, A.D. 1880, and consists chiefly in an appliance for automatically giving a code of signals which may conform to the Government code of signals or rules of the road now in use.

2061. BREECH-LOADING FIRE-ARMS, *J. Williams, Birmingham.*—2*nd May*, 1882. 6*d.*

This refers to improvements in the self-cocking action, to an improved safety block for preventing the hammer from reaching the striker in case of accident, and to a crank arrangement for the opening lever.

2062. STOPPERS FOR BOTTLES, &c., *J. Bussey, Borough.*—2*nd May*, 1882. 6*d.*

The stopper consists of the combination of an externally screwed plug or stopper with a lining of cork, or other suitable yielding or elastic material secured inside the neck of the bottle or other vessel to be stoppered, and constituting a female screw to the externally screwed plug or stopper.

2063. FIRE-ARMS, *H. H. Lake, London.*—2*nd May*, 1882.—(*A communication from J. Schulhof, Vienna.*) 8*d.*

This consists partly in the combination with the breech-bolt of an arrangement whereby the cartridges in the divisions of a magazine in the stock are pushed forward successively out of the said magazine, through the small of the stock into the loading position, by means of the sliding motion of the said breech-bolt in its operation of opening and closing the breech, and are thrust into the breech chamber.

2064. INSTRUMENTS FOR LINEAR MEASUREMENT, *H. H. Lake, London.*—2*nd May*, 1882.—(*A communication from V. von Reitzner, Vienna.*) 6*d.*

The invention consists essentially in arranging a series of graduated discs within a suitable case, which is preferably in the form of a locket; the said discs are marked with figures, so that the distance measured may be readily ascertained.

2065. IMPROVEMENTS IN MICROPHONIC CONDUCTORS OR CONTACTS, &c., *J. H. Johnson, Lincoln's-inn-fields.*—2*nd May*, 1882.—(*A communication from Dr. A. D'Arsonval, Paris.*)—(*Not proceeded with.*) 2*d.*

This relates to the treatment of other materials than carbon, such as manganesian agglomerates, sulphides, &c., by fusion, so that they acquire the requisite homogeneneity for microphonic purposes.

2066. FIRE-PROOF DOORS, SHUTTERS, &c., *S. B. Wilkins, Edinburgh.*—2*nd May*, 1882.—(*Not proceeded with.*) 2*d.*

According to this invention the doors are constructed of a strong framing of iron or steel to cover the opening forming the doorway.

2067. PREPARING COFFEE IN A SOLID FORM, *G. W. von Nawrocki, Berlin.*—2*nd May*, 1882.—(*A communication from E. Geist, Munich.*) 4*d.*

This consists in the production of coffee in the form of a compressed cake or block by mixing burnt and finely ground coffee (with or without admixture of burnt and finely ground figs or other coffee substitutes) with a warm concentrated sclution of sugar in syrup, and if desired with condensed milk, heating the mixture continuously until the sugar becomes stiff, and compressing the so obtained mass.

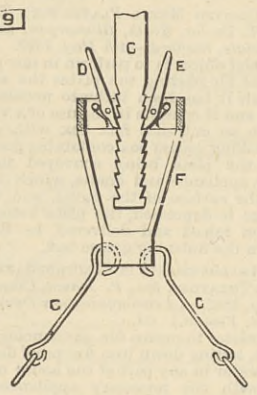
2068. A NEW OR IMPROVED SECONDARY BATTERY, *C. H. Catchcart, Sutton.*—2*nd May*, 1882.—(*A communication from C. B. G. Cole, London.*) 4*d.*

This relates to a method of amalgamating the zinc plate in an amalgamated zinc and lead secondary battery, by which the zinc plate can be kept amalgamated. The liquid used is pure zinc sulphate acidulated with sulphuric acid. The method adopted is to electrolytically deposit pure zinc from a zinc sulphate solution on an amalgamated plate, and when a sufficient thickness has been deposited, to withdraw the plate and at once amalgamate it with mercury again. It is then ready for use.

2069. CONNECTING AND SUPPORTING HEALDS IN LOOMS, *J. Aspinall, Ravensthorpe, Yorks.*—2*nd May*, 1882. 4*d.*

Upon the jack lever, to support and operate the healds, is placed a metal clip C, the lower end of which is serrated to receive the points of two catches

2069



D and E. The end of the clip passes through a bracket F, which also supports the catches. The latter are pressed into the notches by springs. The heald shafts are connected to the bracket by links G.

2070. MECHANICAL SEPARATION OF ORES, &c., *H. J. Haddan, Kensington.*—2*nd May*, 1882.—(*A communication from L. de Soulages, Paris.*) 6*d.*

The separation of various solid materials is effected by breaking and sorting the large pieces, crushing and drying the product, sorting according to volume, and finally sorting according to density. The ores after being crushed are dried at a high temperature to remove all water, and thereby destroy the adhesion of the sterile mineral with the ore before sorting the pulverised material according to density by submitting it to the action of currents of air.

2071. SMELTING FURNACES, *H. J. Haddan, Kensington.*—2*nd May*, 1882.—(*A communication from L. de Soulages, Paris.*) 6*d.*

This relates to the manufacture of carbonic oxide and to its application for smelting ores.

2072. IMPROVEMENTS IN OR RELATING TO ELECTRIC LIGHTS, *T. J. Handford, Southampton-buildings.*—2*nd May*, 1882.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 6*d.*

This relates to arc lamps, one form of which is shown in the figure; coils M and M¹ are of same resistance, but M is the heavier in weight of metal. When the carbons are in contact the current passes by M, it

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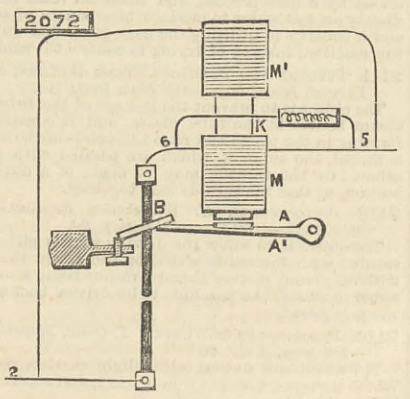

attracts armature A and lever A¹, which lifts gripping piece B, causing the upper carbon to move upward and strike the arc. When this becomes too long M¹ begins to overpower M, A is lowered, and with it the upper carbon, thus the arc is regulated. From 6 to 5 is a low resistance shunt to lessen the resistance of the main line, and allow the current to flow freely to the lamp. 2 and 1 are main conductors, and K stationary core.

2073. CATHETERS, *T. and W. J. Nicholls, Kingsland-road.*—2*nd May*, 1882. 4*d.*

This relates to the construction of catheters from corallide or celluloid.

2074. STEAM GENERATOR, *W. and J. Beesley, Barrow-in-Furness.*—2*nd May*, 1882. 6*d.*

The object is to provide a strong, simple, and efficient vertical boiler with a large heating surface in small compass, self-contained, and all parts of which are easily accessible. Near the lower end of a vertical cylindrical shell A is rivetted the furnace or fire-box B,

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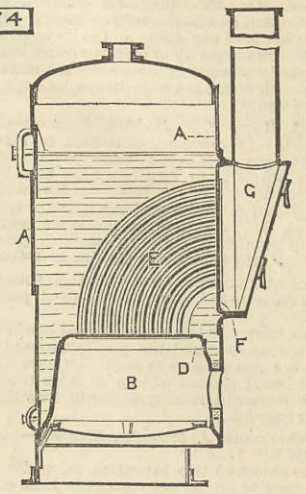


fitted with an ordinary door. The part below the fire-bars forms the ash-pit, and is cut away in front for admission of air. The top of the fire-box is closed by a tube-plate D from which quadrant-shaped tubes E pass to a second plate F, and enter smoke-box G to which the chimney is attached.

2075. CALORIC ENGINES, *J. Buckett, Southwark.*—2*nd May*, 1882. 8*d.*

This relates to improvements on patent No. 4413, A.D. 1876, and it consists, First, in forming a chamber around the distributing valve and its seating, and causing air to circulate through it so as to cool the same; Secondly, in the use for determining the cut off of a sliding piece controlled by a cam which can be adjusted; Thirdly, regulating the inset of the actuating fluid by a sliding piece controlled by a governor and actuated by the cam described; Fourthly, to means for withdrawing the sliding piece from the action of the cam so as to stop the engine; Fifthly, to means for reversing the engine by acting on the sliding piece by either of two cams placed in the required positions to effect the rotation of the engine in opposite directions; Sixthly, to a fuel-feeding valve. The invention further relates to the mode of supplying and regulating the admission of air to the engine.

2076. MALTING, *B. J. B. Mills, London.*—2*nd May*, 1882.—(*A communication from W. F. Howe, Chicago.*)—(*Not proceeded with.*) 4*d.*

This relates to the use of a movable germinating apparatus, in combination with a refrigerating room, by means of which the temperature can be regulated during germination, a kiln and a bath for washing and cleaning the vessel, which runs on rails so as to be readily shifted to the desired positions, and can also turn on its axis.

2077. REFINING PETROLEUM OILS, &c., *E. W. Bell, Liverpool.*—2*nd May*, 1882.—(*A communication from E. C. Kattell, New York.*) 6*d.*

This relates to the process of deodorising an oleaginous substance, which consists in subjecting it to the action of superheated steam and atmospheric air introduced below the surface of the mass, the oleaginous substance being maintained at a temperature between 212 deg. Fah. and its point of vaporising to prevent condensation of steam.

2078. CONNECTING LINKS FOR RAILWAY COUPLINGS, &c., *G. Turton and J. Brunlees, Westminster.*—2*nd May*, 1882.—(*Not proceeded with.*) 2*d.*

This relates principally to making the coupling links so that they may be elongated to reach from one coupling hook to the other, or contracted or shortened so as to tighten up the coupling, and when thus adjusted the hook will keep the two opposite couplings properly together but with an elastic tension, so as to facilitate turning round curves.

2079. DRAWING, COMBING, OR PREPARING WOOL, &c., *H. H. Lake, London.*—2*nd May*, 1882.—(*A communication from C. Fletcher, Rhode Island, U.S.*) 6*d.*

This consists in the combination with the drawing rolls of a wool preparing machine of a travelling cushion or apron passing between them, formed of an endless piece of material without joint or seam.

2080. TESTING THE STRENGTH OF MATERIALS, *W. Porter, Kent.*—2*nd May*, 1882. 1*s.* 2*d.*

The two ends of the material to be tested are held in clips, one of which is secured to one end of a spring, to which a rack is also connected. The opposite end of the spring is secured to a bar carrying a dial and pointer, upon the axis of which is a pinion gearing with the rack. So as to cause the spring to be put in tension at the same rate in all cases, a second spring of more than double its strength is used, and is allowed only to extend the first one gradually at any predetermined rate. For this purpose the bar of the weaker spring is attached to the piston-rod of a piston working in a cylinder filled with liquid, a passage being provided from one end to the other of the cylinder on opposite sides of the piston. The stronger spring is placed in the cylinder in a position to act on the piston in opposition to the weaker spring.

2081. ELEVATING MACHINERY, *J. V. Hope, Wednesbury.*—3*rd May*, 1882.—(*Not proceeded with.*) 2*d.*

The elevator consists of a spiral tube or a strong cylinder with an internal spiral flange in cross section turned upwards, so as to resemble an elevator bucket, the pitch of the spiral and the angle at which it stands being so regulated that the entire periphery of the spiral shall slope downward from those points in which it touches the highest side of the cylinder. The cylinder can be run resting on rollers and driven from the top or from the periphery by belting or gearing.

2082 IRON AND STEEL, *T. Lishman, West Hartlepool.*—3*rd May*, 1882. 8*d.*

The pig iron, ore, or mine is reduced in a furnace of special construction to a liquid state, and then transferred to a converting furnace, when, according to the constituent elements of the liquid iron, portions of which are to be eliminated, suitable proportions of one or more of the following ingredients are added thereto, viz.:—Prepared lime, calcined bone, raw bone, salt, soda, manganese, fluor-spar (fluoride of calcium), scrap iron, and ground anthracite. The converting furnace has a steam pedestal, placed so that it can be raised and lowered into and out of the liquid metal, and it is perforated with holes, through which steam is ejected. The chemical action, aided by the intense heat, purifies the crude iron, and afterwards converts it into steel.

2084. WINDOW SASH FASTENERS, *D. Walker, Highbury, and W. S. Simpson, Battersea Park-road.*—3*rd May*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to the application of a pivotted lever to the base plate, in such a position as to be forced by a spring in contact with the edge or face of the fastener

lever, and so prevent the latter from being opened until the pivotted lever has been first removed.

2086. Deodoriser and Filtrant, *O. Bowen and A. Miller, London.*—3rd *May*, 1882. 4*d*.

Cannel coal, preferably that known as "Lanemark Cannel," is broken into small pieces, and after 5 to 10 per cent. of alumina has been added, the whole is subjected to the action of a fire in a kiln or retort, so as to convert the cannel into coke, which is then crushed and used as a filtering and deodorising medium in the treatment of sewage and other fœtid refuse waters.

2087. Sponge Fishing Nets, *H. J. Haddan, Kensington.*—3rd *May*, 1882.—(*A communication from E. Arapian and L. Isaacs, New York.*) 4*d*.

The net is of bag shape, and to its mouth is attached a frame, made partly of metal or other heavy material and partly of wood or other buoyant material, so that the mouth of the net will always be kept open when in the water.

2088. Hats, *H. J. Haddan, Kensington.*—3rd *May*, 1882.—(*A communication from C. Vital, Paris.*)—(*Not proceeded with.*) 2*d*.

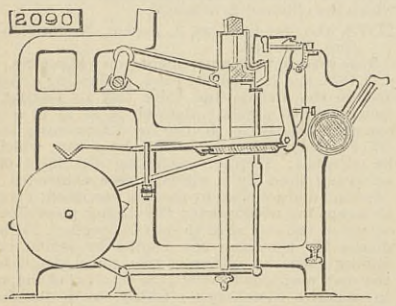
The object is to ventilate high hats by providing the lower edge of the inner surface with a border forming an inwardly projecting flange wider in front and at the back than at the sides, and perforated with a number of holes to establish communication with the atmosphere and the inside of the hat.

2089. Attachments for Securing Tires, *N. J. Crow, Pimlico.*—3rd *May*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the use of a metal band or clip shaped to embrace and hold the elastic tire and felly of the wheels of velocipedes or small carriages together, such band being formed of one or more pieces, and provided with a tightening device to draw the ends of the band together.

2090. Looms, *J. Brownlee, Glasgow.*—3rd *May*, 1882. 6*d*.

The object of this invention is, while causing the weft fork to act, so as to stop the loom on the breakage of the weft, to prevent the action of the weft fork which should be idle for any shot, that is the fork at end of the shuttle race from which the shuttle is thrown. For this purpose one of the weft forks is so fitted that when the weft thread is felt by and raises



the fork, the opposite fork, which alone acts directly on the handle for stopping the loom, is caused to rise also. The improvements also comprise means for clearing the threads of the idle shuttles out of the way of the weft forks. The drawing is a vertical section showing the action of one of the weft forks.

2091. Locomotive Engines, *J. H. Johnson, London.*—3rd *May*, 1882.—(*A communication from L. Brière, Paris.*)—(*Not proceeded with.*) 2*d*.

The boiler is placed under the driving axles, the wheels on which are made of considerable size (say about 14ft.). The cylinders of the engine are on top of the boiler.

2093. Driving Engines and Machines, *H. F. Maitland, Henley-on-Thames.*—3rd *May*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to economise and concentrate power in steam and other motive engines by substituting an endless band motion for the ordinary crank motion.

2094. Preparation of Preserves, &c., *V. Manuel, Brixton.*—4th *May*, 1882. 6*d*.

The object is to render preserved liquid or semi-liquid articles of diet or medicaments, suitable for direct consumption without requiring to be cooked, and it consists in tinning the articles in their natural condition, and then placing the tins for a suitable period in boiling water. To the tin a second vessel is secured and contains cotton impregnated with a suitable combustible matter, so that by igniting the same the contents of the tin may be heated.

2096. Valves of Engines, *J. Hopwood, Poulton-le-Fylde, Lancashire.*—4th *May*, 1882.—(*Not proceeded with.*) 2*d*.

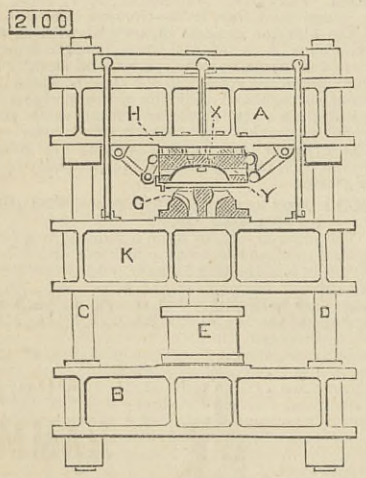
This relates to improvements in sliding, expansion, or "cut-off" valves, so as to render the fluid pressures upon them nugatory, the object being to remove the back pressure from such valves by applying a separate balance ring severally to the central exhaust port, and to each end port, and placing the cylinder port spaces permanently in free and separate communication with the spaces enclosed by the balance rings opposite to them at the back of the valve.

2097. Artificial Marbles, *R. Guelton, Brighton.*—4th *May*, 1882. 6*d*.

This relates to the production of artificial marbles by the use of superfine and coarse cements made of alabaster, combined with alum and coloured with vegetable and mineral colours.

2100. Stamping and Punching Steel and Iron Plates, *J. Westwood and R. Baillie, Poplar.*—4th *May*, 1882. 6*d*.

The object is to stamp or bend plates or sleepers and then punch vertical and horizontal holes therein by one machine. The machine for stamping and punching consists of a top and bottom crosshead A and B, columns C and D, and hydraulic cylinder E. The lower block G to give form to the plate is fixed on top



of casting K, resting on the ram of the hydraulic cylinder. In this lower block steel discs are inserted. The upper block H is mounted on four bolts attached to the underside of crosshead A, and has a motion in a vertical direction to produce the punching, when a suitable rod placed between the top block and the crosshead is withdrawn. The top block is fitted with punches X and Y to form vertical and horizontal holes in the plate or sleeper.

2098. Machines for Making Paper Bags, *H. J. Haddan, Kensington.*—4th *May*, 1882.—(*A communication from M. N. Stanley, New York.*) 6*d*.

This relates to machines for making bags from a continuous web of paper, and it consists, First, in a knife composed of a straight stock-piece cut away on the under side, a bowed stock-piece slitted at each end to form two fingers, the upper one of which is detachably secured to the straight stock-piece, and the lower of which laps under the same and the sectional blade; Secondly, in the combination of a pair of rollers, a reciprocating knife in one roller, yokes to which said knife is connected and which slide on the ends of the roller, and cams to move such yokes to operate the knife; Thirdly, the combination of two rollers between which the paper passes and which have beads and grooves, and a knife in one of the rollers; Fourthly, the combination of a paste-box supported by a reciprocating carriage, and a connecting-rod for operating the same; Fifthly, the combination of a paste-box, a plate to support the bags, a shaft with which the plate rotates, and mechanism to move the plate towards and from the centre of shaft; Sixthly, to a creasing blade and elastic roller and means for operating the same in connection with the pasting mechanism.

2102. Steam Generators, *J. I. Thornycroft, Chiswick.*—4th *May*, 1882. 8*d*.

This relates to tubulous steam generators in which the water is contained in the tubes. These tubes are arranged in coils forming approximately concentric hemispheres, so arranged about the fire that the heating surface of each may be throughout as nearly as possible equidistant from the centre of heat. In conjunction with these coils a conical dish is sometimes provided for the fire, so as to dispense with the use of fire-brick. Each hemisphere of coil is formed of a number of lengths, each constituting a separate coil, the upper end of which is connected with the upper part of a vessel, serving as a combined water reservoir and steam chamber, termed a separator. The lower end of each length of coil is connected to a water chamber, connected itself to the lower end of the separator.

2103. Box Irons Heated by Gas, *G. W. von Nawrocki, Berlin.*—4th *May*, 1882.—(*A communication from A. Brecher, New York.*) 6*d*.

This relates to box irons in which the box is jointed to a handle by a leg descending from the latter, and it consists in the mode of attaching the box to the handle, in the employment of a goffering or crimping roller on the iron, and of a goffering or crimping plate for use in connection with the iron; and lastly, to appliances for heating the iron.

2104. Burners for Burning Hydrocarbon Gas with Oxygen, *E. Hagen, Ealing.*—4th *May*, 1882.—(*A communication from L. Q. Brin, Paris.*)—(*Not proceeded with.*) 2*d*.

This relates to burners for the "Brin" light, which is produced by burning carbonaceous bodies in or with oxygen, and consists of an upright socket secured to the gas pipe, and having an interior lining, with an intermediate annular space. The lining has apertures to allow gas to enter the interior. Oxygen is conveyed to the bottom of the socket by a pipe, and rises centrally therein.

2105. Iron and Wire Fencing, *G. J. Dawson, Leeds.*—4th *May*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the use of H-shaped uprights, to which metal loops are secured between the flanges, their outer ends being shaped to support the horizontal bars or wires of the fencing.

2106. Coating Metal Plates with Tin, Lead, &c., *H. T. Taylor, Neath, Glamorgan, and G. Leyshon, Tividale, Stafford.*—4th *May*, 1882. 6*d*.

The chief object is to perform in one pot containing the metal for coating the plates the same operation for which it has been hitherto necessary to employ several, and it consists in the use of a vertical coating pot with an entrance flux box with guide, and an exit finishing grease box containing pressing finishing rollers, the plate being conveyed into a suitable nipping appliance and cradle, which is always kept under the surface of the metal, and which nipping appliance is depressed, the plate being then coated, and then raised and delivered to the nip of the rollers in the finishing grease box.

2107. Improvements in Electric Safety Apparatus for Theatres, &c., *P. Jensen, Chancery-lane.*—4th *May*, 1882.—(*A communication from R. J. L. Haviland, Vienna.*) 6*d*.

This relates to means for announcing the outbreak of a fire, letting down iron fire-proof doors, and turning on water in any part of the house or theatre provided with the necessary appliances. Cords are stretched at intervals, so that when consumed they shall let go a spring, in connection with one pole of a battery, against a contact piece in connection with the other pole, and so complete a circuit, in which are the various other apparatus for carrying out the invention.

2108. Automatic Feathering Water Wheels, *C. Megow and J. L. Markel, San Francisco.*—4th *May*, 1882.—(*Not proceeded with.*) 2*d*.

The wheel is caused to revolve in a case, and is fitted with a series of floats suitably mounted, and operated so as to cause them to feather when desired.

2109. Repeating Fire-arms, *P. Mauser, Würtemberg.*—4th *May*, 1882. 6*d*.

This relates to breech-loading fire-arms known as the "Mauser gun" and which may be used as repeaters or as single shooters, and more particularly to the guns described in patent No. 1343, A.D. 1881. The carrier is fixed in its extreme positions temporarily, or as long as the gun is used as a single-shooter, by means of a projection or a spring taking into an indentation formed on the left side of the carrier. An arrangement is also described for extracting and expelling the shells when the gun is used as a single-shooter.

2110. Manufacture of Carbonate of Soda by Aid of Ammonia, *S. Pitt, Sutton.*—4th *May*, 1882.—(*A communication from T. Schloesing, Paris.*) 4*d*.

This relates to improvements on patent No. 2130, A.D. 1878, in which bicarbonate of ammonia is produced by a new process, and made to react immediately on salt water to produce bicarbonate of soda, and it consists in utilising the heat generated during the reaction, instead of trying to control the same.

2111. Tubular and Tubulous Steam Boilers, *A. F. Yarrow, Isle of Dogs.*—4th *May*, 1882. 4*d*.

The object is to prevent the leakage of the tubes of steam boilers in the tube plates, and it consists in forming in the plates and round the ends of the tubes a thread, the sides of which are parallel with each other. Or the threads may be made of a dovetail section, so that the threads lock together.

2113. Velocipedes, *H. Whitehouse, Reading.*—5th *May*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to allow the driving wheels either to revolve with the crank shaft, or run freely thereon without giving motion thereto, means being also provided to enable the machine to be driven backwards when required.

2114. Perambulator Wheels, *T. Cooke, Manchester.*—5th *May*, 1882. 2*d*.

The wheels are formed with a light wooden rim, to which a ring of wrought iron is fixed, and receives an india-rubber tire.

2115. Purifying Water, *A. Goldthorpe, Wakefield.*—5th *May*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to render water containing carbonates of iron or lime suitable for dyeing and other uses, and it consists in heating it in a closed boiler by steam so as to liberate the carbonic acid, and then passing the water into a cistern and allowing it to stand until the iron or lime is precipitated or falls to the bottom of the cistern.

2116. Ventilators, *A. W. Kershaw, Lancaster.*—5th *May*, 1882. 6*d*.

Sets of deflectors are arranged with openings between each deflector, those in one set being opposite the deflectors in the next set. The wind impinging on any deflector or passing through any openings of the outer set, tends to create a vacuum therein, and thus causes an up current entirely irrespective of the direction of the wind.

2117. Grinding, Crushing, and Pulverising Flint, &c., *J. Godwin, Stoke-upon-Trent.*—5th *May*, 1882. 6*d*.

A roller of stone when used for grinding materials for potteryware (and of iron for other purposes) is keyed to a horizontal shaft and encased in a cylindrical casting paved or lined with stone when used for potteryware. The case is larger in diameter and wider than the roller, but at top it rests on the periphery of the latter. The case is turned, and by friction causes the rollers to revolve and crush the material between them.

2118. Steam Generators, *A. J. Boult, London.*—5th *May*, 1882.—(*A communication from F. Bosquet, Lyons.*)—(*Not proceeded with.*) 2*d*.

The object is to form a boiler so that it shall occupy little space, shall be easily cleaned and transported, and that steam may be quickly raised therein, whilst its working shall be safe. Inside a cylindrical shell at the bottom a furnace is placed, and is always surrounded by water. The roof is formed by a tube plate, the tubes of which extend up to a second plate, above which is the smoke-box, from which the flue rises and passes through the top of the boiler.

2122. Treatment of Textile Materials for Deodorising and Protecting them against Moth, *G. Jaeger, Stuttgart.*—5th *May*, 1882. 6*d*.

This relates to the use of resins, fats, lack, or analogous substances to render furniture permanently free from disagreeable smells, and protecting it against moths.

2123. Collapsible Boxes, *H. J. Haddan, Kensington.*—5th *May*, 1882.—(*A communication from B. Bückert, Leipzig.*) 4*d*.

The object is to reduce the space occupied by empty boxes by making them collapsible, and it consists in making the sides capable of folding down, and providing the abutting corners with eyelet-holes, through which string may be passed to secure them in position for use.

2124. Locks for Railway Carriages, *J. M. Hart, Cheapside.*—5th *May*, 1882. 6*d*.

This relates to improvements on patent No. 2249, A.D. 1870, and it consists in the application of a plate spring behind the trigger lever, in addition to the spiral spring which acts on one end of the lever.

2130. Armour Plates, *A. Wilson, Sheffield.*—5th *May*, 1882. 6*d*.

This relates to improvements on patent No. 3472, A.D. 1877, in which a wrought iron plate whilst still hot after being rolled is placed in a mould and steel run on to it, and this invention consists in making the plate itself form one side of the mould.

2132. Compositions or Coatings to Act as Non-conductors, *E. C. C. Stanford, Glasgow.*—6th *May*, 1882. 4*d*.

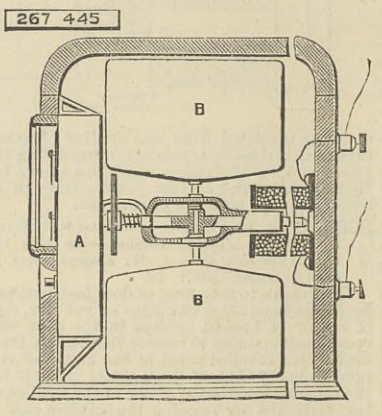
The compositions consist mainly of charcoal mixed with a suitable agglutinating substance.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

267,445. Means for Measuring Electric Currents, *Samuel D. Mott, New York, N.Y.*—*Filed April 24th*, 1882.

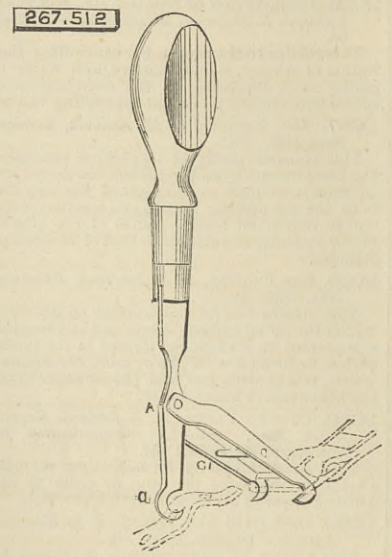
Claim.—(1) The combination, with a train of gearing and registering devices moved by a weight or spring, of a solenoid magnet, through which the current to be measured passes, and a resistance to the revolution



of the mechanism, the same being controlled by the solenoid magnet, so that the greater the current the less the resistance to the revolution of the mechanism, substantially as set forth.

267,512. Belt Stretcher, *Zarda Frost, Kinmundy, Ill.*—*Filed September 19th*, 1882.

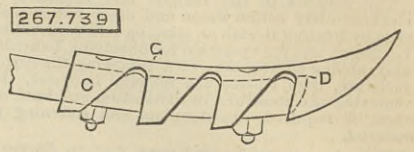
Claim.—In belt stretchers, the combination of hook-



ended blade A and pivotted hooks C C, substantially as described, for use in the manner specified.

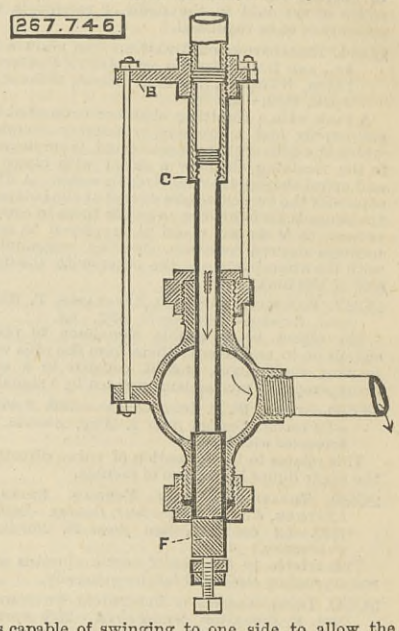
267,739. Cultivator Tooth, *Arthur S. Core, Rochester, N.Y.*—*Filed July 24th*, 1882.

Claim.—A cultivator tooth formed with a point D, and lateral blades C, extending obliquely at each side and back of a central ridge G of the tooth, the lower or cutting edges of said blades being inclined obliquely outward and upward for the purpose of giving a shearing cut to the same, and the plane of either blade passing in rear of the next blade above, substantially as shown and described.



267,746. Steam Trap, *Jerome B. Fuller and Dwight P. Mills, Naugatuck, Conn.*—*Filed August 31st*, 1882.

Claim.—(1) In a steam trap, the expansion pipe composed of two parts connected at their middle or meeting ends, but of different diameters and sensitiveness of heat, substantially as and for the purposes set forth. (2) In a steam trap, the combination, with an expansion pipe and a plug with a valve seat, of a cross bar or yoke provided with a set screw and a jam nut, and constructed at one end with a cross slot and the other end working on an axis, whereby the cross



bar is capable of swinging to one side to allow the removal of the movable plug and lower end of expansion pipe, substantially as described. (3) The improved steam trap, consisting of the globe with the inlets and outlets, and provided with central flange E, plate B, with central screw-threaded opening, connecting rods, the expansion pipe C, composed of two sections made of different metals, the plug F, and the cross bar H, with set screw and jam-nut, substantially as described.

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