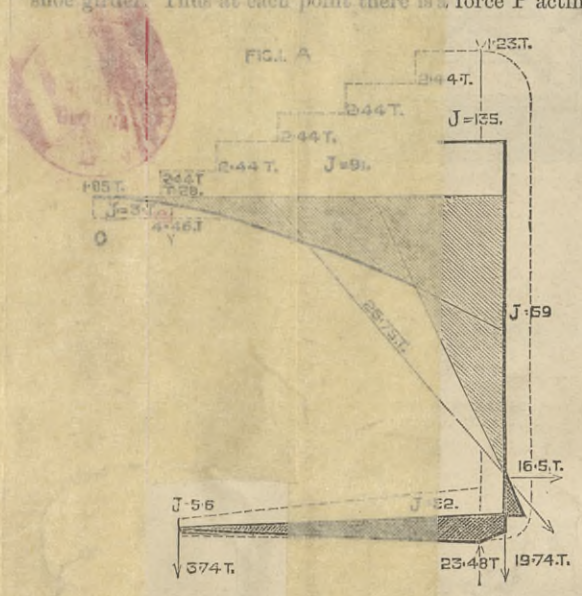
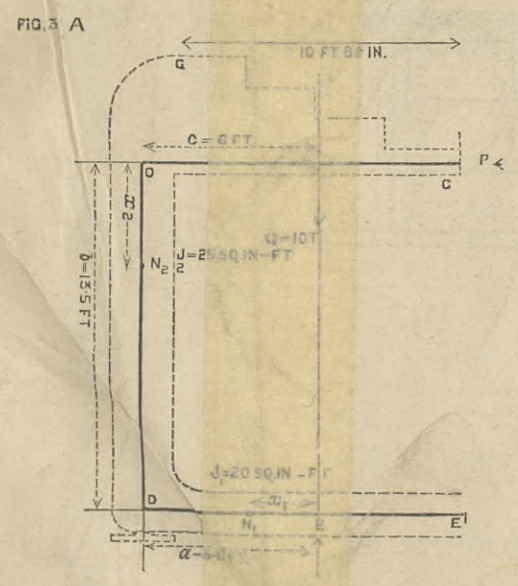
which equation determines F, viz., = 4·46 tons. The forces are now all known, and the calculation of strains can be made. This calculation was made graphically, but as it does not offer any novel features beyond the combined action just referred to, and as the diagrams together with an explanation would occupy considerable space, the particulars are here not stated. Figs. 1A and 2A are only a record of the results. The second problem being of more special interest, may here be treated more fully. The treatment is algebraical. Fig. 4A shows one-half of the horseshoe girder, which may be considered immovably fixed at B and free at A. At points O_8, O_6, O_4, O_2, O are fixed the branch-and-root girders, one of which is represented by Fig. 3A. Points O in the latter, if considered independent of the horseshoe girder, will describe a forward movement, dependent on the load Q = 10 tons, and on their construction; but this forward movement is to some extent resisted by the strength of the horseshoe girder, and more so at point O_8 than at O_6. The resisting forces P_0, P_2 .... P_8 are horizontal, and act in the plane of the web of the horseshoe girder. Thus at each point there is a force P acting in



the direction from C to O upon the branch-and-root girders, and the same force P acting in an opposite direction upon the horseshoe girder, every P being of different quantity. If then the forward movements of the former under the influence of Q and P are $\delta_0, \delta_2, \delta_4, \delta_6, \delta_8$, and the deflections of the latter at the corresponding points under the influence of the forces P are $\delta^1_0, \delta^1_2, \delta^1_4, \delta^1_6, \delta^1_8$ there must be—

$$\left.\begin{aligned}\delta_0 &= \delta^1_0\\ \delta_2 &= \delta^1_2\\ &\text{\&c.}\end{aligned}\right\} \quad \dots\ \dots\ \dots \quad (1)$$

Forward Movement of Branch and Root Girders.—The girder C O D E—Fig. 3A—is supported by a wall along the



line D E¹. When acted upon by the two forces Q and P, its point O will describe a horizontal movement, which is produced by the bending of the piece O D, and by the extension and compression of the metal in the piece D E¹. The actual condition of the latter not being free to bend will be somewhat complicated, and would be different in each girder. It will be sufficiently accurate to assume as equivalent to the actual condition that each girder is firmly held at D and E, but free to turn at both points. The movement at D would then be $= Q c - P b$, and the movement μ at N_1 at the distance x_1 from E

$$\mu_1 = (Q c - P b)\frac{x_1}{a}$$

After the bending of D E the elements of the neutral fibre at D and E are inclined towards each other under an angle ϕ_1 which is :—

$$\phi_1 = \int_o^a \frac{Q c - P b}{E J_1}\,\frac{x_1}{a}\,dx_1$$

where J_1 is the moment of inertia at N_1, and E the modulus of elasticity. The movement of point O in consequence of this bending is $b\phi_1$. The moment in the vertical part at point N_2 at the distance x_2 from O is $\mu_2 = Q c - P x_2$, and the horizontal movement of point O in consequence of this bending is :—

$$\Delta y = \int_o^b \frac{Q c - P x_2}{E J_2}\,x_2\,dx_2,$$

where J_2 is the moment of inertia at N_2. The total horizontal movement δ, of point O is thus :—

$$\delta = b\phi_1 + \Delta y = b\int_o^a \frac{\mu_1}{E J_1}\,dx_1 + \int_o^b \frac{\mu_2}{E J_2}\,x_2\,dx_2 =$$

$$b\int_o^a \frac{Q c - P b}{E J_1}\,\frac{x_1}{a}\,dx_1 + \int_o^b \frac{Q c - P x_2}{E J_2}\,x_2 dx_2 \quad (2)$$

In this expression is: Q = 10 tons; $a = c = 6{\cdot}6$ ft.; $b = 13{\cdot}5$ft.; $J_1 = 20$ square inches – feet (constant between $x_1 = o$ and $x_1 = c$); $J_2 = 25$ square inch – feet (constant between $x_2 = o$, and $x_2 = b$); E the modulus of elasticity for wrought iron = 11,000 tons (constant.)
Hence :

$$\delta = \frac{1}{11{,}000}\left[13{\cdot}5\,\frac{10\times 6{\cdot}6 - 13{\cdot}5\,P}{20\times 6{\cdot}6}\int_o^a x_1\,dx_1 + \right.$$

$$\left. + \frac{1}{25}\int_o^b (10\times 6{\cdot}6\,x_2 - P x_2^2)\,dx_2\right.$$

$$\delta = 0{\cdot}0351 - 0{\cdot}0057\,P$$

Thus :

$$\left.\begin{aligned}\delta_0 &= 0{\cdot}0351 - 0{\cdot}0057\,P_0\\ \delta_2 &= 0{\cdot}0351 - 0{\cdot}0057\,P_2\\ \delta_4 &= 0{\cdot}0351 - 0{\cdot}0057\,P_4\\ \delta_6 &= 0{\cdot}0351 - 0{\cdot}0057\,P_6\\ \delta_8 &= 0{\cdot}0351 - 0{\cdot}0057\,P_8\end{aligned}\right\} \quad \dots\ \dots\ \dots \quad (3)$$

Deflection of the Horseshoe Girder.—In Fig. 4A the line $B A_8 \ldots\ldots A_0$ represents the neutral fibre of the girder which can be considered as immovably fixed at B, but otherwise free to bend. Forces $P_8 \ldots\ldots P_0$, viz., the pressures from the branch-and-root girders act upon it as shown. Disregarding the compression of the neutral fibre, the deflection of the girder at any given point is according to the theory of flexure of curved beams :

$$\delta = \int_o^s \frac{M}{E J}\,x\,ds$$

where s is the length of the neutral fibre between the given point and B, ds a very small part of it, x the distance from the given point of any ds measured horizontally—*i.e.*, at right angles with the deflection to be calculated—M the moment of all forces P in the middle of ds, J the moment of inertia at that point, and E the modulus of elasticity. As the above expression cannot be integrated with infinitely small ds, an approximation must be resorted to by making ds measurable. For this purpose $B A_0$—or s—is divided into fourteen nearly equal parts, the points of division being marked 0 to 14 on the engraving. The length of ds and the moments of inertia in the middle of each are likewise indicated, and the values required for the calculation of the above expression which now may be written in accordance with the approximation

$$\Sigma_o^s \frac{M}{E J}\,x\,ds$$

are recorded in the following table :—

Point.	M.	$\frac{ds}{J}$	x, measured from points.				
			8	6	4	2	0
1	$3\,P_0$	0·00694	0	0	0	0	6
2	$9\,P_0$	0·00694	0	0	0	0	12
3	$3\,P_2 + 15\,P_0$	0·00694	0	0	0	6	18
4	$9\,P_2 + 21\,P_0$	0·00694	0	0	0	12	24
5	$3\,P_4 + 15\,P_2 + 27\,P_0$	0·00694	0	0	6	18	30
6	$9\,P_4 + 21\,P_2 + 33\,P_0$	0·00694	0	0	12	24	36
7	$3\,P_6 + 15\,P_4 + 27\,P_2 + 39\,P_0$	0·00694	0	6	18	30	42
8	$9\,P_6 + 21\,P_4 + 33\,P_2 + 45\,P_0$	0·00694	0	12	24	36	48
9	$3\,P_8 + 15\,P_6 + 27\,P_4 + 39\,P_2 + 51\,P_0$	0·00633	6	18	30	42	54
10	$9{\cdot}2\,P_8 + 21{\cdot}2\,P_6 + 33{\cdot}2\,P_4 + 45{\cdot}2\,P_2 + 57{\cdot}2\,P_0$	0·00420	12·4	24·4	36·4	48·4	60·4
11	$13\,P_8 + 25\,P_6 + 37\,P_4 + 49\,P_2 + 61\,P_0$	0·00280	13·6	25·6	37·6	49·6	61·6
12	$13{\cdot}8\,P_8 + 25{\cdot}8\,P_6 + 37{\cdot}8\,P_4 + 49{\cdot}8\,P_2 + 61{\cdot}8\,P_0$	0·00229	14·0	26·0	38·0	50·0	62·6
13	$14{\cdot}15\,P_8 + 26{\cdot}15\,P_6 + 38{\cdot}15\,P_4 + 50{\cdot}15\,P_2 + 62{\cdot}15\,P_0$	0·00245	14·3	26·3	38·3	50·3	62·3
14	$14{\cdot}35\,P_8 + 26{\cdot}35\,P_6 + 38{\cdot}35\,P_4 + 50{\cdot}35\,P_2 + 62{\cdot}35\,P_0$	0·00262	14·4	26·4	38·4	50·4	62·4

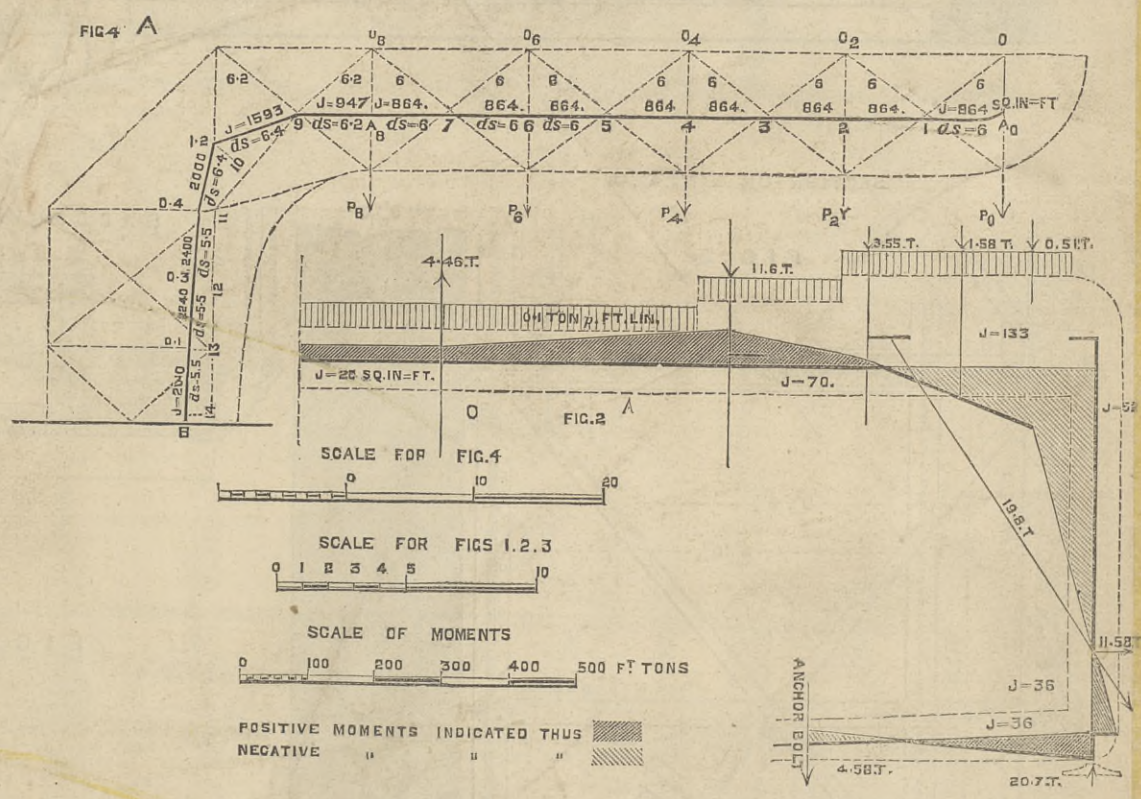
In forming the expression $\Sigma \frac{M}{J}\,x\,ds$, each of the last columns must be used separately. For example, for point 4 the expression $\frac{M}{J}\,x\,ds$ will be, for the eleventh point,
$37{\cdot}6\,x\,0{\cdot}0028\,[13\,P_8 + 25\,P_6 + 37\,P_4 + 49\,P_2 + 61\,P_0]$, and for the third point it will be 0. The sum of the fourteen values thus obtained would be the expression $\Sigma_o^s \frac{M}{J}\,x\,ds$ for point 4, and this divided by E would be the value of δ_4. In this manner the following equations are obtained :—

$$\left.\begin{aligned}\delta_0^1 &= \frac{1}{E}(12{\cdot}071\,P_4 + 30{\cdot}660\,P_3 + 55{\cdot}745\,P_2 + 65{\cdot}021\,P_1 + 87{\cdot}251\,P_0)\\ \delta_2^1 &= \frac{1}{E}(11{\cdot}695\,P_4 + 24{\cdot}306\,P_3 + 43{\cdot}414\,P_2 + 85{\cdot}327\,P_1 + 118{\cdot}403\,P_0)\\ \delta_4^1 &= \frac{1}{E}(6{\cdot}832\,P_4 + 17{\cdot}055\,P_3 + 29{\cdot}776\,P_2 + 43{\cdot}521\,P_1 + 56{\cdot}467\,P_0)\\ \delta_6^1 &= \frac{1}{E}(4{\cdot}647\,P_4 + 11{\cdot}600\,P_3 + 18{\cdot}878\,P_2 + 26{\cdot}156\,P_1 + 33{\cdot}435\,P_0)\\ \delta_8^1 &= \frac{1}{E}(2{\cdot}572\,P_4 + 4{\cdot}371\,P_3 + 8{\cdot}171\,P_2 + 10{\cdot}970\,P_1 + 13{\cdot}770\,P_0)\end{aligned}\right\} \quad (4.)$$

Combining equations (1), (3), and (4), five equations are obtained which contain only the five forces P as unknown quantities; these are therefore determined. The equations, being repetitions of previous statements, need not be given here; but the results are as follows :—

$$P_0 = -0{\cdot}046^T;\ P_2 = +1{\cdot}153^T;\ P_4 = +2{\cdot}053^T;$$
$$P_6 = +3{\cdot}445^T;\ P_8 = +5{\cdot}93^T.$$

Putting these values into equations (3) the following results are obtained :—



$\delta_0 = 0{\cdot}0354$ft.; $\delta_2 = 0{\cdot}0286$ft.; $\delta_4 = 0{\cdot}0234$; $\delta_6 = 0{\cdot}0155$ft; $\delta_8 = 0{\cdot}0013$ft.

P_0 being negative, it follows that the horseshoe girder instead of diminishing the forward movement of the last pair of branch-and-root girders, slightly increases it; but as it diminishes that of all the others, the total effect is one of diminishing the forward movement.

The angle ϕ, which, after the bending, the element of the neutral fibre of the branch-and-root girders at point O forms with the vertical, is—

$$\phi = \phi_1 + \varphi_2 = \int_o^a \frac{M_1}{E J_1}\,dx_1 + \int_o^b \frac{M_2}{E J_2}\,dx_2$$

from which is found by reference to previous statements:

$$\varphi = 0{\cdot}00423 - 0{\cdot}000533\,P.$$

Point G, at the top of the girder—Fig. 3—is 4·25ft. above point O. The forward movement of G is therefore $\delta_0 + 4{\cdot}25\,\phi +$

At the extreme pair of girders where $P = P_0 = -0{\cdot}046^T$ this forward movement will accordingly be—

$$0{\cdot}0354 + 4{\cdot}25 \times 0{\cdot}004254 = 0{\cdot}05348\text{ft.} = 0{\cdot}64\text{in.}$$

Being produced, as previously stated, by a load of 175 lb. per foot sup. The forward movement for a load of 200 lb.

WROUGHT IRON GALLERY—READING TOWN HALL.

DESIGNED BY MR. MAX AM ENDE, C.E., CONSTRUCTED BY MESSRS. HANDYSIDE, AND CO., DERBY.

(For description see page 2.)

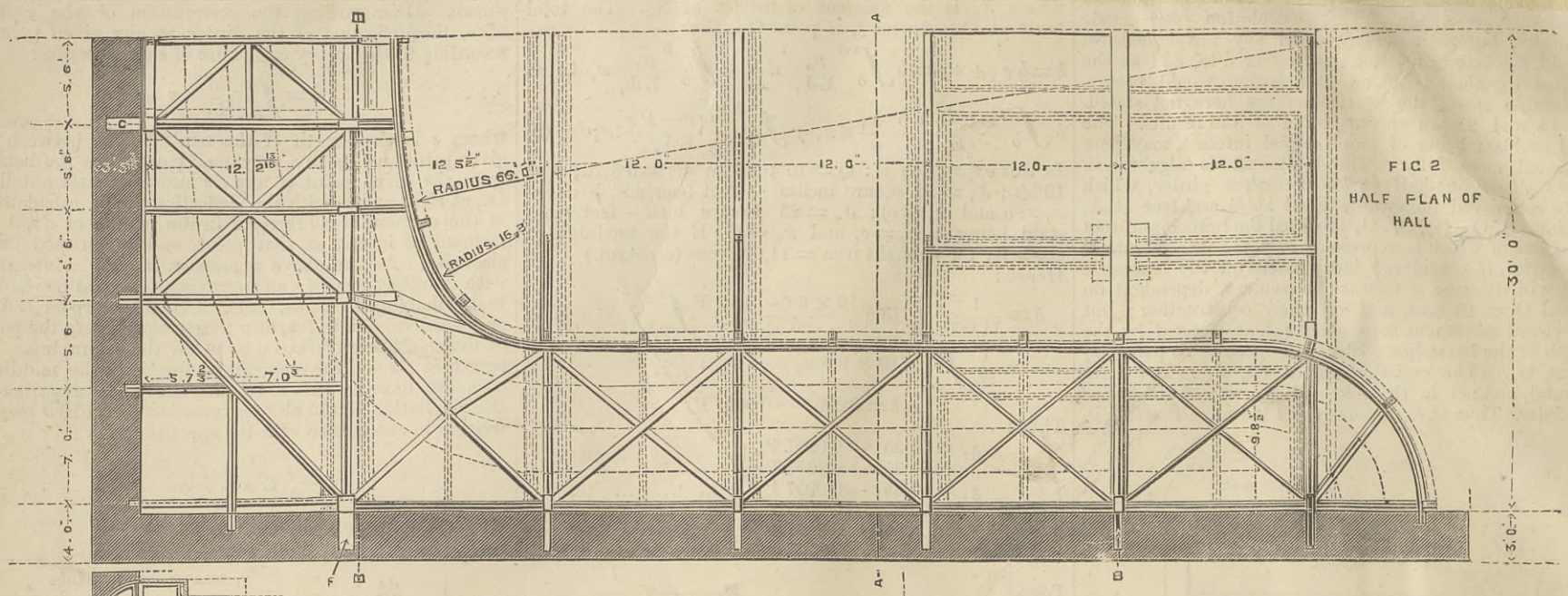


FIG. 2
HALF PLAN OF HALL

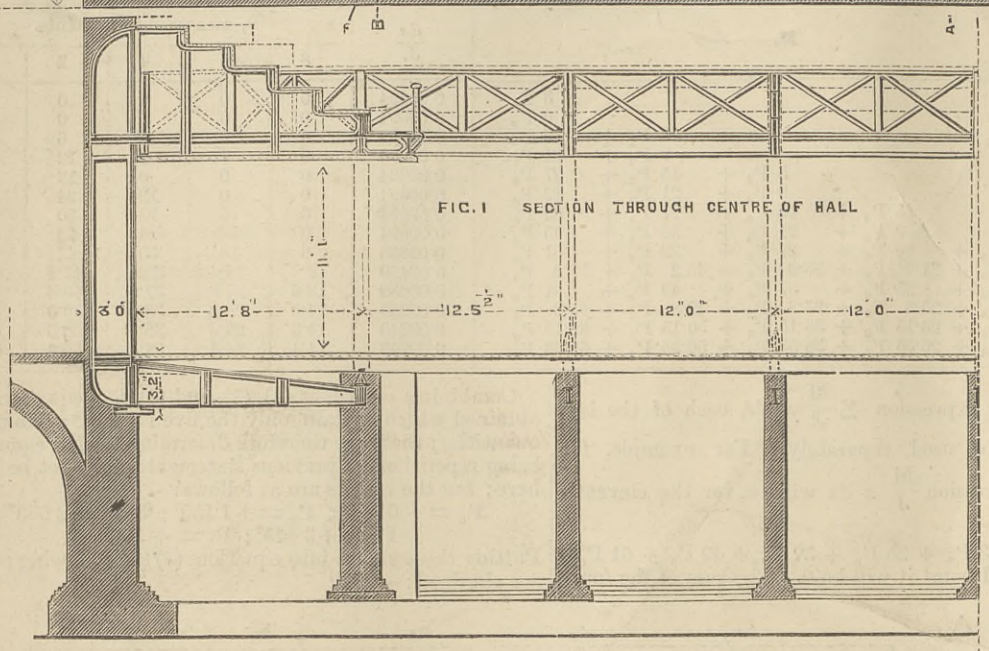


FIG. 1 SECTION THROUGH CENTRE OF HALL

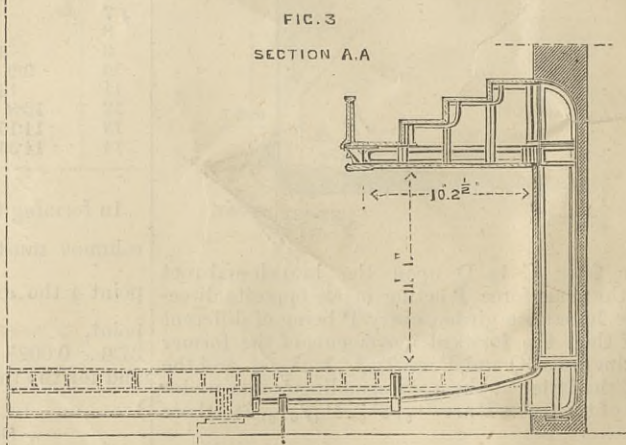
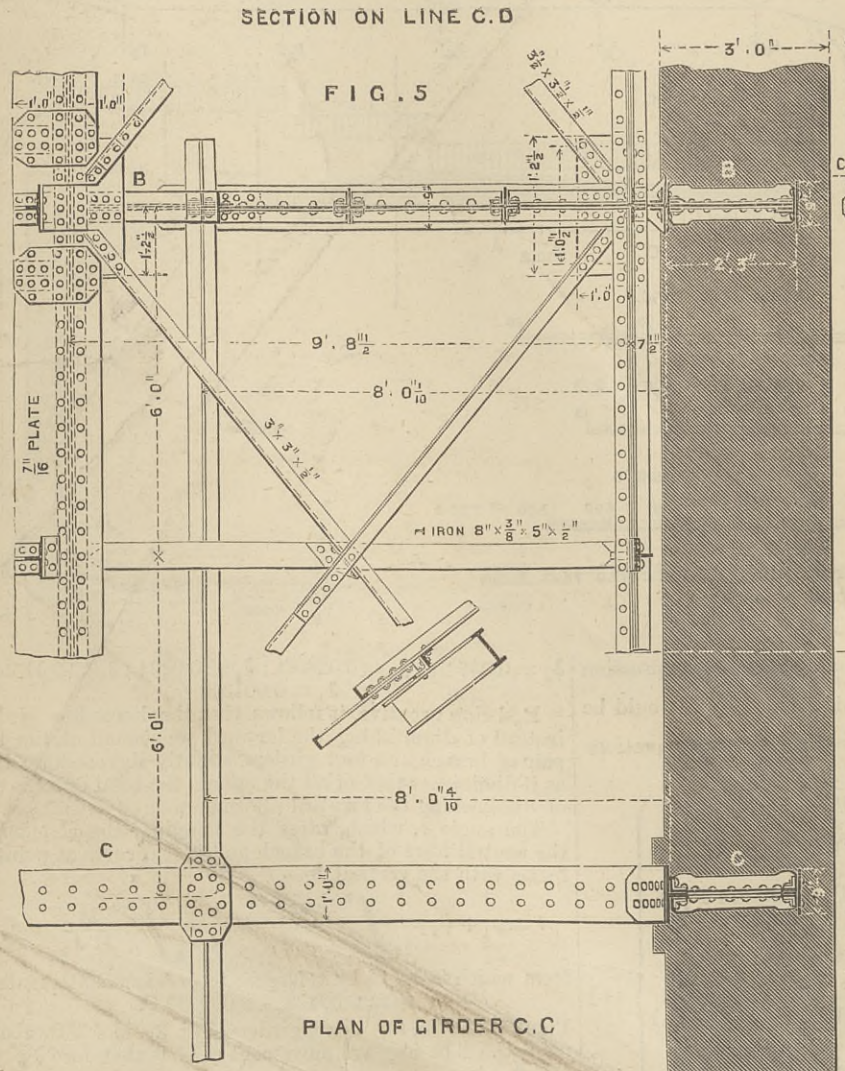


FIG. 3
SECTION A.A

SECTION ON LINE C.D

FIG. 5



PLAN OF GIRDER C.C

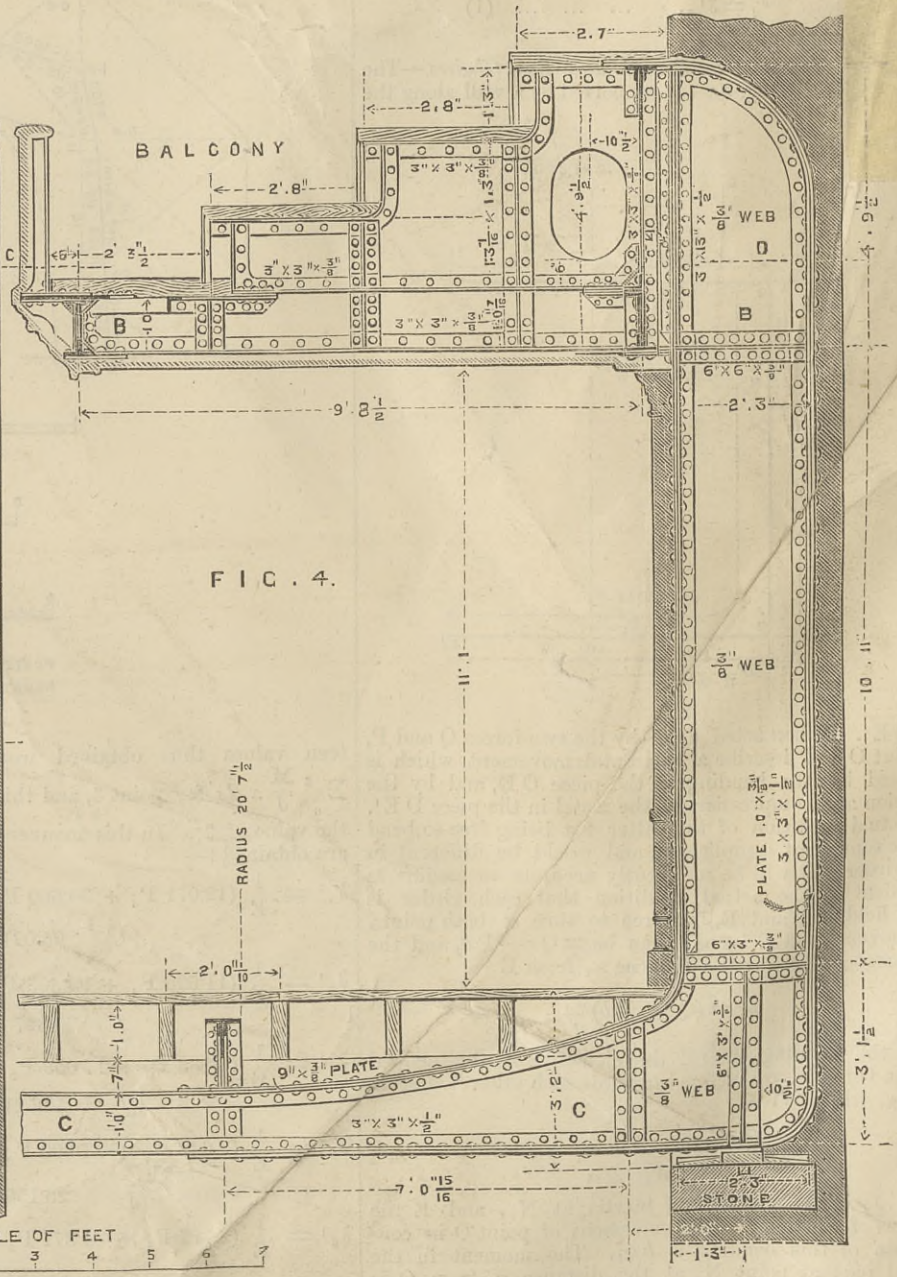


FIG. 4.

SCALE OF FEET

0 1 2 3 4 5 6 7

WROUGHT IRON GALLERY—READING TOWN HALL.

DESIGNED BY MR. MAX AM ENDE, C.E., CONSTRUCTED BY MESSRS. HANDYSIDE, AND CO., DERBY.

(*For description see page 2.*)

FIG. 6.

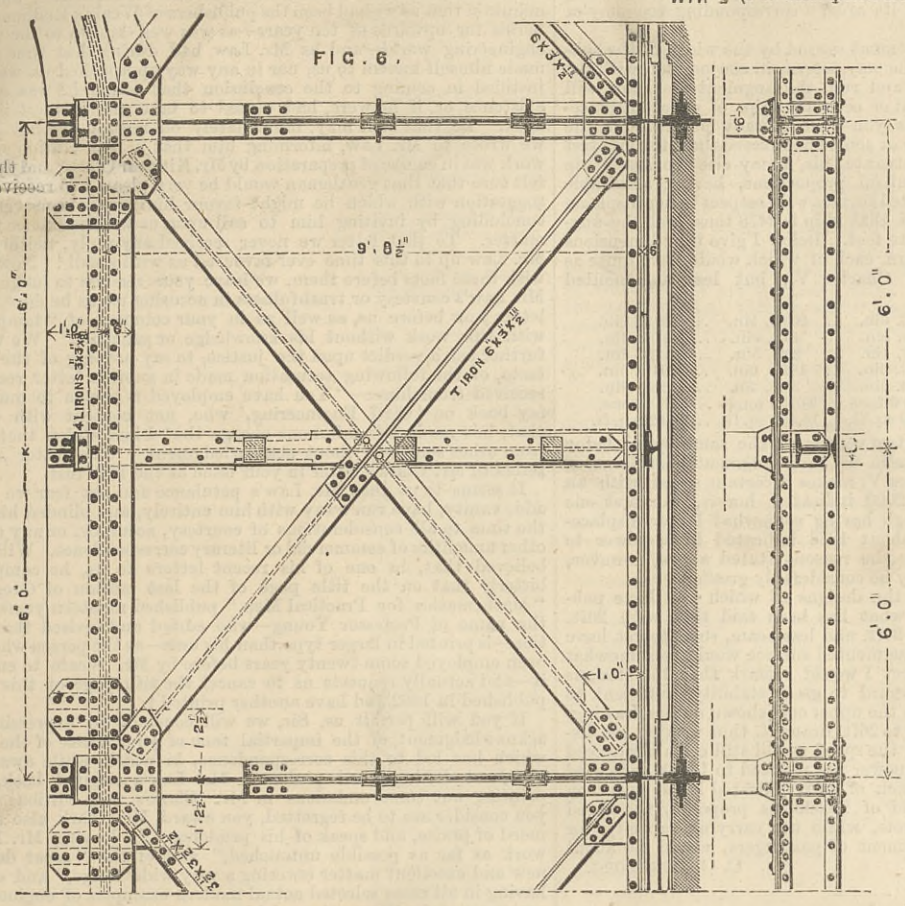


FIG. 8.

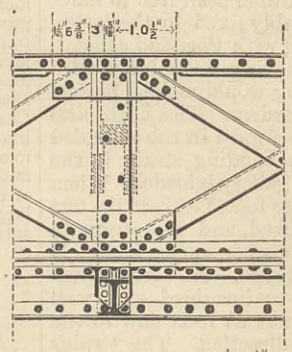
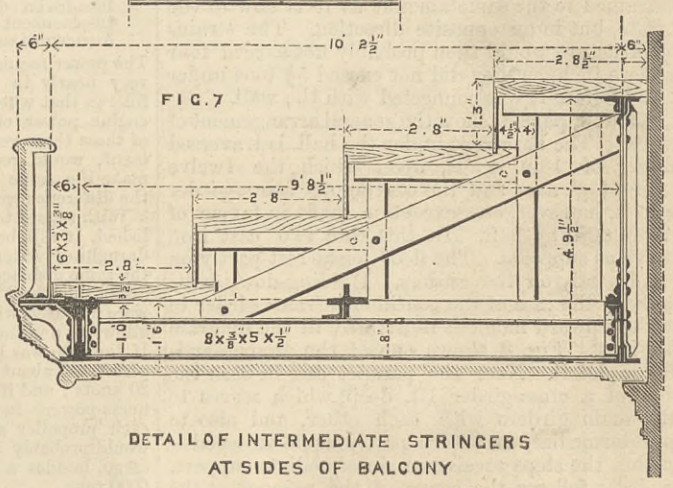


FIG. 7



DETAIL OF INTERMEDIATE STRINGERS AT SIDES OF BALCONY

FIG. 9

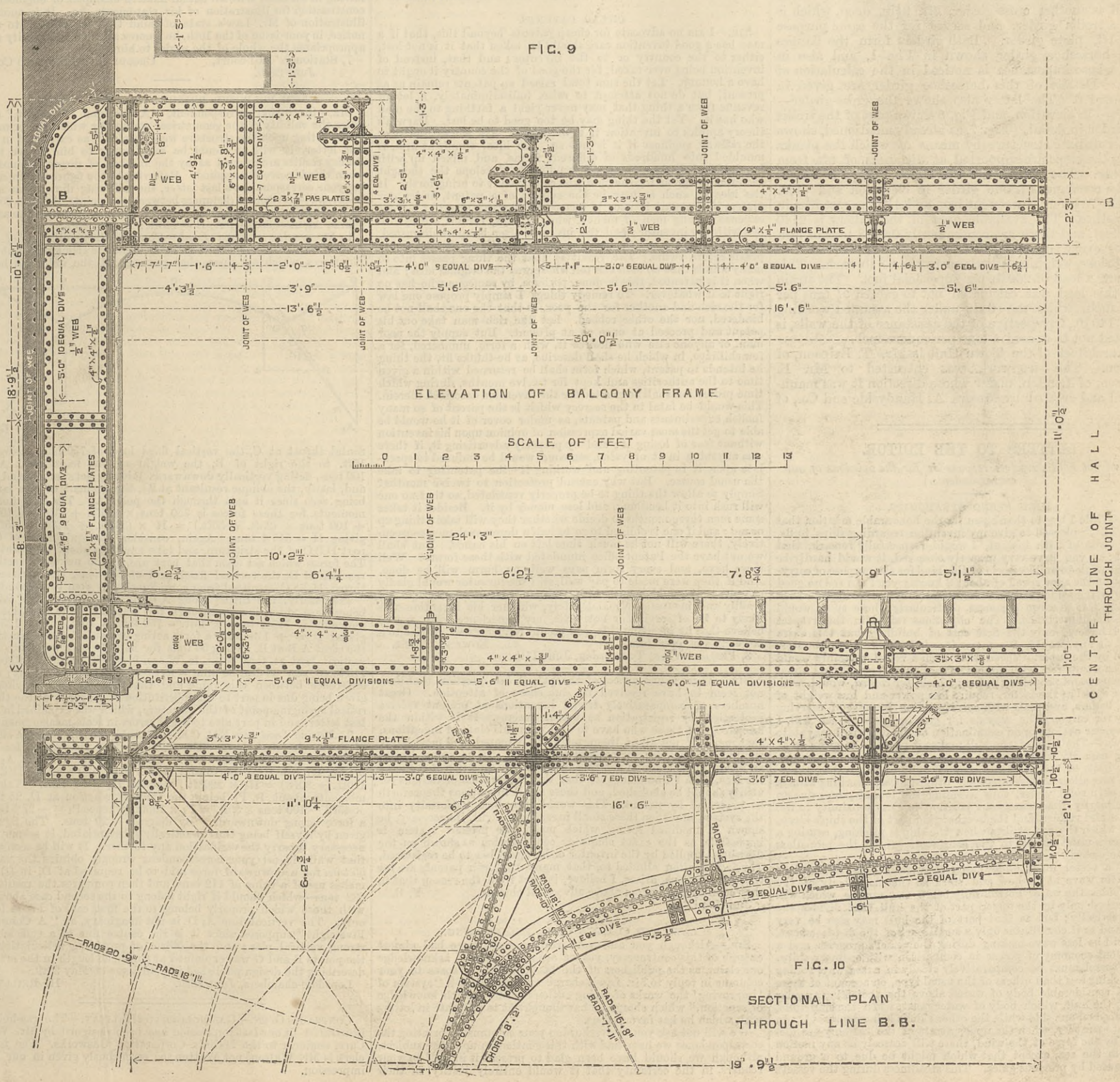


FIG. 10

SECTIONAL PLAN THROUGH LINE B.B.

which was the test load, would be according to this calculation $= \frac{200}{175}\ 0{\cdot}64 = 0{\cdot}73$in. The actual movement was at one side $= 0{\cdot}9$, and at the other 0·5in., the inequality possibly being caused by the fact, that the bricks which constituted the test load were piled up at first at one side of the gallery and then at the other.

After one-half of the test load was removed all the branch-and-root girders, having till then been free to move in niches of the wall, were immovably fixed to the latter. This was done by means of grouting with Portland cement, the inner surface of the niches having been built with vertical grooves, so that the grouting would make a perfect bond between the wall and the girders. The horizontal pressure upon the wall being thus outward in the unloaded condition of the gallery, there is a bending strain in the wall. This will be reduced when the gallery is loaded. When the load is about 100 lb. per square foot, *i.e.*, half the test load, the wall will be entirely relieved, and the strain in the ironwork will not exceed $2\frac{3}{4}$ tons per square inch. If the load should be increased to 200 lb.—an event which will not happen, but which may be imagined—the wall would be strained to the same amount as it is now in the unloaded state, but in an opposite direction. The strains in the iron structure would then probably not exceed four tons per square inch, as they did not exceed $5\frac{1}{2}$ tons under the same load before it was connected with the wall.

Figs. 1, 2, and 3, page 4, show the general arrangement of the structure. The basement under the hall is traversed by a number of 18in. walls, upon which the twelve branch-and-root girders and the continuous frame-girder rest. There is, however, one exception made in favour of a supper-room 60ft by 24ft. In this case two cast iron columns serve as supports. The floor joists rest partly on the walls and partly on the girders. Holding-down bolts are used only in the case of the continuous-frame girder to counteract the upward moment illustrated in the diagram of strains, Fig. 2. Fig. 4 shows one of the branch-and-root girders in detail. Near the parapet can be seen the cross-section of a cross-girder 1ft. deep, which serves to connect the main girders with each other, and also to support an intermediate structure partly made of wood—Fig. 7—so that the steps receive an intermediate support. This cross-girder follows the curve of the parapet at the back of the hall and at the two ends of the gallery. Near the wall is another cross-girder, 4ft. $9\frac{1}{2}$in. deep, which is partly a trellis girder, and serves for the same purpose as the 1ft. plate girder. Both girders form the flanges of the horseshoe girder shown in Fig. 1, and also in Fig. 4, whose importance is noticed in the calculation of strains. Details of this horseshoe girder are given in Figs. 5 and 6. The latter also shows the cross-girder—1ft. deep—in elevation, and Fig. 8 shows part of the trellis cross-girder in detail. Fig. 7, as already mentioned, shows the intermediate structure by means of which the planks forming the steps are supported at distances of 6ft. from each other. The planks are 3in. thick. Figs. 9 and 10 show the continuous frame girder in elevation and plan. There are $76\frac{1}{2}$ tons of wrought iron and $4\frac{1}{2}$ tons cast iron in the structure. The available area of the gallery is 2140 square feet, and there are consequently 0·0378 tons of iron used for every superficisl foot. The test load consisted of 50,000 bricks, weighing a little more than 8 lb. each. This represents a load of 200 lb. per superficial foot. The strain under this load was calculated not to exceed $5\frac{1}{2}$ tons per square inch, while the strain under the assumed working load of 140 lb., irrespective of the assistance of the walls, is calculated not to exceed 4 tons per square inch.

The architect of the Town Hall is Mr. T. Lainson, of Brighton. The ironwork was entrusted to Mr. E. Matheson, of London, under whose direction it was manufactured and erected by Messrs. A. Handyside and Co., of Derby.

LETTERS TO THE EDITOR.

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

HIGH SPEED STEAMSHIPS.

SIR,—While I beg to thank you for the honourable mention that you have been pleased to give my invention regarding ships' hulls, in your issue of 24th instant, I would respectfully remark, that although, as you have very properly observed, it would hardly be worth the while to build vessels of this kind for the purpose of carrying cargo at the slow speed of about 8 knots; yet I can see no good reason why the same principles of design may not be applied with advantage also to cargo steamers, particularly where speed would be of some importance. The objections raised in this respect regard, I believe, only the first cost of building; but this extra expense, if any, would, I am convinced, be more than counterbalanced by the superior speed that such a vessel certainly would attain, as compared with others of ordinary form having equal displacement and propelling power; which, *per contra*, would, with the same speed as the latter, require less power and less weight of engines, boilers, and coals with corresponding increase of carrying capacity for cargo. The reasons for greater speed, which will, I think, appear obvious upon examination of the designs, I may state as follows:—The form of the hull makes it possible to unite great carrying capacity with very fine lines and the greatest sharpness. It also admits of the finest and cleanest run astern possible, allowing the propellers to develope their utmost effect, working always in unbroken solid water, thus avoiding the loss of power due to their ordinarily disadvantageous position in close proximity to the sternpost and rudder, and the overhanging part of the ship's stern, against which the sea strikes when the ship is pitching, causing a disturbance unfavourable to the continuous grip of the propellers upon the water.

Such a vessel must glide easily through the water, creating very little wave at its bow and stern as the main body of the hull divides the water horizontally below the surface, which will be disturbed only by the upper part of the hull that divides the water vertically; but as that part of the hull may also be very sharp, and as it constitutes only a small part of the displacement, there will be less wave-making during the vessel's progress, and a consequent economy of power in comparison with ordinary ships. Such a vessel must be comparatively steady in a sea-way, rolling and pitching less than others of the usual type, on account of there being a considerable body of water above the projecting angular sides of the hull, which body of water must, when the ship rolls, be elevated on one side while the other side is being depressed. In moderate weather, when the upper strata of the sea only are disturbed by the force of the wind, there will scarcely be any motion felt from the sea, except that which might be due to a ground swell caused by previous gales. This steadiness during the vessel's progress will save power in no inconsiderable degree. The rudder—which may be nearly perfectly balanced, so as to require little power to move it—may have much less area than in vessels of the usual model and yet be more effective, requiring less angular motion to swing the ship's stern, which presents a favourable form and comparatively small vertical surface to be moved sideways. The resistance to the ship's progress caused by the rudder being diminished in proportion to its area, a corresponding economy of power will follow.

Owing to the large displacement caused by the width of the submerged part of the hull all the way astern, in conjunction with the great sharpness of entrance and run, the augmented surface will compare favourably with that of ordinary ships of equal displacement, particularly when, as you have already pointed out, the draught of water approaches or somewhat exceeds half the greatest beam. As an example to illustrate this, I may cite the steamship Charles V. a vessel of beautiful proportions, having admirable lines and very small augmented surface with respect to her displacement. The displacement of that ship is 2478 tons, and the augmented surface 15,266 square feet. Below I give the dimensions of three vessels upon my plan, each of which would have quite as large displacement as the Charles V., but less augemented surface:—

Extreme length ..	210ft. 0in. ..	203ft. 5in. ..	224ft. 0in.
Bxtreme breadth ..	35ft. 0in. ..	40ft. 6in. ..	37ft. 3in.
Draught of water ..	20ft. 4in. ..	20ft. 3in. ..	18ft. 3in.
Length on L. W. L. ..	192ft. 5in. ..	182ft. 0in. ..	204ft. 5in.
Breadth on do. ..	28ft. 0in. ..	32ft. 5in. ..	29ft. 9in.
Displacement	2510·0 tons ..	2482·0 tons ..	2484·5 tons.
Augmented surface..	13,990 sq. ft. ..	14,638 sq. ft. ..	14,827 sq. ft.

The power required to drive two vessels at the same speed being very nearly in the same ratio as their augmented surfaces, it follows that when the Charles V. makes a certain speed with an engine power of, suppose, 2000 indicated horses, the first one of these three vessels, although having somewhat larger displacement, would require only about 1833 indicated horse-power to make the same speed. For the reasons stated above, however, the difference would probably be considerably greater.

With regard to the vessel, the designs of which you have published, it will be seen from what has been said that with 26ft. draught of water, instead of 24ft. and less beam, so as to yet have the same displacement, the augmented surface would be somewhat diminished, and in this respect I would remark that the designs were prepared with special regard to great stability, sufficient to allow yet another deck above the upper one, shown on the drawing. If the ship was loaded down to 26ft. draught. thus making the displacement about 16,030 tons, the speed would still certainly exceed 20 knots; and if the engine power was reduced to 16,000 indicated horse-power—two engines, each of 4000 indicated horse-power on each propeller shaft—instead of 22,800 as proposed, the speed would probably reach 19 knots, while the carrying capacity for cargo, besides a full complement of passengers, would be about 6000 tons. C. G. LUNDBORG.

London, June 28th.

CHEAP PATENTS.

SIR,—I am no advocate for cheap patents beyond this, that if a man has a good invention care should be taken that it is not lost, either to the country or to the inventor; and that, instead of invention being over-taxed, for the good of the country it ought to have a bounty. Let the sum total raised on patents remain as at present, but do not attempt to raise, indiscriminately, a lot of revenue from a thing that may never yield a farthing to the man who has it. Yet the thing may be too good to be lost. Darwin's theory applies to invention if to anything. Ask the artillerist or the railway engineer if it is not so. An idea, simple at first, is moulded into hundreds of different forms, and mixed up with hundreds of diverse ideas, all tending to develope the thought that was too great for the man who conceived it to bring forth. If the idea be such as may be the subject of a patent, under our system if the man is poor it has to be hawked about at a great expense among men of money, who, perhaps, cannot see eye to eye with the inventor; and the inventor often becomes disgusted, and thinks he has either heard or read something about casting pearls before swine. The result is that the thing passes into so many minds that no man can tell whose was the original idea; and when it is patented, this is done, perhaps, by someone who has no right to it whatever. To remedy things I simply propose one law for the rich and another for the poor, so that the one shall not be hindered, nor the other robbed. Let the rich man take out his patent and proceed at once as at present. But supply the poor man, or anyone else who desires it, with a form, numbered, for a few shillings, in which he shall describe, as he thinks fit, the thing he intends to patent, which form shall be returned within a given time to the authorities and kept for twelve months, during which time protection shall be granted for the invention described therein. This would be fatal to the secrecy which is the parent of so many foolish experiments and patents, as under cover of it he would be able to get the most varied expression of opinion upon his invention without fear of losing it; and by properly advertising it, if there was anything in it of value, someone would be induced to speculate upon it in patenting and working it—the patenting to take the usual course. But why extend protection to twelve months? Simply to allow the thing to be properly ventilated, so that no one will rush into it headlong, and lose money by it. Besides it takes some men three months to decide whether they will take a thing up or not; and if one is obliged to go to half a dozen such men consecutively, there will not be much time left on his hands. But shall we not have the Patent-office inundated with these forms? Well if we have, and every form pays well, no harm will be done. And if they were made to pay well, still the inventor would gladly submit, as it would furnish him with the means of ascertaining, readily and inexpensively and safely, whether his invention was likely to be of service or not. Sir, my experience leads me to believe that by inserting this you would render great service to a large class of inventors. EDWARD HOYLE.

3, Pleasant View, Todmorden, June 11th.

SIR,—There is one aspect of the patent law question that does not seem to have received its due share of attention. Great numbers of comparatively trivial inventions at present receive protection by registration as useful designs. It is within the knowledge of those who have to deal with this class of inventions, that many, if not all of them, might be patented, and most likely would be if the fees for patents were lower. If, as seems likely, an alteration is made in the patent laws in the direction of reducing the fees, then I would suggest that the registration of designs for utility should be abolished, and these small inventions thenceforth be protected by patent. This would introduce uniformity into the system, and then these small inventions might, if necessary, be shown in modified forms, which under the present system is impossible, as the exact shape or configuration as shown on the drawings supplied by the inventor or his agent has to be registered. The fact so often alluded to, that many American patents are for trivial inventions, arises, I believe, in part from the reason that in that country the system above advocated obtains. Y. R.

June 23rd.

LAW AND CLARK'S CIVIL ENGINEERING.

SIR,—Although you and your readers must have had almost enough of this controversy, yet we are sure you will acknowledge our claim, as the publishers of the book, to a short space in your columns in reply to Mr. Law's charge against us of a "system of 'improving' the works of living authors without their knowledge or sanction," which charge he has thought fit to reiterate in letters with which he has favoured us.

We will not ask you to overburden your columns by printing the correspondence we have had with this gentleman upon the subject, although we should have been glad to present it in full to your readers, in the certainty that it would entirely justify, in their estimation, the course we have taken. We will confine ourselves to the charge as it affects the book now under notice.

In March, 1880, we received from Messrs. Strahan and Co. a letter addressed to them by Mr. Law, saying that he should like to see them previous to the work on "Civil Engineering" being reprinted. Previously to that we had not been aware that Mr. Law was in England, or, indeed, that he was in existence; and we maintain that as we had been the publishers of Weale's Rudimentary Series for upwards of ten years—as was well known to the whole engineering world—and as Mr. Law had during that time never made himself known to us, nor in any way approached us, we were justified in coming to the conclusion that either he was not in existence or, if he were, had ceased to take any interest in the book. Be that as it may, immediately on receipt of that letter we wrote to Mr. Law, informing him that a new edition of the work was in course of preparation by Mr. Kinnear Clark; and that we felt sure that that gentleman would be very pleased to receive any suggestion with which he might favour him for its improvement, concluding by inviting him to call upon us with reference to the matter. To that letter we never received any reply, neither has Mr. Law up to this time ever favoured us with a call! Now, Sir, with these facts before them, we leave your readers to judge as to Mr. Law's courtesy or truthfulness in accusing us, as he does in his letter now before us, as well as in your columns, of "tampering with this work without his knowledge or sanction." We would further ask a verdict upon the justice, to say nothing of the good taste, of the following accusation made in another letter recently received from him:—"You have employed a person to mutilate my book on 'Civil Engineering,' who, not content with doing that, has made the infamous charge that I had stolen that book from other sources without acknowledgment." The latter clause refers to Mr. Clark's letter in your issue of the 17th inst.

It seems to us that Mr. Law's petulance and, we fear we must add, vanity, have run away with him entirely, and blinded him for the time to all considerations of courtesy, accuracy, or any of the other amenities of commercial or literary correspondence. Will it be believed that, in one of his recent letters to us, he complains bitterly that on the title page of the last edition of Gregory's "Mathematics for Practical Men," published nineteen years ago, the name of Professor Young—who edited and revised that edition—is printed in larger type than his own—as the person who had been employed some twenty years before by Mr. Weale to enlarge it—and actually requests us to cancel the title-page of this book published in 1862 and have another printed!

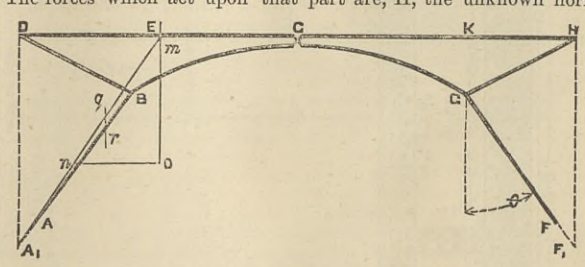
If you will permit us, Sir, we will conclude by expressing an acknowledgment of the impartial tone of your notice of the book which has led to this correspondence, in which, while awarding the most distinguished praise to Mr. Law's original book, and pointing out some omissions in Mr. Clark's new edition which you consider are to be regretted, you award Mr. Clark also a full meed of praise, and speak of his prudence "in leaving Mr. Law's work as far as possible untouched," and of the "great deal of new and excellent matter covering a very wide range," and of his having in all cases selected actual modern examples of engineering construction for illustration of his statements, &c. It is another illustration of Mr. Law's state of mind that in referring to this notice, in your issue of the 10th, he ignores all this impartiality and appropriates the whole of the praise to himself.

7, Stationers'-hall-court, CROSBY LOCKWOOD AND CO.
June 28th.

THE PROPOSED BRIDGE OVER THE DOURO.

SIR,—Since your correspondent, "A Common Five-eight," disputes the validity of the geometrical method by which the primary forces acting upon the structure were obtained, as explained in my last letter, it will no doubt be satisfactory to him to see that similar results are arrived at by the method of direct calculation when this is correctly applied. Referring to the figure accompanying your correspondent's last letter, the following dimensions may be given:—Horizontal distances between the points, A_1, A = 25ft.; A, B = 110ft.; B, C = 160ft.; vertical distances between the same points, A_1, A = 33·5ft.; A, B = 148ft.; B, C = 45ft.

1. *Stresses due to Fixed Load.*—Consider the equilibrium of the part A_1 D C B of the structure and take moments about the point A_1. The forces which act upon that part are, H, the unknown horizontal thrust at C, the vertical fixed load of 750 tons acting at 10ft. to the right of B, the weight of the main strut A B, 100 tons, acting vertically downwards midway between A and B; and, lastly, the oblique resultant at A_1, the moment of this latter being zero since it acts through the point A_1. The equation of moments for these forces is 750 tons × (25ft. + 110ft. + 10ft.) + 100 tons × (25ft. + 55ft.) = H × ($33\frac{1}{2}$ft. + 148ft. + 45ft.), giving H = 515·4 tons. Again, consider the equilibrium of the part D B C of the structure, and take moments about the point B. The forces which act upon that part are, P, the unknown vertical reaction at D, the vertical fixed load of 750 tons, the horizontal thrust H at C—omitted from consideration by your correspondent—and, lastly, the thrust along A B, the moment of this latter being zero since it acts through the point B. The equation of moments is 515·4 tons × 45ft. − 750 tons × 10ft. = P × 135ft., giving P = + 116 tons, a force acting upwards. The thrust on the strut A B at B, adding 50 tons for half its own weight to the vertical load at that point, is W sec. θ = (750 tons + 50 tons — 116 tons) sec. 36 deg. 30 min. = 684·0 × 1·244 = 851·0 tons; the difference between this value and that of 830 tons previously given being due in part to the substitution of A_1 for A as the theoretical springing point of the structure, which was explained in my last letter, and in part also to small errors in scale measurement.



2. *Moving Load over* E C, C K.—Consider for this case the effect of the moving load alone. The amount of the unbalanced load is 8 bays × $12\frac{1}{2}$ tons = 100 tons. Taking moments about A_1 as before, H_1 being the horizontal thrust at C, 100 tons × (25ft. + 110ft. + 80ft.) = H_1 × $226\frac{1}{2}$ft., whence H_1 = 95 tons. Taking moments about B, P_1 being the vertical reaction at D, 95 tons × 45ft. — 100 tons × 80ft. = P_1 × 135ft., whence P_1 = — 27·5 tons, a force acting downwards. By diagram — 25 tons. The figures given by myself being thus practically substantiated, it seems unnecessary to carry the verification any further. It will be seen also that while in (*a*) your correspondent wrongly obtains the value 55 tons for a downward force said to be required at D, in (*e*) he makes use of a value of 112 tons, and then compares the result of 632 tons—which should if right belong to the second case above—with those which properly belong to the first case of Fixed load only. The vertical line A_1 D is not imaginary, as "A Common Five-eight" supposes, since it is the centre line of a sufficiently strong vertical pier; and the object of providing articulation at the points B and G was explained at sufficient length in the article describing the design published in your issue of May 20th.

Lonsdale-chambers, June 28th. H. REILLY.

CONTRACTS OPEN.—GAS-HOLDER FOR HALIFAX.—The gas-holder illustrated in our last impression has been designed by Mr. Wm. Carr, engineer to the Halifax Corporation Gasworks. The town clerk is Mr. Walton, not Watton, as erroneously given in our last impression.

RAILWAY MATTERS.

THE Société d'Acoz, in Belgium, has obtained a contract from the United States for 1000 tons of iron rails. Other orders of minor importance are expected, and these prospects are calculated to give the market a greater degree of firmness.

TENDERS were opened a few days ago at Strasburg for the supply of 1000 steel axles for the Alsace-Lorraine Railway Company. Bochum secured three lots of 200 each, one at 347f. 50c., and the others at 367f. 50c.; and Krupp and the Phœnix Company, Laar, tendered for three lots at 368f. 75c.

IT is said that experiments are being made with a view to running trains through the St. Gothard Tunnel by electricity, with motive power obtained from the Reuss and the Tessin. The boring of the Arlberg Tunnel proceeded last month at the rate of six and a half metres per day. The making of the lines of access will shortly be undertaken.

A SELECT Committee of the House of Lords has passed a Bill, which has already received the sanction of the House of Commons, authorising the Metropolitan Railway Company to extend its Harrow and Rickmansworth Extension Line as far as Aylesbury, and thereby eventually to establish a new communication with Birmingham.

TO-DAY two important alterations in the train service between Leeds and Wetherby and Harrogate will come into operation. An express train will leave Leeds every afternoon at 4.30 for Harrogate, *viâ* Wetherby, stopping only once—at Thorner—between Leeds and the latter place, and arriving at Harrogate at 5.20. The express is timed to leave Harrogate at 6.10 p.m., and to reach Leeds at 7.17.

GERMANY is, it is said, to contribute to the Electro-technical Exhibition at Paris the model of a new and important signalling apparatus, the invention of a railway official at Elberfeld, which is intended to dispense with intermediate block stations, and to allow trains to follow each other at closer distances than hitherto. The device, which has, we understand, been tried and found to work excellently, is called an electro-automatic block station telegraph, and is so constructed as to register at two stations simultaneously, by wheel-pressure, the passage of a train at a point equidistant from them.

THE murder of Mr. Gold on the London and Brighton Railway on Monday last has been followed by the publication of a number of letters in the daily press, advocating the introduction of the American system of railway carriage. The chances of any individual being murdered in a railway carriage are absolutely infinitesimal—hundreds of millions to one against the occurrence—and it is not we think likely that the comfort and privacy of the English carriage will be exchanged for the publicity and discomfort of the American car, which has been fully tried on the Midland Railway and abandoned.

A SELECT committee of the House of Lords on Wednesday passed a Bill, which has already received the sanction of the House of Commons, authorising the construction of a line from the Uxbridge branch of the Great Western Railway to join the Watford and Rickmansworth Railway to Rickmansworth, a distance of over eight miles. The line will be constructed by an independent company, which has powers to raise capital to the extent of £150,000 and to borrow any sums not exceeding £50,000. The cost of construction is estimated at £114,425, which provides for the erection of stations at Uxbridge, Denham, and Harefield, and for enlarging or building a new station at Rickmansworth.

ACCORDING to the Paris correspondent of the *Liverpool Journal of Commerce*, the Upper Italian Railway Company has invited tenders for 5 first-class carriages, each having two *coupes lits* and 2 ordinary compartments; 5 with one *coupe lit* and 3 ordinary compartments; 40 ordinary first-class carriages; 35 mixed ditto; 33 second-class; 22 luggage vans; 410 cattle and goods wagons, closed; 300 coal wagons; and 108 flat trucks; 30 ditto of 20 and 3 of 25 tons. The value of these contracts is estimated at 5,400,000f. The same company is to order locomotives to the value of about 3,000,000f., eighteen of them charged to the current year's accounts, and twenty-two to the account of 1882.

WE learn that Mr. Frederic W. North, F.G.S., the mining engineer appointed a few years ago to report upon the coal-fields of Cape Colony, has just returned to England from a similar visit to Natal. His investigations for that Government have been highly satisfactory, and among the various and prolific seams of anthracite and bituminous coal, some of them 10ft. or 12ft. in thickness, he has found several that are well adapted for locomotive and general steam purposes. That this coal is suitable for the former work he proved before leaving the colony by working the locomotives of the existing railways for some hundreds of miles to and fro between Durban and Maritzburg, and he has handed to that Government a tabular statement showing the advantage of using colonial coal instead of any English varieties. The possibility of using cheap local fuel instead of costly English coal in these distant colonies may, according to the *Times*, give a great impetus to railway construction, and an extension beyond Ladysmith, in Natal, will provide a better and more expeditious highway to the Transvaal and Orange Free State. The Railway Bill for the expenditure of £5,000,000 upon railway construction in Cape Colony, which has just received the sanction of the Assembly at Cape Town, contemplates the intersection by a main line of the coal deposits of that colony. Therefore, after considerable delay, those coal-fields are now going to be placed in direct communication with both the coast and the Diamond Fields.

INFORMATION as to foreign railway rates on iron and steel and iron-making materiale, has been obtained for the British Iron Trade Association from the French railway companies by H. B. M. Ambassador in Paris, by the courtesy of the French Minister of Public Works. The charges authorised by law on the Paris, Lyons, and Mediterranean Railway are, from 4 to 62 miles, 1·23d. per ton per mile; from 62 to 210 miles, 0·77d. per ton per mile; from 210 miles and upwards, 0·62d. per ton per mile. The actual charges made by the company are considerably lower than those authorised, down to, for iron ore, 0·38d. per ton per mile; for coal and coke, 0·38d. per ton per mile; for pig iron, 0·46d. per ton per mile. On the Eastern Railway there is a special tariff for iron ores, the maximum charge being 0·77d. per ton per mile, and the minimum 0·35d. per ton per mile. By the ordinary Est-Nord tariff, the rates for iron ore are—maximum, 0·46d. per ton per mile; minimum, 0·3d. per ton per mile, excluding station charges, which are fixed at 0·80f. per 1000 kilogrammes—about 8d. per English ton—and are divided equally between the two companies of the Est and of the Nord. Rates for pig iron are, maximum, 0·77d. per ton per mile; minimum, 0·46d. per ton per mile, not including the costs of charging and discharging at the stations, which are fixed at 1f. per 1000 kilogrammes—9·6d. per ton. The rates by the ordinary special Est-Nord tariff are, maximum, 0·46d. per ton per mile; minimum, 0·3d. per ton per mile, exclusive of station charges, which are fixed at 0f. 80c. per 1000 kilogrammes (about 8d. per ton), and are divided equally between the two companies. The rates for wrought iron by special interior tariff are: maximum, 0·91d. per ton per mile; minimum, 0·62d. per ton per mile, not including the charges for loading, unloading, and the station user. By another special tariff this company carries bar iron at a uniform price of 0f. ·04c. per ton per kilometre—0·62d. per ton per mile—including all station charges for loading and unloading. This tariff is specially applied to the conveyance of iron from various iron-making centres to Paris. The ordinary tariff of the Est-Nord and of the Est-Ouest provides for carrying bar iron for 0f. ·05c. per ton of 1000 kilogrammes per kilometre—about 0·77d. per ton per mile—as a maximum, and for 0f. ·03c. per 1000 kilogrammes per kilometre—about ·52d. per ton per mile—as a minimum, excluding in both cases the charges for loading, unloading, and the use of the station, which amounts to 1·40f. per ton, and is divided equally between the two companies.

NOTES AND MEMORANDA.

NICKEL ore of fine quality is reported to have been discovered in the upper valley of the Youghiogheny, Virginia.

Der Mash Constr. says that Professor Boettger recommends the following solution for coating copper plates with iron. Ten parts of ferro-cyanide of potassium and twenty parts of tartrate of soda are dissolved in 220 parts of distilled water, adding a solution of three parts of sulphate of iron in fifty parts of water. Caustic soda solution is then poured into the mixture until the Prussian blue formed is re-dissolved.

THE pyramids of Egypt are thirty-eight in number, and stretch for some fifty geographical miles along the western reach of the Nile valley, just where the Libian desert and the cultivated land struggle for extension, or from nearly opposite Heliopolis to past the site of Memphis. Of the whole number, only one, the first, most northern, or "Great Pyramid," is a true pyramid; thirty-four are mere imitations, *i.e.*, only approximately true, while the remaining three scarcely deserve to be classed as pyramids at all.

ACCORDING to a report on the working of the Suez Canal in 1880, published by the Statistical Bureau of Egypt, under the direction of Amisi Bey, it appears that during the year, 2017 ships passed through the canal, with an official tonnage of 2,860,448, but really amounting to 4,378,964. The number of hands employed in the navigation was 128,453; the number of passengers, 53,517. Of the 2,860,441 tons official reckoning, 2,247,306 were British, 177,771 French, 75,820 Austrian, 124,083 Dutch, 71,039 Italian, 56,245 Spanish, 38,162 German, 29,607 Russian, 7203 Turkish, and 8032 Egyptian, while 25,180 tons belonged to other States.

IT has, no doubt, been a mystery to many how the iron ball inside of sleigh bells got there, and it is said to have taken considerable thought on the part of the discoverer before the idea struck him. In making sleigh bells the iron ball is put inside a sand core, just the shape of the inside of the bell. Then a mould is made just the shape of the outside of the bell. This sand core, with the jinglet inside, is placed in the mould of the outside, and the melted metal is poured in, which fills up the space between the core and mould. The hot metal burns the core so that it can all be shaken out, leaving the ball within the shell.

THE number of artesian wells in New York steadily and rapidly increases, something like forty having been sunk during the past year. Their depths range from 200ft. to 2000ft., and the flow ranges from 1000 to 2000 barrels a day. These wells are used mainly by brewers and other large manufacturers who require a large amount of water, and who find the artesian well water economical both for its cheapness and its coolness, which enables them to dispense with much ice. Usually the wells are vertical. In one instances seven holes were drilled in different directions and at different angles, only one being vertical. The boring was carried to a depth of about 260ft. on the average, the longest at an angle being 457ft. deep. Water was struck in all the borings, and an abundant supply has been obtained continuously.

IN order to obtain iridium in a convenient form for making pen points, the molten metal is poured on an iron plate, when the workman immediately strikes it with a heavy iron, thereby flattening it out into a slab of about one-thirty-secondth of an inch in thickness. This slab is broken up into small pieces, which are then ground into the proper shape. The grinding is accomplished as follows:—A copper wheel, technically called a lap, about 12in. in diameter and ½in. in thickness, revolving about 3000 revolutions per minute, is covered with fine emery corundum mixed with oil. The emery imbeds itself into the copper, forming a rough and sharp surface. When the object to be ground is too small to hold in the hand it is soldered on a piece of brass, which, after the grinding, is dissolved in nitric acid, leaving the iridium free. One ounce of iridium yields from 5000 to 10,000 pen points.

PROFESSOR ABEL has made a report to the Home-office on a series of samples of coal-dust collected from Seaham collieries after the terrible explosion last year. He says it may be admitted as possible that in the large volume of flame, and the great disturbing effect of a blown-out shot as the initiatory cause of the ignition of dust and its suspension in the surrounding air, such inflammation may, in the complete absence of fire-damp, be propagated to a greater distance than the results of small experiments would warrant one in assuming. But it scarcely can be maintained that the air of a mine in which the coal gives off gas at all can be at any time free from fire-damp, and as the existence of very small and unsuspected quantities of that gas in the air of a mine may suffice to bring about the ready propagation of flame by coal dust, and thus to develope violent explosive effects, it would appear needless to assume that coal-dust may, in the entire absence of fire-damp, give rise to explosions even of only limited character in coal mines, in order to account for casualties which cannot be ascribed to the existence of accumulation or sudden outbursts of fire-damp.

A NEW form of seismometer is described by Dr. G. Wagener of Kioto, Japan. From a strong rigid frame in the form of a short quadrangular pyramid is suspended an iron ball weighing about fifty pounds, by means of a bundle of untwisted silk fibres three feet long. Below this ball is an indicating pendulum consisting of a hollow sphere pivotted near its centre of suspension upon a small polished ball, also rigidly fixed to the frame, and carrying beneath it a light arm, whereby its motions are multiplied twenty-four times. A small sphere fixed to the bottom of the iron ball plays into a cavity in the summit of the indicating pendulum. The latter has, by reason of its construction, a very short period of oscillation as compared with that of the iron ball. Hence when an earthquake occurs the inertia of the heavy ball will keep it for a considerable time in its position, while the pointer of the indicating pendulum moves toward the region whence the disturbance came, and can return almost instantly if the horizontal displacement be succeeded by a displacement in the opposite direction. That the movement of the pendulum may be registered accurately in point of time, a small silk thread attached to the bottom of the indicating pendulum passes through a small eye-hole in a porcelain plate immediately beneath, and thence passes round a light indicating wheel which is also in connection with a lever which at the slightest movement drops, and stops a clock. A kindred apparatus is employed to register the direction of the shock, eight threads from the indicating pendulum of a similar instrument being wound round eight indicating wheels for the eight chief points of the compass.

A PROCESS described in a recent number of the *Revue Industrielle*, if it prove successful, is likely to affect the price of copper, and consequently of brass and gun-metal. At Lyons, attempts have been made to adapt the Bessemer process to the refining of copper ores. These attempts have been confined to simply burning off the sulphur, combined with the metal in the form of pyrites, by means of a powerful blast. The process has already been described in THE ENGINEER. The difficulty has been, according to our contemporary, that, toward the end of the process, the charge has been always cooled down too much by the operation. This obstacle has, it is said, been at length overcome by the Lyonnais. One day, when melting down some old copper, a piece of phosphor-bronze having found its way into the mass, the superintending engineer was surprised at seeing the phosphorised metal, when exposed to the heat, increase in temperature far beyond that of the surrounding copper, and at length arrived at a dazzling white heat. The phosphorus, thus burning, disengaged an enormous amount of heat, which liquefied the copper. In studying the order of combustion in air of the substances capable of being mixed with pyrites or matter, it was found that sulphur burns first, then certain metals, and last of all phosphorus. The inference was drawn that all that is necessary in order to prolong to any length the Bessemer operation in copper refining is simply to add a small quantity of phosphorus to the charge, and thus obtain, after the combustion is all over, a cake of pure copper. A company has been formed in Lyons for the purpose of working the new process, and works have been laid down respecting which further particulars are promised.

MISCELLANEA.

A NEW bridge is about to be erected over the Tweed, near the town of Peebles.

A NEW street is in course of formation out of Chancery-lane through Bream's-buildings into Fetter-lane.

THE contractor of the new dock at Swansea has brought the electric light to bear for the night shifts, and to considerable advantage.

THE City Commissioners of Sewers have accepted the tender of the Val de Travers Company for paving the roadway of Queen Victoria-street. At the same meeting it was decided to remove the wood paving in Coleman-street, and replace it by asphalte.

EIGHTY of the public lamps of Sheffield are now being lit and extinguished by a pneumatic system invented by Mr. George Weston. The operation of lighting or putting out is done in less than fifteen seconds. It is expected that the experiment will answer.

HER MAJESTY'S GOVERNMENT have appointed the Earl of Crawford and Balcarres, Chief Commissioner, and Sir Charles T. Bright, Professor D. E. Hughes, F.R.S., and Lieut.-Colonel C. E. Webber, R.E., as Commissioners, at the forthcoming Electrical Exhibition and Congress at Paris.

THE construction of the new high level bridge at Barrow is proceeding very satisfactorily. The masonry and brickwork is in a forward state, and the ornamental iron and girder work which is to span the main line of the Furness railway and docks has nearly all been made, but the work of erection yet remains to be done.

ARRANGEMENTS have been made between the Gas Committee of the Corporation of Birmingham and the Smethwick Local Board to transfer on the 1st October next, part of the gas undertaking purchased by Smethwick. This is considerably earlier than the date fixed in the award, which was the 1st of July, 1882.

THE telegraph steamer Faraday, of London, Captain Maypee, which is engaged in laying the new Atlantic cable, has picked up the end of the English shore section which had been buoyed thirty-six miles away, and, having effected the splice, proceeded to pay out the mid-ocean section of the cable. The section off the American coast is already laid.

A GREAT deal of fuss was made about a fire on board the twin-ship Calais-Douvres, which it seems was of little or no consequence. There was a good deal of smoke and very little fire; but no damage whatever was caused to the saloon or any other part of the vessel, which performed the usual mail service on Tuesday morning between Dover and Calais.

IN April last an application was made by the Birmingham, Tame, and Rea District Drainage Board to the Local Government Board for permission to borrow £188,000 for the purchase of land, &c., for works of sewerage and sewage disposal in the Tame Valley. An inquiry into the matter was subsequently held by Mr. J. Thornhill Harrison C.E., an inspector, and an intimation has now been received from the Local Government Board that the application for the loan has been granted.

THE work of re-opening the Maudlin seam of the new Seaham Colliery, where for the past nine months the bodies of twenty-eight of the sufferers by the disaster have been lying, has now been commenced. The workmen have advanced to within less than 1000 yards of the spot where it is supposed the remainder of the bodies will be found. Mr. Fleuss's apparatus for enabling persons to work with safety in noxious atmospheres, and also a safety lamp of his invention, have been used with great advantage in the operations. It is expected that some important discoveries as to the cause of the explosion will be made.

A MEETING of the Amalgamated Society of Engineers and of non-society men has been held in Birmingham, in the interests of trade unionism. It was stated that the membership was increasing and that the funds now amounted to £132,000. Since its birth the society had expended nearly two millions of money in its benefits. Mr. Broadhurst, M.P., said that he firmly believed there had been a distinct increase both in the quantity and quality of work done in a given time since the introduction of the short hours system by trade societies. He believed that if America, and the chief European countries, took off their protective tariffs, England would become the workshop of the world.

FURTHER experiments with the electric light were made in the House of Commons on Friday night. In addition to the twelve Brush lanterns in the roof, there were thirty-four small incandescent lights on the Swan system under the galleries. These lights superseded sixty-four gaslights in the roof, and thirty-four gas jets on the pillars. There was a perceptible diminution of heat under the galleries, and the light there was steady and clear. Though some alterations had been made in the deeply ground glass which encased the opal globes in the roof, no change was observable from the previous experiment. Opinion is still divided as to the comparative merits of the old and new systems of illuminating the chamber.

A SOCIETY which promises to have an important future commenced its first general meeting on Tuesday, in the hall of the Institute of Civil Engineers, Great George-street. Inaugurated as recently as the 4th of April last at the rooms of the Chemical Society, Burlington-house, it already numbers more than 300 members, and yesterday's meeting was largely attended. Professor Roscoe, F.R.S., the president of the Chemical Society and also of the new society, was in the chair. The aim of the society is to bring more closely together the scientific chemist and the practical man, or, as it is worded in the laws, "to promote the acquisition and practice of that species of knowledge which constitutes the profession of a chemical engineer." After the president's address three papers were read:—On "Recent Legislation on Noxious Gases," by Mr. E. K. Muspratt; "The Brewing of Lager Beer," by Professor C. Graham; and "Mechanical Furnaces," by Mr. James Mactear. In the evening the members dined in the Pillar hall at Cannon-street Hotel.

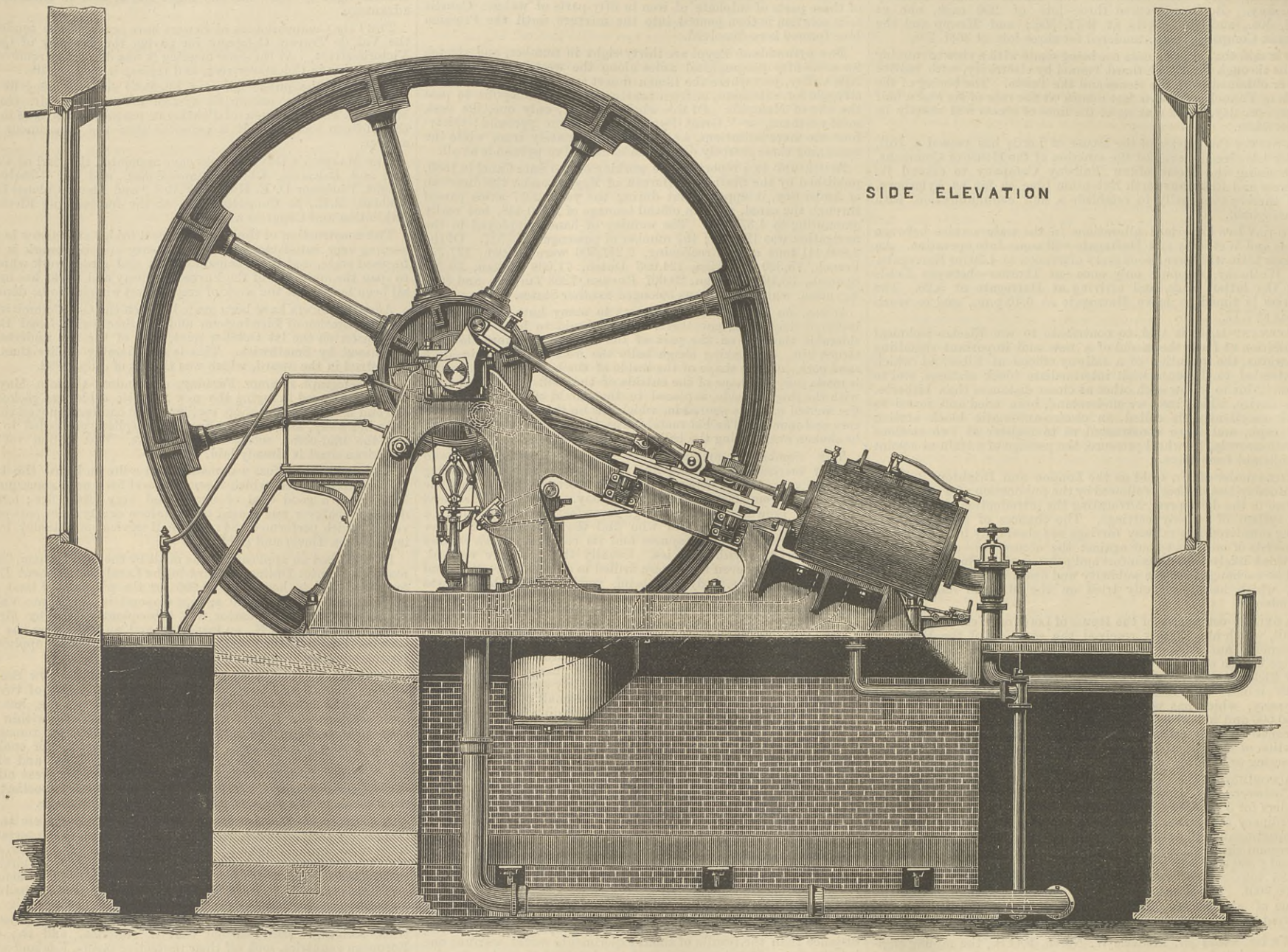
PLYMOUTH has been carrying out a large drainage scheme, and on Saturday Sir Joseph Bazalgette, the engineer of the Stonehouse Lake drainage scheme—with whom have been associated Messrs. Law and Chatterton, of Westminster, Mr. J. L. Hodge, acting as resident engineer for them—made a final inspection of the works which have been in progress upwards of two years. A huge sewer reaches from the Old Rectory at Stoke Damerel, round by the Military Hospital, across Mill Bridge, past the Naval Hospital, across into Chapel-street, Stonehouse, up Durnford-street, and so to the sea under Eastern King Point, and is in all about two miles and a quarter long. The sewer, so far as it follows the level of the lake, is of ordinary brickwork, but when it reaches the ascent to Durnford-street it takes the form of a tunnel of considerable size, and sometimes at a great depth from the surface. Atogether 3500ft, have been tunnelled, and 8006ft. are of brickwork, the total length being 11,506ft. The tunnel is 5ft. 6in. one way, and 4ft. 6in. the other. The contract was let to Mr. Henry Stephens, of Ashburton, for £12,866, but the extras paid up to the present date amount, according to *The Western Morning News*, to £5619, and by the time the work is wholly completed it is expected that they will reach £6144, thus making the total sum spent upon the work £19,000. The extras have been occasioned by the nature of the ground through which the tunnel has been cut. The limestone rock through which it had to pass proved faulty; and instead of merely having to put a little concrete over the rock as it was excavated, in many cases the fissures were so large that regular concrete blocks and oftentimes brickwork had to be resorted to. Sir Joseph Bazalgette himself says the work has been one of extreme difficulty. While the sewer will act as the main sewer for Stonehouse, and some old catchpits which have hitherto been used will be done away with, the principal object of the work has been the purification of the Stonehouse Creek.

THREE CYLINDER COMPOUND ENGINE.

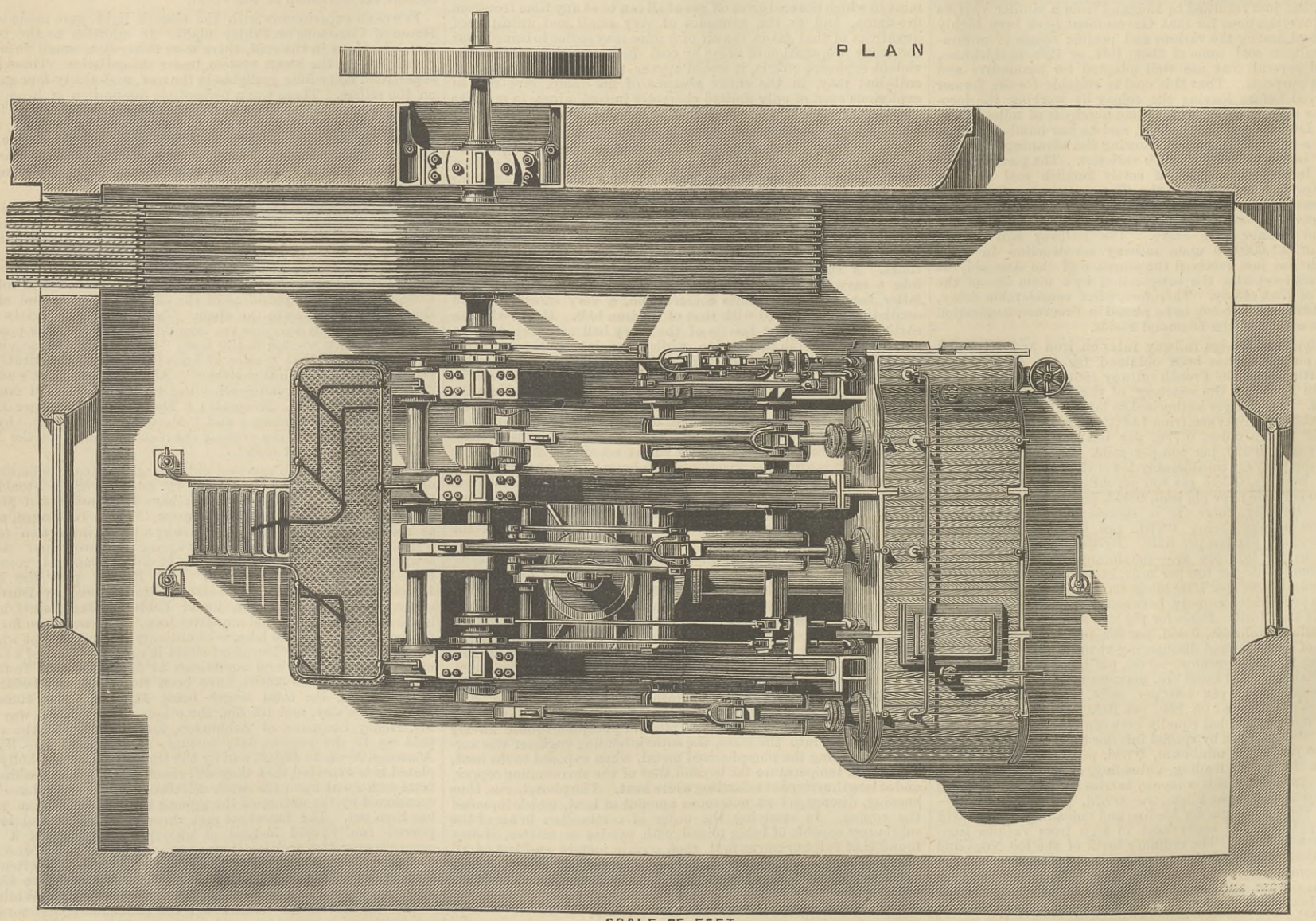
MESSRS. DUNCAN, STEWART, AND CO., LONDON-ROAD IRONWORKS, GLASGOW, ENGINEERS.

(*For description see page* 11.)

SIDE ELEVATION



PLAN



SCALE OF FEET

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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TO CORRESPONDENTS.

*** *In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a 2d. postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions.*

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

A. J. C. E. (Hull).—*A letter lies at our office for this correspondent.*

X. AND CO.—*Letters lie at our office for this correspondent.*

NOVUS HOMO.—*Much obliged, but better left alone.*

J. D. (Cavendish-road).—*You can obtain a book on the subject from Messrs. Crosby Lockwood and Co., Stationer's-hall-court, Ludgate-hill.*

C. W. C.—*There is no reason to conclude that any particularly economical results would be obtained from the engine to which you refer. Bisulphide of carbon has an intolerable odour and is very poisonous.*

K.—*The smooth crushing rolls referred to in column 3, page 345, of* THE ENGINEER, *May 13th, are made by Messrs. Nagel and Kemp, of Hamburgh; see also* ENGINEER, *page 425, June 10th. Messrs. Escher, Wyss, and Co., have their milling machinery works at Ravensburgh, in South Germany. We agree with your remark that there is room for a good historical and practical treatise on grain milling machinery. A good work of this kind is extant in Germany by Friedrich Kich, entitled "Die Mehlfabrikation," published at Leipsic, 1871.*

E. F. (Keighley).—*It is not very easy to give you the names of books, moderate in price, which will serve for self-instruction. Most of the following works can now be obtained, second-hand, for small sums:— Tyndall's "Heat a Mode of Motion;" Law's "Civil Engineering," Weale's Series, second edition; Lardner "On the Steam Engine," Weale's Series; "Cranes," Weale's Series; "Mechanics and Hydrostatics," in the same Series; Colenso's "Algebra." If you can get the algebra published in Orr's "Circle of the Sciences," some thirty years ago, you will find it the best to be had for self-teaching.*

COTTON BELTING.

(*To the Editor of The Engineer.*)

SIR,—Will any reader give us the name and address of the manufacturer of Scandinavia cotton machine and elevator belting?

Bristol, June 29th. W. S. AND Co.

COOLING CHILLS.

(*To the Editor of The Engineer.*)

SIR,—Will any reader kindly tell me the simplest and best way of keeping plough-share chills cool while frequently casting in them?

June 22nd. J. H. S.

WANTED, A NON-CONDUCTOR.

(*To the Editor of The Engineer.*)

SIR,—Can any of your subscribers or numerous readers inform me as to the best method to adopt to prevent heat passing through the walls of a large oven or core drying stove into an adjoining dwelling-room, which is only divided off at present by a sound 18in. wall? The heat in winter in the room is scarcely to be felt, but in summer it is objectionable.

Sheffield, June 23rd. FOUNDER.

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

DEATH.

On the 22nd June, at his residence, 24, Loughborough-road, Brixton, THOMAS BEVINGTON, A.I.C.E., aged 48.

THE ENGINEER.

JULY 1, 1881.

MILL ENGINES.

THE term "mill engines" is generally reserved for steam engines employed in driving the machinery of cotton mills, but it is also sometimes applied to those found in jute and woollen factories. The title is never given to engines working in flour or rice mills, rolling mills, or tin or copper mills. The mill engine is, and has been from the first, a special machine, usually of very considerable power. For many years Fairbairn had almost a monopoly of design, if not of actual construction, in this class of machinery, and he pretty closely followed Watt's notions. Fairbairn preferred to use two beam engines driving one crank shaft, with a spur fly-wheel between the two overhung cranks. The valves were of the Cornish type, worked by revolving horizontal cam plates. This type of engine gave great satisfaction; it was massive, heavy, very expensive, and fairly economical, even when measured by the highest standard. In process of time it was often found necessary to augment the power of the mill engine, and to this end it was compounded or McNaughted. By-and-bye, compound engines were built for driving cotton mills; then came the Corliss engine, and by degrees the speed was increased. The latest development of improvement in the machinery used for driving cotton mills consists in the abandonment of the spur fly-wheel. Its place is taken by what is neither more nor less than a huge drum or pulley; and from this ropes or belts are taken to as many pulleys as there are floors, and the machinery on each floor is driven by a principal lay shaft appertaining to that floor. Thus transmission is effected almost wholly without the aid of gearing. One of the most direct consequences of the adoption of this system, is that engine shafts are now driven at a much higher velocity than was thought of in Fairbairn's time. The efficiency of a fly-wheel in producing regularity of motion varies, other things being equal, as the square of its angular velocity. Consequently it has become possible, thanks to the high-speed of modern engines, to drive a cotton mill with a single cylinder engine. As an example of what can be done in this way we may cite Messrs. Hick, Hargreaves, and Co.'s great Corliss engine, illustrated in our impression for April 29th. In cotton spinning it is essential that the engine should revolve with the utmost uniformity of velocity; and instances are not unknown in which a small band from the main crank shaft has been made to drive the hands of a clock without works, and that with such regularity, that the clock driven and regulated by the engine has not been wrong more than a couple of minutes in a day. So long as the slow speed was adhered to, two cylinders were of necessity used to get regular turning, and the compound engine was little more than a development of the two-engine system. Nothing was heard concerning the relative merits in point of economy of the simple and compound engine, just because the matter had little or no interest for millowners; but the advent of high-speeds and the consequent possibility of using single-cylinder engines has altered the aspect of affairs; and the question of the comparative advantages of simple and compound engines, with all its side issues, is now, perhaps, more keenly discussed by millowners than by anyone else.

It must be understood that the millowners approach the subject from a very practical point of view. Economy of fuel is but one factor in their calculations. The first cost, space occupied, interest on first cost, and outlay on maintenance have all to be considered. Small savings of fuel one way or another are of little consequence. Thus if we suppose that of two engines each indicating 1000-horse power, one burns 2·75 lb. while the other burns 3·0 lb. of coal per horse per hour, the difference for a day of ten hours in favour of the last engine is represented by the value of 2500 lb. of coal, amounting to, let us say, 10s., or for a year of 300 days £150. This sum is a mere nothing in the expenses of a great cotton mill, and may be very readily absorbed by the additional cost of the engine. Thus an outlay of a couple of thousand pounds extra to secure economy of fuel would run away with the whole of the profit. To obtain precise information on such points, and on many others, the millowner will not rely on books or calculations. He asks for facts obtained by experience. He wants to know what the simple and compound engine actually do in cotton mills. No one can dispute the wisdom of this, and an attempt is being made to supply the required information by the various engineers of the boiler associations and companies. We had reason recently to criticise Mr. Longridge's report on the trial of a compound engine at Messrs. Nuttall's, in which results difficult to believe in were obtained, probably as a result of the use of inaccurate indicator springs. Mr. Fletcher not long since reported to the Manchester Steam Users' Association on the relative performance of several compound and simple engines working in cotton mills, and Mr. Neil McDougall, engineer to the Boiler Insurance and Steam Power Company, devotes a chapter of a very interesting and able annual report to his directors on the same subject. We may say before going further that Mr. McDougall quite dissents from Mr. Fletcher's views. He holds that as regards economy of fuel, there is little or nothing to choose between the two classes of engines, but that as regards first cost and maintenance, the advantage is with the simple engine. Mr. Fletcher asserts, as the result of his experience over a given time, that the average net consumption of fuel in the compound condensing engines under his inspection is 62 per cent. of that of the single cylinder condensing engines. Now it is well known that in cotton mills a great deal of steam is used for heating the buildings, and it is sometimes not easy to separate the engine consumption from this. It is clear, therefore, that Mr. Fletcher has had some obstacles to get over before he could come to any conclusion. However, it seems that he has succeeded in getting at net results. There is no theoretical reason why a compound engine should, other things being equal, burn only 62 per cent. of the coal required by a simple engine; and this being the case, Mr. Fletcher's figures require to be regarded at least with some hesitation. Mr. McDougall has no hesitation in rejecting them as untrustworthy, and he has no doubt made a good point. Mr. Fletcher has, unfortunately, not stated all the circumstances; and he has made comparisons where none ought to have been drawn. For example, he compares a non-compound engine, in which the steam is wire drawn down from 43 lb. in the boiler to 23·35 lb. in the cylinder, and a second engine with 35 lb. boiler and 26·4 lb. cylinder pressures, with compound engines working with cylinder pressures of 78·5 lb. and 76·5 lb. Again, he makes a curious average of the performance of four of the best compound engines and four of the best non-compound engines. From this it appears that all the compound types worked at 73 lb. boiler pressure, 17·73 lb. mean cylinder pressure, and used 2·37 lb. of coal per indicated horse-power per hour; and that all the non-compound engines worked with a boiler pressure of 52 lb., a mean cylinder pressure of 21·84 lb., and a consumption of coal of 3·72 lb. per horse per hour. As a matter of fact, these figures do not represent the actual pressures, but have been averaged for the engines named in a way which is really inadmissible and misleading, and we are quite at a loss to understand what was passing through Mr. Fletcher's mind when he dealt with his figures in this way. Mr. McDougall has recently tested a compound engine, and he compares this with one of the simple engines cited by Mr. Fletcher. This engine burned 3·24 lb. of coal per horse-power per hour; but the compound engine used no less than 6·83 lb., although it had a higher pressure of steam and a better vacuum to work with. Mr. McDougall explains why its performance was so bad, and he goes on to point out that it would be most unfair to use the figures we have given, to reduce an average setting forth the performance of compound engines. Comparisons should only be drawn between the best engines of their type, and in this we fully agree with Mr. McDougall.

The most interesting feature in this portion of Mr. McDougall's report is a tabular statement of the performance of two engines, one compound, the other simple expansive. Both engines were built by the same makers, Messrs. Hick, Hargreaves, and Co., of Bolton. These engines are for convenience termed "B" and "C." "B" consists of a pair of compound tandem engines with Corliss valves to the high-pressure cylinders, which are steam-jacketted. The low-pressure cylinders have slide valves. The engines closely resemble that of Messrs. Nuttall reported on by Mr. Longridge. The high-pressure cylinders are 20in. and the low-pressure 31in. in diameter, the stroke is 6ft., and the ratio of volume is 2·42 : 1. Steam is supplied by three Lancashire boilers 30ft. by 7ft., the flues being 2ft. 9in. diameter. The feed is heated by a Green's economiser. The simple engine has an inverted vertical cylinder 32in. diameter and 4ft. stroke, and is fitted with Corliss valves. Steam is supplied by two Lancashire boilers 30ft. by 7ft., of steel; 2ft. 9in. flues; feed heated by an economiser. The compound engine during its trial made 46·7 revolutions per minute, corresponding to 560·4ft. of piston per minute, while the simple engine made 82·8 revolutions, or 662·4ft. per minute. The compound engine "B" indicated 635-horse power, and engine "C" 540 indicated horse-power. The boiler pressures were 71 lb. and 70 lb. respectively. The compound engine required 2·86 lb. of coal, and the non-compound 2·35 lb. of coal per indicated horse-power per hour. It would be easy to draw the conclusion that the non-compound engine "C" was the more economical of the two, but Mr. McDougall has very properly pointed out that we must look to the boilers' performance before we express an opinion of this kind; and doing this we find that while boiler "B" evaporated but 6·66 lb. of water per pound of coal, boiler "C" evaporated 8·81 lb., the difference being principally due to the quality of the coal. Leaving the fuel and returning to the water and steam, we find that the compound engine used 18·9 lb. per indicated horse-power, and the simple engine 20·5 lb. of steam, or 1·6 lb. more than its rival; that is to say, it was 8 per cent. less economical, the relative efficiency of the two machines being as 92·1 is to 100. Again, the weight of steam required for a perfect engine working between the limits T and t of temperature which actually obtained, and which were the same for both engines, being 8 lb., the actual efficiency of "B," compared with a perfect engine, was ·423, while that of "C" was ·39; but it is a noteworthy fact that the indicator in the case of "B" could account for but 80 per cent. of the steam used, while in the case of "C" it accounted for 91 per cent. The mean ratio of expansion in the compound engine was apparently about the best that can be adopted with steam of the given pressure, namely, 6·56, but in the non-compound engine the steam was expanded but 4·27 times, and, we believe, a sensible advantage would have been derived from expanding it five times. Be this as it may, it is evident that the difference between the two engines in point of economy of fuel is so small that some other consideration must be employed to make a millowner decide which type of engine he will have. The cost of the "B" engine was £3600, that of "C" £2500; the difference £1100 is important. The cost of foundations of "B" was £1326, but the foundations of "C" cost only £250. Thus, the annual charges for the two engines, allowing 4 per cent. interest on capital and 7 for depreciation—neither sums being enough—amounts, for engine "B," to £449, while for "C" they reach but £385. The difference is £64 per annum in favour of the non-compound engine; but £64 would buy, at 7s. per ton, 183 tons of coal, which is about equal to 0·25 lb. of coal per indicated horse-power per hour for 3000 working hours—figures which bear out the statement we have made, that a saving of a fourth of a pound of coal per horse-power per hour may be of no importance whatever, and may, indeed, be more than counterbalanced by the outlays entailed in other directions. We have said nothing concerning the room taken up by the two types of engines, but it is quite obvious, we think, that the simple engine has everything in its favour in this respect.

Mr. McDougall's experiments are peculiarly interesting to us, because they confirm in the fullest manner all that we have repeatedly contended for. They demolish the heat-trap theory, which maintains that the presence of a second cylinder neutralises the influence of the condenser in the most effectual way; the cylinder condensation in the non-compound engine being actually considerably less than that in the compound engine, in which, moreover, expansion was certainly not pushed too far. We have over and over again shown that the presence of an extra cylinder in the compound engine must neutralise all the advantages to be gained from the interception of the cooling influence of the condenser; and it will be seen that in the cases cited the small difference in efficiency of the steam in the compound as compared with the non-compound engine, 0·423 : 0·39, was due entirely to the extra expansion. The value of various measures of expansion is in theory determined by the hyperbolic logarithm of the ratio of expansion, and we have accordingly for engine "B" 1·881, and for "C" 1·451, and taking the efficiency of "C" as 39, that of "B" should have been 50·5 instead of 42·3. It is difficult to contend

in the face of such facts that the compound system is specially economical. The truth is that the compound system possesses great advantages under all circumstances where two cylinders must be used to get regular turning, in that it renders the employment of a complex valve gear unnecessary, and that it saves machinery some strains; but that it, as ordinarily used, secures economy of fuel, and that it is better in this respect than simple engines, has never yet been proved when justice was done to both systems. The compound engine has great advantages for use at sea; but they do not depend on economy of fuel, and for mill engines it may be said that they have no existence. In practice, as in theory, the engine which is best made and best worked is most economical, no matter whether it is compound or non-compound; and all that can be said on the matter seems to be, that whether the millowner uses a compound or a simple engine, he can work on a very small consumption of fuel as compared with that usually required, but, comparatively speaking, a few years back. In conclusion, we would add that there is a great deal in Mr. McDougall's report which requires to be noticed on our part; we shall return to it in an early impression.

PATENT-OFFICE FEES.

Mr. Hoyle's letter, which will be found on page 6, deserves more attention than it would, perhaps, have received if we had not specifically noticed it here. It contains a suggestion which is, unfortunately, so worded that it apparently contemplates the making of one law for the rich and another for the poor; but this is really not the writer's intention, as will be seen if his letter be read with due care. In few words, his proposal is that it shall be possible to obtain for an invention on payment of a very small fee, what we may for convenience call temporary protection. There is a great deal to be said against the official adoption of such a scheme, yet there is also something to be said in its favour; but it should be fully understood that the proposal would lead to very radical changes in patent law practice in more ways than one. Whether such changes are or are not desirable is a point which need not be discussed. We do not think they would be desirable; but if it can be shown that, on the whole, the change would serve the interests of the inventor, then it ought to be made. The bearings of the whole question may be readily rendered intelligible. As the law now stands, no manner of safeguard can be obtained for less than £5, which is the stamp duty or fee charged by the Government for granting provisional protection. Nominally this protection lasts six months; really the time is somewhat curtailed by the circumstance that the certificate of allowance is not granted for a few days after application for protection has been made, during which the inventor can do nothing; and notice to proceed, which involves a further expenditure of £5, must be given two clear months before the expiration of the time of protection. Furthermore, provisional protection is of doubtful value, as anyone who can subsequently get a patent sealed can generally cut out the original applicant. To meet this expenditure of £5 many inventors have, it is urged, no spare money, and they are thus debarred from obtaining a patent. But unless they have protection they cannot with safety show their invention to manufacturers or others who would be likely to take it up. A term of six months is more than enough, it may be argued, to obtain opinions and advice, although it is not enough to get an invention into working order. If, now, it were possible for an inventor to obtain absolute protection for, say, two months on payment of a small fee—as, for example, five or ten shillings—he would then be able to show his invention to capitalists, and ascertain whether it was or was not good for anything. This is the theory lying at the root of our correspondent's proposal.

We need hardly say that we do not regard a reduction in the official fees charged by Government to inventors with much favour. Our objection to small fees is that if patents were made very cheap, hosts of men would fly to take them out, and neglect their own business in the attempt to make a fortune. The Patent-office would become a huge State lottery, in which, like all lotteries, the blanks would be multitudinous, the prizes very few. The cost of a ticket in this lottery is now comparatively high, and the number of tickets—if we may continue our metaphor—sold is small. Let the price be reduced from £5 to say £1, and the tickets sold would be augmented in number at least five-fold. Inventions which now rest peacefully in the brains of hard-working men, or cost no more than a little drawing done during spare hours, would then involve a continuous outlay of money, and time which is the same thing; and when it was too late the unfortunate inventor would learn the bitter lesson that the possession of a patent had not advanced his prospects of obtaining a fortune by one jot. If we believed that patents were really valuable, or likely to aid the poor inventors of this kingdom to become rich, we should advocate the total abolition of all patent fees. It is because we hold that patents are dear at any price that we deprecate the adoption of any change which will facilitate their attainment. We promote, as we believe, the best interests of the poor inventor when we urge him to keep away from the Patent-office, and when we refuse to advocate the reduction in fees which would lure him to his loss and possible ruin. A patent only becomes worth something when it has had an extrinsic value imparted to it by the energy and money of some individual who as a rule is not the inventor. If a man has an invention alone, let him keep away from the Patent-office; but if he has an invention and a capitalist ready to work it, let him patent it by all means. Under these conditions, however, the fees would not stand in the way if they were twice as great as they are.

While we write thus we are not guilty of any inconsistency if we say that we look with some favour on Mr. Hoyle's scheme. But our reasons for doing this are not, perhaps, identical with his. At present it is certain that there is an immense number of men who have inventions which they keep to themselves, and they suffer all sorts of mental tortures in doing so. They dare not speak because they fear to consult others; and they form opinions concerning their inventions which are almost always exaggerated, and sometimes totally erroneous. Now it would be a very good thing if these men would consult someone with money and knowledge, who would be able to tell them at once whether their inventions were or were not new, or worth something or nothing. If any reasonable arrangement then could be contrived by which protection could be obtained for a small sum for, say, two months, it would apparently serve a double object. It would enable inventors to obtain sound information, and this would be a very good thing. We can speak with some experience on this point. We are held, it appears, by inventors to be worthy of confidence, and we are consulted continually by correspondents who usually begin by complaining bitterly that the cost of a patent is so high that they cannot take the first step on the road to fortune; and after carefully pledging us to secrecy, reveal the nature of their inventions, and ask our opinion concerning their value. We can safely say that in ninety-nine cases out of a hundred the inventions are either old or useless; and they display an amount of ignorance concerning not the science or practice of mechanical engineering, but concerning what is going on in the outer world, which is simply astounding. We have had the power loom and the link motion submitted to us as new inventions, and this by men who we believe had honestly re-invented them. There is not a gun in the service of this or any other country which has not been invented over and over again by half a dozen persons. The same may be said of boilers, brakes, steam engines, and propellers. It would be waste of time to extend the list. In the majority of cases our correspondents have been quite content to accept our verdict as correct. If we tell an inventor that what he proposes as a new thing has been in regular use for thirty years, more or less, he usually expresses his thanks, and announces his intention of inventing something else. It may be argued that it is the business of every inventor to ascertain, before he spends money on his ideas, whether they are or are not original and valuable; but the facilities for doing this are not great. The Patent-office helps very little. Educated engineers not unfrequently fall into error, and repatent old inventions. How much more is the man of slender education, and with small means of acquiring information, likely to make a mistake? Such a man, endeavouring to find out whether an invention is or is not new and valuable, is in the position of one who wishes to learn a foreign language without a master. He may spend months if not years in blundering through one publication after another without finding what he wants. Could he consult his employer, or some one else trained and educated, he might perhaps have all his doubts settled one way or another in ten minutes. It may be urged—and urged with truth too—that men of education are more honest than the needy inventor thinks, and that the said inventor is unnecessarily cautious and reticent. But this does not really matter in the least, and we think that something would be gained by the introduction of a system which would let the inventor make his invention public in safety for a short time, on payment of a small fee. We are, therefore, prepared to go so far as to say that it would be a good thing if an inventor could, on payment of, say, £1 1s. and a deposit of a description of his invention, obtain absolute protection for two months from the date of application. But having gone so far, we at once come face to face with difficulties of a very important character, which our correspondent has passed over in silence, but which must none the less be overcome before his scheme, or anything like it, can be put in practice. What, we may ask, will be the effect of the temporary protection? Let us assume that A obtains temporary protection, and finds that his invention is quite new, but that no one will take it up. Is the invention to become public property at the end of the two months, and so be lost to the inventor for ever? If not, and temporary protection is not to be regarded as publication, what is to prevent B, to whom A has submitted the invention, from patenting a colourable imitation of it in his own name, as soon as A's temporary protection has elapsed? It will be seen that in whatever way these queries are answered, changes would have to be made in the existing legal rules for deciding questions of priority. It may seem to be a small thing to let the existing patent law stand as it is, and merely add facilities for obtaining what we have called temporary protection for a trifling fee, but it is not a small thing. The change would involve questions of the utmost moment, and would probably, if adopted, be followed by endless litigation. We do not say that it may not be possible to find a way out of the difficulty, but we confess we have not found it. The nearest approach to a solution which we can think of is, that what is now called provisional protection should be made absolute, that it should run for a clear six months; and that the initial fee to be paid should be £1. Notice to proceed to be given one month before the expiration of the patent, and to involve no fee save perhaps 1s. for a stamp. The fee on the application for a patent to be £9, that is to say it should include the £4 which were remitted to the inventor in the first instance, and the £5 now paid with the notice to proceed; other fees to remain untouched. In this way the inventor would have six months clear in which to work for £1, and he would have absolute protection; while the comparatively heavy fee at the end of the six months would act as a powerful influence to check a poor man who was disposed to waste time and money in pushing an invention which could do him no good. If on the other hand he had met with encouragement, £9 or £10 for fees at the end of six months would not stand in his way. It will be seen, however, that concerning this proposition a great deal may be said on both sides. We have the best interests of the inventor at heart; and we shall be glad to see the question raised by Mr. Hoyle, with its collateral issues, discussed in our correspondence columns.

UNIVERSITY COLLEGE, LONDON.

The *soirée* given annually by the professors of University College, London, at the close of the session, was held on Monday evening last, and was in every way successful. We understand that something like 3000 persons were present. There was, as usual, an excellent show of pictures in the library, as well as many objects interesting from an artistic point of view, and a good collection of physical apparatus and microscopes. The great feature of the gathering was, however, the lighting up of the quadrangle by the electric light. Three large lamps of Mr. Crompton's were in use, one placed over the portico in the centre of the building, and one over the apse of each of the wings. The three lamps were quite sufficient to light the whole area brilliantly, and the effect was most picturesque, the fine evening and the band of the Coldstream Guards attracting hundreds of the guests out on to the portico and over the lawns in front. It was altogether the most effective exhibition of the electric light on a large scale which we remember seeing, and Mr. Crompton is much to be congratulated on his success. The Engineering Laboratory was open all the evening, and Professor Kennedy showed his testing machine at work to a number of visitors. Besides the students' drawings and some valuable series of tested specimens exhibited in the Laboratory, we particularly noticed a very neatly designed model—by Mr. A. G. Ashcroft, a former student—for showing and measuring the tensile and compression stresses in the flanges of a beam. Many of the students' drawings were done in a very workmanlike and effective manner. The annual distribution of prizes was held on Wednesday afternoon, Lord Kimberley, the president of the College, presiding, and among other awards it was announced that the two Gilchrist Engineering Scholarships—each of the value of £35 per annum for two years—had been awarded to Mr. P. V. Appleby and Mr. T. E. Beare respectively. We are informed that there will be two similar scholarships offered for competition next session among the engineering students, one at entrance—in October—and one at the end of the session.

HORSES AND ELECTRIC RAILWAYS.

History repeats itself. When electric telegraph wires first were run along our railways and across the country, stories were constantly told of birds killed by electric shocks while perched on the wires. The fact that a few partridges now and then killed or maimed themselves by flying against the wires was regarded as proof positive of the accuracy of the statement. Need we say that no bird ever yet was killed by a current passed through a telegraph wire? The tales about bird massacre now begin to reappear under a new form. According to a Berlin paper a horse while crossing the electric railway having set his hoof upon a rail, was instantly thrown down, and another horse, having also touched the rail with his iron shod hoof, received a shock which sent him galloping off in wild terror. The idea is that a shock was given to the horses by the escape of electricity from the rail through their bodies. The story requires confirmation. The quantity of electricity required to work an electro-motor is of course enormously greater than that needed to send a telegraph message; but, so far as shock is concerned, quantity alone has very little to do with the matter. What is needed is high tension. A small Leyden jar will, by its discharge through the body, give a violent shock, while a thousand times the quantity of electricity given off by a battery will excite but a slight pricking sensation in the ends of the fingers. The fact that a very moderate amount of insulation seems to be sufficient for the purposes of the electric railway goes to prove, what indeed is well known, that low tension electricity is employed to work it. It is possible that the horses were affected as described; but it is very doubtful that they were. We venture to think that this story may be classed with the bird myths to which we have already referred.

THE BASIC PROCESS.

Since Mr. Thomas returned from America some progress appears to have been made in the formation of the new steel company at Middlesbrough, for which a certain syndicate bought 20 acres of land a few months since. The company is to be called the "North-Eastern Steel Company, Limited," and among the first directors will be Messrs. S. G. Thomas, P. C. Gilchrist, A. J. Dorman, T. Wrightson, and J. Denton. It is said that the promoters and their friends have already subscribed £80,000 out of the total of £200,000 required. It is proposed to work upon the basic process only, and to produce in the first instance ingots, blooms, billets, and tires. Four converters will be put down, and the weekly product arrived at will be 2000 tons. It is hoped that a large business may be done with existing rolling mills in the locality in hammered or cogged blooms, and that in this way, if steel is to supersede iron for purposes other than rails, the present iron manufacturers may find it to their interest to work with, rather than against the new company. It is contemplated, also, to make arrangements with some of the neighbouring smelters, to supply pig iron in the molten state. It is understood that a well-known engineer of high repute has been provisionally engaged as general manager. Should the remainder of the shares be taken up, as is hoped, operations will be commenced forthwith, and the new company might expect to be at work by the end of 1882, or early the following year. The birth of this company is the outcome of the efforts of those in the district and elsewhere who are sanguine as to the future of basic steel. It is only right to add, however, that there are a great many others, whose position and experience entitle them to respect, who consider that the commercial success of the basic process is still problematical, and that the victory of steel over manufactured iron other than rails is much more so.

THE LIVADIA.

According to a Russian paper, the Livadia is to be broken up forthwith, her machinery being transferred to other vessels yet to be built we suppose. It is by no means impossible that this rumour is true. Whatever may be urged to the contrary, the ship has in one sense, and that most important, been a failure. She is structurally very weak. Sir E. J. Reed admitted this in his defence of the vessel at the last meeting of the Institution of Naval Architects, and no one can say what the effect of the continued action of the seas on her flat bottom would be; and Russia does not at present possess a dock in the Black Sea in which she could be repaired. There is little doubt that the original purpose for which she was intended was that of carrying armour if necessary. That she is too weak to fulfil this was discovered not long after she was well advanced; but it also became apparent that she could be made to carry as many as nine or ten thousand troops for a short voyage in the Black Sea in case of necessity, so she was finished and fitted up luxuriously to serve as a yacht till wanted for other purposes. In spite of the Russian rumour to which we have referred, it is not impossible that the Livadia when dismantled may be laid by. She would serve as a transport ship with half her present engine power.

NOMINAL HORSE POWER.

We are glad to see that another blow has been struck at the term "nominal horse-power." Messrs. John Fowler and Co., of Leeds, announce that in future they will sell their engines by

letters, "A," "B," "C," and so on, and in their price list they will give size of cylinder, length of stroke, and heating surface of the boiler, so that the purchaser will really know what he is getting for his money. The only argument which can be used in defence of the nominal horse-power system of rating engines is that the term has a definite meaning well understood, so that the initiated can tell when they buy an 8-horse power, what sized cylinder, and how much heating surface they have got, but unfortunately a rule is not observed by all makers, and the diameter of the cylinder alone is used to show the power of the engine. A cylinder which cannot be properly supplied with steam is, however, open to the charge that it is not quite what it pretends to be, and for this reason Messrs. Fowler have done well to give the heating surface, as well as the cylinder diameter, in their price list. Messrs. Hornsby, of Grantham, and one or two other firms have, since last year, given up the term nominal horse-power as applied to vertical engines. It has remained for Messrs. Fowler to dispose of the phrase as regards traction engines. We trust that their example will be rapidly followed.

LITERATURE.

Lathe Work: A Practical Treatise on the Tools, Appliances, and Processes employed in the Art of Turning. By PAUL N. HASLUCK. London: Crosby Lockwood and Co. 1881.

IT is a curious fact that there is no complete treatise in the English language on the construction of machine tools. Holtzapffel's book is not yet finished, although the first volume was published in 1847, and if it should be finished on the scheme of the author of the first two volumes—long since dead—it would not be a treatise of the kind to which we refer. England is the birth-place, the very cradle of the machine tool trade. The principles involved in the construction of lathes, planers, drills, shaping and slotting machines are very complex and important. The details of construction of such tools pass through very wide ranges; but no engineer seems to possess at once the ability and the will to write a book comprehensively dealing with the whole subject. Reciprocating machine tools are especially badly off in this respect. Concerning the lathe, several small works have been written—some good, some bad; but they all deal with lathes of small dimensions. Mr. Hasluck's work is no exception to the general rule; it is a small octavo of 195 pages, and it is very well written, illustrated by admirable engravings, and well printed on good paper. In so far it has everything in its favour, and yet we have found it in several respects a most exasperating volume. Its title is deceptive. It is not a treatise on the tools and processes used in the art of turning. It is a treatise, and a very good one, on some of the processes and tools, but not all. Mr. Hasluck posseses the most minute knowledge concerning one kind of lathe, that driven by the foot; but if he knows anything worth knowing about large lathes driven by power, he has taken great pains to conceal the fact from his readers. Whenever he has occasion to refer to a big lathe he is, indeed, almost certain to make a mistake. Thus, for example, we are told "that lathes capable of taking discs 40in. in diameter are often incapable of taking in a cylinder 6in. long." The tool here referred to is not properly called a lathe at all; and the only one which will not take in cylinders in the sense employed by Mr. Hasluck is a tire lathe. In another place Mr. Hasluck speaks of lathes of 60 tons weight as the maximum dimensions yet reached, whereas the weight has been much exceeded; and we also learn from him that some lathes have been made which will take in discs 30ft. or 40ft. in diameter. We never heard before of such machines. There is a horizontal turntable at Woolwich on which the base rings for turrets, and even the armour-plates themselves can be faced, but this is certainly not a lathe, although it is over 40ft. in diameter.

Putting power-driven lathes altogether on one side, mentally correcting Mr. Hasluck's title-page, and calling his work a treatise of the foot-lathe, we have no fault to find with it. Our author deals with his subject in a very practical point of view. He does not write about the amateur's lathe, with a multitude of complicated chucks, but about a workman's lathe, such as used to be found in millwrights' shops all over the country. Our readers must know the kind of lathe we mean—one with a single ∧ bed, about 3in. or 4in. centres, and with the screw let into a groove under the bed. Concerning this tool and its congeners Mr. Hasluck writes admirably, and gives complete instructions, not only for doing work with it, but for it.

All lathes are in a sense alike. They have besides points of absolute similarity in the principles of their mode of action; and therefore much that Mr. Hasluck has written concerning the foot-lathe can be made to apply to heavy, power-driven lathes. We take, for example, what he has said on change wheels for screw cutting. There is a large number of rules for finding the proper wheels to cut a screw of any given thread on a given lathe. But the rule of three is perhaps more employed than any other, and is that with which we are most familiar. Mr. Hasluck gives a rule which will be new to many of our readers, while it is very simple and straightforward:—"Write down in the form of a vulgar fraction the number of threads in a given length of the guide screw, and the threads in the same length of the screw to be cut. Multiply both by a number that will produce a numerator and denominator equal to some two or four sets of change wheels. Put the quotient of the guide screw on the mandril, or as drivers, and that of the pitch as required on the guide screw or as driven; arranged in this way the desired result will be attained." Further on our author gives an example. To cut five threads to the inch with a guide screw of ·25in. pitch, "Put down the two rates in the form of a vulgar fraction $\frac{5}{4}$; multiplying both by a number, say 10, we get $\frac{50}{40}$; by 15, $\frac{75}{60}$; by 20, $\frac{100}{80}$. Every one of these numbers is to be found in the usual set of change wheels, and in practice we simply select those two which are of most convenient size." Of course fractional pitches have to be cut now and then. Mr. Hasluck shows how this can be accomplished by using several change wheels instead of two by the rule we have reproduced.

We can safely recommend the work to young engineers. To the amateur who has not yet advanced to rotating tools, geometrical chucks, and such like, it will be simply invaluable. To the student it will convey a great deal of useful information, and it is no small point in the author's favour that he writes very good English in a pleasant style; his descriptions are lucid, and his drawings excellent. Certain of his instructions are never carried out in engineers' shops, and would enhance the cost of work, and prolong the time spent in doing it; but the pupil who can read Mr. Hasluck after hours, and can see lathe work done while he is in the shops, will readily find out for himself in what way Mr. Hasluck's practice differs from that of the engineer, without assistance from us. As far as it goes, the book is very good indeed, but then it does not go quite far enough.

BOOKS RECEIVED.

The Purchase of Gas and Waterworks, with latest Statistics of Municipal Gas and Water Supply. By A. Silverthorne. London: Crosby Lockwood and Co. 1881.

Dirty Dust-bins and Sloppy Streets. By H. P. Boulnois, M.I.C.E. London: E. and F. N. Spon. 1881.

Practical Ventilation and Warming. By Joseph Constantine. London: J. and A. Churchill. 1881.

Ryland's Iron, Steel, and Tin-plate Trades Directory and Guide to the Iron Ore Mines and Collieries of Great Britain. Birmingham: Offices of *Ryland's Iron Trade Circular*.

Journal of the Society of Telegraph Engineers. No. 34, 35, and 36. Vols. IX. and X. London: E. and F. N. Spon. 1881.

The Scientific Roll and Magazine of Scientific Notes. Conducted by Alexander Ramsay, F.G.S. Part I.: Climate. Vol. I. London: Bradbury, Agnew, and Co.

Celebrities of the Day—British and Foreign. Part II. Vol. 1. London: W. Pool. 1881.

Forty-eighth Annual Report of the Royal Cornwall Polytechnic Society. 1880. Falmouth: Lake, and Co., and R. C. Richards. Truro: Heard and Son and J. R. Netherton. 1881.

Nautisch Technisches-Woerterbuch der Marine, Deutsch, Italienisch, Franzoesisch, und Englisch. Pola: Wilhelm Schmidt. Erster Band. 1881.

Cassell's Household Guide. Part I. New Edition. London: Cassell, Petter, and Galpin. 1881.

TENDERS.

WALTHAMSTOW.

FOR building a Mortuary and Disinfecting Oven, except Ironwork. Mr. George B. Jerram, A.M.I.C.E., Surveyor.

	£	s.	d.
Fuller, Walthamstow	139	0	0
Probert, Walthamstow	125	0	0
Barton, Walthamstow	98	0	0
Good, Walthamstow—accepted	90	0	0

WALTHAMSTOW.

Tenders for Sewers, &c. Engineer, Mr. George B. Jerram, A.M.I.C.E. Quantities by Messrs. Hovenden, Heath, and Berridge.

Contractor's name.	Contract No. 11. *a*	Contract No. 11. *b* Deductions if 12in. pipe is used instead of 15in. do.	Contract No. 12.	Contract No. 13.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Stubbs	1348 0 0	73 0 0	5876 0 0	4272 0 0
T. Adams	1338 9 9	30 3 6	5256 18 2½	3964 19 8½
J. Simmons	1272 6 10	63 4 6	5191 18 2	3928 8 3
Porter	1216 8 11	39 10 0	5364 14 3½	3584 10 5
Rutty	1211 2 6	60 0 2	5052 6 4	3919 7 4
Wilkes & Co.	1276 10 1	34 11 3	4958 10 5	3696 1 11
Hunter	1066 11 3	38 17 0	4548 1 0	3486 6 4
Botterill	1093 0 0	48 0 0	4625 0 0	3376 0 0
Acock	1089 17 0	38 16 0	4338 8 3	3340 14 10
McKenzie	1004 0 0	48 0 0	4378 0 0	3067 0 0
Neave	1030 5 4	20 9 0	4074 2 10	3227 11 11
J. Bloomfield	1000 0 0	54 0 0	4238 0 0	3100 0 0
J. Bell	1007 0 0	43 11 3	4124 0 0	3098 16 3
Dewitt	943 0 0	42 18 9	4072 0 0	3185 0 0
Good	976 10 6	48 16 6	4251 16 0	2970 10 0
Stevenson	918 0 0	37 0 0	3695 6 0	2697 0 0
Ford & Everitt	860 0 0	50 0 0	3808 0 0	2655 0 0
Palmer	899 2 0	37 6 11	*3547 19 9	2655 5 9
Currall & Co.	*849 16 6	*36 16 5	3525 0 0	*2595 10 0
Reeves	1479 2 11½	28 7 2	—	—
Jesse Jackson	1222 0 0	58 0 0	—	—
Stracham	940 11 4	56 1 3	—	—
Engineer's estimate	856 0 0	—	3710 0 0	3207 14 0

* Accepted subject to usual conditions.

THREE-CYLINDER COMPOUND ENGINE.

THIS engine, constructed for a French cotton mill, has been specially designed to get the most equable possible turning, and it has therefore three-cylinders compounded. The single high-pressure cylinder is 19in. diameter, and the two low-pressure cylinders 26in. diameter; all 3ft. 6in. stroke, working on three cranks placed at 120 deg. apart, and intended to work at fifty revolutions per minute, with a steam pressure of 60 lb. in the boilers. The power is transmitted from a fly-wheel 20ft. diameter by twelve 5in. ropes all passing over a pulley 6ft. 6in. diameter on a second motion shaft. Steam is admitted to the high-pressure cylinder by means of two main D valves, one at either end of the cylinder, having a fixed intermediate plate and cut-off plate on the back of each, the cut-off being automatically regulated by the governor by means of Dobson's patent valve gear. After doing duty in the high-pressure cylinders the steam passes over the top of the same to the valve casing between the two low-pressure cylinders, which is enlarged to act as a receiver as well, and is then admitted to the low-pressure cylinders by two ordinary double-ported valves placed back to back. All three cylinders are steam jacketted, and connected directly to the valve casing of the high-pressure cylinder. The air-pump is 22in. diameter and 1ft. 9in. stroke, and worked off the crosshead of the centre engine by means of a bell-crank and rocking shaft, and is completely surrounded by the condenser.

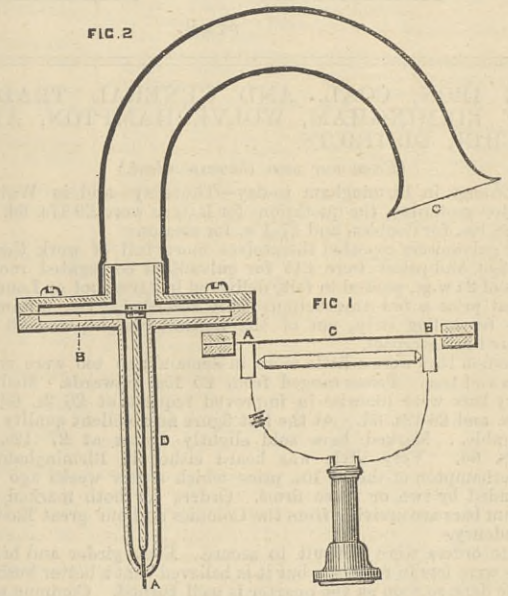
On page 12 we illustrate the valve gear of this engine. A is the slide bar, R^1 R^2 are steel slips on it, B^1 B^2 slider loose pieces of hardened steel; C is the slider, D^1 D^2 are rocking cam levers, E^1 E^2 regulating connecting rods, F^1 F^2 levers connected by spur segments; G is a lever connected to the governor by means of a rod with a hand regulating screw N; H is a double-action dash pot, having two pistons I^1 I^2, and one spiral spring S common to both; J^2 cut-off plate, K^2 the intermediate plate, held stationary by projections on it entering the slots L^1 L^2 in the casing; M^2 one main D valve. When in the central position both steam ports are closed by the cut-off plates. The action of the valve motion when steam is being admitted to the back end of the cylinder is as follows: The cut-off excentric moves the slider to its furthest position from the crank shaft, when the loose piece B^2 drops down into the recess in A, so that on the return of the slider, B^2 comes in contact with R^2, and thus the slider, and therefore the cut-off plate J^2, are pulled forward along with it, until the rocking cam lever D^2 is so canted that B^2 is raised clear of the slip R^2; thus permitting the spring S to force back the piston I^2 into its original position, and therefore the cut-off plates to the central position, thus closing the port. The action at the front end is exactly similar. The governor, by acting on G, causes the levers D^1 D^2 to approach or recede from one another, thus causing the let-off to take place earlier or later. The cut-offs at each end of cylinder can be altered independently of each other by screws on E^1 E^2, or both together, by regulating screw N.

UPON A MODIFICATION OF WHEATSTONE'S MICROPHONE AND ITS APPLICABILITY TO RADIOPHONIC RESEARCHES.*

BY ALEX. GRAHAM BELL.

IN August, 1880, I directed attention to the fact that thin discs or diaphragms of various materials become sonorous when exposed to the action of an intermittent beam of sunlight, and I stated my belief that the sounds were due to molecular disturbances produced in the substance composing the diaphragm†. Shortly afterwards Lord Raleigh undertook a mathematical investigation of the subject, and came to the conclusion that the audible effects were caused by the bending of the plates under unequal heating ‡. This explanation has recently been called in question by Mr. Preece,§ who has expressed the opinion that, although vibrations may be produced in the discs by the action of the intermittent beam, such vibrations are not the cause of the sonorous effects observed. According to him the aerial disturbances that produce the sound arise spontaneously in the air itself by sudden expansion due to heat communicated from the diaphragm, every increase of heat giving rise to a fresh pulse of air. Mr. Preece was led to discard the theoretical explanation of Lord Raleigh on account of the failure of experiments undertaken to test the theory. He was thus forced—by the supposed insufficiency of the explanation—to seek in some other direction the cause of the phenomenon observed, and as a consequence he adopted the ingenious hypothesis alluded to above. But the experiments which had proved unsuccessful in the hands of Mr. Preece were perfectly successful when repeated in America under better conditions of experiment, and the supposed necessity for another hypothesis at once vanished. I have shown in a recent paper read before the National Academy of Science|| that audible sounds result from the expansion and contraction of the material exposed to the beam; and that a real to-and-fro vibration of the diaphragm occurs capable of producing sonorous effects. It has occurred to me that Mr. Preece's failure to detect with a delicate microphone the sonorous vibrations that were so easily observed in our experiments might be explained upon the supposition that he had employed the ordinary form of Hughes's microphone, shown in Fig. 1, and that the vibrating area

FIG. 2



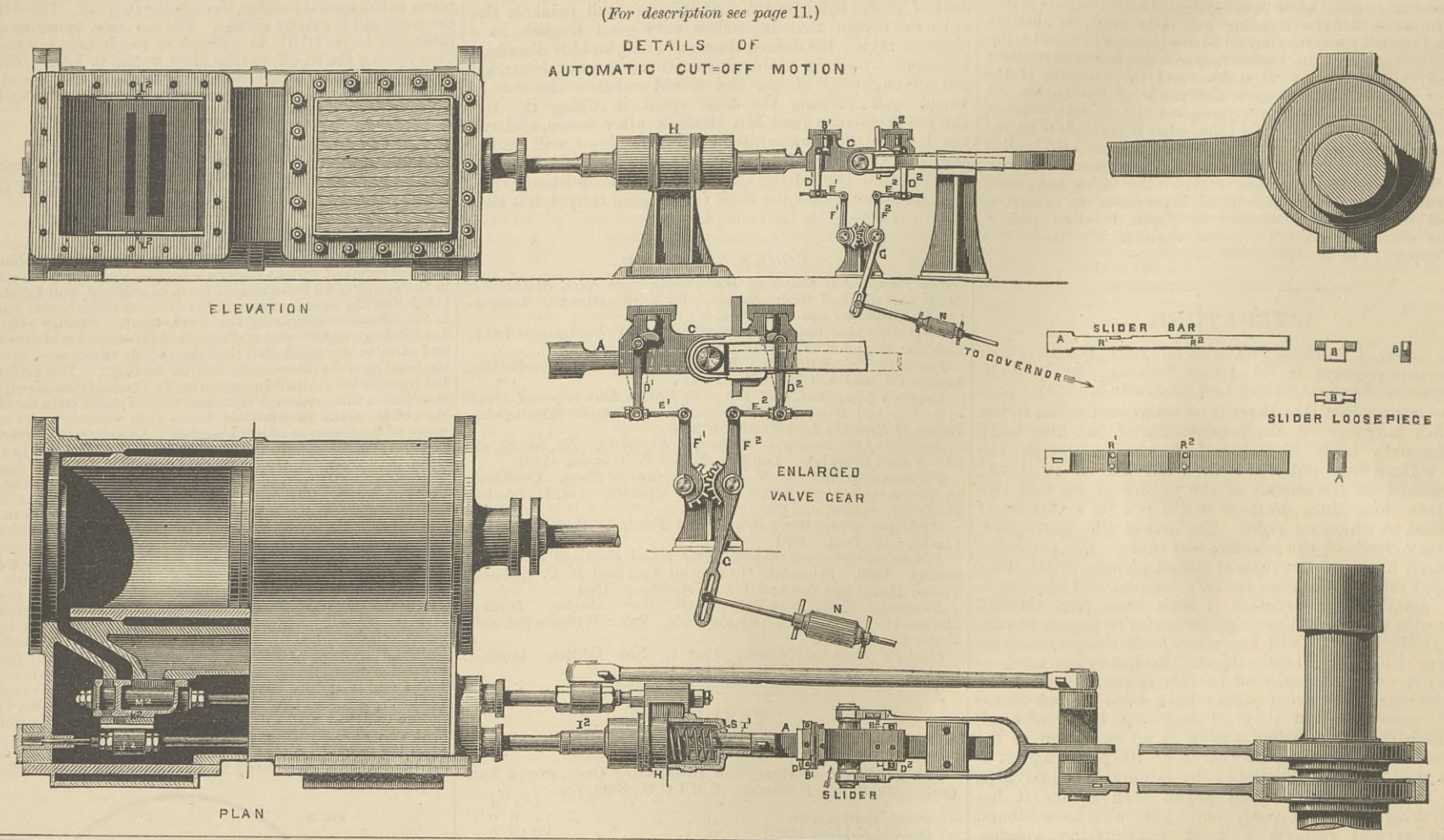
was confined to the central portion of the disc. Under such circumstances it might easily happen that both the supports *a*, *b*, of the microphone might touch portions of the diaphragm which were practically at rest. It would, of course be interesting to ascertain whether any such localisation of the vibration as that supposed really occurred, and I have great pleasure in showing to you to-night the apparatus by means of which this point has been investigated. (See Fig. 2). The instrument is a modification of the form of microphone devised in 1827 by the late Sir Charles Wheatstone, and it consists essentially of a stiff wire A, one end of which is rigidly attached to the centre of a metallic diaphragm B. In Wheatstone's original arrangement the diaphragm was placed directly against the ear, and the free extremity of the wire was rested against some sounding body, like a watch. In the present arrangement the diaphragm is clamped at the circumference like a telephone-diaphragm, and the sounds are conveyed to the ear, through a rubber hearing-tube C. The wire passes through the perforated handle D, and is exposed only at the extremity. When the point A was rested against the centre of a diaphragm upon which was focussed an intermittent beam of sunlight, a clear musical tone was perceived by applying the ear to the hearing tube C. The surface of the diaphragm was then explored with the point of the microphone, and sounds were obtained in all parts of the illuminated area, and in the corresponding area on the other side of the diaphragm. Outside of this area, on both sides of the diaphragm, the sounds became weaker and weaker, until at a certain distance from the centre they could no longer be perceived. At the points where one would naturally place the supports of a Hughes microphone (see Fig. 1) no sound was observed. We were also unable to detect any audible effects when the point of the microphone was rested against the support to which the diaphragm was attached. The negative results obtained in Europe by Mr. Preece may, therefore, be reconciled with the positive results obtained in America by Mr. Tainter and myself. A still more curious demonstration of localisation of vibration occurred in the case of a large metallic mass. An intermittent beam of sunlight was focussed upon a brass weight (1 kilogram), and the surface of the weight was then explored with the microphone shown in Fig. 2. A feeble but distinct sound was heard upon touching the surface within the illuminated area and for a short distance outside, but not in other parts. In this experiment as in the case of the thin diaphragm, absolute contact between the point of the microphone and the surface explored was necessary in order to obtain audible effects. Now, I do not mean to deny that sound waves may be originated in the manner suggested by Mr. Preece, but I think that our experiments have demonstrated that the kind of action described by Lord Raleigh actually occurs, and that it is sufficient to account for the audible effects observed.

* Read before the Philosophical Society of Washington, D.C., June 11th, 1881.
† Amer. Ass. for Advancement of Science, Aug. 27, 1880.
‡ Nature, Vol. XXIII., p. 274.
§ Roy. Soc., Mar. 10, 1881.
|| April 21, 1881.

DOBSON'S PATENT VALVE GEAR.

MESSRS. DUNCAN, STEWART AND CO., ENGINEERS, GLASGOW.

(*For description see page* 11.)



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

(*From our own Correspondent.*)

On 'Change in Birmingham to-day—Thursday—and in Wolverhampton yesterday, the quotations for lattens were £9 17s. 6d. per ton, £8 10s. for doubles, and £7 15s. for singles.

The galvanisers reported themselves more full of work than a week ago, and prices were £15 for galvanised corrugated roofing sheets of 24 w.g., packed in felt, delivered in Liverpool or London. At that price a few transactions were recorded. The minimum figure for baling strip, not of the lightest weight, was £6 5s., delivered in Liverpool.

Common bars were a little more in demand; so too were small angles and tees. Prices ranged from £5 15s. upwards. Medium quality bars were likewise in improved request at £6 2s. 6d. to £6 10s. and £6 12s. 6d. At the last figure an excellent quality was procurable. Marked bars sold slightly better at £7 12s. to £7 12s. 6d. Very little was heard either in Birmingham or Wolverhampton of the £7 10s. price which a few weeks ago was demanded by two or three firms. Orders for both marked and medium bars are arriving from the Colonies and our great Eastern dependency.

Plate orders were difficult to secure. Even girder and bridge plates were less in request; but it is believed that a better business will be done so soon as the quarter is well turned. Common sorts were £8 per ton, and from this figure, up to £9 10s., prices ranged according to quality and favourite brands.

The latest mail advices received by merchants in this district give prices in Melbourne as:—Corrugated galvanised iron, ordinary brands, £20 10s. for 28 gauge; best brands, £21 10s. to £22; black sheets, Nos. 8 to 18, £11; Nos. 20 to 26, £13; plates firm at £10 to £11; bars and rod iron, £8 10s. to £11; and hoop iron for trade purposes, £10 to £11. Tin plates were about 21s. 6d. per box for I.C. coke.

This afternoon pigs were a little firmer. There were indeed vendors who reported better prices by from 1s. 3d. to 2s. 6d. per ton than some of their customers would have given a week or ten days ago. These improved rates applied equally to Derbyshire and Northamptonshire pigs, and likewise to hematites. Both the former qualities were quoted at the advanced price of £2 5s. per ton; and there had been some sales on Saturday last at £2 3s. A few consumers who had previously declined to buy hematites at £3 5s. are this week giving that price.

Staffordshire all-mine pigs were easy to be had at £3 2s. 6d., and there was a good all-mine pig made from Staffordshire stone which might have been bought at from 1s. 3d. to 2s. 6d. per ton under £3. Shropshire all-mine iron was abundant at £3. Pigs having so little cinder in their mixture as to be classed as all-mine are, however, being delivered into this district from remote centres of production at £2 2s. 6d. per ton. Staffordshire cinder iron was easy to purchase at £1 17s. 6d. The class of pigs in which most business was done were those suitable for foundry purposes; still the purchases were not so free as was noticeable a month ago.

The next quarterly meetings will be held on July 13th and 14th. The second half of the year is being entered upon with rather more confidence by ironmasters than had been expected.

Representative South Staffordshire colliers and their employers have again met to consider a mutual insurance scheme to supersede the Employers' Liability Act. It was reported that the thin coal miners were favourable to the scheme, but that the thick coal men were undecided, as they have not been accustomed hitherto to contribute to any kind of society. It was resolved to establish and accept the scheme and put it in operation at once for the benefit of the thin coal men, leaving the thick coal men to move for themselves.

The delegates of the Staffordshire Miners' Federation, at a meeting in Wolverhampton on Tuesday, passed a resolution expressing regret that "certain employers at Birchills are paying 1½d. per stint less than the recognised scale." A deputation was appointed to interview the employers. They will try to induce the Birchills masters to pay their men according to the scale; and they were "empowered to take action to enforce the resolution."

The operatives in the Staffordshire wrought nail trade, to the number it is estimated—including women—of about 28,000, came out on strike on Monday in accordance with resolutions passed during the preceding week. Their object is to obtain the wages paid by the "1878 list"—an advance of 10 per cent. upon the "1879 list," and of 30 per cent. upon present wages. Happily the strike is not likely to be a long one, for the men have nothing to support them; and it is also stated that some masters are already willing to give a portion of the advance wished for.

Encouraged by the success of the leather curriers of Walsall in obtaining a hearing before the French Treaty Commissioners, the other branches of the staple industry of the town have just met to consider their grievances under the proposed tariff. The value of the leather exported to France from this country annually is upwards of a quarter of a million sterling; and the great bulk of this goes from Walsall. The new tariffs on many of the goods used in saddlery are, it was urged, almost prohibitory. All men's saddles would be charged a duty of 8s. each, and ladies' saddles 10s. each, irrespective of quality. The bridle trade would be affected more seriously than any other in the town, the inferior articles being subject to the same duty as those which cost double the money. Nickel goods are also sufferers. Paris is Walsall's chief competitor, especially with South American markets, in this industry. A list of goods was drawn up with the exporters' ideas of what the duties ought to be annexed. It was determined to forward this to the Commissioners, and to ask for the reception of a deputation.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—Although it can scarcely yet be said that a decided improvement has set in, the more healthy tone which I noticed in the iron trade of this district last week has been fairly maintained. Lancashire makers of pig iron report that a very fair amount of business has been coming to hand during the past week, and as the iron is going direct into the hands of consumers, this is a satisfactory indication of a better state of things in the district. Consumers, also, are showing more confidence, and are giving out orders for larger quantities than they have been doing of late, whilst sales could be freely made up to the end of the year; but local makers decline to go further than the next three or four months. No alteration has yet been made in the quotations for local iron, but makers are very firm at their full rates, the minimum quotations for delivery into the Manchester district being 43s. for No. 4 forge, and 44s. for No. 3 foundry, less 2½; but in some cases 6d. per ton above these figures is being asked.

In outside brands the chief business doing has been in Lincolnshire irons, the prices which makers are now asking for Derbyshire and Middlesbrough brands tending to check any business in this district. Lincolnshire irons, however, have maintained the advance of 1s. per ton put on last week, and fair sales of forge have been made at 43s. 10d., whilst foundry has been sold at 44s. 10d. per ton, less 2½, delivered equal to Manchester.

Finished iron appears to be meeting with a fair inquiry. Bars, hoops, and sheets are in demand for export, and the last-named class of goods is also going off tolerably well for home consumption. Makers generally also speak more hopefully than they have been doing of late, and prices as a rule are firm, with a slight advance being obtained in some cases. For delivery equal to Manchester or Liverpool, the average quotations are about £5 15s. to £5 17s. 6d. for bars, £6 5s. to £6 10s. for hoops, £6 15s. to £6 17s. for common plates, and £7 12s. 6d. up to £7 17s. 6d. for ordinary sheets.

A considerable number of American orders for machinery is now coming into Lancashire, and some of the large firms in the Manchester district are at present tolerably busy making general tools, such as radial drills, planing, slotting, and drilling machines, for the United States.

A short time back I referred in my Notes to the fact that tool makers in this district were developing the manufacture of twist drills, which, until a comparatively recent date, were produced almost exclusively in America. Extensive plant has now been laid down by some of the firms in this district for this class of work, and I need scarcely add that improvements in the method of manufacture are being introduced. During the week I have had brought under my notice an excellent machine specially designed by Messrs. Smith and Coventry, of Manchester, for grinding the drills, which is perhaps one of the most important operations in their manufacture, as it is an essential condition to secure an even length to each lip of the drill. This machine consists of a grindstone trough with a stone, 30in. diameter and 5in. broad, driven by a three-speed cone pulley to which are attached compound slides for giving the necessary movements for setting on the cut and traversing over the periphery of the stone, and the grinding apparatus specially designed by Messrs. Smith and Coventry. In this apparatus the drill is cramped up solid while being ground, the grinding being performed by traversing the drill across the stone and at the same time grinding the clearance on the drill by raising and lowering an oscillating arm on which it is fixed. The drill being thus held solid, the clearance is ground upon it by a simple movement of the point of the drill about a fixed centre arranged in such a manner that the proper clearance is given by one movement. The first lip having been ground, by means of a simple dividing head the drill is revolved exactly half a revolution, and the second lip is then ground, so that a perfectly even length is secured on both lips. Several of these machines, I understand, have recently been supplied to the Government dockyards.

In the coal trade business is extremely dull. The average prices at the pit mouth are about as under: Best house coal, 8s. 6d.; seconds, 6s. 3d. to 6s. 9d.; good screened gas coal, 6s. 6d. to 6s. 9d.; common coal, 4s. 6d. to 5s. 3d.; good burgy, 4s. 3d. to 4s. 9d.; and good slack, 3s. 9d. to 4s. 3d. per ton.

Coke is in moderate demand at about late rates, small cokes averaging about 8s. to 10s., and large 12s. to 14s. per ton at the oven.

Barrow.—The iron and steel trades in this district are fairly but not actively employed, except perhaps in one or two instances. Fully one-third of the furnaces in the district are out of blast, but at Barrow makers are, comparatively speaking, well off, inasmuch as they have twelve out of fourteen furnaces making iron. Orders are very well held, and makers have at present as much work in hand as will furnish employment for a few months. Deliveries, however, are not nearly so large as they were expected to be at this part of the year, and it is now more than ever evident that the competition experienced from the other districts engaged in the manufacture of Bessemer and other classes of iron is having the effect of checking any buoyancy which the market may have. During the past few days there has undoubtedly been a better tone, but prices, although they are a shade firmer, do not show any quotable alteration. The steel makers of the district have their hands fairly filled with work, and the mills are working very full time, the output of both rails and merchant steel being very extensive. Shipbuilders have not booked any new orders of note, but both in the erecting and engineering departments there is very great activity. No change can be noted in the dull state of the finished iron trade, but there still seems reason to believe that in dull times this trade will be driven out of the district. Iron ore sells slowly at easy rates. One or two encouraging finds of iron ore in this district lately have opened the eyes of explorers, and have pointed to the probability that rich metal lies in abundance in parts of the Furness district where hitherto ore has not been found.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

The event of the week is the changing of the old-established firm of Thomas Firth and Sons, Norfolk Works, into a limited company, restricted to members of the Firth family. It is no secret that it was the intention of Mr. Mark Firth to have carried out this change in his lifetime, and had he not been so suddenly cut off, it would have been completed. The company was incorporated on the 15th June last, with a capital of £320,000 in 640 shares of £500 each. Mr. Mark Firth had five sons, only one of whom, Mr. John Bradley Firth, has attained his majority. The trustees of the late Mr. Firth sign the register for the other sons, who will form the company when they reach the age specified in the will. The company at present consists of Mr. Charles Henry Firth, Mr. Edward Firth, and Mr. Thomas Firth—brothers of the deceased—Mr. J. B. Firth, Mr. L. J. Firth—son of the late Mr. John Firth—Mr. J. Loxley Firth—son of Mr. Edward Firth—and the three gentlemen who, with two members of the Firth family, act as executors under the will.

Messrs. John Brown and Co., Limited, held their annual meeting on Wednesday. Mr. J. D. Ellis, the chairman, presiding. The report, declaring a dividend of 5 per cent., was adopted. It was stated, I understand, that the shareholders would shortly be asked to furnish the further capital, either in the form of 5 per cent. preference shares or by call. The last call was made fourteen years ago.

Messrs. Brown, Bayley, Dixon, and Co., Limited, the successors of Messrs. Brown, Bayley, and Dixon, Limited, have now placed their scheme before the public. The substance of it has been anticipated in previous letters. The capital is fixed at £150,000, divided into 8000 A and 4000 B shares of £12 10s. The latter will be issued as fully paid-up, and allotted—without payment—to the allottees of A shares, on which it is proposed to call up £7 per share. The directors are to hold 1400 A shares,

being more than one-sixth of the entire capital of the company. The results of the trading during the liquidation are reported to have been satisfactory, both as regards working profit and amount of income. Creditors at a distance will be interested to know that the compostion of 6s. 8d. in the pound is payable in three instalments—3s. 4d. within six weeks of the registration of the new company, 1s. 8d. on the 30th November next, and 1s. 8d. on the 15th April next. I believe the new company will be successfully launched.

At a meeting of the executives of the South and West Yorkshire Miner's Association, held at Barnsley this week, it was agreed that the amalgamation should take effect from July 1st.

A number of pony drivers struck work at Denaby Main Colliery on Monday for an advance of 2d. and 3d. per day. The lads did not clearly know their own minds, several of them desiring to return to work on the terms against which they struck, provided the wages were paid by the company instead of the contractors, and others wishing to stand out for the advance. No doubt a settlement will soon be arrived at.

An increased demand for the best qualities of crucible steel is noted from the States. Rails, armour plates, ship plates, and boiler plates continue in heavy request. Other departments unaltered.

The petition with reference to the French Treaty has been signed by over 12,000 working men. Other sheets were still to come in from the workshops.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE iron market, after experiencing about a week of firmness, with a tendency to increased prices, has again become quiet. The changes have been due to speculative influences founded upon rumours with reference to a slight diminution in the production. These reports were believed to have good foundation a week ago, but arrangements have since been made to keep in blast for at least a short time longer four furnaces at one of the ironworks, which were expected to be damped down at the end of the present week. As a result, and failing any apparent disposition of the ironmasters as a body to curtail production, the quotations of warrants have receded, and there is less firmness in the market. The production continues large, although the sale appears to be rather smaller than it was at this time last year. At the close of the year the stocks of pig iron in Scotland amounted to 739,000 tons. During the past six months the make is believed to have been about 645,000 tons. The shipments and the amount sent by rail to England are calculated at 272,000, and the local consumption at 220,000 tons, thus leaving 892,000 tons in stock, of which Messrs. Connal and Co. hold 565,500, and makers 326,500 tons. This gives the increase of stock since the beginning of the year at 153,000 tons, which is certainly very large when it is considered that there are eight more furnaces in blast than a year ago.

Business was done on Wednesday from 46s. 8d. to 46s. 10½d. cash and 46s. 10d. to 47s. one month. To-day—Thursday—the market was quiet at 46s. 10d. fourteen days and 46s. 11d. one month and 46s. 10d. to 46s. 8½d. cash.

Business was done in the warrant market on Friday forenoon at from 47s. 1d. to 47s. 6d. cash, and 47s. 2d. to 47s. 7½d. one month, the afternoon quotations being 47s. 5d. to 47s. 9d. cash and 47s. 6d. to 47s. 8½d. one month. The tone became weaker on Monday, when business was done in the morning at 47s. 6d. to 47s. 1d. cash, and 47s. 7d. to 47s. 2d. one month. In the afternoon transactions were effected from 47s. 2d. to 46s. 11d. cash and 47s. 3d. to 47s. 1d. one month. On Tuesday the market was quiet at 46s. 11d. cash and 47s. 0½d. one month to 46s. 8d. cash and 46s. 11d. one month. Owing to the demand for iron direct from the makers, quotations of special brands are a little higher, the following being the figures :—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 54s. 6d.; No. 3, 49s.; Coltness, 56s. 6d. and 49s. 6d.; Langloan, 56s. 6d. and 49s.; Summerlee, 54s. 6d. and 47s. 6d.; Calder, 55s. and 49s.; Carnbroe, 51s. 6d. and 47s.; Monkland, 47s. 6d. and 45s. 6d.; Govan, at Broomielaw, 47s. 6d. and 45s. 6d.; Shotts, at Leith, 56s. and 49s. 6d.; Carron, at Grangemouth, 52s. 6d. (specially selected, 56s.) and 51s. 6d.; Kinneil, at Bo'ness, 47s. 6d. and 45s. 6d.; Glengarnock, at Ardrossan, 51s. 6d. and 48s.; Eglinton, 48s. and 45s.; and Dalmellington, 48s. and 45s. 6d.

Most of the departments of the malleable iron trade are still well employed, and with the exception of cast iron pipe makers, makers of manufactured iron are likewise doing well.

The hammermen still remain on strike at the Steel Company of Scotland's Newton and Blochairn works.

The coal trade continues very good for the season, the shipments being especially satisfactory. There is a good demand for steam coals, and altogether there is little reason to complain. Prices are low, but so also are the miners' wages, and in the absence of unionism and strikes any requisite amount of work can be got out of the men, who appear in better circumstances then in some years when their pay was higher, with more frequent interruptions to work.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

MR. HOLLAND has been appointed works manager at Ebbw Vale. The gist of the report issued by the directors of this company on Saturday last is that a gross profit for the year ended 31st March has been realised of £75,688 6s. 8d. Striking off expenses of head office and legal expenses, together with interest on debentures and fully paid up shares, a net profit is shown of £34,406 15s. 1d. This balance is appropriated thus : Written off for depreciation of property, £22,028 11s.; and the remainder, £12,378 4s. 1d., added to last year's balance, which increases the amount at the credit of profit and loss account to £46,192 18s. 8d. No dividend has been declared, the directors wisely deciding not to do so until the bank balances are extinguished or very much reduced. Most of the shares are held in the Sheffield and Manchester districts.

An absolute sale is now fully expected to take place of the whole of Booker's Works, Pentyrch, Melingriffith, and the coalfields.

One of the best industries in the Swansea district is that of patent fuel, no less than 7000 tons having been shipped last week, and 17,000 tons of coal. In coal there was a tendency upward some weeks back, which has been effectually quieted. There is also another unfavourable characteristic of existing trade—so many stoppages have taken place of ironworks and tin-plate works that small coal has become a drug, and can be bought at almost anything at some collieries. Coke-makers, too, complain, and prices rule low for all but best qualities.

Tin-plate continues at its minimum price. Common cokes are quoted for delivery or London as low as 14s. 3d. Fortunately makers of good brands hold orders at better figures. Another rupture has taken place amongst the workmen at Old Lodge Works—tin-plate—Llanelly. The sliding scale committee of Associated Coalmasters held a meeting at Cardiff this week, under the presidency of Mr. W. T. Lewis. The only subject brought under notice was a private inquiry submitted by the men, and discussed in private.

No practical step has taken place at Cyfarthfa. It is expected that the railway connection between the Cyfarthfa collieries and the Taff Vale Railway will be carried out.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

21st June, 1881.

2709. SETTING CAPS in EMPTY CARTRIDGES, W. Lorenz, Germany.
2710. AIR-COMPRESSING ENGINES, E. Holt, Radcliffe.
2711. SIGNALS for RAILWAYS, T. Putnam, New York.
2712. TELEGRAPHS, D. Nicoll, London.
2713. COMBING MACHINES, J. Walker and J. Stephenson, Shipley.
2714. UTILISATION of CLAY, E. Digby, London.
2715. NECKTIES, J. Thomas and B. White, London.
2716. FILTERING WATER, P. Justice.—(*J. Hyatt, U.S.*)
2717. STEAM BOILERS, H. Lake.—(*E. Hall, U.S.*)
2618. CARRIAGE BRAKES, W. Corteen and T. Cooper, Brentford.
2719. REAPING and MOWING, J. Lines, Hadleigh.
2720. WASHING WOOL, J. Petrie, jun., Rochdale.
2721. EGG TIMERS, A. Houghton, Birmingham.
2722. SEWING MACHINES, W. Lake.—(*G. Copeland, U.S.*)
2723. SCREW PROPELLERS, G. Leslie, Fairfield.
2724. GLASS BOTTLES, J. Jeffs, London.
2725. FORMING MOULDS, F. Ley, Derby.
2726. CARRIAGES, D. Kerridge, Needham Market.

22nd June, 1881.

2727. HEALDS, W. Gedge.—(*N. and J. Chaize, France.*)
2728. EXCAVATING HARBOURS, &c., W. Smith, N.B.
2729. BUTTONS, &c., J. Harrington, Brixton.
2730. SWEETMEATS, H. Bories and P. Tostain, Paris.
2731. KEYS for LOCKS, C. Strauss.—(*O. Strauss, Germany.*)
2732. SLICING APPARATUS, G. Robertson, Glasgow.
2733. RAILS, A. Browne.—(*H. Rimbach, Germany.*)
2734. GAS BURNERS, W. Brewer, London.
2735. BUCKLES, J. Belicard, Manchester.
2736. COMBING WOOL, J. and W. Baldwin, R. Haddon, and J. C. Dyson, Halifax.
2737. SPINNING, W. and J. Riley, York.
2738. TREATING BESSEMER METAL, P. Jensen.—(*H. Tholander, Sweden.*)
2739. DISTRIBUTING ELECTRICITY, H. E. Newton.—(*A. Gravier, Paris.*)
2740. REFRIGERATING APPARATUS, A. Haslam, Derby.
2741. COLOURING MATTER, A. Gough, Buckingham.
2742. CALENDERING PRINTED PAPER, H. H. Lake.—(*C. Chambers, jun., Philadelphia, U.S.*)
2743. PAVEMENTS, H. Lake.—(*D. McLean, New York.*)

23rd June, 1881.

2744. CANS, C. Laurent and H. W. Brand, Middlesex.
2745. MANURE, E. Davies, Liverpool, & E. Massey, York.
2746. BOOTS and SHOES, D. W. Cuthbert, Glasgow.
2747. PURIFICATION of WATER, G. Bischof, Middlesex.
2748. FEEDING WOOL, W. Cliffe and T. E. Ainley, York.
2649. STEERING GEAR, A. Higginson, Liverpool.
2750. DEPOSITING METALS, G. Bower, St. Neots.
2751. FORMING JOINTS, D. Church, Southwark.
2752. PACKING for BOXES, F. des Vœux, Middlesex.—(*G. van Wagenen, U.S.*)
2753. HEATING FURNACES, T. Adams, Brierly-hill.
2754. PENS, W. R. Lake.—(*F. X. Poznanski, Paris.*)

24th June, 1881.

2755. DRIVES for SEWING MACHINES, J. Sefton, Belfast.
2756. STEAM SHIPS, G. A. Cochrane, Liverpool.
2757. WINDING YARN, J. and T. A. Boyd, Lanark.
2758. SEPARATING BODIES, &c., H. J. Smith, Glasgow.
2759. DOOR LATCHES, S. L. Coales, Buckingham.
2760. RAILWAY AXLE GUARDS, J. Whittle, Chorley.
2761. ELECTRO-MAGNETIC MACHINE, L. A. Groth.—(*D. Lachaussé, Liége.*)
2762. CHAIRS and COUCHES, T. Barnby, Birmingham.
2763. WATER-CLOSETS, W. Bryan, Blackburn, and A. Fryer, Wilmslow.
2764. PARTITIONS for STALLS, W. S. Hunter, Canada.
2765. MOTIVE POWER, J. Levassor, Paris.
2766. EXERCISING MACHINES, H. J. Allison, Holborn.—(*J. R. Judd, U.S.*)
2767. DRESSING LEATHER, P. Newall and J. Barker, Warrington.
2768. COMPRESSING AIR, W. R. Lake, London.—(*E. Hill, Connecticut, U.S.*)
2769. TOOL HOLDER, W. R. Lake, London.—(*E. Dervaux-Ibled and G. N. Schœnberg, Paris.*)
2770. ELECTRICAL RESISTING MEDIUMS, R. H. Courtenay, Southampton-buildings.
2771. FINISHING SCREW-BOLTS, A. M. Clark, London.—(*Messieurs Baville and Montlebout, Paris.*)
2772. CIGAR LIGHTERS, A. M. Clark, Chancery-lane.—(*W. W. Batchelder, New York.*)
2773. SPINNING MACHINERY, A. M. Clark, Chancery-lane.—(*P. Townson, Hartford, U.S.*)

25th June, 1881.

2774. SUPPLYING STEAM for HEATING, A. M. Clark, London.—(*B. Holly, Lockport, U.S.*)
2775. MANUFACTURE of GAS, J. Woodward, Ancoats.
2776. SUPPLYING STEAM for HEATING, A. M. Clark, London.—(*B. Holly, Lockport, U.S.*)
2777. SIGNALLING, G. Brocklebank, Anerley.
2778. STEAM GENERATORS, W. Cook and D. Mylchreest, Liverpool.
2779. COMPRESSING AIR, R. E. Dickenson, Birkenhead.
2780. PIPE JOINTS, J. Barlow, Winchester.
2781. OIL, E. Brydges.—(*F. Stoll, Germany.*)
2782. BATTERIES, H. E. Newton.—(*Société Universelle d'Electricité Tommasi, Paris.*)
2783. PHOTOGRAPHIC SHUTTER, C. Sands, London.
2784. CONSUMING SMOKE, W. P. Thompson.—(*C. McWilliam, H. Hogel, and A. Foster, U.S.*)
2785. SLEEPERS, C. G. Clarke, Kingston-upon-Hull.
2786. KILNS, T. Carder, Chudleigh.
2787. DRYING, &c., SUBSTANCES, J. C. Mewburn.—(*F. Stroehmer and W. H. Eales, Saxony.*)
2788. OBTAINING LIGHT by ELECTRICITY, B. J. B. Mills.—(*F. Million, France.*)
2789. ROLLER BLINDS, H. Otway, London.
2790. DRYING APPARATUS, G. W. von Nawrocki.—(*J. Swiecianowski and S. Adamozewski, Russia.*)
2791. GUIDING TRAMCARS, W. Sterling, Rusholme.
2792. CARRIAGES, A. E. Dalzell, Pall Mall.
2793. VENETIAN BLINDS, J. L. Seymour, New Cross.
2794. LOOMS, W. H. Beck.—(*J. C. N. Mouret, France.*)
2795. FASTENING for LEGGINGS, M. Hess and A. Hess, Steward-street, London.
2796. LOZENGES, W. Sharp, Birmingham.
2797. TREATING GASEOUS FUEL, S. Lloyd, Birmingham.
2798. RAISING ALE, J. Bennett, King's Heath, J. Herd and B. P. Walker, Birmingham.
2799. STEAM BOILERS, R. Thomson and J. Watson, Liverpool.

27th June, 1881.

2800. REVERSING GEAR, G. P. Renshaw, Nottingham.
2801. WATER BOILERS, F. Hocking, Liverpool.
2802. WEAVING, O. Drey, Manchester.
2803. CLEANING RICE, R. Douglas and L. Grant, N.B.
2804. MINING CARS, F. Haddan.—(*S. Henvard, Spain.*)
2805. ROPE ATTACHMENTS, H. Haddan.—(*W. Healey, U.S.*)
2806. SHEEP SHEARS, W. Gedge.—(*J. J. Bogard, U.S.*)
2807. TELEGRAPH CABLES, A. C. Ranyard, Lincoln's-inn, and J. A. Fleming, Cambridge.
2808. SIGNALLING, J. Jebb, London.—(*W. Barker, U.S.*)
2809. MANUFACTURE of CEMENT, W. Joy, Aylesford.
2810. SEPARATING FLUIDS, F. H. F. Engel, Hamburg.—(*G. de Laval, Stockholm.*)
2811. PAPER CUTTERS, J. Gruneke, Paris.
2812. SEWING MACHINES, T. J. Denne, Red Hill.
2813. PRODUCING DESIGNS, E. Lee, Leeds.
2814. ENVELOPES for BOTTLES, W. H. Beck, London.—(*P. Marbeuf, Cognac, and C. Wilhelm, Argentat.*)
2815. PREPARING BAGS, A. M. Clark, London.—(*I. T. Tichenor, Auburn, U.S.*)
2816. SPENT LIES of SOAP WORKS, G. Payne, Millwall.
2817. LAMPS, W. Lake.—(*E. Follet and A. Bixby, U.S.*)
2818. PREVENTING the ESCAPE of SPARKS from CHIMNEYS, W. R. Lake.—(*A. Petzold, Germany.*)

Inventions Protected for Six Months on deposit of Complete Specifications.

2670. OBTAINING MOTIVE POWER, B. J. B. Mills, Southampton-buildings.—A communication from J. Lurant, Lyons, France.—*18th June*, 1881.
2687. GOVERNOR for STEAM ENGINES, J. M. Gorham, New-road, Lincoln.—*20th June*, 1881.
2700. TREATING WHEAT, M. Benson, Chancery-lane, London.—A communication from O. Oelxe, Augsburg, Germany.—*20th June*, 1881.
2706. FIXING PLAITED FABRICS, W. P. Thompson, Lord-street, Liverpool.—A communication from M. F. Sallade, New York, U.S.—*20th June*, 1881.
2768. COMPRESSING AIR, W. R. Lake, Southampton-buildings, London.—A communication from E. Hill, Connecticut, U.S.—*24th June*, 1881.
2772. CIGAR LIGHTERS, A. M. Clark, Chancery-lane, London.—A communication from W. W. Batchelder, New York, U.S.—*24th June*, 1881.

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

2477. ELECTRIC LIGHTING, R. Werderman, London.—*21st June*, 1878.
3002. SPINNING, J. Birkenhead, U.S.—*29th July*, 1878;
2488. BOOTS, &c., E. Edmonds, London.—*22nd June*, 1878.
2573. REMOVING EARTH, &c., W. Howard, Birmingham.—*26th June*, 1878.
2520. TURNIP THINNERS, J. Garrood, Fakenham.—*24th June*, 1878.
2755. DOUBLE-ACTION PUMPS, C. F. Amos and H. W. R. Smith, Kingston-upon-Hull.—*9th July*, 1878.
2524. WIRE HEALDS, H. B. Barlow, jun., Manchester.—*25th June*, 1878.
2534. CUTTING PAPER, H. M. Nicholls, London.—*25th June*, 1878.
2553. UTILISING HEAT for GENERATING STEAM, W. Morgan-Brown, London.—*26th June*, 1878.
2587. SEPARATING WHEAT, J. F. Stewart, London.—*27th June*, 1878.
2602. GRID for RAISING VESSELS, J. L. Clark and J. Standfield, London.—*28th June*, 1878.
2663. PAPER DISHES, J. H. Johnson, London.—*3rd July*, 1878.
2712 PORTABLE ENGINES, N. Clayton and J. Shuttleworth, Lincoln.—*6th July*, 1878.
2517. EXPLOSIVE COMPOUNDS, F. Wirth, Frankfort-on-the-Main.—*24th July*, 1878.
2531. CHILLED-IRON TURRETS, C. M. Sombart, Magdeburg.—*25th June*, 1878.
2529. ENDLESS PAPER VESSELS, J. A. Crane, London.—*25th June*, 1878.
2533. PURIFICATION of GAS, J. J. Shedlock, London.—*25th June*, 1878.
2689. RUNNING TRAMS on CAGES, H. Fisher, Nottingham.—*5th July*, 1878.
2690. COATING IRON, J. F. Crease, Eastney Barracks.—*5th July*, 1878.
2922. PUMPING ENGINES, J. Gwynne, London.—*23rd July*, 1878.

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

2508. DRYING TIMBER, A. McNeile, Pentonville.—*17th July*, 1874.
2208. DESTROYING INSECTS, A. McDougall, Penrith.—*25th June*, 1874.
2243. FILTERS, G. Bischof, Glasgow.—*29th June*, 1874.
2423. RAILWAY SIGNALS, J. S. Farmer, Kilburn, and E. Tyer, Finsbury.—*10th July*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 15th July, 1881.

716. REPEATING FIRE-ARMS, J. J. Atkinson and J. Needham, Middlesex.—*19th February*, 1881.
746. BAROMETERS, F. H. F. Engel, Hamburg.—A com. from J. D. Möller.—*21st February*, 1881.
749. COLOURING MATTERS, C. D. Abel, London.—A com. from C. Martius.—*22nd February*, 1881.
750. COLOURING MATTERS, C. D. Abel, London.—A com. from C. Martius.—*22nd February*, 1881.
755. BOXES of CARRIAGE AXLES, J. Grice, Birmingham.—*22nd February*, 1881.
766. PURIFYING MIDDLINGS, J. Sutcliffe, Bacup.—*23rd February*, 1881.
781. EXTRACTING OXYGEN from NITROGEN, H. Haddan, Strand.—A com. from E. B. Reynolds.—*24th February*, 1881.
784. AUTOMATIC MEASURING COCKS, W. J. C. Joughin, Walthamstow.—*24th February*, 1881.
810. ROASTING COFFEE, P. Pearson, Manchester.—*25th February*, 1881.
926. DECORATING BRICKS, &c., G. and A. Maw, Broseley, Salop.—*4th March*, 1881.
953. CARRIAGE BRAKES, E. G. Brewer, London.—A com. from P. Prat.—*5th March*, 1881.
1041. DRINKING FLASKS, J. Hall, Sheffield.—*11th March*, 1881.
1091. TILING for ROOFS, A. M. Clark, London.—A com. from J. J. Williams.—*14th March*, 1881.
1223. PUMPS, A. Rigg, London.—*21st March*, 1881.
1256. COLOURING MATTERS, G. von Nawrocki, Berlin.—A com. from J. R. Geigy,—*22nd March*, 1881.
1601. RAILWAY BRAKES, C. Fairholme, London.—A com. from W. Bandel.—*12th April*, 1881.
1629. SHARPENING DRILLS, E. E. Bentall, Maldon.—*13th April*, 1881.
1659. MAST WINCHES and CAPSTANS, E. E. and F. A. Bentall, Maldon.—*14th April*, 1881.
1675. TREATMENT of MAIZE, A. W. Elliott, Bruges.—A com. from C. van Outrive.—*16th April*, 1881.
1714. HEATING and COOKING, C. R. Stevens, Lewisham.—*20th April*, 1881.
1781. CASTORS, A. Bell, Edinburgh.—*25th April*, 1881.
2196. FIGURED CLOTH, T. Taylor and J. Warburton, Bolton.—*19th May*, 1881.
2293. PISTON VALVE MUSICAL INSTRUMENTS, B. Mills, Southampton-buildings.—Com. from C. G. Conn.—*25th May*, 1881.
2359. FILTERING, J. Macay, London.—*28th May*, 1881.
2375. MAGNETO-ELECTRIC MACHINES, H. E. Newton, Chancery-lane.—Com. from C. Hussey and A. Dodd.—*31st May*, 1881.
2447. COMBING COTTON, W. R. Moss, Bolton.—*3rd June*, 1881.
2593. ELECTRIC CLOCKS, A. M. Clark, Chancery-lane, London.—Com. from J. Schweizer.—*14th June*, 1881.

Last day for filing opposition, 19th July, 1881.

751. TREATMENT of ROOTS, R. Stone, London.—*22nd February*, 1881.
753. BICYCLES, G. Ash, Southsea.—*22nd February*, 1881.
767. STEAM BOILERS, T. Joicey, Gateshead-on-Tyne.—*23rd February*, 1881.
770. BOTTLES, A. Savage, London.—*23rd February*, 1881.
773. HEATING AIR, G. Seagrave, London, and S. B. Bevington, Bermondsey.—*23rd February*, 1881.
674. ELECTRIC LAMPS, J. Fyfe, London.—*23rd February*, 1881.
787. VULCANISING ARTICLES, T. Rowley, Manchester.—*24th February*, 1881.
791. CHILDREN'S COTS, E. A. Brydges, Upton.—A com. from C. Schmidt, Berlin.—*24th February*, 1881.
799. GAS ENGINE, J. Graddon, Forest Hill.—*24th February*, 1881.
800. BLASTING COMPOUND, B. J. B. Mills, London.—A com. from J. Anders, Bohemia.—*24th February*, 1881.
801. BLASTING COMPOUND, B. J. B. Mills, London.—A com. from J. Anders, Bohemia.—*24th February*, 1881.
804. FOOD for FORMING DRINKS, E. and J. Williams, Swansea.—*25th February*, 1881.
805. CRAYONS, W. Horne, Bexley.—*25th February*, 1881.
808. BUSHES for PULLEYS, J. Gordon, jun., Dundee.—*25th February*, 1881.
811. GAS ENGINE, W. B. Haigh and J. Nuttall, Oldham.—*25th February*, 1881.
818. SUBSTITUTE for COFFEE, S. T. Francis, London.—*25th February*, 1881
821. INDICATING the ILLUMINATING POWER of GAS, T. Thorp & R. Tasker, Lancaster.—*26th February*, 1881.
824. DRYING COTTON, &c., D. Dawson, Huddersfield.—*26th February*, 1881.
840. INTERNAL PARTS of CUPOLAS, B. G. D. Cooke, Colomendy.—*28th February*, 1881.
848. SEWING MACHINERY, H. H. Lake, London.—Com. from J. Fare.—*28th February*, 1881.
873. REMOVING OIL from TIN, T. H. Morgan, Swansea.—*1st March*, 1881.
874. COMPRESSING FUEL, H. J. Haddan, London.—Com. from E. Geisenberger and E. Picard.—*1st March*, 1881.
940. REED ORGANS, W. R. Lake, London.—Com. from J. Morgan.—*4th March*, 1881.
1037. PACKING MATERIAL, W. R. Lake, London.—Com. from R. Thompson and H. Norris.—*10th March*, 1881.
1081. GAS for LIGHTING, W. L. Wise, London.—A com. from N. F. Delean and La Société Hubert Frères.—*12th March*, 1881.
1133. MILK CANS, T. Harte, Reddish.—*16th March*, 1881.
1497. VARNISHING PAPER, W. and S. Rawcliffe, Liverpool.—*6th April*, 1881.
1674. GUN CARRIAGES, J. Vavasseur, London.—*16th April*, 1881.
2274. DYE COLOURS, W. G. and R. A. A. White, Crayford.—*24th May*, 1881.
2338. STOPPERS for BOTTLES, J. S. Davison, Sunderland.—*27th May*, 1881.
2355. DOUBLING, &c., WOOL, &c., T. Robinson, Leeds.—*28th May*, 1881.
2362. PAPER-CUTTING MACHINES, R. M. Greig, Edinburgh.—*30th May*, 1881.
2390. PIANOFORTES, W. R. Lake, London.—Com. from A. K. Hebard.—*31st May*, 1881.
2406. CHIMNEY TOPS, W. Chrystal, London.—*31st May*, 1881.
2420. STEAM BOILERS, J. Henderson, London.—Com. from J. R. Russell.—*1st June*, 1881.
2457. FEEDING PAPER to PRINTING MACHINES, J. Dinsmore and F. Hoyer, Lancaster.—*4th June*, 1881.
2496. ELECTRIC ARC LIGHTS, E. G. Brewer, London.—Com. from T. A. Edison.—*8th June*, 1881.
2566. BOOT SOLE-EDGE SETTING MACHINES, C. H. Trask, Lynn, U.S.—*13th June*, 1881.
2587. ICE-MAKING APPARATUS, W. R. Lake, London.—Com. from G. W. Stockman.—*14th June*, 1881.
2590. GRATE-BARS for FURNACES, W. R. Lake, London.—Com. from W. U. Fairbairn.—*14th June*, 1881.
2622. DRYING LIMESTONE, &c., W. R. Lake, London.—Com. from The International Pavement Company, Incorporated.—*16th June*, 1881.

Patents Sealed

(*List of Letters Patent which passed the Great Seal on the 24th June*, 1881.)

5217. PISTONS, J. Wavish, Leytonstone.—*13th December*, 1880.
5453. ARTIFICIAL EAR DRUMS, H. P. K. Peck, U.S.—*28th December*, 1880.
5468. OPENING DOORS, R. Waller, Leeds.—*29th December*, 1880.
5498. CAST IRON, J. J. Shedlock, Uxbridge.—*30th December*, 1880.
5505. STEAM TRAPS, H. Lancaster, Pendleton.—*31st December*, 1880.
5516. DESIGNS on WOOD, A. Guattari, Paris.—*31st December*, 1880.
4. SHAPING HAT BRIMS, T. Rowbotham, Chester.—*1st January*, 1881.
10. PHOTOGRAPHIC PRINTING, A. M. Clark, London.—*1st January*, 1881.
79. CHRONOGRAPH, A. M. Clark, London.—*6th January*, 1881.
102. METALLIC WAGONS, R. Hudson, Gildersome.—*8th January*, 1881.
232. WHEELS for VEHICLES, A. M. Clark, Chancery-lane, London.—*19th January*, 1881.
483. WHEELS for VEHICLES, A. M. Clark, London.—*4th February*, 1881.
502. WATERPROOF GARMENTS, J. T. Goudie, Glasgow.—*15th February*, 1881.
1478. CLEANSING WOVEN FABRICS, W. Mather, Manchester.—*5th April*, 1881.

(*List of Letters Patent which passed the Great Seal on the 28th June*, 1881.)

5465. RAISING SUNKEN VESSELS, W. Atkinson, London—*29th December*, 1880.
5469. MOULDING, F. Wirth, Germany.—*29th December*, 1880.
5478. AMMONIA, H. A. Dufrené, London.—*29th December*, 1880.
5479. OBTAINING MOTIVE POWER, J. Graddon, Forest-hill.—*29th December*, 1880.
5481. SOFA BED, R. E. Parr, Greenwich.—*29th December*, 1880.
5495. REGULATING ADMISSION of AIR to FIREPLACES, R. Burchell, Kettering.—*30th December*, 1880.
5507. MOULD CANDLES, W. E. Nutt, Hounslow.—*31st December*, 1880.
5508. FEEDING FIBROUS SUBSTANCES to CARDING MACHINES, W. Fox & J. Hall, Leeds.—*31st December*, 1880.
5509. CHIMNEY PIECES, J. H. Corke, Badford House, Southsea.—*31st December*, 1880.
3. FLOOR SPRINGS, E. Bull, Halifax.—*1st January*, 1881.
5. CENTRAL FIRE CARTRIDGES, F. Wirth, Germany.—*1st January*, 1881.
14. PORTABLE FURNACES, J. Tenwick, Grantham.—*3rd January*, 1881.

18. TIP WAGONS, G. Allix, London.—*3rd January*, 1881.
22. CAST IRON, C. F. Claus, Mark-lane, London.—*3rd January*, 1881.
25. SHEARING MACHINES, J. H. Johnson, London.—*3rd January*, 1881.
42. DRYING BRICKS, J. Craven, Wakefield, and H. Chamberlain, Barnsley.—*4th January*, 1881.
45. EXPANSION GEAR for STEAM ENGINES, J. Bodington, Birmingham.—*4th January*, 1881.
46. SUPPLYING HEAT in DWELLING HOUSES, E. F. Osborne, Minnesota, U.S.—*4th January*, 1881.
56. MECHANICAL TELEGRAPHS, W. Chadburn, Liverpool.—*5th January*, 1881.
63. INFLAMMABLE COMPOSITION, W. R. Lake, London. —*5th January*, 1881.
68. WEAVING, G. H. Hodson and J. Broadley, Bradford. —*6th January*, 1881.
83. CIRCULAR REVOLVING MEASURE, H. J. Allison.—*7th January*, 1881.
86. RACK for MECHANICAL PURPOSES, W. Prowett, Birmingham.—*6th January*, 1881.
88. BREECH-LOADING FIRE-ARMS, A. M. Clark, London. —*7th January*, 1881.
101. FURNACES for STEAM BOILERS, J. Lart, London.—*8th January*, 1881.
106. PENHOLDERS, R. Spear, London.—*8th January*, 1881.
111. PREVENTING SHIPS from SINKING, R. G. Sayers, London.—*10th January*, 1881.
116. CARDING ENGINES, P. L. Klein and G. Hundt, Prussia.—*10th January*, 1881.
118. BRUSHES, G. W. von Nawrocki, Germany.—*10th January*, 1881.
145. COVERING WATER-CLOSET SEATS, W. R. Lake, London.—*12th January*, 1881.
167. PACKING for STUFFING BOXES, C. A. Maynard, London.—*13th January*, 1881.
191. LOOMS for WEAVING, J. Northrop, Skipton.—*14th January*, 1881.
195. CLOSE STOVES, H. Doulton and W. P. Rix.—*14th January*, 1881.
208. PREPARING TEXTILE FABRICS, R. W. Morrell, Bradford, and J. Shaw, Wakefield.—*15th January*, 1881.
281. CRUSHING FLOUR, P. Pfleiderer, London.—*22nd January*, 1881.
282. VELOCIPEDES, E. R. Settle, Coventry.—*22nd January*, 1881.
336. MECHANICAL MOTOR for ROTARY ACTION, M. Gandy, Liverpool.—*25th January*, 1881.
390. RESPIRATORS, E. Rinzi and A. A. Berthier, London.—*28th January*, 1881.
524. STOPPERING BOTTLES, F. G. Riley, London.—*7th February*, 1881.
618. VELOCIPEDES, W. H. J. Grout, South Hornsey.—*14th February*, 1881.
685. FASTENING TIRES, D. M. Yeomans, London.—*17th February*, 1881.
717. SELF-ACTING FASTENER for DOORS, J. Woodward, Wolverhampton.—*19th February*, 1881.
722. ROTARY ENGINES, E. A. Brydges, Upton.—*19th February*, 1881.
806. PURIFYING COAL GAS, G. A. Northcote, London. —*25th February*, 1881.
1108. COP SPINDLES, G. W. von Nawrocki, Germany.—*5th March*, 1881.
1209. UMBRELLA FRAMES, G. Neu, London.—*19th March*, 1881.
1469. MINING MACHINES, H. H. Doubleday, Washington.—*4th April*, 1881.

List of Specifications published during the week ending June 25th, 1881.

3774, 6d.; 4116, 6d.; 4127, 6d.; 4153, 6d.; 4177, 6d.; 4243, 6d.; 4261, 6d.; 4289, 2d.; 4306, 6d.; 4349, 2d.; 4519, 6d.; 4565, 6d.; 4571, 6d.; 4634, 8d.; 4662, 10d.; 4672, 6d.; 4691, 6d.; 4693, 6d.; 4697, 6d.; 4703, 4d.; 4704, 4d.; 4708, 6d.; 4709, 6d.; 4714, 6d.; 4715, 2s. 8d.; 4717, 6d.; 4718, 6d.; 4721, 6d.; 4727, 2d.; 4732, 6d.; 4733, 10d.; 4737, 6d.; 4748, 6d.; 4749, 6d.; 4752, 6d.; 4757, 8d.; 4759, 6d.; 4761, 6d.; 4766, 6d.; 4767, 6d.; 4769, 8d.; 4781, 6d.; 4792, 6d.; 4796, 6d.; 4797, 6d.; 4798, 6d.; 4803, 6d.; 4805, 4d.; 4806, 6d.; 4807, 6d.; 4810, 6d.; 4811, 4d.; 4812, 4d.; 4818, 6d.; 4819, 8d.; 4822, 6d.; 4826, 6d.; 4828, 6d.; 4829, 6d.; 4831, 4d.; 4832, 4d.; 4834, 6d.; 4841, 6d.; 4842, 6d.; 4845, 6d.; 4848, 4d.; 4849, 6d.; 4851, 2d.; 4852, 6d.; 4853, 6d.; 4854, 2d.; 4856, 2d.; 4857, 6d.; 4859, 2d.; 4860, 6d.; 4862, 2d.; 4863, 2d.; 4865, 2d.; 4867, 2d.; 4871, 2d.; 4872, 2d.; 4873, 6d.; 4875, 2d.; 4876, 2d.; 4877, 2d.; 4878, 2d.; 4879, 6d.; 4880, 6d.; 4882, 2d.; 4883, 4d.; 4884, 6d.; 4888, 2d.; 4891, 2d.; 4892, 2d.; 4893, 4d.; 4894, 2d.; 4895, 2d.; 4896, 2d.; 4897, 4d.; 4898, 6d.; 4899, 2d.; 4900, 2d.; 4901, 6d.; 4903, 2d.; 4904, 2d.; 4905, 6d.; 4906, 4d.; 4907, 6d.; 4908, 2d.; 4911, 6d.; 4912, 2d.; 4916, 2d.; 4918, 2d.; 4919, 2d.; 4922, 4d.; 4224, 2d.; 4929, 2d.; 4932, 4d.; 4933, 6d.; 4934, 2d.; 4935, 2d.; 4936, 4d.; 4937, 6d.; 4940, 2d.; 4941, 2d.; 4943, 2d.; 4944, 2d.; 4945, 6d.; 4246, 2d.; 4949, 4d.; 4950, 2d.; 4952, 2d.; 4953, 2d.; 4955, 2d.; 4957, 2d.; 4958, 2d.; 4960, 2d.; 4961, 2d.; 4969, 6d.; 4970, 2d.; 4971, 6d.; 4985, 6d.; 5007, 4d.; 5287, 4d.; 5352, 8d.; 5427, 6d.; 213, 6d.; 402, 6d.; 626, 4d.; 748, 6d.; 876, 6d.; 1093, 6d.; 1169, 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.*

4116. AN IMPROVED METHOD OF AND MEANS FOR TRANSMITTING ELECTRICAL CURRENTS THROUGH CONDUCTORS, AND FOR FACILITATING THE ACTION OF INSTRUMENTS CONNECTED THEREWITH, *W. R. Lake.* —*Dated 9th October*, 1880.—(*A communication from L. Maiche.*) 6*d.*

This invention is chiefly designed for facilitating the transmission and reception of telephonic or telegraphic messages or signals, and consists in transforming at the starting station quantity currents of high tension produced by the battery into induced currents of high tension capable of overcoming the resistance of the line, also in the transformation of these induced high tension currents back into quantity currents on their arrival at the receiving station. Fig. 1 shows the means by which this is done on a telephone line. At the two stations a sending telephone

4116

FIG. 1

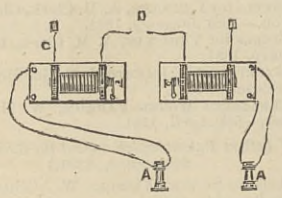
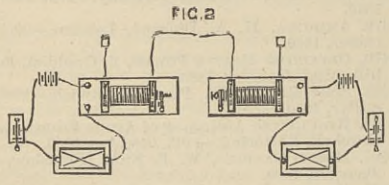


FIG. 2

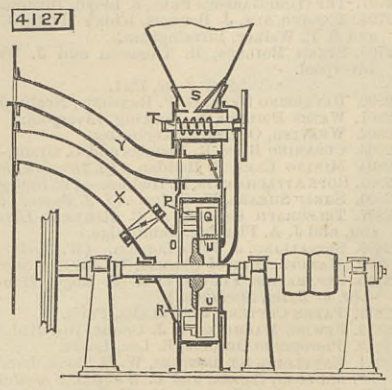


A is placed in the circuit of the coarse wire of the induction coil. The fine wire of the latter is connected to earth C, and also to the line wire D as shown. Fig. 2 shows the arrangement for a telegraph line. The transmitters and relays in this case are placed in the circuit of the coarse wire of the induction coil, and the other connections are shown. This arrangement can also be applied to the electrophone patented by the inventor on the 7th August, 1880, No. 3231. The inventor also describes a modification of his invention, which has for its object the neutralisation of the effects of induction caused by the line wires in proximity to the wire by which signals are sent.

4127. PULVERISING MACHINES, &c., *W. Michaëlis.*—*Dated 11th October*, 1880. 6*d.*

The pulverising apparatus consists of a cast iron circular box O, in which a steel disc R, provided with a number of beaters P and fan blades Q, say eight of each, rotates with great velocity. The material which is to be pulverised is put into the hopper S, and pushed on by the Archimedian screw T into the pulverising chamber. It passes the beating bars U, made of steel, which crush such pieces as are too

4127



thick. The material is then struck by the beaters P, and by them thrown against the periphery of the circular box, which periphery is lined with smooth or grooved plates of steel or chilled cast iron. Here it is worked upon between the disc and these hard surfaces till it becomes dust, and is carried away by the air current created by the fan blades Q through the further centre of the pulverising chamber, and through the tube X into the dust collecting chamber. The air in the upper dust chamber is partly carried back to the pulveriser through the tube Y.

4153. REGULATING POSITION OF DOORS AND WINDOWS, *R. W. Gossage.*—*Dated 13th October*, 1880. 6*d.*

This relates to an apparatus to be used in combination with door springs to regulate the angle at which it is to remain or shall resume after being opened, and it consists in enclosing the spring in a barrel and passing a rod through it, the projecting end being screw-threaded so as to regulate the tension of the spring by means of a nut.

4177. APPLIANCE FOR FIRE-GRATES FOR CONSUMING SMOKE, &c., *E. Taylor.*—*Dated 14th October*, 1880. 6*d.*

A perforated or slotted bar is placed in the flue immediately above the fire in a diagonal position towards the back of the fire, and when heated serves to burn the smoke.

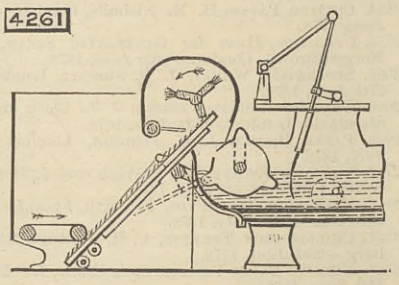
4243. PIANOFORTES, *E. G. Brewer.*—*Dated 18th October*, 1880.—(*A communication from Count V. C. A. P. D. G. Nydpruck and L. A. Beunon.*) 6*d.*

The action is composed of four main parts made from metallic bands, which, according to the elasticity required, is used flat or bent over so as to form a kind of tube.

4261. SCOURING, WASHING, AND RINSING WOOL, &c., *J. Petrie, jun.*—*Dated 19th October*, 1880. 6*d.*

The material is placed in a hopper having at its bottom a creeper or travelling surface, which carries the material to a lifting apparatus provided with points or spikes attached to the sliding bars for lifting

4261



the material. At the upper end of such lifting apparatus is placed a vibrating blade, which regulates the amount of feed. The material carried past the beater is removed from the lifting apparatus by a revolving brush or similar means, and then passes into the steeping, scouring, washing, or similar machine.

4289. ROLLERS FOR WINDOW BLINDS, &c., *R. Carlyle.* —*21st October*, 1880.—(*Void.*) 2*d.*

The roller is made hollow with a slot along it from end to end, through which the top of the blind is passed, this end being formed with a narrow hem in which a wire is inserted.

4306. BOBBINS FOR WINDING YARNS, *L. Briggs, jun.*—*Dated 22nd October*, 1880. 6*d.*

The barrel on which the yarn is wound is formed from a sheet of paper bent into a tube or cylinder, on which collars are formed to prevent the yarn slipping off; the collars may be slipped over the cylinder and secured by glue.

4349. BUTTONS, *F. Dietermann.*—*Dated 25th October*, 1880.—(*Void.*) 2*d.*

The object is to produce buttons from bone, horn, or plastic material, having the appearance of silk or mohair buttons, and it consists in cutting the face of the button so as to give it the desired appearance, and then staining it to the required colour.

4519. OXIDISING OR "AGEING" DISTILLED AND FERMENTED LIQUORS, *W. R. Lake.*—*Dated 4th November*, 1880.—(*A communication from C. W. Ramsay.*) 6*d.*

This consists in first vaporising or atomising the liquor, and then subjecting it to violent shocks or concussions, finally injecting oxygen into the vapour, so as to permeate the mass and thoroughly oxidise it.

4565. LIFE RAFTS, &c., *T. Cornish.*—*Dated 6th November*, 1880. 6*d.*

The water and provision casks for use on board ships are fitted with air and water-tight covers, and the seamen's and passengers' trunks are similarly formed; and the casks are provided with a network of wire or other ropes with loops on each side to receive light spars, so as to form the framework of a raft in a few minutes. The space between the spars is fitted with mattresses constructed of a floatable material.

4571. LOOMS, &c., *C. Campbell.*—*Dated 8th November*, 1880. 6*d.*

This relates to improvements in looms for weaving figured fabrics, and in the pattern or shedding mechanism or dobbies for operating the leaves of heddles to shed the warp. According to the pattern a low rectangular frame is slotted to receive two horizontal reciprocating crossheads B passing transversely across it, one on each side of the centre. A transverse rocking shaft C is carried in the centre, and has a double crank at each end, and also a working crank attached to a connecting-rod actuated from any revolving shaft of the loom by a crank of smaller throw than the working crank, so that the shaft C is made to oscillate. The upper crank of this lever is connected by a link D to one of the crossheads B, while the lower crank is connected by another link to the other crosshead. The forward crosshead carries an adjustable plate, to which a series of longitudinal spear or fluke-headed hook bars E are jointed, their spear heads in their traverse catching on to either the upper or lower sets of hooked bars or draw bars F mounted in

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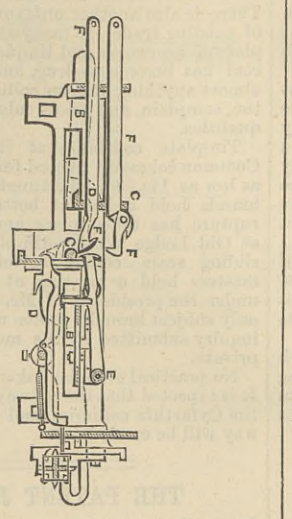


guide bars G, resting one end on the frame and the other attached to the rear crosshead. According as the hooks E are raised or met by the action of the pattern card, barrel, and pushers, a number of them engage with the corresponding upper slide bars F, the remainder engaging with the lower slide bars. The rear ends of the lower bars F are connected to the leaves of the heddles.

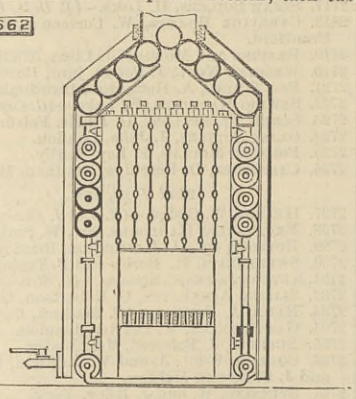
4634. OPEN FIREPLACES, *J. Jobson.*—*Dated 11th November*, 1880. 8*d.*

The object is to effect the consumption of the smoke produced in open fireplaces, and consists in forming an opening through the back of the combustion chamber and leading into passages at the sides thereof. A secondary back or screen is placed in front of the ordinary back and forms a chamber opening upwards near the upper part of the ordinary back, and downwards into the passages at the sides. The back and side passages and the front part of the fireplace over the combustion chamber have flaps, by which communication may be opened or closed to the ordinary flue.

4662. STEAM BOILERS, *S. Ballian.*—*Dated 12th November*, 1880. 10*d.*

The boiler is constructed of a belt of tubes placed tangentially to one another, and in the interior of which belt is placed the grate and furnace. The interior of the belt above the furnace is filled with successive rows of vertical tubes touching one other. Each of these tubes encloses a centre tube, the space between the two concentric tubes being filled with water, and is closed at top and bottom; each tube

4662



communicates with those in its row, and each row with the vertical tubes of the outer belt. From this arrangement it follows that the gases from the combustion pass into the interior tubes placed in the centre of the others and through the spaces between four adjacent tubes. Around the boiler are placed superposed horizontal tubes for feeding the boiler; such tubes communicate with one another and with the vertical tubes, and are connected at the bottom with two collectors, in which the deposits are received. The said tubes are connected at the top to large horizontal tubes placed at a gradient, and serving as receivers for the steam.

4672. TWIST LACE FABRICS, *G. Bentley.*—*Dated 13th November*, 1880. 6*d.*

This relates to improvements in twist lace machines. Three colours are used instead of two, each colour representing a different action. One colour represents the warp threads crossing from one pillar to the other on the front motion; a second colour represents the spool threads crossing from one pillar to the other

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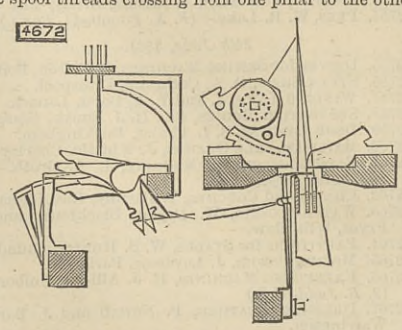

on the back motion, and the warp threads crossing from one pillar to the other on the front motion; a third colour represents the spool threads traversed across one or more pillars, as may be required on both the back and front motions. The drawing shows a sectional view of portion of a twist lace machine with the improvements, and shows the relative positions of the guide-bars and their threads, the jack-bar and spring jacks with the strings for selecting them.

4691. SPINNING MACHINERY, *R. E. Osborne, A. P. Matheuson, and J. Guild.*—*Dated 13th November*, 1880. 6*d.*

This relates particularly to the temper tension or friction bands employed to regulate the strain on the winding thread by pressure on the turning bobbins or forming a drag or brake for them. The temper or tension band A is of iron, steel, or brass wire, preferably slightly curved to bear with its concave side on the lower flange of the bobbin B, and lying across the upper surface of the rail C. The band is formed with a loop at each end, and is connected at the back to a screw bolt passing through the back edge of the rail and adjustable by nuts. The outlet loop is connected

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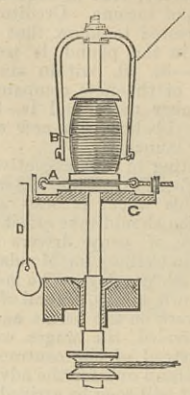

to one end of a cord or wire D passing over the fron edge of the rail and secured to a weight.

4693. EXTRACTING OILY AND GREASY MATTER FROM COTTON WASTE, &c., *C. T. Bastand.*—*Dated 13th November*, 1880. 6*d.*

The process consists in subjecting cotton waste in a closed vessel to the action of bisulphide of carbon, ether, or other volatile liquid, which flows with the oil and grease it takes up from such waste to a second vessel where the bisulphide of carbon or other volatile liquid is vaporised, and thereby separated from

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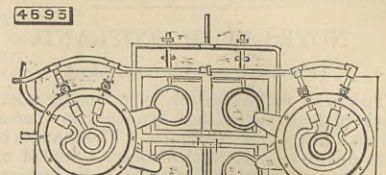

such oil and grease, and afterwards condensed for reuse. The drawing is a plan of the apparatus with the cover of the cylinder or vessel for containing the cotton waste removed, and also the perforated plates employed therein, and with the cover of the vaporising vessel or cylinder also removed.

4697. RIBBING APPARATUS FOR KNITTING MACHINES *W. H. Beck.*—*Dated 15th November*, 1880. 6*d.*

The needle and cam plates are supported and carried by a pillar or bracket secured firmly to some fixed part of the knitting machine and are connected to the said pillar or bracket in such manner that they can be adjusted with facility either vertically or horizontally. The needle plate is held rigidly by means

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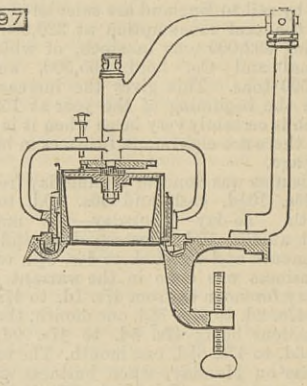

of the fixed pillar or bracket, and is adjusted circumferentially by means of an index finger or arm secured to the spindle of the needle-plate, and so adapted and arranged as to be easily manipulated and secured at the upper part of the machine. The drawing represents the arrangements applied to a circular knitting machine of the type known as the "little rapid."

4703. TWISTING OR DOUBLING MACHINES, *J. E. Heppenstall.*—*Dated 15th November*, 1880. 4*d.*

This consists in the lowering of the lifter rail and flyers below the bobbin, and winding the yarn upon the spindle previous to "doffing" the full bobbins.

4704. BURNERS FOR LAMPS, *F. Rosenthal.*—*Dated 15th November*, 1880.—(*A communication from M. Berger.*)—(*Not proceeded with.*) 4*d.*

This relates to improvements in the burners to lamps burning paraffine, petroleum, and other oils and liquid hydrocarbons, and it consists particularly in the use of a novel central air conduit with deflecting flange or disc, whereby a considerable quantity of cold air is conveyed to the interior of the flame.

4708. APPARATUS FOR SOUNDING DEPTH OF WATER IN SHIPS' WELLS, &c., *R. and J. Jones.*—*Dated 16th November*, 1880. 6*d.*

This consists in the manufacture of sounding tubes or rods for ascertaining the depth of liquid in ships' wells and other places, in which said tubes or rods are provided floats sliding therein or thereon, and prevented from falling by a rack and pawl or other equivalent mechanism when the tube is being withdrawn from the water, so that by the position of the float the depth of the water sounded can be ascertained.

4709. CAST IRON SLAG BOXES AND STEEL INGOT MOULDS, *M. and J. Cornthwaite.*—*Dated 16th November*, 1880. 6*d.*

The box or mould is constructed circular in form and of a number of parts relatively small, and the said parts are bound together by means of malleable wrought iron bands or hoops, preferably in two parts with flanges, the two parts of the hoops or bands being held together by bolts and nuts, the said bands or hoops being placed in suitable grooves cast or formed in flanges on the parts forming the body of the mould.

4714. CONCRETE BUILDINGS, *J. M. Tall.*—*Dated 16th November*, 1880. 6*d.*

This consists in the use of a combination of the slab and block systems, the slabs and blocks being cast of such form as to dispense with the use of apparatus during the binding, and also to avoid the necessity for first setting up the framework of the house.

4715. PAPER-FOLDING MACHINERY, *W. Conquest.*—*Dated 16th November*, 1880.—(*A communication from L. C. Crowell.*) 2*s.* 8*d.*

The apparatus is adapted to give to a web of paper as it issues from the printing machine a longitudinal fold or folds, and also to cut it into sheets and fold them transversely without retarding their travel. The web A on leaving the printing cylinders B passes through the primary folder C, which folds it longitudinally, such fold consisting of four turners, over which the web passes, two arranged that if extended they would meet at a common point, and at about an angle of 90 deg. to each other, and inclined forward at about 45 deg. The other two are placed so that if extended they also would meet at D and extend

forwardly and downwardly at about 45 deg., being spread a slight distance apart at their free ends. After being folded longitudinally, the web passes over the leading roller E and through a secondary folder F

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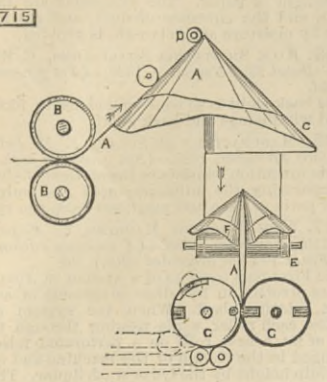

which forms a second longitudinal fold in it, when it passes to the cutting cylinders G, where it is cut into sheets and folded transversely.

4717. ECONOMISING FUEL IN STEAM BOILER FURNACES, &c., *W. R. Lake.—Dated 16th November*, 1880.—*(A communication from L. Juilliard.)* 6*d.*

Steam is used, which is dried, re-heated, and superheated, and which serves as a vehicle for drawing air and causing it to enter the furnace. This steam must be as dry as possible; it is therefore caused to enter a special drying and reheating apparatus, which is made of extremely refractory material, which apparatus is placed in the front part of the furnace. This blower

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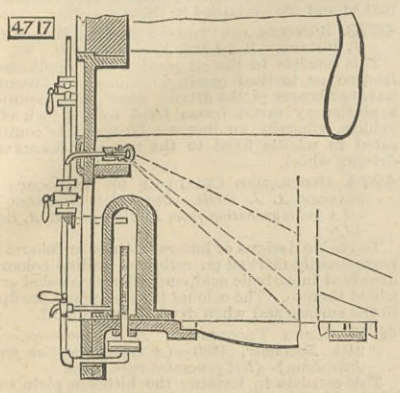


is so arranged that it may be detatched with facility, and the attendant can at any time take the same off and clean it, and then replace it, and the two apparatuses, that is to say, the superheater, and the blower, are quite independent of each other, although they are used simultaneously. The drawing shows the apparatus applied to a stationary boiler.

4718. APPARATUS FOR CONDENSING OR COOLING, &c., *J. H. Johnson.—Dated 16th November*, 1880.—*(A communication from F. Fouché.)* 6*d.*

This consists, First, in the system or mode of condensing steam or vapour or cooling liquids by the employment of moist air supplied by a fan or blower; Secondly, in the employment of apparatus for condensing steam or vapour by the use of dry air without the addition of moisture, the same air being subsequently employed in a dry and heated condition for the purposes of heating, ventilating and drying.

4721. APPARATUS FOR SYRUPING AND BOTTLING AERATED LIQUORS, *W. A. Ross and F. Lockhart.—Dated 16th November*, 1880. 6*d.*

This consists, First, in the means by which provision is made for the escape of gas or air from the syrup chamber as the syrup enters it, the apparatus being furnished for this purpose with a valve which stands open when not exposed to pressure, but closes with the pressure resulting from the admission of aërated water to the syrup chamber; Secondly, in the means by which provision is made for the escape of air from the bottle as the aërated liquor enters, the apparatus being furnished for this purpose with an outlet passage from the cone or cork compressor, and a valve controlled by the bottling handle.

4727. PREVENTING TRAINS LEAVING THE RAILS AND PREVENTING COLLISIONS ON RAILWAYS, *C. J. A. Nicolet.—Dated 16th June*, 1880.—*(Provisional protection not allowed.)* 2*d.*

For preventing trains from leaving the rails, the rails are provided throughout their length with a slot, which, when the rails are in position, is inside the line. Each railway carriage and locomotive is provided with vertical iron bars, terminated by iron cramps, which cramps may slide in the slot of the rails, and as many of these said vertical bars as required will be employed. For preventing collisions between railway trains, four telegraph wires are placed on the line, two of the said wires being placed on the right side of the right rail and the two others on the left side of the left rail. Each locomotive or one of the carriages is provided with an electric apparatus.

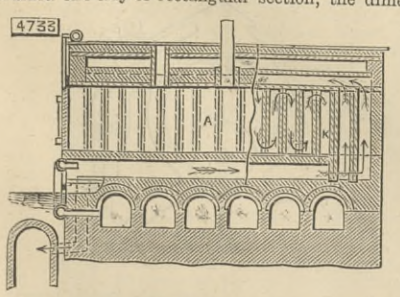
4732. FORCING SAUSAGE MEAT INTO SKINS, &c., *T. Williams, jun., and W. Sangster.—Dated 17th November*, 1880. 6*d.*

This relates to machines wherein a cylinder and a piston or plunger working therein are employed for forcing the meat into skins or other receptacles, and consists in the combination with such machines of a peculiar arrangement of driving gear.

4733. COKING AND DISTILLING COAL, *L. V. Semet and E. Solvay.—Dated 17th November*, 1880. 10*d.*

This relates to ovens in which the body is divided into compartments disposed alternately, one for the passage of the products of combustion, and the other to receive the coal to be coked or distilled, and it consists in forming the flues or passages K for the passage of the products of combustion of hollow pieces of moulded fire-clay of rectangular section, the dimen-

4733



sions of the length being greater than those of the sides, the chambers A to receive the coal being formed by the space left between two rows of retorts. By this means no joints are formed in the side walls of the ovens. The retorts may be built up vertically, as shown, or horizontally; when vertical they are formed in one piece and are set side by side, so as to form a zigzag passage for the flames, which pass from one to another and then to a flue leading to the chimney; and when horizontal they are placed end to end, and the required number placed one above the other to the required height, the retorts at the ends forming a communication between the lower range and those immediately above them. Iron doors and frames are used, the faces of both being ground.

4737. LOOMS, &c., *E. Crossley.—Dated 17th November*, 1880. 6*d.*

This relates, First, to means of inserting the wires used in weaving carpets between the warps in nearly a straight line, which allow of the employment of broader looms; and Secondly, in the means of stripping carpets or other fabrics from the breast roller of the loom by mechanical means. The drawing shows the improved wire motion. Instead of one guide rail A to guide the hopper B in coming out and going in to insert the wires between the warps, an additional rail D

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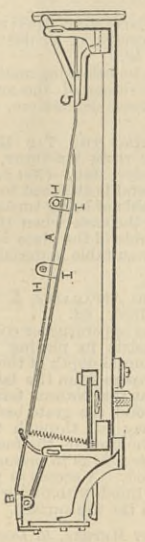


is used to receive the wires, and is made of curved steel, the extreme end being formed so as to leave a small opening for the entrance of a knife end G between the rails when the wire is on the return stroke to insert the wire between the warps. On the back of rail A are two angle brackets H, and on D are also two brackets I bolted to the brackets H, a passage being left between the tops of the latter and the rails to permit the hopper B and wire to pass.

4748. VESSELS FOR CONTAINING AND SUPPLYING OIL, *A. C. Wells and R. Wallwork.—Dated 18th November*, 1880. 6*d.*

This consists in the construction of vessels for containing and supplying oil for lubricating purposes, of solid cast iron annealed, combined with the spouts screwed in, and also such vessels combined with valve arrangements.

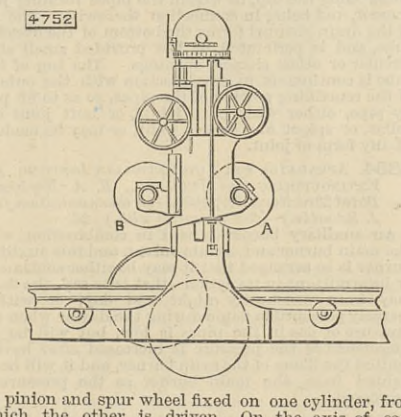
4749. SHAPING SOAP, &c, *J. O'Keeffe and W. Robertson.—Dated 18th November*, 1880. 6*d.*

The apparatus consists of dies, one or both of which is made to move and shape the soap into the desired outline. The die or dies is operated by a lever moving on a fulcrum pin, and it may be actuated by a steam cylinder, by hand, or otherwise. Cutting wires are employed.

4752. CUTTING OR DRESSING STONE, &c., *J. Holgate.—Dated 18th November*, 1880. 6*d.*

This relates to machines in which the stone is placed upon a travelling bed, and it consists in employing two or more cylinders A and B, placed one behind another, and caused to revolve in the same direction, each cylinder having different widths of cutters, the first being narrow to take the rough off the stone, and the second broad to finish the work. By gearing and screws the cylinders can be raised and lowered together or independently. They are driven

4752



by pinion and spur wheel fixed on one cylinder, from which the other is driven. On the axis of each cylinder is a spur wheel gearing with one or more pinions, supported and capable of moving up and down in a radial or circular slot, and connected by links to the shaft adjoining, so as to allow the cylinder to be adjusted and still remain in gear. The travelling bed is made to have both quick advance and return motions by open and crossed belts, and also a slow advance for cutting by means of a friction cone carrying a long revolving pinion gearing with two spur wheels of varying number of teeth, one being dead and the other fixed on the shaft. By a clutch the pinion is made to slide in and out of gear.

4757. TRAMCAR ENGINES, &c., *J. Hall.—Dated 18th November*, 1880. 8*d.*

The object is to improve the construction and reduce the working cost of engines by returning all exhaust steam to the boiler, for which purpose a rotary knuckle pump (shown in the drawing) is

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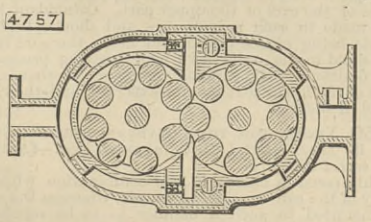

employed, and acts as a steam exhauster, steam condenser, and knuckle pump, being driven from the engines in either direction. The driving wheels are placed in the centre of the bar and are of large dimensions, a forerunner and trailing wheel being employed. The driving wheels are driven by spur gearing from coupled engines with reversing gear, the whole carried on an independent bed-plate. The boiler is vertical, with cross tubes, drop ash-box, and grate, for cleaning out. The bottom of the fire-box is encased with fire-bricks. The boiler is fed by an injector placed outside the water tank with removable nozzle and orifice. Beyond this is a boiler scavenger with back-pressure valve for purifying the water. On top of the tank is a double lift and force injector to lift water from the road to feed the boiler direct, or fill up the tank.

4759. SUPPLYING STEAM BOILER AND OTHER FURNACES WITH FUEL, *J. Proctor.—Dated 18th November*, 1880. 6*d.*

This relates partly to improvements on patent No. 191, A.D. 1879, for working movable fire-bars, and partly to an improved mechanical stoker. The feed-box A is made in one casting, the bottom being semi-cylindrical with an opening at each end. In it works the ram D, also semi-cylindrical and having a wedge-shaped projection E on its upper surface and a poker F at each end, the former serving to guide the fuel right and left, and with the pokers to stir up the fuel in the feed-box and prevent it becoming solid. As the ram moves to and fro it causes the fuel to fall alter-

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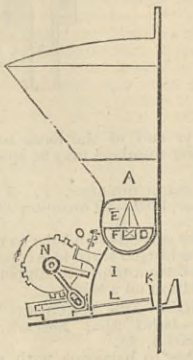

nately through the openings at each end of the feed-box into the trough I, the bottom of which is inclined upwards. The shovel consists of a plate K fitting the trough I and attached to a bar L carrying teeth which gear with an intermittent spur wheel N. The spring Q forces the shovel back after it has forced the fuel into the furnace. The improvements to movable fire-bars consist in the method of driving the tappet shaft from the main shaft.

4761. DOMESTIC GRATES AND STOVES, *H. Thompson.—Dated 18th November*, 1880. 6*d.*

This consists essentially in the construction and arrangement of sliding bars, having a slot or space, and the employment in connection therewith of a dividing plate.

4766. LOCKS AND KEYS, *T. E. Julian.—Dated 18th November*, 1880. 6*d.*

This relates, First, to the construction of locks, the improvements consisting in the combination of the levers carried by the sliding bolt with the other parts of the mechanism, so that one lock is capable of application in either of six different arrangements—that is to say, in four as a mortice lock, and in two as a rim lock. The key is furnished with steps or notches on both sides of the spindle.

4767. TRICYCLES, BICYCLES, &c., *H. Weatherill.—Dated 19th November*, 1880. 6*d.*

This relates, First, to the axles and bearings; Secondly, to the application of conical friction brakes in or upon and to the hubs; Thirdly, to the application of foot brakes to the hub.

4769. ROLLER AND ROLLING MILLS, *C. Herbert.—Dated 19th November*, 1880. 8*d.*

The invention is applicable to roller and rolling mills of all kinds. The rollers A and A^1 are supported in bearings, those of the latter being carried by levers B, capable of turning on fulcrum C. Extending from side to side of the machine is a shaft F, carrying cams G, engaging with forks or slots at the lower end of levers B. Attached to shaft F is a lever H, whose

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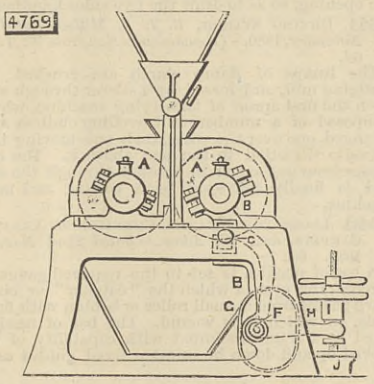

outer forked end engages with a screw hand wheel I, working on a screw held in position in the box J by a powerful volute spring and screw nut. By raising and lowering the end of lever H the pressure is regulated.

4781. WATCH CASES, *W. R. Lake.—Dated 19th November*, 1880.—*(A communication from Sir A. von Loehr.)* 6*d.*

The case is formed so as to allow the watch always to be in one position, for which purpose it is made in the form of a polygon, with the corners and edges rounded, so that it cannot shift round in the pocket.

4792. FURNACES FOR STEAM BOILERS, &c., *W. L. Wise.—Dated 19th November*, 1880.—*(A communication from G. Criner.)* 6*d.*

This relates to the consumption of smoke, and consists of means for thoroughly mixing it with an excess

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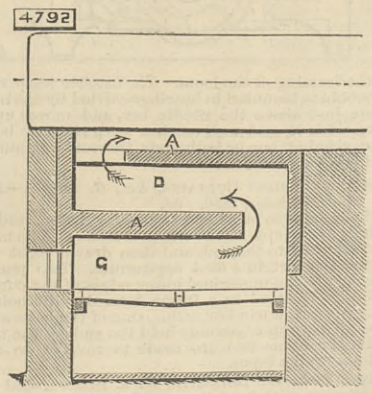

of air, and for raising the whole to a high temperature. Two or more bent or zigzag flues D and G are formed by two arches A placed between the grate H and the boiler, and in these flues the gases are mixed with an excess of air, heated, and burned.

4797. MACHINE EMBROIDERY, &c., *C. A. Barlow.—Dated 20th November*, 1880.—*(A communication from J. Wiggett and C. Wetter.)* 6*d.*

The object is to embroider eyelets, spiders, sprigs, dots, or other figures so that they are connected together and to the body by embroidery thread only. The machine is fitted with a perforating apparatus, and a piece of cloth is placed in the machine as usual, and on it "understitches" are made where the figures are to be embroidered. The work is commenced at any convenient part where a figure is to be formed, and then the fabric is perforated outside the figure at right angles to a line radiating from the centre of the figure, and a thread is drawn across the perforation on the front side of the cloth to another figure, where two or more understitches are made; then the leap stitch or connecting thread already drawn from the first figure is surrounded with thread stitched through the perforation between the first and second figure, and fastened at the edge of the first figure.

4796. PERMANENT WAY OF RAILWAYS AND TRAMWAYS, *A. Fairlie.—Dated 19th November*, 1880. 6*d.*

This relates, First, to the form and construction of longitudinal metallic sleepers; and Secondly, to the form of rails to be used therewith. The sleeper A is of iron or steel, and according to the arrangement is

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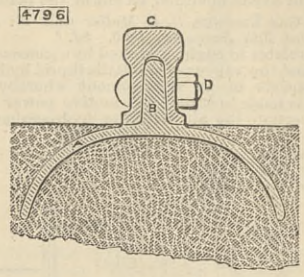

semicircular in cross section, with a rib B projecting along the crown. The rail C is of bridge form, the rib B entering the recess in its underside, when the two are secured by bolts and nuts D, or by rivets, thus forming one strong girder.

4798. ROLLING, SHAPING, CUTTING, AND STRAIGHTENING WIRE, &c., *R. A. Hill and H. B. Barlow.—Dated 20th November*, 1880. 6*d.*

To cleanse and soften the wire it is passed through a bath of molten lead, and then through a guide B to the grooved roll C and flanged roll D; the bracket supporting the latter being adjustable in slides. When rolled the wire passes through a guide plate E, in which is a small bowl to enter the groove in the metal, the plate E being mounted on a sliding bracket. On the upper part of the machine frame is fixed a sliding

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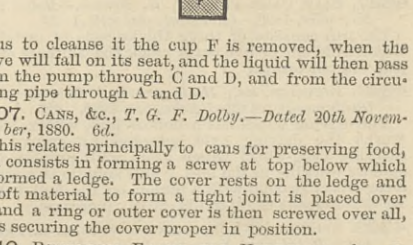

table F, on which is mounted a fixed cutter G and a movable cutter H, actuated by a wedge I, when the table moves to and fro. J is a straightener made in two parts. The rolls are preferably made in two or more pieces of steel and cast iron combined.

4803. ORNAMENTAL PRINTING WITH BLOCKS, *J. Macleod.—Dated 20th November*, 1880. 6*d.*

The object of the invention is to enable the printer by depressing a treadle to cause colour to be spread on the sieve or blanket, and the fabric advanced forward as it is printed, instead of requiring a special workman to effect these objects.

4805. CORDS, &c., *J. and W. Schofield and J. E. Bentley.—Dated 20th November*, 1880. 4*d.*

This relates to woven goods called cords, and its object is to obtain a fabric with a good back, and which at the same time will cut well and have a good curl or cockle. The cord is woven with eight shafts, and in a round of twelve picks four are binding picks and eight pile or face picks. Of the four binding picks, two, say the first and seventh in the round, are made with the ends lifted as for plain cloth, the end lifted for the first pick being down for the seventh. For the other two binding picks, which would be the fourth and tenth, the two ends in the middle of each alternate race are lifted, the two ends in the middle of each intermediate race being down, the ends which are lifted for the fourth pick being down for the tenth pick. The intermediate ends between the centre ends so lifted and lowered in pairs are alternately up and down in regular order.

4806. PUMPING VALVES FOR HOT WATER APPARATUS, *W. Stainton.—Dated 20th November*, 1880. 6*d.*

A four-way piece X is used, the ways A and B being connected with the circulating pipes, C serving for the pump connection, and D for the discharge. Instead of placing the valve E with the spindle downwards, it is placed as shown in relation to the four-way piece F, and the screw cap to close the discharge, and H a rod fixed to the cap. When the cap is screwed on the way D the upper end of rod H raises the valve and leaves the passage open through the ways A and B. When required to force water through the appa-

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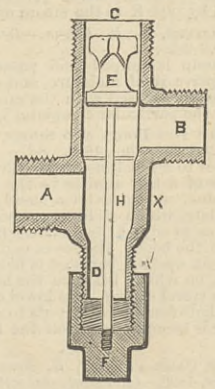

ratus to cleanse it the cup F is removed, when the valve will fall on its seat, and the liquid will then pass from the pump through C and D, and from the circulating pipe through A and D.

4807. CANS, &c., *T. G. F. Dolby.—Dated 20th November*, 1880. 6*d.*

This relates principally to cans for preserving food, and consists in forming a screw at top below which is formed a ledge. The cover rests on the ledge and a soft material to form a tight joint is placed over it, and a ring or outer cover is then screwed over all, thus securing the cover proper in position.

4810. REVOLVING FRAME FOR UMBRELLAS, &c., *E. Edmonds.—Dated 20th November*, 1880.—*(A communication from C. C. Juif.)* 6*d.*

The frame is so attached to the handle, that upon receiving a shock, or under pressure of a strong wind, it will revolve with the cover about the same.

4811. GRINDING APPARATUS, *R. R. Gubbins.—Dated 20th November*, 1880. 4*d.*

The object is to gather the dust given off from the emery or other grinding surface, and it consists in mounting on the shaft carrying the wheel a rotary fan which draws off the dust and delivers it through pipes into any suitable place.

4812. COUPLING AND UNCOUPLING RAILWAY CARRIAGES, &c., *F. Barnes.—Dated 20th November*, 1880. 4*d*.

To a suitable handle is attached a forked arrangement, so formed that one part is bent to take into the opening in the links of the ordinary coupling chain, while the other part has a waved or zigzag form to enable the links to rest thereon. The first part is inserted in the second link and the end link rests on the second part, and is raised so as to pass over the hook on the draw-bar of the next carriage.

4818. SHARPENING LEAD PENCILS, &c., *W. R. Lake.—Dated 20th November*, 1880.—(*A communication from F. F. Hultrich.*) 6*d*.

According to one form the apparatus consists of two plates of sheet metal connected by a hinge so as to open to admit the pencil and then close thereon, their inner surfaces being roughened, and a curved piece of sheet metal inserted in each The wood is removed from round the pencil by means of a helicoidal knife placed in a cone mounted on one of the plates.

4819. GAS ENGINES, *H. L. Muller and W. Adkins.—Dated 20th November*, 1880. 8*d*.

This relates to engines worked by a gaseous mixture of air and the vapour of a volatile liquid hydrocarbon, and consists in an arrangement whereby the gas engine is made to supply the motive power requisite to impregnate the air with the hydrocarbon vapour

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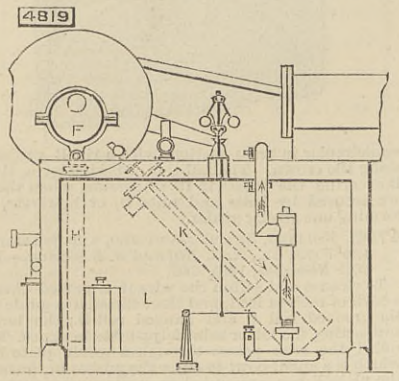

and produce an inflammable gaseous vapour. The excentric F on the engine shaft works a pump H, which raises the hydrocarbon placed in the carburetter from the bottom and delivers it on to the top one of a series of trays arranged therein, from which it descends through the whole series to the bottom, while air is forced through the carburetter by means of the pump K worked from a disc on the engine shaft, the air in its passage through the carburetter becoming impregnated with the vapours of the hydrocarbon fluid.

4820. SUBSTITUTE FOR EYES OR EYELETS FOR BOOTS AND SHOES, *C. Varlot.—Dated 20th November*, 1880. —(*Not proceeded with.*) 2*d*.

This relates to the use of a specially formed eyelet to be attached to the two sides of the opening, and through which the lace can slide freely.

4821. OIL FOR PREVENTING OXIDATION OF METAL SURFACES, *W. R. Lake.—Dated 20th November*, 1880. —(*A communication from J. C. Bourdenst and A. Pradon.*) 2*d*.

Olive oil is placed in an earthenware vessel with lead and allowed to stand for some days, the oil becoming thickened, and on being drawn off deposits the thickened part, when it can be used to prevent oxidation.

4822. INSTANTANEOUS CAPILLARY GENERATOR, *A. C. Henderson.—Dated 22nd November*, 1880.—(*A communication from J. J. Guignet.*) 6*d*.

The generator consists of a single tube C of very small diameter arranged in a furnace, either in concentric screws with the closed spirals or with spirals

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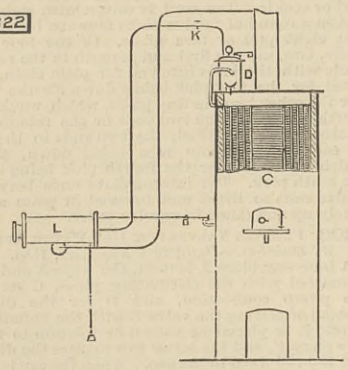

open one above the other, the flame of the furnace passing between them. The water is forced into the tube by a pump, and the steam generated passes into vessel D and by pipe K to the steam cylinder L.

4823. PLAISTERS, *A. H. Mason.—Dated 22nd November*, 1880. 2*d*.

Leather scrap is pulped and passed under couch rollers to deprive it of moisture, and upon the sheets so formed fosilline mixed with the medicinal matters required for the particular complaint is spread.

4826. HEELS FOR BOOTS AND SHOES, *S. H. Hodges.—Dated 22nd November*, 1880. 6*d*.

This relates to a machine for building up the heels, and consists of a last similar to the one used in the Blake machine, mounted on a stand, fitting into a hole in a plate, which slides on a bed to or from a hammer, so as to adjust the distance from the head of the latter to the boot. The lower end of the hammer is hinged to an upright bar, and is held in position by a screw pin, on which, between the hammer and the upright, is a spiral spring. The lower end of the bar is keyed to a shaft connected by rods to a crank, so that the hammer is brought down on the heel and fills up all cracks.

4827. SALT CAKE PANS, *J. H. Dennis.—Dated 22nd November*, 1880.—(*Not proceeded with.*) 2*d*.

The pan consists of three thicknesses of metal, so that should one or two parts crack the contents of the pan will not escape.

4829. BICYCLES, &c., *H. Hayward, J. Day, and J. H. Gosling.—Dated 22nd November*, 1880. 6*d*.

The driving wheel has a hollow hub, within which works the driving axle actuated by cranks and carrying a cog-wheel which gears with a pinion on a spindle working in the fork. This spindle also carries a cog-wheel gearing with a pinion on the hollow hub. By these means the speed is greatly increased.

4828. SPINNING AND DOUBLING COTTON, *C. E. Thompson.—Dated 22nd November*, 1880. 6*d*.

This relates to throstle and doubling frames, in which the spindles revolve in fixed vertical tubes secured in the lifting rail, and upon each of which is mounted a loose tube to carry the bobbin, and it consists in the employment of a ring of metal H inserted in an annular cavity between the two tubes A and B, a slight shoulder being formed inside the loose tube and on the fixed tube to form bearings for the ring, the edges of which are feathered or reduced to the smallest possible diameter. By this means the bearing surface of the loose tube is reduced, and it is brought as near as possible to the diameter of the spindle, while the drag on the bobbin (which rests on a flange

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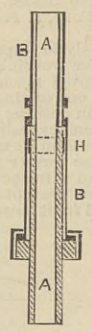

on the lower end of the loose tube) is diminished, whereby finer numbers may be spun and doubled than hitherto.

4830. BOUQUET-HOLDERS, *F. Wirth. — Dated 22nd November*, 1880.—(*A communication from C. Erhard.*) 4*d*.

The holder consists of a tube to receive the bouquet, to which are hinged three legs capable of being opened out so as to form a tripod to support the bouquet in an upright position on a table.

4831. KILLING AND CATCHING WHALES, &c., *O. C. Bjerke.—Dated 22nd November*, 1880.—(*Not proceeded with.*) 4*d*.

This relates to harpoons with movable barbs, and consists in so connecting it with wires from a battery as that when the harpoon enters the whale or other animal, a current of electricity will be sent with it.

4832. WOODEN PAVEMENTS, *E. Young.—Dated 22nd November*, 1880. 4*d*.

In order to prevent horses slipping on wooden pavement, a nail or spike is driven into each block, its head resting on a washer, so as not to sink into the block under the pressure of the traffic.

4834 DOOR FURNITURE, *J. Brownrigg.—Dated 22nd November*, 1880. 6*d*.

A separate spindle is attached to each knob, and each one is inserted into the lock from opposite sides. The knobs are secured to plates by means of slotted pieces, which slide in grooves and pass through the neck. The sliding plates are kept in position by the rose, which is cupped to fit the outside of the fixing plate, and when placed over it and turned partly round the fixing is complete.

4835. STRAP JOINTS, *J. Ewerhard.—Dated 22nd November*, 1880.—(*Not proceeded with.*) 2*d*.

The joint consists of a buckle with three studs, the ends of which are united by side plates, the ends of the strap or driving band being secured by their friction against each other, and against the studs round which they pass.

4838. SELVAGES OF COTTON VELVETS, &c., *H. Heywood.—Dated 22nd November*, 1880.—(*Not proceeded with.*) 2*d*.

The fabrics after being dyed, and either before or after they have received the final finish, have their selvages subjected to a process whereby silk, cotton, linen, wool, or other threads are commingled or interspersed amongst the threads already woven in the selvage, the operation being effected by apparatus of the character of an ordinary sewing machine.

4840. GLOVE FASTENERS, &c., *R. Weiss.—Dated 22nd November*, 1880.—(*Not proceeded with.*) 2*d*.

The glove or other article is fastened by a thread attached at one end to a bar of metal stitched to one side of the opening, its other end being secured to a disc capable of rotation fixed on to the other side of the opening, so as to draw the two sides together.

4841. DRYING STARCH, *B. J. B. Mills.—Dated 22nd November*, 1880.—(*A communication from W. Angele.*) 6*d*.

The lumps of damp starch are crushed by a dredging mill, and forced by a stirrer through a sieve upon the first apron of the drying machine, which is composed of a number of travelling endless aprons arranged one over the other, each one moving in the opposite direction to the one above it. The starch passes from one apron to another through the series, and is finally conveyed to a cooling and mixing machine.

4842. LOOMS FOR WEAVING CHENILLE OR AXMINSTER CARPETS, &c., *W. Adam.—Dated 22nd November*, 1880. 6*d*.

A bar of needles is set to the required gauge, and through the eyes of which the "catcher" or binding warp passes from a small roller or bobbin with flanged ends, on which it is wound. The bar of needles is fixed to a frame mounted with capability of being moved up and down in suitable fixed guides carried

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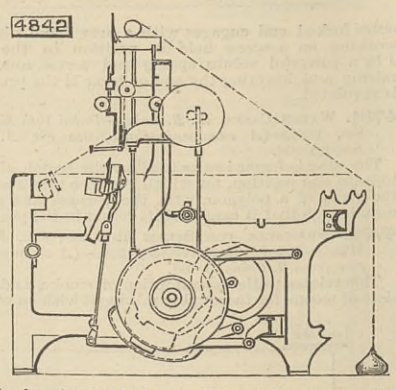

by the framing of the loom. The catcher warp roller or bobbin is mounted in bearings carried by the needle frame just above the needle bar, and moves up and down with it, and such catcher warp roller or bobbin is provided at one or both ends thereof with suitable taking-up appliances.

4843. ATTACHING CURTAINS, &c., *G. Moore.—Dated 22nd November*, 1880. 6*d*.

This relates to means for attaching tapes, cords, or strings of curtains to the window sashes. The tape is first attached to the sash and then drawn tight so as to give the curtain a neat appearance. Two pins are attached to the upper and lower edges of the curtain, and each is fitted to a frame formed with holes to secure it to the window sash. One of the bolts at the top and bottom edges only hold the ends of the tapes, while the other two are made to revolve, so as to tighten up the tapes.

4844. TREATING DOLOMITE, *W. R. Lake.—Dated 22nd November*, 1880.—(*A communication from A. Braconnier.*) 4*d*.

This consists chiefly in the manufacture of refractory material by extracting from calcined dolomite any desirable portion of the lime it contains by means of a solution of hydro-chlorate of ammonia containing a suitable proportion of this salt.

4845. FURNACES OR FIREPLACES, *W. R. Lake.—Dated 22nd November*, 1880.—(*A communication from J. Wolstenholme.*) 6*d*.

This consists of a furnace or other heating device having the usual chimney for producing the necessary draught, a substantially air-tight door and the usual open grate for admitting air to the fuel in combination with a tube or coil having its inlet opening in the

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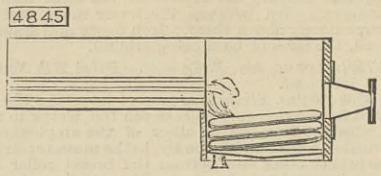

outer air and its outlet opening terminating in a long narrow opening adapted for conducting the heated air across the path of the gases in their course to the chimney.

4846. NEW COLOURING MATTERS FOR DYEING AND CALICO PRINTING, *O. N. Witt.—Dated 22nd November*, 1880. 4*d*.

This relates to colouring matters obtained by exposing organic bases of the aromatic series to the action of nitroso derivatives of tertiary aromatic amines.

4848. COVERING THE TAP HOLES OF CASKS AND RENDERING THEM AIR-TIGHT, &c., *J. Clubb.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 4*d*

A plate of metal is attached to the cask at one end, so as to be capable of being turned to cover or uncover the top hole of the cask when the tap is withdrawn. On the under side of the plate is a washer of india-rubber or other suitable material to fit tightly over the taphole.

4849. COOKING APPARATUS, *L. W. Leeds.—Dated 23rd November*, 1880. 6*d*.

This relates to apparatus for cooking by direct radiation, and consists in placing the grate vertically, while the horizontal depth of the fuel chamber is very shallow, and tapers from the bottom upwards. The fuel chamber at the bottom terminates in an ash pit projecting beyond the grate bars, so as to catch anything which may fall through them. The draught flue enters at the back of the fuel chamber and near its vertical centre, so as to promote combustion where it is most needed. A screen is placed in front of the fire, and being lined with fire-brick, when hot throws heat back upon the fire surface.

4851. CURRENT METERS, *H. Law.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 2*d*.

The meter is so formed that the shaft put in motion by the current imparts its motion to a vertical shaft enclosed in a tube closed at top, such shaft extending to the upper part of the tube, where is an arrangement which causes an electric circuit to be completed on each revolution of the shaft thereby actuating a signal above the water.

4852. VALVES AND VALVE GUIDES FOR THE AIR AND CIRCULATING PUMPS OF MARINE ENGINES, &c., *W. Bury.—Dated 23rd November*, 1880. 6*d*.

This consists in the combination in a valve designed to close against a seat having a grating of a renewable face of cork, wood, or the like, so arranged as to cover

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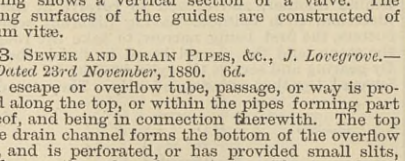

the whole area of such grating, in the seating and a frame or body wherein such face is secured. The drawing shows a vertical section of a valve. The bearing surfaces of the guides are constructed of lignum vitæ.

4853. SEWER AND DRAIN PIPES, &c., *J. Lovegrove.—Dated 23rd November*, 1880. 6*d*.

An escape or overflow tube, passage, or way is provided along the top, or within the pipes forming part thereof, and being in connection therewith. The top of the drain channel forms the bottom of the overflow tube, and is perforated, or has provided small slits, circular or other shaped openings. The top of this tube is continuous in cross section with the outside of the remaining portion of the pipes, so as to fit pipe by pipe, either with butt joints, or butt joint and collar, or spigot and socket joint, or may be made to fit any form of joint.

4854. APPARATUS FOR AUTOMATICALLY IGNITING AND EXTINGUISHING GAS JETS, &c., *E. A. Brydges.—Dated 23rd November*, 1880.—(*A communication from J. Schuelke.*)—(*Not proceeded with.*) 2*d*.

An auxiliary burner is used in combination with the main burner and certain valves, and this auxiliary burner is so arranged that it may be either continuous or intermittent in its action—that is to say, the flame may burn constantly night and day, or with a scarcely perceptible flame during the day or when the pressure of gas in the pipes is low, but will be extinguished as the pressure is increased after having ignited the flame of the main burner, and it will be relighted from the main burner as the pressure is decreased.

4856. LOOMS, *J. Crook.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 2*d*.

The object is to weave a fancy border formed of one, two, or more thick cords, with or without spaces between, across the face of the piece by the weft itself, with the same kind of filling throughout, and this is accomplished by repeating the pick, whilst holding open and without moving the shed whenever such thick cords are required, the selvedges being formed by catch cords worked in the usual manner, the cloth thus woven being suitable for handkerchiefs and similar articles.

4857. BRACE BUCKLES, &c., *T. Walker.—Dated 23rd November*, 1880. 6*d*.

The ears are formed on opposite sides of the upper part of the buckle, the said ears being turned at right angles. Similar ears are formed on the opposite sides of the lower part; the ears of the lower part, when the two parts are put together, bearing against the inner sides of the ears of the upper part. Coincident holes are made in each pair of ears, and short cylindrical rivets being placed in the said holes, the said rivets are fixed in the outer ears by a rivetting process, or the positions of the ears may be reversed—that is, the ears of the lower part may be external, and the rivets fixed in them.

4859. VESSEL FOR THE CONVEYANCE OF MILK, &c., *W. Legge.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 2*d*.

This consists chiefly in the combination with the body of the can or vessel of wheels, whereon the same is mounted in such a manner as to be capable of standing upright thereon, and of being conveniently wheeled along.

4860. LAMPS, *S. Pitt.—Dated 23rd November*, 1880.—(*A communication from W. B. Robins.*) 6*d*.

The lamp consists mainly of a long and narrow vessel constituting the front. From the bottom of said front, immediately in rear of its front wall, rises a long flat wick tube or holder. Enclosing this wick holder on its front and rear sides respectively are sheath plates or wick guards, capable of accurate vertical adjustment. A plate extending upward from the rear of the boat is perforated to receive bolts or hooks projecting from the wall of the apartment to be lighted.

4862. IMPROVEMENTS IN TELEPHONES, *S. Pitt.—Dated 23rd November*, 1880.—(*A communication from C. de Nottbeck.* 2*d*.)

The inventor closes the mouthpiece of the transmitting telephone by pasting or cementing over it a diaphragm of paper. The vibrations are thus developed, and the entrance of dust, and rusting of the plate by moisture of the breath, is avoided.

4863. BACK SIGHTS FOR SMALL-ARMS, *C. Wozencroft.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 2*d*.

The back sight is so constructed as to form a combined wind gauge and back sight.

4865. MANUFACTURE OF SUGAR, *F. M. Lyte.—Dated 23rd November*, 1880.—(*Not proceeded with.*) 2*d*.

This invention consists in the method of eliminating or separating the sulphuric acid and sulphates or other parts of lime and magnesia from the syrups.

4867. WOOL WASHING MACHINE, *C. Pieper.—Dated 24th November*, 1880.—(*A communication from R. Franz.*)—(*Not proceeded with.*) 2*d*.

The First part consists of a system of two or more rollers pivotted in two discs or systems of arms fixed on a rotating shaft. When the system of rollers rotates, each roller while passing through the lower part of its course rolls on a perforated false bottom arranged in the trough of the machine and covered to a certain height by the lye or wash liquor. The Second part consists of a rake composed of a frame to which is attached a number of cross bars, each of these bars being provided with a row of broad teeth or pegs.

4871. AERONAUTIC APPARATUS, *R. Stevenson.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to the employment of a centrifugal exhausting fan or paddle for the purpose of raising the vessel and contents.

4872. COMBINED CABINET AND MUSICAL INSTRUMENT, *A. King.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*.

This consists in a method of constructing cabinets or articles of furniture in such a manner that musical boxes or other automatically playing instruments form part of and are contained in them.

4873. BICYCLES AND TRICYCLES, *T. J. Palmer and C. F. Dietrich.—Dated 24th November*, 1880. 6*d*.

This consists in the adaptation and application of friction or toothed gearing, arranged between the naves or bosses of the driving wheel, and mounted in a stationary metal frame fixed to the fork of the vehicle, whereby an increase of speed is communicated to wheels fixed to the naves or bosses of the driving wheel.

4874. DECORATING CELLULOID OR ANALOGOUS SUBSTANCES, *A. J. Boult.—Dated 24th November*, 1880. —(*A communication from N. Hart and R. A. Bacon.*) 4*d*.

To enable designs or letters in tints or colours to be permanently marked on celluloid, aniline colours are dissolved in carbolic acid, and ether or alcohol or both added thereto. The colours thus prepared are applied to the surface and when dry will not rub off.

4875. SCREW PROPELLERS, *J. D. Custance.—Dated 24th November*, 1880.—(*A communication from J. Johnstone.*)—(*Not proceeded with.*) 2*d*.

This consists in forming the hitherto plain surface of the blade with a series of transverse, curved, or serpentine corrugations running parallel to the centre line of the shaft, or at any angle therewith, as found most desirable.

4876. UMBRELLAS AND PARASOLS, *T. Baker.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*.

This relates chiefly to an improved construction of the supporting ribs and stretchers.

4877. APPARATUS FOR PRESSING, SMOOTHING, AND FINISHING GARMENTS, &c., *C. Hayes.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*.

On a framework is an arm, having one end mounted or hinged in suitable bearings. At the other end is attached a hollow smoothing iron, heated preferably by gas flame. To this iron is or are attached a tube or tubes to carry off the waste gases to a flue.

4878. SILENT MINCING MACHINES, *J. Marshall.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*

This relates to a means for operating the machines with less power than hitherto.

4879. HOISTING MACHINES, *J. B. Handyside.—Dated 24th November*, 1880.—(*A communication from T. McCabe.*) 6*d*.

The principal distinguishing features of the machine are, First, the application of a yoke or arc-shaped piece, which, by an automatic binding action, prevents the hoisting rope or chain from slipping; Secondly, the application of an excentric automatic

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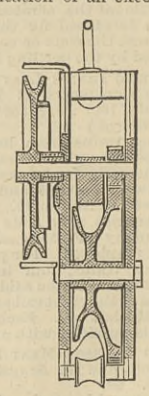

brake block to the pulley on which the hand rope acts; Thirdly, the application of certain guide pulleys in connection with the hand rope, and of similar pulleys and a deflecting plate or guard in connection with the hoisting rope; and, Fourthly, the application of certain fixed guards to prevent displacement and fouling of the rope.

4880. SPINNING MACHINERY, *T. Craven and T. Muter.—Dated 24th November*, 1880. 6*d*.

This consists in mounting a twizzle at the head of

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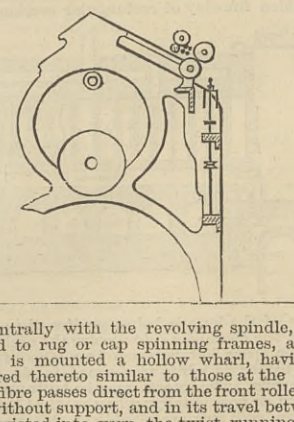


the flyer, centrally with the revolving spindle, and when applied to rug or cap spinning frames, above each spindle is mounted a hollow wharl, having a twizzle secured thereto similar to those at the flyer heads. The fibre passes direct from the front rollers to the twizzle without support, and in its travel between the same is twisted into yarn, the twist running the whole distance from the top of the twizzle close to the

nip of the front rollers, twisting the short fibre directly it is delivered by the said rollers.

4882. REDUCING STONES TO FRAGMENTS, *Sir F. C. Knowles.—Dated 24th November*, 1880. 2*d*.
This consists in placing the reduced substance within a furnace or kiln, and heated to a cherry red temperature; it is then drawn in its heated state, and either plunged into cold water, or quenched with water.

4883. KEYHOLES OF LOCKS, *H. C. Roberts.—Dated 24th November*, 1880. 4*d*.
This consists in providing keyholes with key directors having cavities or recesses with inclined sides or walls so shaped as to guide keys into locks.

4884. LEAD AND CRAYON HOLDERS, *J. H. Johnson.—Dated 24th November*, 1880.—(*A communication from Reckendorfer.*) 6*d*.
This consists in the combination with the sheath or handle and the longitudinally moving lead containing the tube of one or more lead-holding jaws inside of and connected with the sheath, and extending into the interior of the tube through one or more openings therein, so as to have contact with the lead and operated by the tube according to the direction of its movement to clamp and to release the lead.

4888. WASHING MACHINES, *A. G. Collings and F. Bryant.—Dated 24th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to a vessel which is rocked to and fro and provided with slots.

4891. GAS BURNERS, *J. Jamieson.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to burners provided with two nipples.

4892. NOTCHES OF UMBRELLA FURNITURE, *J. Allen.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
The notches are stamped from two discs of metal by suitable tools.

4893. RAILWAY CARRIAGES, *F. S. Thomas.—Dated 25th November*, 1880.—(*Not proceeded with.*) 4*d*.
This relates to means for preventing injury from the effects of collision.

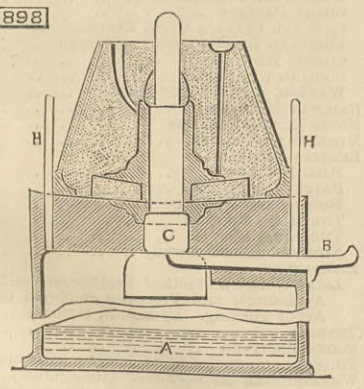
4894. COMPRESSED AIR LOCOMOTIVES, *H. Bruchet.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
Air is admitted directly into the body of the pump, which latter is automatically worked in an inclined plane by a simple crank in conjunction with cog wheels actuated by a lever placed near the hand of the driver, and which also serves as a brake in descending steep inclines.

4895. OBTAINING AND APPLYING MOTIVE POWER, *W. P. Kelly.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to a method of using the alternate vaporisation of condensation of the vapour of ether, gasoline, or other suitable volatile liquids for the production and application of motive power.

4896. COMBINED BLOWER AND FIRE GUARD, *H. Hunt.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
A frame is fitted to the fireplace, and is constructed to receive a suitable number of transparent windows or plates. The blower is provided with hooks or studs to allow of it being adjusted to the fireplace, or it may be adapted to slide or to be hinged thereto. The blower is provided with adjustable slides, so that it may be withdrawn a certain distance from the fire when not required to be used as a blower, and will then serve as a fire-guard.

4897. PRINTING AND REGISTERING MUSICAL NOTES AS PLAYED ON THE PIANO, ORGAN, &c., *L. A. Groth.—Dated 25th November*, 1880.—(*A communication from N. Beugtsson.*)—(*Not proceeded with.*) 4*d*.
This relates to means for printing or registering the notes played on a piano or organ during the playing of the same in the form of longer or shorter strokes on paper, in such a manner that they may be afterwards used as notes to be played from.

4898. CASTING METALS IN METALLIC MOULDS, *L. A. Groth.—Dated 25th November*, 1880.—(*A communication from F. Tellander.*) 6*d*.
The apparatus consists of a body, the lower part A of which forms a vessel which contains the cooling liquid. Upon the top of this vessel is a lid, and over this lid is placed the casting-box, which is guided into its proper position by two guide standards H placed at opposite sides of the casting-box. At one side of the lower part of the apparatus, and directly beneath its lid,



is a bar B, which slides in and is supported by a groove formed for this purpose in the said lower part. The said bar B extends into the apparatus to a distance sufficient to enable it to support the metallic core C of the metallic mould. This metallic mould C is provided with grease grooves.

4899. SUBSTITUTE FOR COFFEE, *L. A. Groth.—Dated 25th November*, 1880.—(*A communication from P. Schwing.*)—(*Not proceeded with.*) 2*d*.
Arabian or Turkish wheat and other kinds of maize is malted and roasted, and then ground, and used in the same way as coffee to produce a beverage.

4900. TREATING NIGHT SOIL FOR MANUFACTURE OF ARTIFICIAL MANURE, *H. W. Parrott.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
The night soil is placed in a tank, and the ammonia fixed by the addition of sulphate of iron and muriatic acid, after which the solid and liquid portions are divided by straining. The liquid portion is then allowed to percolate through a layer of charcoal and finally discharged into a river. The solid portion is mixed with plaster of Paris and ground into a stiff paste, the vegetable charcoal through which the liquid portion has been filtered being added thereto.

4901. DYEING WOOLLEN YARNS, *J. H. Rogers.—Dated 25th November*, 1880. 6*d*.
This relates to dyeing yarns in two or more colours in a uniform manner, and it consists in connecting the hanks of yarn together by looping, so that the hanks being of uniform length, the parts where they are looped together will prevent the die penetrating at such parts, and consequently they will be of a different colour at regular intervals throughout the length of the yarn.

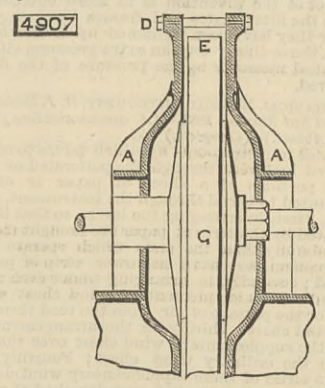
4903. SPILES, VENT PLUGS, OR VALVES OF CASKS, *D. Scott and J. Mackay.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
A tube is screwed into the barrel, and is perforated at top, and also at bottom, to allow air to enter the barrel. A valve near the top is kept up to a seat in the tube by a light spring, so as to prevent air entering when beer is not being drawn off, but when beer is being drawn off the external air opens the valve, and allows air to pass inside the barrel.

4904. SHARPENING AND SETTING CUTTING BLADES OF REAPING AND MOWING MACHINES, &c., *A. W. Tooley.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to means for adjusting the grinding wheel to the various positions, forms, and angles of the cutters or tools to be ground.

4905. LIFE BUOYS, *E. J. Johnson and J. Clayton.—Dated 25th November*, 1880. 6*d*.
The buoy is elliptical and tubular, and is divided into watertight compartments. A band is fitted across it towards one end with a spring clip, so that it can readily be detached from the bulwarks of the vessel. A ballast boat is fastened to one end and can be detached when more buoyancy is required. One of the compartments has a lid so that documents, &c., may be inserted. A flag may be attached to the end of the buoy, which stands up out of the water. Bands are attached to the sides to receive life lines, and loose lines to pass round the wearer. A bell may also be attached to the upper end.

4906. ARTIFICIAL STONES FOR CHILDREN'S TOYS, &c., *H. G. Grant.—Dated 25th November*, 1880.—(*A communication from F. A. Richter.*) 4*d*.
The composition to form these stones consists of finely ground sand and chalk in equal proportions, to which any required colour is added, together with a fourth the weight of the whole of linseed oil varnish. After being thoroughly mixed the composition is pressed to the required form and dried in an oven for about a week at a temperature of from 100 deg. to 150 deg. Celsius.

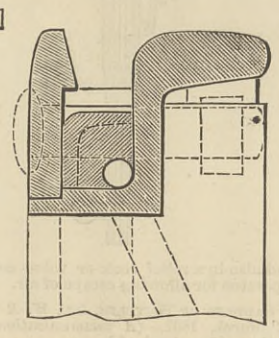
4907. APPARATUS FOR MANIPULATING TWIST DRILLS OR BITS TO GRIND AND SHARPEN THE SAME, &c., *J. D. Ashworth.—Dated 25th November*, 1880. 6*d*.
This relates to the combination and application to metal grinding machines of a safety appliance, being suitably constructed to protect the workman from injury when the wheel bursts. G is the wheel. The



upper part or rim of each shield A is formed with holes through which the bolts D are passed to connect the two shields together. Hydraulic tubes E are inserted between the two side shields and surround the bolt shanks. A strip of boiler-plate or other suitable metal is sprung into recesses.

4908. AMMONIACAL SALTS, *H. G. Grant.—Dated 25th November*, 1880.—(*A communication from G. Rousseau.*)—(*Not proceeded with.*) 2*d*.
Ammoniacal liquids are heated to about 60 deg. Centigrade so as to set free the ammonia.

4911. TRAMWAYS, *A. H. Rowan.—Dated 25th November*, 1880. 6*d*.
This consists of constructing train rails in two parts, the one consisting of the head, vertical rib, and



base flange of the rail, and the other forming a side to the groove for the wheel flanges.

4912. PERMANENT WAY OF RAILWAYS AND TRAMWAYS, *J. Livesey.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
For flanged rails a rib is cast on the face of the sleeper on one side of its centre, such rib projecting upwards to form an abutment for one edge of the rail flange. On the other side of the rail flange is cast a jaw projecting up at an inclination towards the rail, its inner face being serrated, and a serrated key is driven in between it and the side of the rail.

4913. BATH ABD LAVATORY VALVES, *F. C. Tompson.—Dated 25th November*, 1880. 6*d*.
This relates to the heads or knobs by which lavatory and bath valves are operated, and consists in making the head of metal or of non-metallic material, or of metal lined with porcelain, and fixing the porcelain head to the upper end of the valve stem by forming on the top of the latter a dovetail projection to fit a corresponding recess in the head, fused lead being poured in to secure the two together.

4916. MOSAIC OR ORNAMENTAL SLABS, TABLETS, TILES, &c., *W. H. Settle.—Dated 25th November*, 1880.—(*Not proceeded with.*) 2*d*.
A number of glass or other beads, or perforated pieces, are threaded on a wire so as to produce the required design, and are then bedded in a cement backing.

4918. CLEARING YARN, &c., *J. Holt.—Dated 26th November*, 1880.—(*Not proceeded with.*) 2*d*.
To the clearer rail is fixed a plate with vertical slots for the yarn to pass through, and on each side of the slots is a plate or slide having on the edge a serrated plate or clearer, the points of which project beyond the slide and are bent slightly towards the centre of the vertical slots in the plate on the clearer rail.

4919. SPINNING MACHINERY, &c., *J. H. Northrop and J. Clough.—Dated 26th November*, 1880.—(*Not proceeded with.*) 2*d*.
The object of the invention is to run the bobbins at such a varying rate of speed as is required to take up the yarn or roving delivered by the front rollers at one uniform tension, and consists in improvements on patent No. 658, A.D 1880.

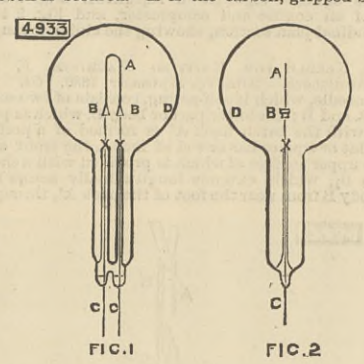
4922. PRODUCING COPIES OF DRAWINGS, &c., *E. Edwards.—Dated 26th November*, 1880.—(*A communication from M. Tilhet.*) 4*d*.
The copies can be produced in any colour, and the paper on which the negative is to be produced is first passed through a bath consisting of 30 parts by weight white soap, 30 parts alum, 40 parts Flanders glue, 10 parts white of eggs beaten up, 2 parts glacial acetic acid, 10 parts alcohol at 60 deg., and 500 parts water; and then through a second bath consisting of 50 parts burnt umber ground in alcohol, 20 parts black pigment, 10 parts Flanders glue, 500 parts water and 10 parts bichromate of potash. The paper must be kept in a dark place. To prepare the positive paper it is passed through the second bath, but with black pigment substituted for the umber, or if coloured proofs are required the black pigment is replaced by any other colour. The negative is produced by exposure to light and the paper then washed, after which it can be printed from in the same way.

4923. SEWING MACHINES, *S. Silverman and J. R. Cumming.—Dated 26th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to the general construction and arrangement of the machine.

4929. KNIFE-CLEANING MACHINES, *T. S. Lyon.—Dated 26th November*, 1880.—(*Not proceeded with.*) 2*d*.
Two bands pass over rollers, and move with their faces in close proximity, and the knives are drawn between them while in motion, and are thus cleaned on both sides at one operation. Emery or other powder is supplied to the bands.

4932. TREATMENT of ORES OR METALLIC MIXTURES, *F. M. Lyte.—Dated 26th November*, 1880. 4*d*.
This relates to treating ores or mixtures of lead and zinc, or of lead and zinc with silver or copper, and consists partly in improvements on patents No. 633, A.D. 1877, No. 2807, A.D. 1879, and No. 1051, A.D. 1880. The main difference in the present invention consists in the use, in combination with certain of the processes described in above patents, of cold or slightly warm acid, preferably hydrochloric, in place of the hot hydrochloric acid hitherto used.

4933. IMPROVEMENTS IN ELECTRIC LAMPS AND THE MATERIALS EMPLOYED IN THEIR CONSTRUCTION, *J. W. Swan.—Dated 27th November*, 1880. 6*d*.
This patent refers more especially to the material of which Mr. Swan makes his carbons. He takes cotton thread (preferably crotchet), treats it with sulphuric acid according to the process of making vegetable parchment, washes with water, dries, and then carbonises. The drawings show the way in which the carbon is secured. A is the carbon, gripped by clips



B B connected to the conductors C and surrounded by the glass globe D. The claims are, (1) The method of obtaining the carbon; and (2) the thickening the ends of the carbon to obtain better contact, with a wrapping of cotton or other suitable material and treated as above.

4934. SELF-ACTING NEEDLES, *W. Tatham.—Dated 27th November*, 1880.—(*A communication from J. A. Deslongchamps.*)—(*Not proceeded with.*) 2*d*.
The stem of the needle is hooked at one end, and has the opposite end turned up at right angles to the stem, but in line with the bend of the hook. The stem is grooved on its upper side to receive a covering point, the end of which opposite the point being turned up at a right angle, and forming the portion by which a lever bar or cam plate causes the covering point to slide in the groove, so as to cover or uncover the hooked end.

4935. KNEELER AND BUCKET STAND FOR DOMESTIC SERVANTS, &c., *J. Northwood.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
A board of suitable size is mounted on rollers and padded on its upper side to form the kneeler. The bucket is placed on a frame, also mounted on rollers, to facilitate its removal from place to place.

4936. ROLL TOBACCO, *A. T. Lendrum.—Dated 27th November*, 1880. 4*d*.
This relates to means for dispensing with the cords for confining the rolls while being compressed, and consists in the use of a coil of split cane or half-round metal, or other elastic material, which is wound round the green roll spirally. The roll thus prepared is placed in a cylinder and acted upon by a plunger.

4937. HEATING WATER, MULLING BEER, &c., *B. J. Grimes and L. Dove.—Dated 27th November*, 1880. 6*d*.
The cold water passes into a narrow water-space formed by two concentric rings, to the top of which it flows, and then passes down a tube to a small space between two concave plates, upon the underside of which a gas or other flame plays. Tubes lead from the space between these plates to other similar plates, from the top one of which a pipe passes upwards to an urn or muller, passing round a casing and then down again to the heater.

4940. SIGNALLING ON RAILWAYS, *J. Upton.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
A metal cylinder is fixed in every carriage in a train, and to it is fitted a whistle or gong, so that by pulling a cord, compressed air contained in the cylinder may be allowed to escape and thereby sound the whistle.

4941. AUTOMATIC BRAKE FOR RAILWAY CARRIAGES, &c., *S. Butler.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to the utilisation of the momentum of a railway or other vehicle for the purpose of actuating the brakes, and it consists in making the connection between the engine and carriage by a single bar, forming drawbar, buffer, and brake rod, being capable of drawing the car or resisting its motion. This bar can be thrust in against a strong spring on the car, which in its turn acts upon the brake blocks applied to the wheels.

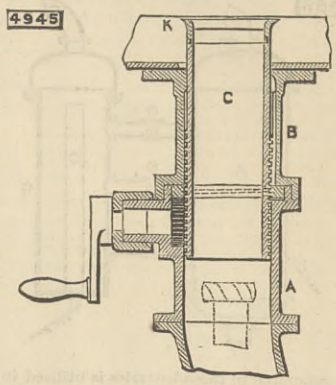
4943. EXPLOSIVE COMPOUND, *W. R. Lake.—Dated 27th November*, 1880.—(*A communication from J. M. Lewin.*) 2*d*.
This consists essentially of nitro-glycerine with cellulose and saltpetre dissolved therein.

4944. GAS STOVE, *S. Smith.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
A gas burner is fitted to the gaspipe, and is introduced into the lower part of a cylinder covered at each end with fine gauze wire. The gas enters through the burner and mixes with air drawn in through the bottom wire gauze, and is consumed on the top wire gauze.

4946. TRANSMUTING WOOD AND OSSEOUS MATERIALS INTO WOOD PULP FOR PAPER &c., *W. Boggett.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to improvements on patent No. 663, A.D. 1880, and consists in the use of a Jordan and Sons' pulverising machine for comminuting the materials. To convert sawdust and shavings into pulp for making paper, they are submitted to a high temperature in a digester, boiled in lard oil, and immersed in diluted acids.

4949. PRODUCING PRINTED REPRESENTATIONS OF PHOTOGRAPHS, *J. Dredge.—Dated 27th November*, 1880. 4*d*.
From relief plates of the photograph prepared in the ordinary method, printed representations are obtained by surface printing, as for instance, in a lithographic press, such transfer being produced by means of lines, dots or granulations of ink or pigment, the lights, shades, and outlines being reproduced by the deposition of the lines or dots on the surface in relief, in such manner that their width varies with the variations of the undulated surface.

4945. TREATMENT OF WORT, *B. J. B. Mills.—Dated 27th November*, 1880.—(*A communication from K. Husak and A. Hanl.*) 6*d*.
This relates to the treatment of wort by drawing it off from the surface by means of a separating sluice



consisting of a chamber A B, adjustable cylinder C, with sharp edged cutting rim or flange K, or in lieu thereof a simple adjustable separating slide with cutting edge.

4950. STOPPERING BOTTLES, &c., *E. Roach.—Dated 27th November*, 1880.—(*Not proceeded with.*) 2*d*.
A cap piece has a flange on its under surface which enters the mouth of the bottle, and over its outer circumference passes the end of a piece of elastic tube secured by a wire. Through the tube and the cap piece passes a screw on top of which fits a nut, by screwing up which the tube is compressed, so as to form a tight joint. A bolt of a lock is then caused to pass through the stem and prevent it being released.

4952. FURNACES FOR METALLURGY OF COPPER, *A. M. Clark.—Dated 27th November*, 1880.—(*A communication from J. Garnier.*)—(*Not proceeded with.*) 2*d*.
The First part relates to the employment of basic linings in furnaces used in the metallurgy of copper, and the Second part to means of improving or reducing the electrical conductibility of copper according to the purpose for which it is to be used.

4953. MANUFACTURE OF RAISED LETTERS AND FIGURES FROM CLAY, &c., *J. and A. Duckett.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
This consists in forming a slab or groundwork of clay in a mould on which the raised letters or figures are afterwards placed and caused to adhere by the application of moisture or clay wash.

4955. RULER, *R. J. Cook.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
This relates to a flat ruler running on two or more rollers.

4957. PROPELLING VESSELS BY HYDRAULIC POWER, *F. W. Richardson.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
The power is derived from the reaction or recoil of two jets of water projected at a high velocity from openings in the ship's sides, such jets being put in motion by the action of two right and left-handed screws revolving on the same shaft about midships, and driven by spur gearing from the engine shaft.

4958. MOTIVE POWER ENGINE, *A. J. Clairmonte.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
The engine is formed by a diagonal diamond-shaped receiver having two ends of four diagonal sides each, with rectilinear points forming guides. The ends are attached to two wheels which revolve off their axes. The four longitudinal sides of the receiver are diagonal, and fit to the lines of the ends and into rectilinear guides. These sides ferm four levers, which are fastened to the wheels at four points at right angles, and which receive the pressure of the motive force, whereby the engine is driven.

4959. BRICKS FOR BORDERS OF PATHS, &c., *H. A. Bonneville.—Dated 29th November*, 1880.—(*A communication from E. Beaucantin.*) 4*d*.
This relates to improvements on patent No. 4322, A.D. 1878, and consists in leaving while moulding the brick a space in the form of an arch at the base, the holes in all the bricks being made to correspond so as to form a drain pipe.

4960. LATHES FOR SCREW-CUTTING, *T. Cawthron and W. Fearnehough.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
The object is to enable bastard thread screws to be cut without stopping or reversing the lathe, by the use of a set of index wheels and pinion driven by the guide screw.

4961. IMPROVEMENTS ON MECHANICAL CONTRIVANCES FOR ELECTRO-MAGNETIC CLOCKS AND APPARATUS, *J. Mayr.—Dated 29th November*, 1880.—(*Not proceeded with.*) 2*d*.
This invention consists in mechanical improvements, by means of which the inventor constructs a new system of electric clocks and signalling apparatus, and replaces the usual sliding spring and mercury contact by reliable metallic contacts with impact motion and exactly controllable duration.

4966. COLOURING MATTER, *F. Wirth.—Dated 29th November*, 1880.—(*A communication from E. Oehler.*) 4*d*.
This relates to the production of colouring matter in applying the usual process for producing azo-colouring matters to the combination of metadiazosulfobenzol, and primary, secondary, and tertiary amines, or their substituted derivatives.

4969. APPARATUS FOR DRAWING BEER, &c., *A. Specht.—Dated 29th November*, 1880.—(*A communication from K. W. Weissenborn.*) 6*d*.
This relates to delivering beer or other liquid by placing it in a vessel open at top, in which moves an air-tight piston, weighted so that the pressure on the surface of the liquid will raise the liquid to the desired height.

4970. PIANOFORTES, *A. Specht.—Dated 29th November*, 1880.—(*A communication from F. Baschmann.*)—(*Not proceeded with.*) 2*d*.
The hammer has a peculiar butt, and is suspended by a hinge between the butt and the strings. The butt rests directly on the head of the key, which is made to raise or lower by a screw. The falling back of the hammer is effected by a spring between the frame and the back of the gut, and this also is adjusted by a screw within the hammer butt.

4971. PLIERS FOR CUTTING WIRE, *J. F. Neighbour.—Dated 29th November*, 1880. 6*d*.
The pliers consist of the ordinary hinged levers, but one or both of the jaws are provided with wheel cutters mounted on pivots.

4985. IMPROVEMENTS IN THE MANUFACTURE OF SODA, &c., BY ELECTROLYSIS, *T. Morgan.—Dated 30th November*, 1880.—(*A communication from N. Glouchoff.*) 6*d*.
This invention is an improvement on one provisionally patented on the 9th December, 1879, No. 5030, by the present inventor and T. Wastchuk. The figure shows one form of the decomposing apparatus, which is in two parts. The carbon or platina C forms the positive electrode, and is contained in a glass cylinder B arranged at the side of the iron cylinder A, which forms the negative electrode. These cylinders are provided with lateral holes as shown, in which are inserted glass tubes connected together

end to end in pairs by the india-rubber collars D, care being taken to insert a thin partition of porous material in the collar between the ends of each pair of tubes. The hydrogen escapes through the pipe F, and the oxygen and chlorine through the pipe G. These gases are collected in reservoirs, and are subsequently distributed to the receivers of the gas batteries. The

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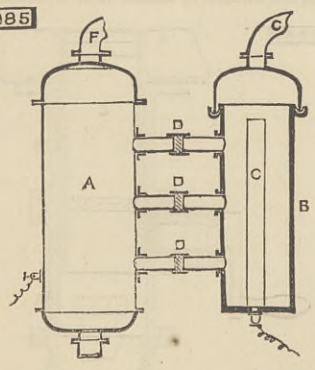

current generated in these batteries is utilised in turn to decompose a soda lye and manufacture soda by electrolysis.

5007. MARINERS' AND AZIMUTH COMPASSES, *J. Readman.—Dated 1st December*, 1880. 4*d*.

In order to prevent the production of currents of air by the motion of compass cards, they are mounted to move in a vacuum.

5013. PRODUCING COPIES FROM TRACINGS OR DRAWINGS, *A. J. T. Wild.—Dated 2nd December*, 1880. 2*d*.

Chromate of potassa is dissolved in water and sulphuric acid added, the paper to receive the copy being then sponged with the solution, and when dry placed in a frame, the original being superimposed thereon and exposed to the action of light. When the drawing has been reproduced the paper is placed within a vaporising box containing aniline oil, and when removed is passed through water and dried. The paper is then sponged with natron or with unslacked lime to fix the copy, and then finally dried and pressed.

5044. CORKING OR STOPPERING BOTTLES, &c., *H. W. Beckton.—Dated 3rd December*, 1880. 6*d*.

This consists of a plug of cork or wood of conical form to fit a corresponding conical-shaped neck of the bottle, and which is secured by wire passing round the neck and over the plug, the ends being twisted together; and further in a machine to cork or stopper the bottles and hold them whilst being filled and wired.

5240. SPINNING ROPE YARNS, *J. Barbour.—Dated 14th December*, 1880. 6*d*.

The novel features of the machine are, First, applying screw gills instead of chain gills for carrying the sliver to the "intercepter" or drawing point; Secondly, the application of Barbour's friction discs to regulate the speed of the fullers or screw gills; Thirdly, a novel conductor at the delivery end of the screw gills to condense the sliver for the "intercepter," such conductor being of the usual "trumpet" shape, but with an opening at top to facilitate the piercing of the sliver; Fourthly, the arrangement of transverse motion for bobbins whereby an instantaneous reverse is obtained by means of clutches and levers; Fifthly, a novel centrifugal drag motion, by means of which the drag upon the bobbin necessary for "taking up" the yarn is obtained; and Sixthly, the general arrangement of the machine, as combining screw gills and horizontal spindles, with the different novel arrangements before described.

5287. SULPHATE OF ALUMINA, *B. E. R. Newlands.—Dated 17th December*, 1880. 4*d*.

This relates to the manufacture of sulphate of alumina from impure sulphate of alumina magma by submitting the same to pressure in order that the greater portion of the free sulphuric acid and of the soluble salts of soda contained therein may be removed.

5311. CANS FOR CONVEYING MILK, &c., *W. W. Marsden.—Dated 18th December*, 1880. 4*d*.

The bottoms and lower hoops of milk-cans used to transport milk and other substances are made in one piece of solid cast metal, and can be either bolted to or screwed into the body of the can.

5352. IMPROVEMENTS IN DYNAMO-ELECTRIC TELEGRAPHY, *S. Pitt.—Dated 21st December*, 1880.—(*A communication from Dr. O. Lugo.*) 8*d*.

This invention has for its object the use of dynamo-electric machines in telegraphy. The inventor arranges his apparatus to obtain uniform currents, to

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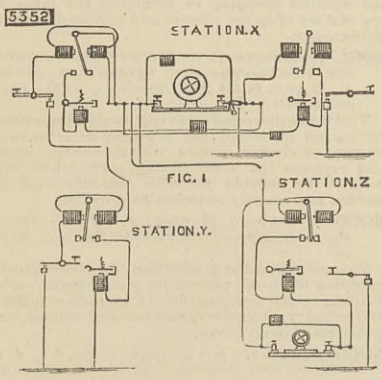

vary the E.M.F. as required, to get multiplex working, &c. This arrangement, which may be modified in various ways, will easily be understood from Fig. 1. The dynamo machine Fig. 2 is so made that the armature may be revolved till the poles P N are connected, as shown by dotted lines B. No current is excited in

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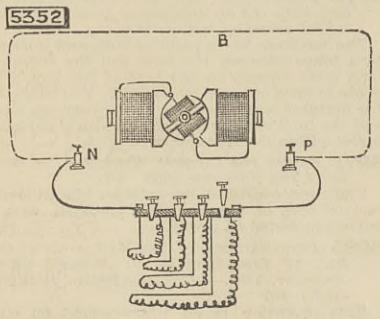

coils, but when so connected a weak current is excited in coils of armature, passes through the field magnets, reacts on armature, and so on till the maximum and constant current is obtained. If circuit B is broken, the field magnets and armatures are discharged.

5427. BLOWING, COMPRESSING, AND DRIVING APPARATUS, &c., *E. P. Alexander.—Dated 24th December*, 1880.—(*A communication from O. S. Presbrey.*) 6*d*.

This consists, First, in the combination in a combined engine and compressor of relief valves arranged to permit the air to escape from the compressor, a governor arranged to be operated from the engine and operating appliances, whereby the valves are controlled by the governor; Secondly, the combination with the compressor cylinder of relief valves, arranged to open under pressure from within the cylinder, and to be

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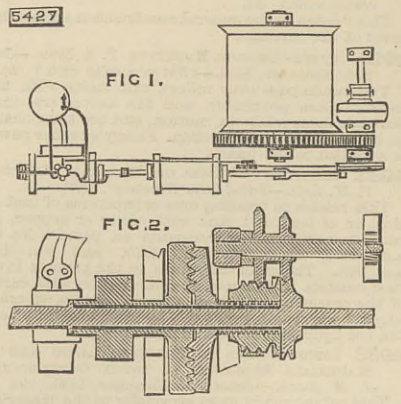

closed by the pressure from the discharge pipe or receiver and appliances; Thirdly, the combination with a driving shaft of a gear or hand-wheel, a friction disc attached thereto, a friction disc turning with the driving shaft, and appliances whereby the two discs may be brought together or separated. Fig. 1 is a plan of an engine and compressor, and Fig. 2 is a longitudinal plan section, showing the clutch arrangement.

3774. NEEDLE FOR KNITTING MACHINES, *F. W. Schwarzbach.—Dated 8th September*, 1880. 6*d*.

The needle, which is self-acting, consists of two solid parts A and B; the lower part or body B, which is provided with the catch hook A^1 is formed of a preferably flat or square bar or rod of metal, the front end of the upper surface of which is provided with a short groove B_1, which extends longitudinally across the said body B from near the foot of the hook A^1, through-

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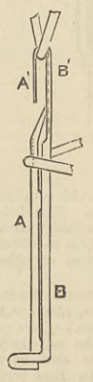

out a part of the length of the said body. The front end of the said groove B^1, near the foot of the hook A^1, is preferably, rectangular. The upper part A of the said double needle, which part is termed the "closing slide" (slide or shutting bar), is also preferably formed of a square or flat bar, or rod of metal, or other suitable material; part of its lower surface may be cut away for the purpose of reducing its sliding surface, but this reduction may be dispensed with if desired.

136. SLABS FOR PAVING STREET CORNERS, *W. Page.—Dated 12th January*, 1881. 6*d*.

This consists in forming blocks or slabs to pave the corners of streets in moulds shaped to suit the curves of such corners.

213. MACHINERY FOR INSERTING BOBBINS IN CARRIAGES OF BOBBIN NET MACHINES, &c., *H. Boden and S. Whitehurst.—Dated 17th January*, 1881. 6*d*.

Beneath a table-top of suitable height is a plate, through which the lower end of a spindle is passed and rests in a thimble. The bobbins to be entered in the carriages are placed upon the spindle, the threads being held between cloth covered clamps; the top plate is raised by means of cords and weights as each bobbin is displaced at the top. Each bobbin is held in position by the head of a piston sliding in a bracket and held up by a spring coiled round it; there is a plate above the table which presses the bobbin on to a

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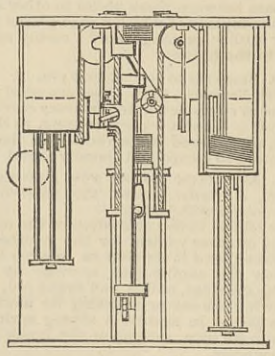

verge, and a second plate which holds a carriage in position. Below the table is a small crosshead guided by vertical slides, a threading hook being attached to the crosshead. Under the table is an arm on which the piston bracket slides. The vertical movement of the threading hook is effected by means of a link attached to a treadle moved by the operator; this link also rocks a lever, the upper end of which places each carriage into position to receive a bobbin, the thread of which being drawn through the hole in the carriage, the process is repeated.

402. SHEEP SHEARS, *P. Ashberry.—Dated 29th January*, 1881. 6*d*.

This consists in forming the bow of the shears long enough to allow it to be bent with a central part projecting inward somewhat in the shape of the centre of the letter W, and through it one or more pivots are passed, the object being to prevent the blades opening sideways.

426. COMPOUND FOR TREATMENT OF STEEL, &c., *A. J. Boult.—Dated 1st February*, 1881.—(*A communication from J. Conant, M.D.*) 4*d*.

This relates to a compound to be used in manufacturing, &c., steel, iron, or other metals, and for the restoration of burnt steel, and consists of $3\frac{1}{2}$ parts sulphate of copper, 4 parts rosin, and $2\frac{1}{2}$ salammoniac.

626. HANDLES OF SCISSORS, *A. J. Boult.—Dated 14th February*, 1881.—(*A communication from T. Fischer.*)—(*Complete.*) 4*d*.

One handle of the scissors, instead of the usual loop at the end, is fitted with a ring through which the thumb is passed, so that the thick part of the thumb presses upon the end of the handle beyond the ring.

748. DRYING PRINTED, VARNISHED, OR GUMMED SHEETS, &c., *B. J. B. Mills.—Dated 22nd February*, 1881.—(*A communication from L. A. Fernow.*)—(*Complete.*) 6*d*.

The drying machine consists of endless chains with transverse supporting wires to carry the sheets of paper along and bring them back near to the starting. Fast and slow moving chains are used with the cross wires so as to alternately retard and accelerate the movement of the sheets.

842. HYDROCARBON FURNACES, *H. J. Haddan.—Dated 28th February*, 1881.—(*A communication from B. Sloper and W. M. Jackson.*)—(*Complete.*) 6*d*.

This consists, First, in the production of heat of a process of decomposing water by injecting it in a vaporised condition, with or without the admixture of liquid or sub-divided fuel, into or upon solid or porous carbonaceous material in a decomposing retort and combustion chamber combined, whereby the mutual decomposition of the water and fuel into hydrogen and carbonic oxide is effected; Secondly, in a process of burning liquid fuel in conjunction with the gases resulting from the decomposition of water; and Thirdly, in the construction of the furnace for effecting such combustion.

876. MACHINES FOR CLEANING BOTTLES, *W. R. Lake.—Dated 1st March*, 1881.—(*A communication from J. H. Hoyt.*)—(*Complete.*) 6*d*.

This relates chiefly to the employment of a peculiarly constructed expansible brush, which enters the bottle in combination with a tubular revolving shaft, through which water is supplied; and further to an arrangement of rotating and non-rotating sleeves combined with a reciprocating frame, and a valve operated thereby to control the flow of the water to the brush.

901. FILTER PRESSES, *H. E. Newton.—Dated 2nd March*, 1881.—(*A communication from A. L. G. Dehne.*)—(*Complete.*) 8*d*.

The object of the invention is to more effectually tighten up the filter plates and frames by giving to them, after they have been tightened up as much as possible in the ordinary way, an extra pressure, either by mechanical means or by the pressure of the fluid being filtered.

909. MECHANICAL MUSICAL INSTRUMENT, *H. J. Haddan.—Dated 3rd March*, 1881.—(*A communication from W. F. Abbott.*)—(*Complete.*) 6*d*.

This relates to instruments by which valves to reeds are operated by levers through the perforated or unperforated portions of a sheet of paper or other material caused to travel through the instrument, and it consists, First, in arranging the levers so that their ends operated by the strip of paper are brought closer together laterally than the ends which operate the valve mechanism, so that a narrower strip of paper can be used; Secondly, in arranging under each reed in the wind chest a supplementary wind chest with openings for the passage of air from the reed through it to the wind chest; Thirdly, in the arrangement of a valve in the supplementary wind chest over the air passage to the ordinary wind chest; Fourthly, in arranging a series of these supplementary wind chests in a board that can be attached and detached at pleasure to the swell board of a reed organ placed over the entrance of the reed chamber.

1093. GOVERNORS FOR VULCANISING APPARATUS, *A. M. Clark.—Dated 14th March*, 1881.—(*A communication from W. E. Gwyer.*)—(*Complete.*) 6*d*.

This consists of a gas cock opened by a spring and closed by steam pressure for regulation of the flow of

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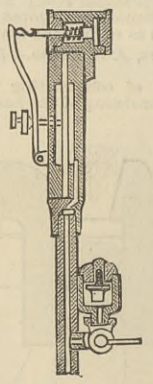

gas, and also in a relief cock or valve combined with the apparatus for allowing escape of air.

1169. SADDLES OF BICYCLES, &c., *W. R. Lake.—Dated 1st March*, 1881.—(*A communication from C. H. Veeder.*—(*Complete.*) 6*d*.

This relates, First, to suspending the leathern part or seating surface of the saddle near the ends thereof, and at a considerable distance above the metallic supporting part, in such a manner as to have a considerable vertical motion and constitute in itself a part of the "spring" of the seat; Secondly, to the form of the saddle spring or support; Thirdly, to means for stretching the leather so as to take up the slack occasioned by use; Fourthly, to clamping devices to hold the seat to the backbone; and, Fifthly, to means for adjusting the saddle vertically and longitudinally with reference to the clamping devices.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

241,495. VALVE GEAR for STEAM ENGINES, *William Johnson, Lambertville, N.J.—Filed March 18th*, 1881.

Claim.—(1) A cut-off mechanism consisting of a flanged plate and an excentric ring, both adjusted across and around the axis of the shaft by means of a governor, as and for the purpose set forth. (2) In a governor cut off, an adjustable compound excentric adapted to be moved across and around the axis of its

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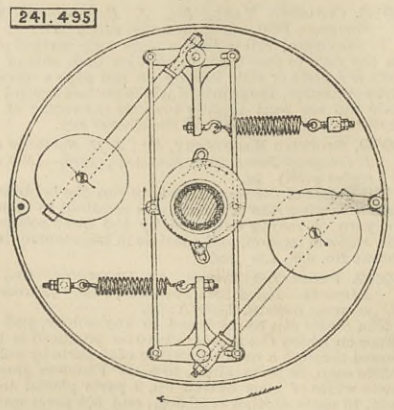

driving shaft by means substantially as described, whereby as the work increases or decreases the speed of the engine is automatically controlled. (3) In a cut-off mechanism, weighted levers revolving with the driving shaft, in combination with a compound excentric consisting of a concentric ring and an excentric ring, which are moved across and around the axis of the driving shaft by means substantially as described, and for the purpose set forth. (4) In a governor cut-off, a pendulous lever, one end of which is adapted to be moved across the axis of the driving shaft by weighted levers attached to a disc revolving in unison with the pendulous lever, combined with an excentric ring, the excentricity of said ring combined with the excentricity caused by the pendulous lever moving across the shaft, serving to control and regulate the movements of the engine. (5) In a governor cut-off, a pendulous lever, one end of which is adapted to be moved across the axis of the driving shaft by weighted and pivotted levers, combined with an excentric ring which moves with and around a flange placed upon the pendulous lever, and is also connected with the above pivotted levers, as and for the purpose set forth. (6) In a governor cut-off, the revolving disc or wheel provided with the reactionary bell-crank lever or levers, and adapted by connecting rods to convey a double movement to the compound excentric, as and for the purpose set forth.

241,534. PORTABLE PIPE VICE AND CUTTER, *George W. Glazier, assignor of one-half to James Rodie, Peabody, Mass.—Filed April 8th*, 1881.

Claim.—The herein-described combined pipe vice and cutter, consisting of the serrated jaws A and D, hinged at C, and provided with the pipe rest and

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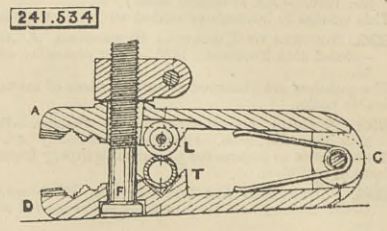

loosely-journalled cutter wheel L, the screw *f*, nut and handle and spring, as and for the purpose set forth.

241,581. STEAM TRAP, *Nelson P. Aldrich, Plainfield, assignor of three-fourths to Alfred P. Pitkin, Hartford, Conn.—Filed February 21st*, 1881.

Claim.—(1) The combination of the casing, the double-elbowed exit pipe, the reciprocating valve, and the float arm, all constructed and arranged substan-

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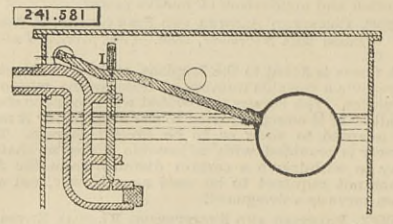

tially as described, and for the purpose set forth. (2) The combination of the exit pipe, the reciprocating valve stem, the pendulous arm I, and the float arm, all substantially as described, and for the purpose set forth.

CONTENTS.

THE ENGINEER, July 1st, 1881.

THE Admiralty have decided to sell her Majesty's ships Black Prince and Simoon should a desirable purchaser be found.

NAVAL ENGINEER APPOINTMENTS.—J. J. Robins engineer, to the Asia as additional, as instructor in working of machinery of torpedo boats, vice A. Court to the Asia as supernumerary; William T. Bray, engineer of the Northumberland to the Indus, as supernumerary; and George H. Weeks, engineer, to the Fawn, vice James Legate, invalided.

INTERNATIONAL MEDICAL AND SANITARY EXHIBITION.—The arrangements for this exhibition are now complete; the offices are removed from the Parkes Museum to the exhibition buildings at South Kensington. The Right Hon. Earl Spencer, Lord President of the Council, has accepted the office of president, and will preside at the opening ceremony on Saturday, July 16th. The exhibition is to be complete on Wednesday, July 13th, and the judges will make their examinations for the awards on the two days previous to the opening.