THE MILLING EXHIBITION.

No. IV.

IN our last we described the milling system of Mr. J. H. Carter. The next to be noticed is that which was exhibited by Messrs. Dell and Son, Stand 27. The machinery was contained in a timber building, three floors high, and illustrated the American process of gradual reduction. On this system one pair of millstones is used for granulating the cleaned wheat, and two pairs for reducing the middlings. The arrangement is shown in Figs. 34, 35, and 36. The first elevator lifts the wheat to a Barnard and Leas' oat and weed separator on third floor—see Fig. 5—thence it falls to Barnard and Leas' Victor smutter; from the smutter a second elevator raises the grain to a Victor brush scourer, thence the cleaned grain falls to the stock hopper, or grinding bin, and is from there spouted to the smooth corrugated granulating stone, with the Smith "dress." The granulated wheat goes to reels E, E, E, where the proper separations are made, the bran being sent to corrugated rolls, the flour to sacks, and the middlings to the purifiers; the purified middlings are spouted to millstone B 2, the ground-middling elevators to reels F and F', and the flour drawn from these reels is the patent flour. Reel G takes the meal from the smooth iron rolls; and the flour can be mixed either with wheat flour or patent flour. Reels J and H dress the meal from two porcelain rollers. The flour from H goes to wheat flour, and from J to low grade. The flour from the bran reel can be drawn either to wheat flour or low grade. By the use of double conveyors on the reels they are enabled to so arrange the spouting, that it is only necessary to pull two slides to allow all the qualities to run together into a worm above sacking valves, where it is thoroughly mixed before being sacked off. The mill is intended to represent a "five run" plant, but only three pairs of stones were erected at the exhibition; the other machines are exactly as for the five run plant. With the five pair of stones it is stated that 175 sacks of flour would be turned out in twenty-four hours. The hursting for the millstones is of American pattern shown in Fig. 37. A full description is not necessary. It will be observed the spindle step is brought down and—with its proper connections—rests upon the main bed-plate, thus precluding the possibility of any trembling, as in the old style of iron hursts, where the bridge tree was attached to the columns at a point above the bed-plate proper. The dress of the stones is shown in Fig. 38. The special feature is the large amount of furrow and small amount of land. This gives less friction on the wheat and produces a large quantity of middlings. Below the plan of the stone face is a section and particulars of the furrows. The speed for 4ft. stones is 150 to 160 revolutions per minute. The stones are dressed perfectly smooth. The dressing of the products of grinding is done by two four-reel bolt chests, of similar construction to the six-reel one we show in Fig. 39.

The purifiers deserve special attention, and of them we give in Figs. 40 and 41 perspective and sectional illustrations, with the following description by Mr. Smith:—The middlings are received into the hopper at the head of the machine, and are fed on to the sieve by feed roll K, which distributes them evenly over the whole width of the silk. The necessary motion is imparted to the sieve by two excentrics, B, running in contact with friction-rolls on the head of the sieve-frame. A spring at the tail of the sieve, regulated by the hand-wheel P, serves to keep the excentrics and friction-rolls always in contact, so there is no jarring of the sieve. The clothing of the sieve is of silk of different numbers, the finest being at the head and the coarsest at the tail. The fan I produces an air-current upwards through the silk into the air-chamber G G, &c., following the bent arrows into the pockets H H, and through the openings J J, &c., into the fan, thence to the stive-room. The air-current induced by the fan, following the course above described, will deposit in the pockets H the best and heaviest of the material it carries up from the middlings on the silk. Access is conveniently had to these pockets from the outside of the machine, and as there are a number of them corresponding

Fig. 39.

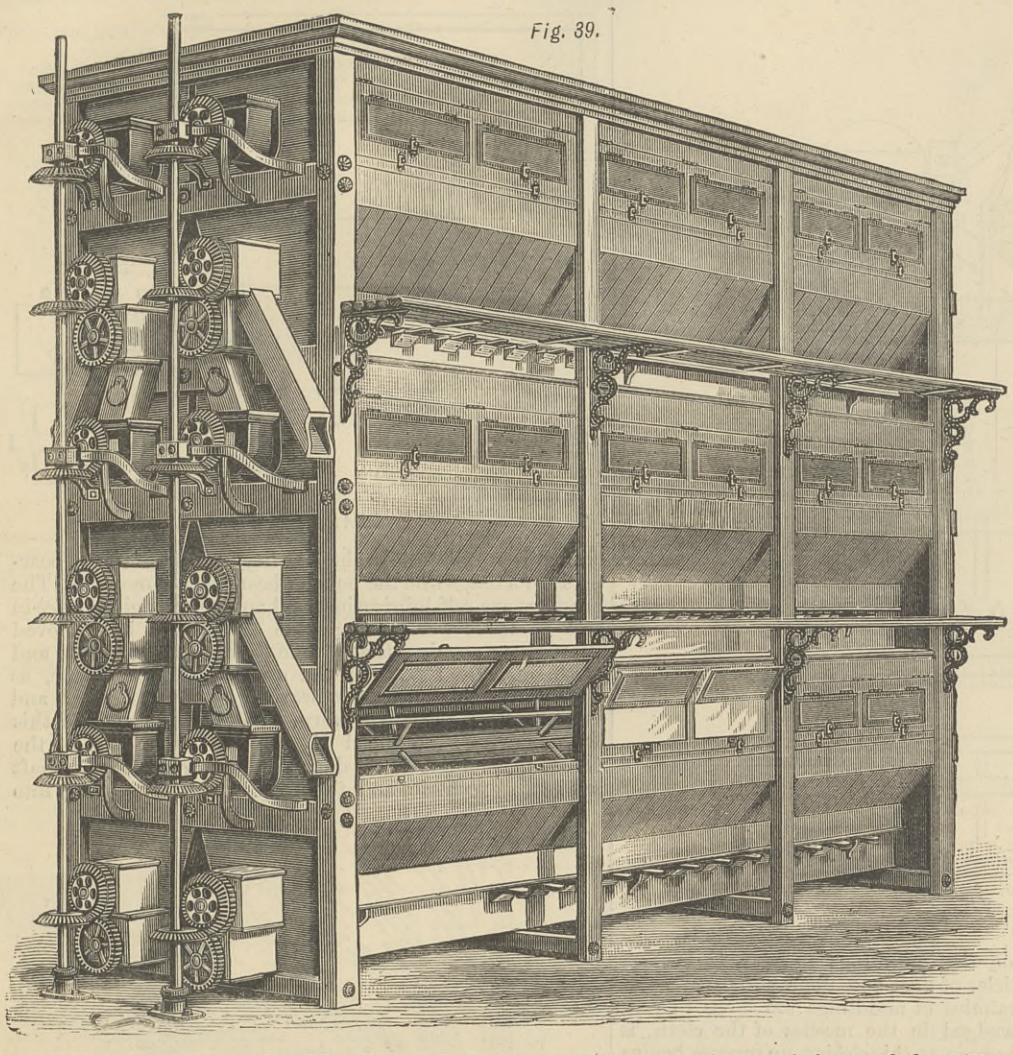


Fig. 37.

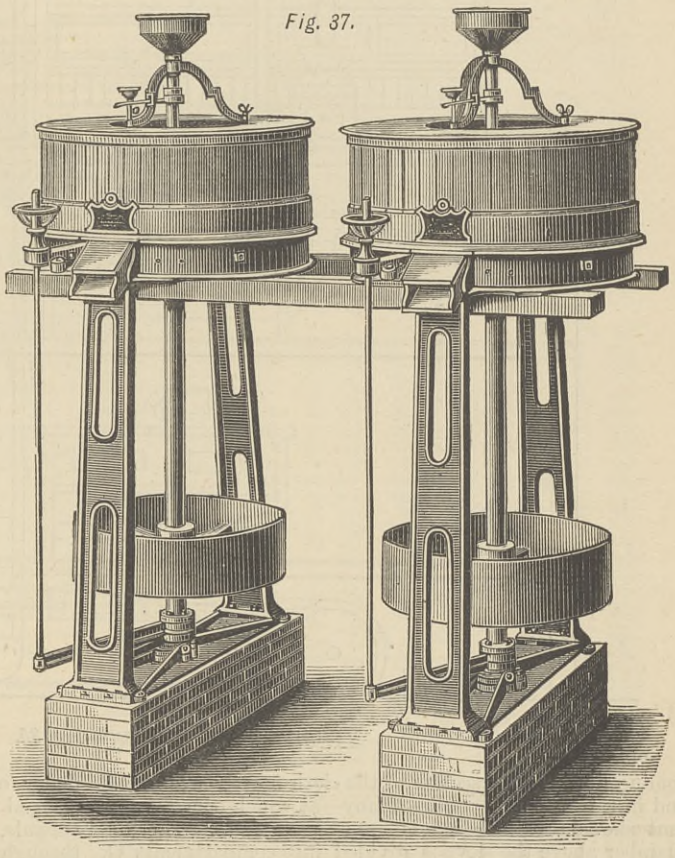


Fig. 41.

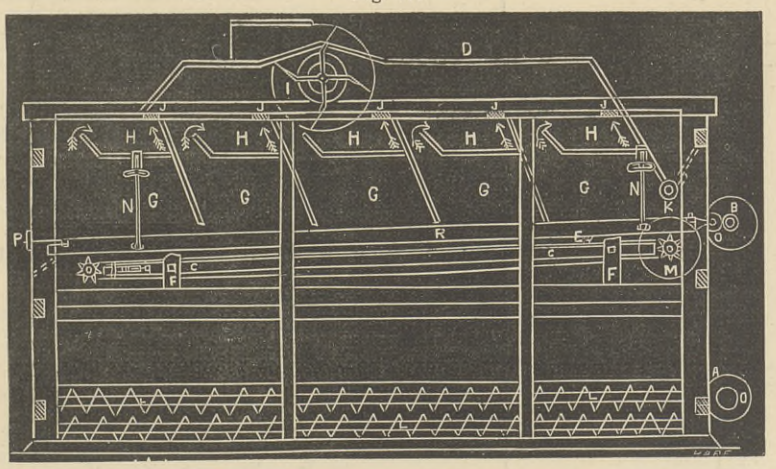


Fig. 42.

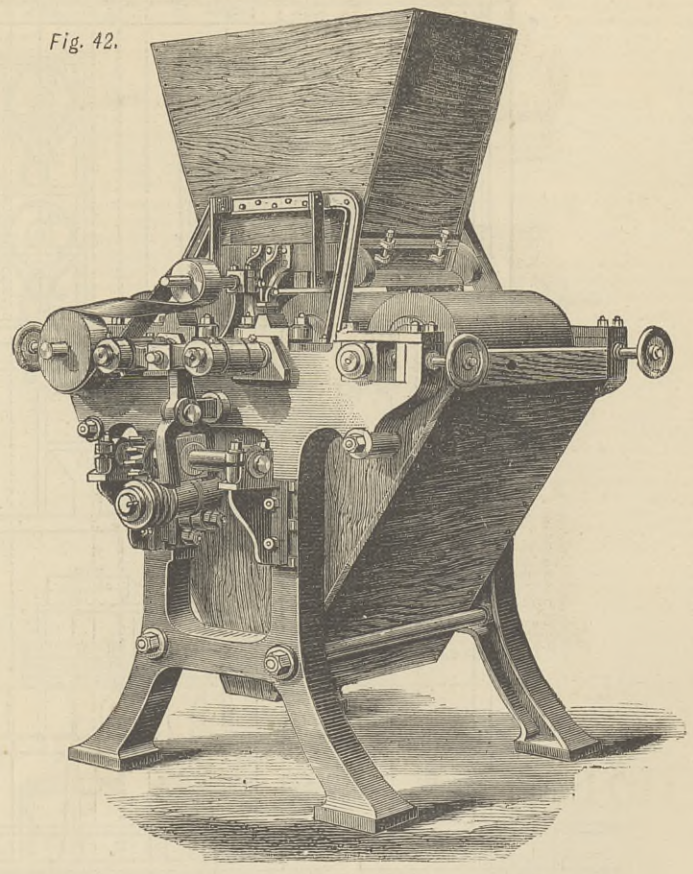
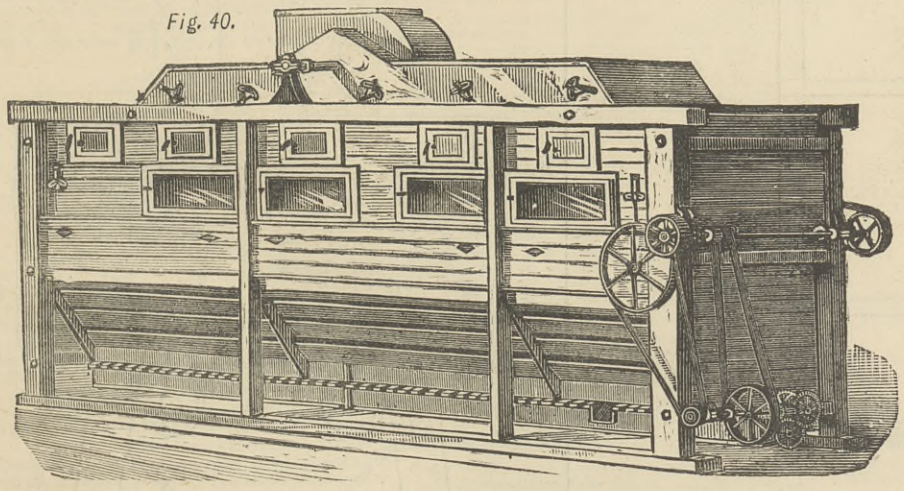
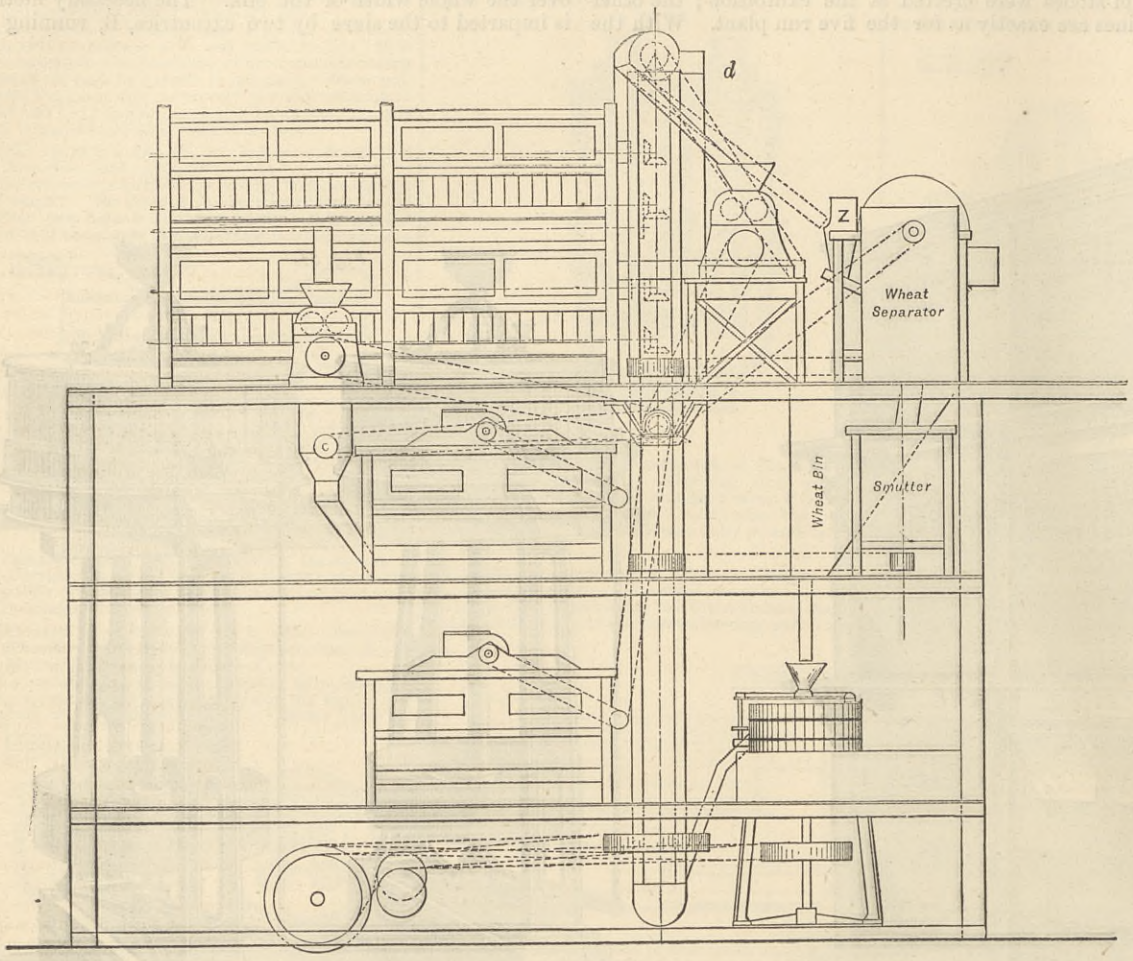


Fig. 40.

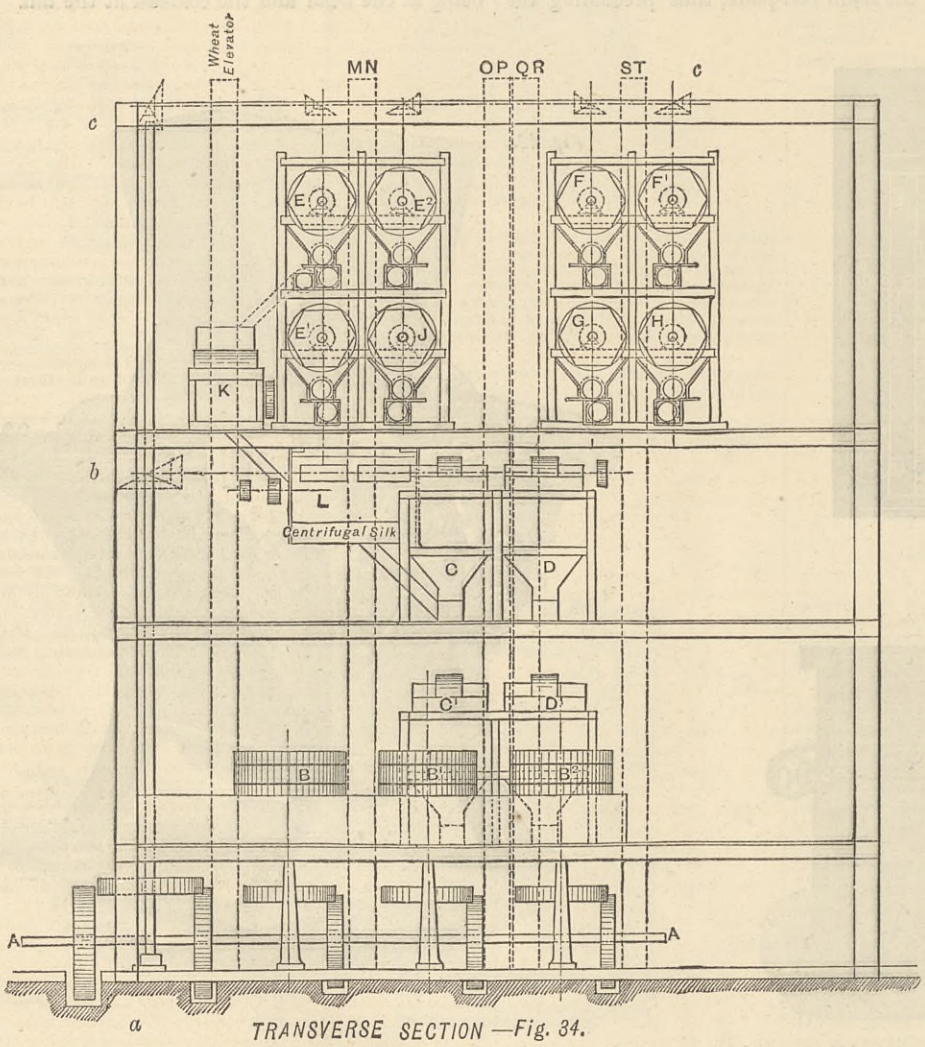


to the number of different grades of silk of which the sieve is composed, it is easy to determine whether any good material is being taken out by the fan, and if so, to say with absolute certainty from what section of the sieve it is being taken, and where the air-current should be reduced. The means of regulating the character of the material removed by the fan from any section of the sieve will be explained presently. The sides of the purifiers are made to open below the sieve, so that the character of the middlings



LONGITUDINAL SECTION—Fig. 35.

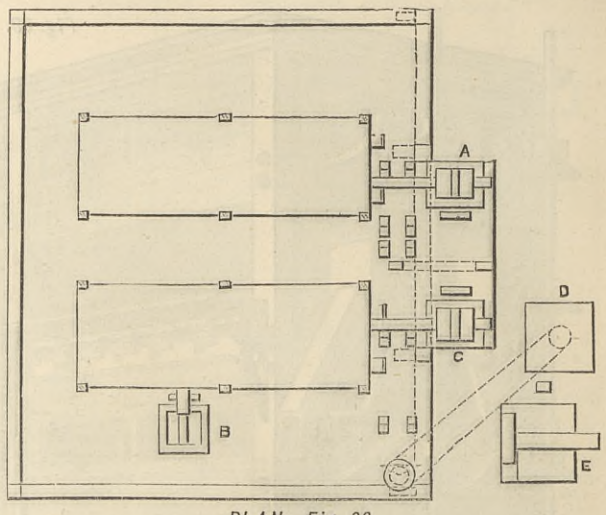
coming through any section of the cloth may be examined, and in this way the point—if any—at which the air-current should be increased is seen at a glance. The air-chamber above the sieve is divided into compartments G, G, G, G, G by transverse partitions. J, J, J, J, J are valves opening from these compartments into the fan-chamber, and adjustable from the outside of the machine. This construction permits of a very severe air-current being passed upwards through the silk under any one of



TRANSVERSE SECTION—Fig. 34.

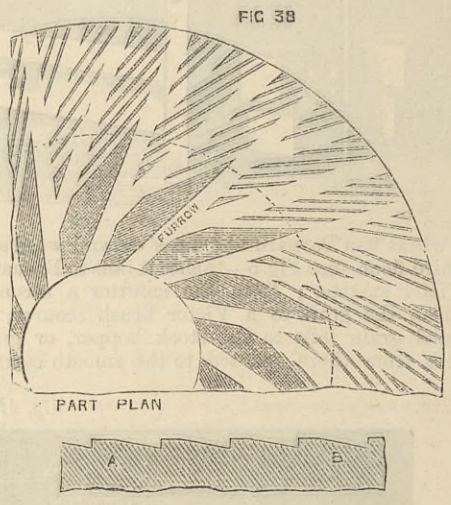
the compartments G, without in the least disturbing the flow of air through the cloth under adjacent compartments. In operation, a very light draught would be used through the compartment G at the head of the machine by slightly opening the first valve J, and as the light and small middlings were worked through the fine silk, and the stock flowed along towards the tail of the sieve, the draught would be gradually increased in each succeeding compartment by opening the following valves wider. It will be seen that these valves afford the means of regulating the character of the material taken out by the fan from any section of the silk, as the velocity of the air-currents is absolutely controlled by opening or closing them. E is a brush mounted on ways, and attached to an endless chain driven by the sprocket wheel M. The brush extends across the sieve, and sweeps the entire under-surface of the cloth from head to tail at very brief intervals. The tendency of the silk on the middlings purifier to become clogged by fine particles of dust and flour adhering to its threads, and by granules of middlings too large to pass through becoming wedged in the meshes of the cloth, is well understood. As soon as this closing-up process begins a waste is made in two ways, first, by throwing over the tail of the sieve material which should have been sifted through the cloth; second, the area of the opening through the cloth into the air-chambers being lessened, the force of the air-currents through the remaining openings is proportionately increased, carrying to the stive-room heavier and better material than should go in that direction

Fig. 42 represents in perspective the "Victor" roller mill with two pairs of rolls. To one roll of each pair a self-acting endways motion is given, the object is stated to prevent the rolls wearing unevenly, but this is only obtained by considerable complication. Fig. 43 represents another form of roller mill in diagram, manufactured by Messrs. Kuhne, of Dresden. The hopper of this double roller mill, for receiving the feed, is attached to two uprights; the feed rolls B have also their bearings in them, and are driven by a belt and pulley from the shaft of the roller. Over the feed rolls, slides are fixed to the hopper, and they can be moved up and down by the handles shown in the engraving, thus regulating the flow of the feed, which passes over the feed rolls through the funnels screwed on the hopper case, between the chilled iron rolls C C, and after it has passed them, leaves the roller mill through the case attached to the frame of the mill. The



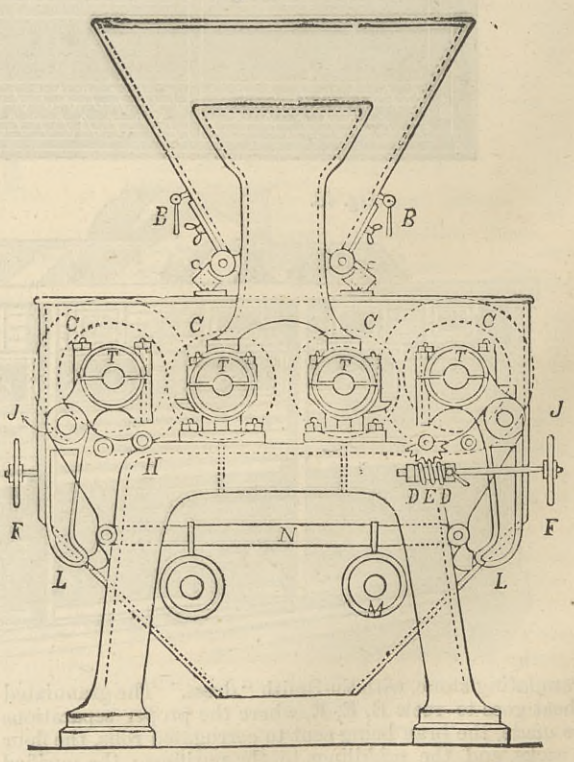
PLAN—Fig. 36.

chilled iron rolls rest in the bearings T T; the inside bearings are fixed, while the outside bearings are movable. The bearings are self-lubricating, and only require oiling once in two or three weeks, when the old oil can be removed through an opening that can be closed with a screw and fresh oil poured in. On the one side of the frame, as shown in the drawing, two bearings D D are attached, and between them there is a worm E, and on the shaft of this worm is the hand-wheel F. On the upper side of the frame, at an angle of 90 deg. to the worm E, is a shaft with two excentrics and the worm wheel H gearing into



worm E. The specially formed side bearings T T of the rollers C C revolve on the shaft J, and on each bearing there is a lengthening sidewise with the screws K, so arranged that their heads lie firmly on the excentrics, when the weights M, by means of the lever N, press the lower arms of the bearings T at the points L. It may easily be seen that by turning the worm E and screw wheel

Fig. 43.



H, by means of the hand-wheel F, the excentrics may be brought by the shaft to the highest or lowest position. The bearings T are hereby raised and lowered, and thus a closer or wider distance is preserved between the rolls; consequently they can be regulated exactly. The screws

K serve to justify the rollers, and by raising or lowering these screws the rolls can be kept in an exactly horizontal position. Each pair of rolls is driven by a belt, and differential motion may be imparted if required by gear. In Fig. 34, *b* and *c c* are horizontal shafts driven by bevel gear and vertical shaft worked by strap from A A. The gear for driving the different apparatus from *b c c* is plainly indicated. In Fig. 36, A is the smooth chilled roller mill, C porcelain roller mill, B bran rolls, and E separator. Messrs. Dell and Son have also a number of other exhibits covering a large space on the floor apart from those at work in their system exhibit.

LETTERS TO THE EDITOR.

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

HIGH-SPEED LOCOMOTIVES.

SIR,—I see "W. S." has been criticising and correcting (?) my letter which appeared in THE ENGINEER for April 8th. I know the value of criticism, and am thankful for corrections of mistakes, as I seek clearness and truth; but after spending some time I confess myself unable to understand "W. S.'s" letter. I shall be obliged if he will explain his methods; and while I am writing, it may be well to show how the formulæ I gave were obtained.

With regard to the breakage of coupling rods. Perhaps the easiest formula to remember for the strength of a beam is the general one $\frac{M}{I} = \frac{f}{y}$, where M = bending moment on section under consideration, I = moment of inertia of section about neutral axis, f = greatest stress per unit area, and y = distance from neutral axis to edge of section. In a beam of rectangular section, length = l, thickness = b, and depth = d, with a load W at the centre, the greatest bending moment $M = \frac{Wl}{4}$. Also $I = \frac{bd^3}{12}$, and $y = \frac{d}{2}$. Putting these values in the above, we get the well-used office formula

$$W = \frac{2}{3} f \times \frac{bd^2}{l} \quad \ldots \ldots \ldots \ldots (1)$$

The centrifugal force $F = \frac{wv^2}{gr}$, where w = weight of rod; so that $F = \frac{lbd\,D\,v^2}{gr}$. This is a load uniformly distributed, and is equivalent to a load at the centre

$$= W = \frac{F}{2} = \frac{lbd\,D\left(\frac{22}{15}\,S\,\frac{r}{R}\right)^2}{2gr} \quad \ldots \ldots \ldots (2)$$

Equating (1) to (2),

$$\frac{2}{3} f \cdot \frac{d}{l} = \frac{ld\,S^2 r}{2g\,R^2} \times \left(\frac{22}{15}\right)^2.$$

Taking the foot and pound as units,

$$S^2 = \frac{4}{3} \times \left(\frac{15}{22}\right)^2 \times 144 \times \frac{fg}{D} \cdot \frac{d}{r} \cdot \frac{R^2}{l^2} = \frac{10800}{121} \cdot \frac{fg}{D} \cdot \frac{d}{r} \cdot \frac{R^2}{l^2}.$$

Putting $f = 20{,}000$, $g = 32{\cdot}2$, D = 480, we get for any iron rod of rectangular section

$$S = 346 \cdot \frac{R}{l} \sqrt{\frac{d}{r}}.$$

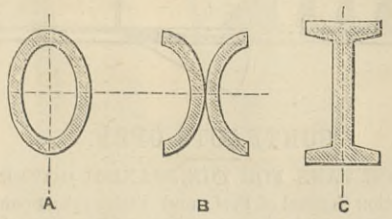
If R = 3½ft., l = 8½ft., d = 4½in., and r = 13in.,

$$S = 346 \times \frac{7}{17} \sqrt{\frac{9}{26}} = 20 \times 7 \times \frac{3}{5} = 84.$$

If R = 3ft., S = 72.

As I have pointed out, steel would be better in this respect than iron. Although there are various incalculable strains in coupling rods there is no doubt that centrifugal force has much to do with breaking them; they do not generally break at low speeds. To discard these rods would be to do away with the danger, but the tendency seems to be more and more to make high-speed engines with four wheels coupled.

It has been suggested that the rods would most resemble the bones of birds if made hollow. The best section would then probably be an ellipse, with the major axis vertical, as at A. It is easy to imagine such a rod, but not at all easy to make one. But cut the ellipse in two down the major axis, and turn the halves back to back, as at B, and we have a section not unlike the I-shaped section C.



"W. S." gives a formula for the speed at which tires may run. How he produces it I fail to make out. The calculation is straightforward enough. It is well known that the bursting tension in a hoop per unit breadth = outward pressure per unit area × radius = in this instance, centrifugal force per unit area × radius. Let A = sectional area of tire. Then—

$$Af = \frac{AD\,v^2}{gr} \times r, \therefore f = \frac{D\,v^2}{g},$$

or, substituting for v in terms of S, and bringing f to tension per square foot, we have $S = \frac{15}{22} \times 12 \times \sqrt{\frac{fg}{D}}$,

$$\text{Or } S = 46{\cdot}6 \sqrt{\frac{f}{D}} \text{ about,}$$

which is much simpler than "W. S.'s" "simple formula." Taking for steel f = 19 tons = 42,560 lb., and D = 490, we find S = 420 about. I cannot see what connection exists between D, the density of the material, and $\frac{\pi}{2}$, the circular measure of two right angles.

Manchester, May 11th. S. R.

SIR,—The sketches of high-speed locomotives by Mr. E. L. Pearce which were reproduced in your number of the 30th of April display, indeed, much ingenuity, but it would have been a good thing if their author had given us some explanation concerning the proportions of their elements. For my part, I am bound to confess that these engines cannot do the duty they are intended for. The adhesive weight is considerably too low in comparison with the tractive power to exert. I will prove it as follows:—

We assume the weight of the train to be 200 tons; that of engine and tender 60 tons; the speed 60 miles; the gradient to be not more than $\frac{1}{200}$. Such were, I think, the conditions of the problem as first proposed by "Running Road." Gross weight of train, 260 tons. Total resistance of train at 60 miles an hour the resistance per ton on an incline $\frac{1}{200}$ being 55 lb. per ton, = 260 × 55 = 14,300.

Such is the tractive power for which we have to proportionate our cylinders. It appears at first sight that the cylinder power is not here deficient at all; for supposing a boiler pressure of 140 lb. per square inch and a cut-off at three-fourths of the stroke, we have $\frac{135 \times 20^2 \times 24}{84} = 15428$ for the second engine, and $\frac{135 \times 20^2 \times 22}{78}$ 15230 for the first. The cylinders would, indeed, be of very good proportions for their work, but it must not be forgotten that tractive power = one-sixth adhesive weight. It should not be more than one-fifth. In our climate engineers agree to take one-sixth. In this case let us see what should be the adhesive weight. For the first engine, $\frac{15230}{373} = 40$ tons about, and for the second, $\frac{15428}{373} = 40{\cdot}8$ tons.

In both cases we have about 20 tons of static charge on each pair of axles. This is enormous, and difficult to realise. It is never seen. These reasons led me to recommend in my letter of the 25th March the employment of the Fairlie engine, or something similar. Sometimes—and it might be done more often—large cylinders are used where the above theory would have them of less proportions, but this is done conjointly with the employment of a long cut-off—cut-off that may be prolonged or shortened, according to the work the engine has to perform.

On level at 60 miles an hour the resistance per ton is 43·5 lb.; for the whole train it would be 260 × 43·5 = 11310, which corresponds to an adhesive weight of 30 tons. It is, again, difficult to meet such requirements with a four-coupled engine. It is very doubtful that such engines could attain an average speed of 60 miles an hour. It might, perhaps, be performed more surely with a diameter of wheel varying between 7ft. 6in. and 8ft. In my opinion, the cylinders should be of dimensions such that the tractive power should not be more than one-fifth of the adhesive weight—conditions exceedingly favourable, but not often met with. With this duty, the steam being cut off at three-fourths of the stroke, it ensures that for ordinary work, when one-sixth is the coefficient, the steam is still cut off at an earlier period. There is sufficient economy in such a system. ED. GOBERT.

39, Heskey-street, Nottingham.

SAFETY VALVES.

SIR,—Seeing letters by "J. M. W." and "Truth" in your issue of the 13th inst., and believing that neither of them had actually arrived at the correct cause of the great loss of pressure in Adam's safety valves under "Chief Engineer's" charge, I thought a little of my experience with valves giving the same results might help to clear the matter up.

I had noticed in Adam's valves after they had been ground several times into their seats that they always lost more pressure before coming back than they did when first put on. I had tried several ways of remedying this, but without success; until on meeting another of the safety valve makers, and asking his opinion, I was advised to cut a little bit off the head of the valves in the lathe, which I did. They were then as sharp in their action as when first put on; although in one case, after doing so they still lost a considerable pressure before coming back. I then replaced the springs with my spare ones. Although they had not been long in use—about two months—the new springs gave no better result, the valve blowing off at 75 lb. at first, then blowing off at 70 lb. and 72 lb., and not coming back until 61 lb. was showing on the gauge. I was completely nonplussed, and being pressed for time, had to let the ship go as she was. On her return I overhauled the valves again to find out if the spindles were binding or sticking fast, but they were all quite clear, and no signs of friction about them. I was advised by the safety valve makers I had got the information from about the head of the valve to try new springs, and when I told them I had done so, they asked to be allowed to put one on themselves, and I must say with the best results, the valve coming back within 3 lb.

In my opinion the valves themselves are the cause of the scum and dirt found in the valves under "Chief Engineer's" charge, as I have noticed when they lose a great pressure before coming back, they go off with a great bang, gripping the water and acting as a surface scum cock, and the formation of the valve makes this scum and dirt all lodge about it. In this way "Chief Engineer," if he acted on "J. M. W.'s" advice, would have to clean out his valves each time they blew off.

I have also like "Truth" four different makers' safety valves on my boilers, although I cannot say with him that Adam's was the best of the lot, as they were all very much alike, losing on an average 3 lb. before coming back. When I informed one of the makers that their valves did not come back until a loss of 3 lb., and they had promised that the loss would only be 1½ lb., they asked me to allow them to overhaul them on the ship's return, with the result of making them come back on 1 lb., and this is the only valve I have working so close to the pressure and allowing no accumulation. One great advantage two at least of the makers have over Adams, that is the avoidance of that steam-hammer action which is so annoying to passengers, and for my part I would rather let the valves accumulate a little to get this result.

To settle the matter, I think a test of all the makes of valve in the market should take place, but let it be a public one, and the results published in THE ENGINEER or some other well-known engineering publication. BILLY FAIRPLAY.

Liverpool, 17th May.

SIR,—In answer to the letter of "Truth," in your last week's ENGINEER, I am called upon to say something more on the subject of Mr. Adams safety valve. "Truth" asks, "Did you see your valves opened, and satisfy yourself that valves and spindles had enough clearance before they were closed up?" (2) "Did you see them thoroughly tested before sailing?" (3) "What was the temperature at the top of the boilers, where the valves were placed, and, if it was very hot, did it not occur to you, as chief engineer, that you should see that your valves were eased every day?" Now, Sir, in answer to these questions, I did not open the valves before leaving England, having much more important work to attend to in other parts of the engine-room, nor did I think it would have been necessary so to do, for whatever style of work Mr. Adams may turn out at the "Ant and the Bee," I do not think he would make so egregious a blunder as to supply spindles of improper size or having an insufficiency of clearance. In asking such a question, I think "Truth" very hard indeed on Mr. Adams. (2) I did not see them thoroughly tested before sailing, as I consider the engineers of Lloyd's and the Board of Trade quite competent to discharge that duty. (3) I don't understand this question at all, for I consider that the efficiency of a safety valve has nothing whatever to do with the outside heat, and I confess I never did take the heat with a thermometer. Surely "Truth" has left out the point of this query? As to the second part of the question: In the case of the steamer wherein we lost 10 lb. pressure every time the valve lifted, before it resumed its seat, I must say that I felt a strong objection to the loss of so much steam, and therefore I never lifted the valve gratuitously. The objections to doing so are evident to engineers, and I am quite sure that had "Truth" been in my place, he would have strongly expressed himself had the valve even accidentally lifted. One more sentence in "Truth's" letter I must notice before going on to your next correspondent. He says, "Springs will sometimes give out, but that Adams's valves will not shut within 10 lb. of their loaded pressure is something new to me." Now, the effect of a spring giving out is not to cause the valve to remain open until the pressure has reduced 10 lb. below its proper amount, for if a spring gives out, the pressure will never rise to its proper height, but rather it prevents its rising to the desired degree. In the Greek boat to which I have alluded in my former letters our safety valves were supposed to blow off at 75 lb., and this they did for some months until the springs weakened, when they blew off at 65 lb., but closed again at 64 lb. I was then obliged to cut the washer off, and to make up for the deterioration of the spring by tightening the screw cap as often as required, until it came hard on the casing of the valve, when it became necessary to introduce a new spring. In the case of the valves, which allowed a loss of 10 lb. before they closed, I fancy the cause is to be found in imperfect workmanship, for unless the angles of the valve and the depth of the cup are exactly what they should be, the thing won't work properly. Mr. Adams would do well to put us straight on this point.

And now, Sir, turning to "J. H. W's" letter of last week, I fancy he has shown us a very weak place in his armour or in his engineering, by questioning my remarks as to the cleanliness of my boilers. He says, "I should like to know where all this dirt came from if not from the boiler." Now, the question of water being clean in a marine boiler is merely one of comparison. A man's boots may be fairly defined to be perfectly clean, but they will not bear a comparison with his collar, and when I stated that my boilers were perfectly clean, I think my meaning was manifest to marine engineers at least, who well know that no matter how clean the water may be stated to be, a certain quantity of dirt and scum must of necessity exist. "J. H. W." goes on to ask me very pertinently whether I prefer "the old-fashioned loaded valve, which would roar at every lurch and heel over of the ship, or Adams's spring valve, which all the rolling and pitching in the world does not affect." Without a moment's hesitation, I answer, of course, I prefer that of Adams; but "J. H. W." seems to be unaware of the fact that there are other spring valves besides those of Mr. Adams, and some of these, too, will resist all the rolling and pitching in the world quite as well as the one which "J. H. W." admires so much. "Truth" has no less than five different spring valves by different makers, and he awards the palm to that of Mr. Adams. "Truth's" experience in this case is of value, but "J. H. W." cannot help us much if his experience is confined to the old-fashioned loaded valve and to the safety valve of Mr. Adams, as it would seem to be. "J. H. W." fancies that I want to make out that, because Adams's valves have worked badly with me, they must do so in all cases. Now I think he has clearly misunderstood me, for I will even go so far as to state that I served in one boat for upwards of a year, and that there the safety valves—Adams's—worked to perfection. My contention, therefore, is, not that Adams's valve is bad, but that it is not by any means infallible, as Mr. Adams seems to think it is. I think, and I know numbers of sea-going engineers who also think this valve is a very long way from being perfect, and that there is plenty of room for improvement yet before we get a really first-class valve which cannot be disorganised by small causes.

London, May 18th. CHIEF ENGINEER.

THE CORROSION OF IRON AND MILD STEEL.

SIR,—In one of your numerous articles on mild steel you say:—"Nothing, perhaps, has done more to hinder the progress of scientific truth than the assumption that a given experience is final." . . . "The error assumes its worst form when a man with a strong bias handles it." . . . "Give an engineer with a strong prejudice and a ready pen, put him in possession of the results of a few experiments—all tending one way—and we have at once an element let loose which may do enormous mischief."

These are statements which no one will gainsay, which every one must applaud, and which offer to the readers of THE ENGINEER a reasonable hope that all matters touched upon by the editorial pen will be treated in a calm and dispassionate manner, nothing but absolute truth evolved, and assertions made finally only after long and patient investigation. In a paper possessing the world-wide reputation and circulation of THE ENGINEER such caution is doubly necessary, for its articles are read and due weight given to them by readers all over the world. It is really a matter for congratulation to the engineering public that they are so carefully guided past the snares set for them by the steel manufacturers. Commercial morality must indeed be at low ebb with them. It would not, perhaps, have been believed on any less authority than that of THE ENGINEER, that the repeated testimonies as to the excellent constructive qualities of mild steel were merely artful stratagems of the steel makers to drive the iron manufacturers out of the market. Yet such is the case; for you warn us, as early as 1875, that "all attempts to prove steel better than iron have sprung from interested motives," *i.e.*, that it would be good for steel makers if iron could be turned out of the market in favour of steel. In your article of the 13th you say: "Having successfully driven iron nearly out of the market for rails, steel makers are now naturally endeavouring to do the same as regards shipbuilding material." When the numerous statements in favour of mild steel are reviewed, the extent of the "ring" which is endeavouring to oust iron, is simply appalling; and when it is remembered that the said ring must be made to include some well-known public men of "independent position," the general state of corruption precludes all possibility of arriving at the absolute truth with regard to the properties of steel.

But let the readers of THE ENGINEER rest secure. They are not likely to be led blindly by the advocates of mild steel, for you are careful to keep them informed that with steel "every success is balanced by a failure." Indeed, the same care to keep the balance true, and so prevent any leanings, is observable all through. For instance, it is pointed out in one place that Mr. Parker's evidence is worthy of all acceptance; and further on you must be understood to say that his conclusions are of no value.

Although the meetings of the Institution of Civil Engineers are not open to the public, I cannot understand why the adverse criticisms on Mr. Phillips' paper should not enjoy the same publicity which has been accorded to the paper itself. In common fairness the discussion should be published. Many of Mr. Phillips' experiments were carried out in the boilers of vessels belonging to the Clyde Shipping Company. It is a curious fact that the same company has had a number of mild Siemens steel boilers in constant use for the last four or five years, and they do not show the slightest sign of corrosion or pitting, the plates being as clean and black as on the day they were put in.

If iron be exposed to corroding influences it very soon becomes destroyed. Even if it be admitted that iron corrodes less quickly than steel, the use of iron would only put off for a little the evil day. In contrast to the present attitude, it is curious to notice that in 1877 you record, without dissent, that from a series of experiments extending over three years, M. Gautier, of Terre Noire, had "established the fact, that when exposed to the action of sea-water, mild steel suffers from corrosion only in the proportion of 60 to 140, when compared with the effect of similar treatment on iron plates."

If it be worth while to incur the extra expense of using steel in a structure, surely such a structure is worth taking care of. If steel be properly cared for, it will not corrode injuriously. Iron requires the same care. Under certain conditions iron and steel must oxidise; but no engineer would dream of allowing a valuable structure to rust away without protection. From the clean surface and freedom from heavy scale, which is characteristic of steel plates, they take a protective coating better and keep it longer than iron plates.

Although, Mr. Editor, it seems at first sight very hard that you should never say one word in favour of steel without accompanying it by two in condemnation, still, it is impossible not to admire the consistency with which you have carried out your policy of decrying steel; and, further, it is comforting to learn from your article on the Gun Question—also in your issue of the 13th inst.—that it is done all for good, for it is there said that "If steel is good the country will reap the benefits of the efforts made by private firms in the teeth of sweeping condemnation and discouragement."

But why always goad the poor steel makers? A goad only gives a momentary and a false energy, and leaves the subject in a greater state of exhaustion than at first. Give them fresh supplies of life from without. In pointing out their difficulties, tell them how they are to be overcome. Do not discourage them by such ambiguous and damaging phrases as "We think that such and such defects may occur in steel; but, remember, that we do not for an instant assert that they do occur." Give facts. Beware of the ready pen.

It is impossible not to be awake to the fact that the articles in your paper—with its ancient authority and wide-spread circulation—will temporarily damage the cause of steel; but they can no more stop its extended use and onward progress than they can arrest the flow of time.

It is to be hoped that the steel millennium will soon come, when the wicked shall cease from troubling, and the weary steel makers be at rest. FRANK W. DICK.

Glasgow, May 24th.

[As it is, we hold, always well that both sides should be heard, we give Mr. Dick's letter a place in our columns. It would, perhaps, have gained something in value had it contained a few statements of fact bearing on the point at issue. It is almost unnecessary to add that our correspondent has drawn to a considerable extent on his imagination, and, aided by a dexterous use of quotation marks, has thus been enabled to attribute to THE ENGINEER passages and statements which it never contained. The question which we have recently discussed is one of very great importance, namely, the relative liability to corrosion of steel and iron; and we repeat that it does not appear to be proved that iron corrodes as fast as steel, and that there is even reason for thinking that steel corrodes faster than the common irons under similar conditions. If our correspondent can throw some light on the question, can supply any information, or help inquirers to a solution of the problem which perplexes them, then we shall be happy to hear again from him. If, however, he can do nothing more than express the feelings of annoyance experienced by some steel-makers because we have dared to question the uniform excellence of steel, we venture to think that our readers will agree with us that our space may be occupied by more valuable matter, and we shall act on this theory.—ED. E.]

THE DE BAY PROPELLER.

SIR,—I am requested by the directors of this company to send you the following statement with regard to the present Eastern voyages of the steamship George Fisher, fitted with the ordinary screw, and the Cora Maria, fitted with the de Bay propeller, both vessels being under the management of Messrs. Capper, Alexander, and Co.

The George Fisher is very nearly of the same horse-power and capacity as the Coria Maria, but when both vessels had the ordinary screw the former was the faster. Messrs. Capper, Alexander, and Co. have informed my directors that they have just received letters and the engineers' logs from both vessels, from which it appears that in the voyage from Suez to Elephant's Point the Cora Maria has beaten the George Fisher by four days, and burnt on an average 15 cwt. of coal less per day.

I may mention that the bottom of the George Fisher was cleaned before she left England, while the bottom of the Cora Maria has not been cleaned since last September. With regard to this, Captain Peacock, in command of the Cora Maria, writing from Rangoon, says:—"Our passage out was slow, and as I am afraid the grass is rapidly growing on the bottom, the passage home will be worse unless, as I hope, this fresh water will kill it."

With regard to the gearing, described in your issue of Feb. 25th, 1881, Mr. Scott, the chief engineer of the Cora Maria, writes:—"The gearing has worked without a single hitch all the way, never having to stop for any purpose connected with the propeller machinery.'

An inspection of the previous logs of the George Fisher has been made, from which it appears that her engines have not been working on this voyage as efficiently as usual, as they show about ten revolutions less per minute, which would have increased her speed about a knot per hour; but the consumption of coal would also have been increased about 15 cwt. per day. On the other hand, had the bottom of the Cora Maria been in the same state as that of the George Fisher, it may be fairly assumed she would have gone from half a knot to a knot per hour faster, without any further consumption of fuel.

These results speak for themselves, and fully bear out the favourable opinion you have always expressed of this invention.

W. T. TANNER,
Secretary.
De Bay's Patent Direct-acting Propeller Company, Limited,
14, St. Mary Axe, London, May 25th.

THE EDUCATION OF ENGINEERS.

SIR,—I notice a slight error in my letter on the "Education of Engineers," which you inserted in your last issue. Mechanical engineers are trained up for the profession in the Ecole Centrale des Arts et Manufactures, not the Ecole Centrale des Arts et Métiers as I have written it. This mistake, though unimportant, might perhaps mislead some of your readers, as the latter title is given more especially to the schools of Angers and Châlons, which were founded for the purpose of educating chiefly foremen and making first-class workmen. ED. GOBERT.

COLD AIR MACHINES.

SIR,—By his letter to you on this subject last week, it would appear that Mr. J. J. Coleman has rather misapprehended that portion of your article on our dry air refrigerator relating to the question of speeds, and I should therefore like, with your permission, to draw his attention to the point which I think was intended by you to be recognised, though, I trust, Sir, that if I do not properly interpret your meaning I may be corrected.

In that article it is stated:—"It is a new thing that a cold air machine may be run at any speed from 32 to 120 revolutions per minute;" but instead of observing the two limits of variation in speed here mentioned, which, so far as I understand, you gave in order to show the correctness of the disposition of the various cylinders as regards turning moments on the crank shaft, Mr. Coleman seems to have simply noticed the maximum velocity. The machine you referred to has a stroke of 15in., against, I believe, 12in. in machines of about similar capacity made by the Bell-Coleman Company, and it can be and often has been run for considerable periods at 140 revolutions per minute, equivalent to a piston speed of 350ft., and it can be worked as slow as 70ft. per minute, at which speed the revolution of the shaft is accomplished without any of that "hitching" motion, which is only too visible in many other refrigerators, even when running at a very much higher rate.

With the machines we are now making for the Peninsular and Oriental Steam Navigation Company, though they are designed to carry out their full duty at about 100 revolutions per minute, I anticipate that we shall be able to get a speed of from 30 up to 150 or 160 revolutions per minute, and to run them between these limits safely and smoothly without excessive noise, and with small fly-wheels. If Mr. Coleman can do this with his machines, I am confident that many of his friends will be pleased to hear it.

Respecting the compression cylinder suction valves, I think it must surely be admitted by every engineer that with no system of valves, dependent to a large extent on springs, or upon their own weight for bringing them to their seats, can the cylinder, when taking its supply, be kept full of air at atmospheric pressure—otherwise how could the valves be kept open? Certainly on all the indicator cards from compression cylinders of the Bell-Coleman machines that I have seen there has been a most unmistakeable partial vacuum all through the inlet stroke. With the cam arrangement adopted in my refrigerators this of course never takes place, the surface of the cam is profiled according to the piston speed during half a revolution, and in the hundreds of diagrams we have taken from compression cylinders fed on this plan, at speeds from 30 to 140 revolutions per minute, in not one single case has even the slightest vacuum been shown, except just at the first opening of the valve, when, as may be seen by reference to the diagram published by you the week before last, a small lip appears below the atmospheric line for an instant.

In conclusion I may say that my machine was designed not only as Mr. Coleman states, "to do away with the nuisance of snow produced by other machines," but to practically avoid the formation of snow altogether, and to accomplish this without the necessity of having anything to do with the cold air after it has once been discharged from the expansion cylinder, and without the introduction of ranges of pipes and cooling surfaces of very considerable weight, and occupying much valuable space on shipboard exterior to the refrigerating machine itself. Whether I have been successful in producing such a machine, is a question I am quite willing to leave to the public for decision.

I must apologise for trespassing on your space with what I fear can at best only claim to be a personal matter. T. B. LIGHTFOOT.

Dartford Ironworks, Dartford, Kent.
May 23rd.

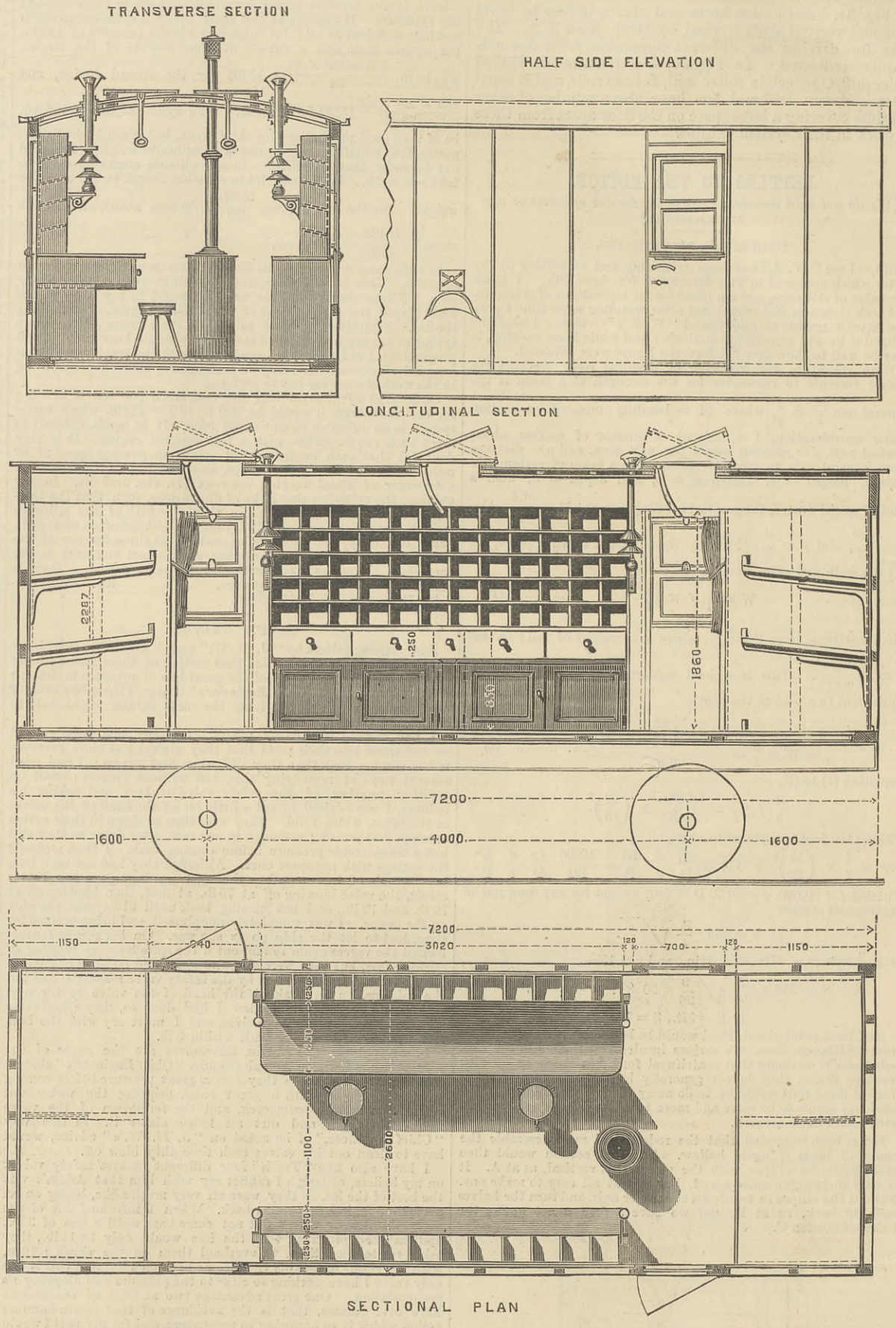
[Mr. Lightfoot has accurately interpreted our meaning.—ED. E.]

SEA VIEW PIER.

SIR,—I have read with great interest the letter of your correspondent Mr. Edwin W. de Rusett, in your issue of the 20th. This week I see the engineer, Mr. Frank Caws, has very kindly pointed out some slight inaccuracy in that gentleman's letter. If Mr. Caws could furnish your readers with drawings, and a descriptive account of his work, through your valuable paper, he would, I am sure, confer a great favour on those who, like myself, are unable to examine the structure itself. Before Mr. Rusett's letter appeared I had heard this work spoken of as having a very light and elegant appearance, I trust, therefore, we may be favoured with a full description. ENGINEERING DRAUGHTSMAN.

NAVAL ENGINEER APPOINTMENT.—The following appointment has been made at the Admiralty:—George A. Haddy, engineer, to the Hector, vice Brown.

CONTRACTS OPEN.—POST-OFFICE VANS FOR SPAIN.



CONTRACTS OPEN.

POST OFFICE VANS FOR THE SPANISH GOVERNMENT.

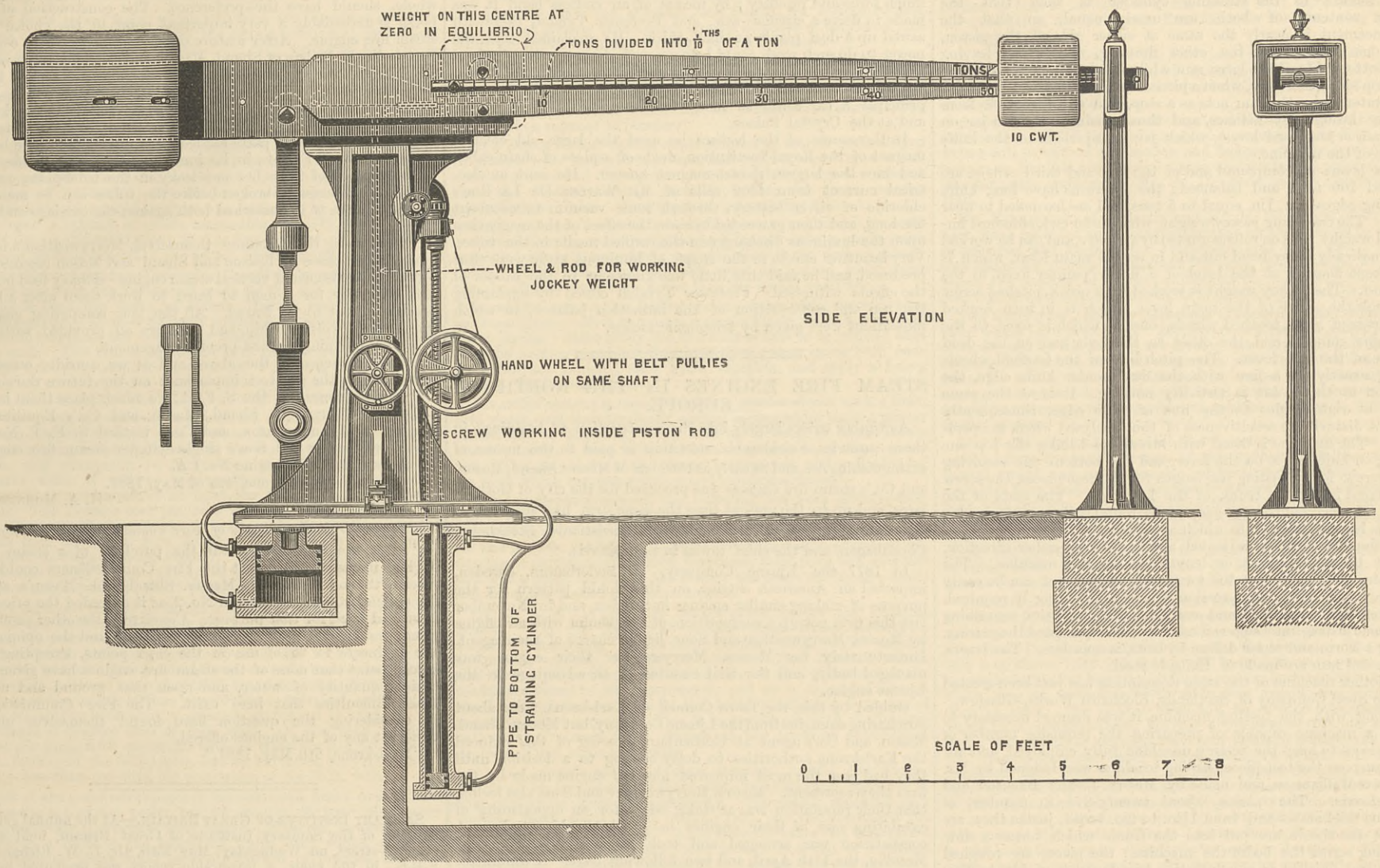
THE Direction General of Posts and Telegraphs, Spain, asks for tenders for twelve post-office vans, the construction of which is illustrated by the accompanying engravings. The specification is very meagre. It states that all the materials used shall be of the best quality and exempt from all defects. The planks must all have been sawn for at least two years before they are used. The framing is to be of wrought iron, and also the wheels and axles. The tires and the springs, both carrying and traction, are to be of the best steel. In the construction the contractor is to be guided by the designs furnished by the Chemin du fer du Nord, as that line will keep the vans in order. The heights of the vans and their wheel bases shall all be identical with those of the post-office vans used by the French company. The framing of the body is to be in oak, and the roof and lining panelling in pine, painted in imitation of the natural wood and varnished; outside the vans are to be painted cherry colour. The vans are each to be fitted with four lamps to a pattern which will be supplied. The arrangement of the interior is shown by our engraving.

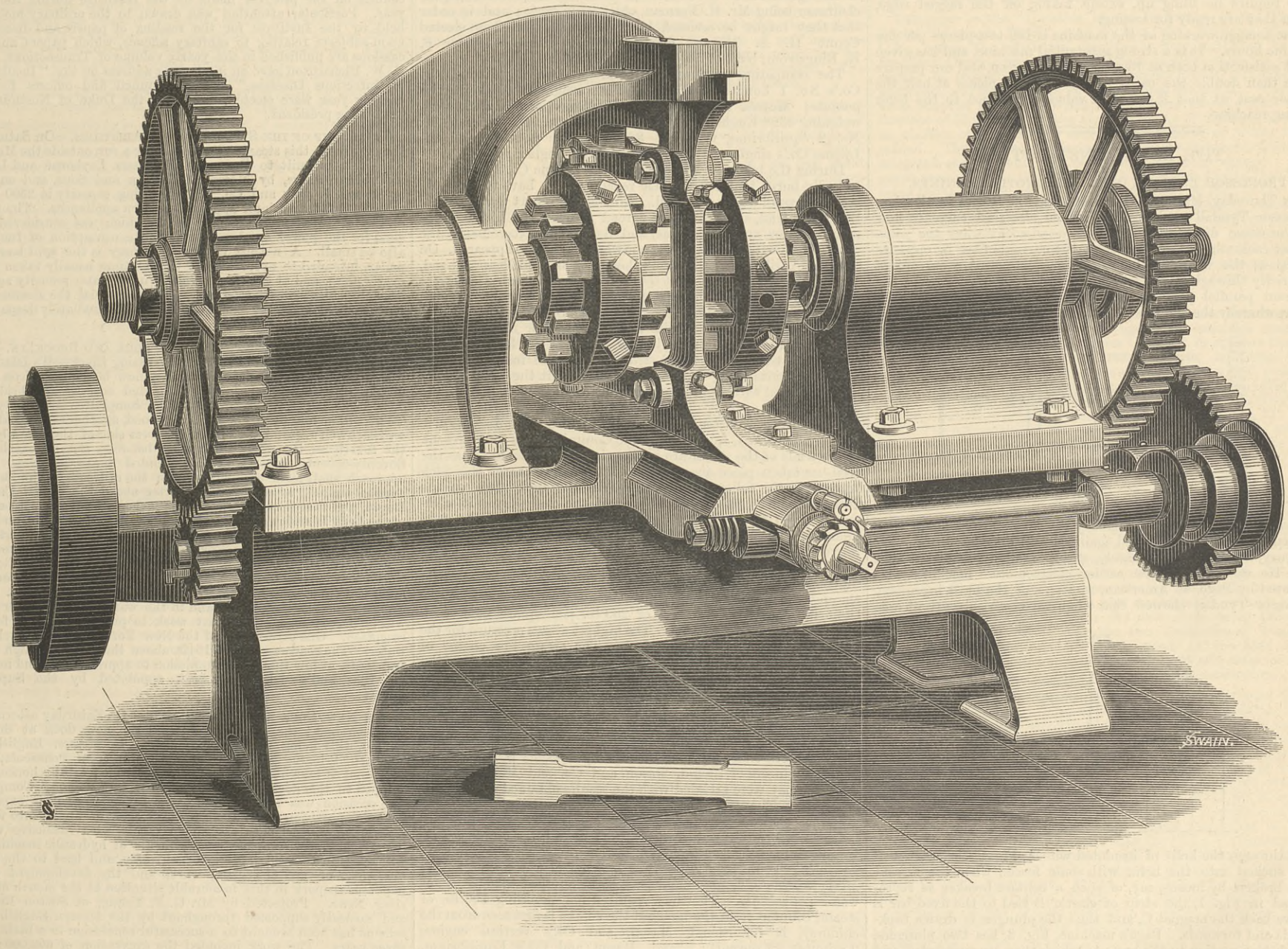
The wagons are to be delivered carriage paid at the railway station at Irun; the duty will be paid by the Spanish Government. Six wagons will be paid for by a Treasury order during the next financial year; two will be paid for in September, 1883; two in September, 1884, and the two last in September, 1885.

Tenders are to be sent in in sealed envelopes to the Director-General of Postes and Telegraphs, 10, Rue de Carretas, Madrid, on or before the 6th of June, and the tenders must be in the following shape:—"Le soussigné m'engage à livrer à la Direction Générale des Postes et des Télégraphes, en gare d'Irun, douze wagons poste, conformément à toutes les conditions énumérées dans le Mémoire publié par la Gazette de Madrid du 22 Avril, 1881, au prix de — — pesetas chaque wagon, et en vue de garantir ma proposition, présente le document ci-joint faisant foi d'avoir déposé le cautionnement de six mille pésétas, exigé par la 24 condition du Memoire." The 24th clause stipulates for the deposit of 6000 pesetas as caution money for the fulfilment of the contract. The peseta is worth 9½d

FIFTY-TON TESTING MACHINES.

DESIGNED BY MR. THOS. WILLIAMSON AND MADE BY MESSRS. WESTRAY, COPELAND, & CO., ENGINEERS, BARROW-IN-FURNESS, FOR THE STEEL COMPANY OF SCOTLAND.





In order to meet the increasing demand for mild steel ship and boiler plates, and also to carry out the requisite tests—tensile—specified by the Admiralty, Board of Trade, Lloyd's and Liverpool Registry, Bureau Veritas, &c., the Steel Company of Scotland found it necessary to have a machine capable of getting through a great number of tensile tests in a comparatively short time with precision and accuracy, and also to save the delay and inconvenience to which shipbuilders and boiler-makers were subjected when the materials had to be tested at their own yards.

Through the inefficiency of the hand-moved machine at the Works, the machine we illustrate was designed by Mr. Thomas Williamson, works manager to the Steel Company of Scotland, and was made by Messrs. Westray, Copeland, and Co., of Barrow-in-Furness. It has been in use for about two and a-half years, and has been found to fulfil all the requirements in a satisfactory manner. The average number of tensile tests, for several months' actual work, was 90 per day of nine hours, or 10 per hour, and the machine is capable of breaking one test piece every two minutes with perfectly accurate results, whence it becomes a question of measuring, checking, calculating, and reducing the strains per square inch, &c., in order to keep pace with the work of the machine. The labour has been reduced by one half, while the work done has been increased about two-thirds per day, thus effecting a great saving in time and labour.

The machine is driven by two hydraulic rams, the small one for forcing and the large one straining. The small forcing ram—pump—is worked by a screw driven by worm gear and strap by

power from line shafting, which arrangement gives a steady flow of pressure in the large cylinder, and does away with the objectionable intermittent reciprocating action of the ordinary plunger pumps, which may affect the real accuracy of a test when strain nas gone beyond the limit of elasticity. The capacity of the forcing to the straining cylinder is such that the cubic contents of both are nearly equal, so that the displacement is nearly the same at either side of the piston, the one forcing and the other drawing, the water leaving the bottom side of the large ram while it is being forced down on the top side; therefore, when a piece is being tested and it breaks, the water under the ram acts as a stop, and so prevents it from falling through any distance, and thus causing a sudden jar on the ram or steelyard levers, which jar is injurious to the knife edges of the machine.

The levers are compound and of the first and third orders, are graded 100 to 1 and balanced; the fulcrums have long knife bearing edges, viz., 1in. equal to 5 tons, and are hardened to wear well. The travelling jockey weight, which is 10 cwt. standard imperial weight, runs on rollers guided by a groove, and can be worked automatically or by hand out and in on the main lever, which is just kept floating at the level of a finger pointer fixed to the column. The jockey weight is worked by a quick pitched screw through the centre of the main lever, which is in turn worked by a pair of small toothed wheels, one of which is fixed to the machine column, and the other to the lever and on the dead centre of the first lever. The pitch line of the toothed wheels being exactly in a line with the dead centre knife edge, the motion at this point is virtually nothing. It is at the same time at right angles to the line of knife edge, consequently cannot disturb the sensitiveness of the steelyard when in operation. The machine is fitted with strong steel links, the top one being on knife edges on the lever, and the bottom one receiving the screw for adjusting the length for the test pieces, the screw is secured inside the trunk of the large ram. The ends of the links for receiving the test-pieces have round sockets with circular glands let into them, into which are fitted the tapered grips, so that the grips can be adjusted and turned in either direction, either to stand across or lengthways of the machine. The machine is specially adapted for tensile testing, but can be easily made to do either compression or bending testing if required. The machine is compact and easily got at for repairs, examining and re-adjusting knife edges; it takes up little space, and the gearing, being a worm and screw driven by belts, is noiseless. The levers, links, and ram are made of Hallside steel.

Another machine of the same description has just been erected at the Steel Company of Scotlands, Blochairn Works, Glasgow.

Along with the testing machine it was deemed necessary to have a machine capable of preparing the requisite number of test-pieces to keep the testing machine fully employed, and for this purpose the test-piece shaping machine was designed by Mr. Thomas Williamson, and made by Messrs. Joshua Buckton and Co., Leeds. The pieces, about twenty-five in number, of various thicknesses and from 1½in. to 2in. broad, justas they are cut at the shears, are put into the frame which forms a slide working across the bedof the machine; the pieces are roughed down and finished in one operation to a breadth of 1in. to ¾in.; they require no filing up, except taking off the ragged edge, when they are ready for testing.

The average working of the machine is 150 test-pieces per day of nine hours. It is a strong substantial machine, and has given great satisfaction both at Blochairn and Newton, and can prepare more than double the usual number of test-pieces at half the former cost, so that it forms a valuable adjunct to the lever testing machine.

THE ROYAL INSTITUTION.

PROFESSOR TYNDALL ON ELECTROMOTIVE ENGINES.

ON Thursday, May 19th, at a lecture at the Royal Institution, Professor Tyndall explained that when electrical currents flow in the same direction through two adjacent wires the wires attract each other, and that when the currents flow in opposite directions the wires repel each other. He sent a current of electricity through a vertical spiral of copper wire A, Fig. 1; the different parallel portions of the wire therefore attracted each other, whereby the spiral was shortened and its lower end thereby

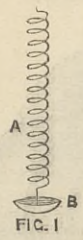


FIG. 1

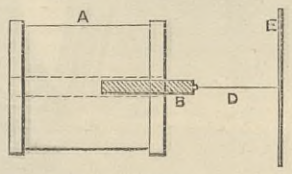
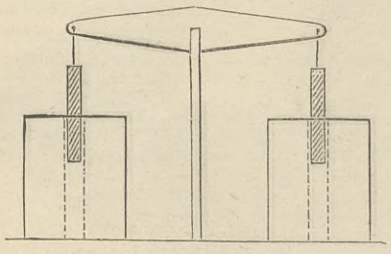


FIG. 2

raised out of the cup of mercury B. The current being thus broken, the spiral lengthened again, dipped once more into the mercury, and so on alternately, steady motion being thus kept up. He said that of the earlier electromotive machines that invented by Page, an American, was one of the most ingenious. Professor Tyndall showed that when an electrical current was

FIG. 3



sent through the helix of insulated wire A, Fig. 2, the magnet B was sucked into the helix with some force; when the current was broken by means, say, of such a contact breaker as represented in Fig. 1, the strip of elastic D tied to the fixed bar E draws back the magnet C, and thus the plunger is drawn backwards and forwards. Page's machine, Fig. 3, has two plungers, which give motion to the beam to which they are suspended, and the motion of the beam is, by means of a crank and fly-wheel, applied to the performance of mechanical work.

The lecturer said that electro-magnetic engines were useful for fine work, requiring little power, but were costly, because the zinc used in the battery was a far more expensive source of power than coal. Of late years, however, by means of improvements in magneto-electric machines, mechanical power obtained from steam could be transferred into electricity, so that the production of powerful currents of electricity had been much cheapened. Downstairs, he said, was a gas engine presented to the Institution by the Duke of Northumberland, and it was then driving a dynamo-electrical machine presented by Mr. C. W. Siemens, whereby a powerful current of electricity was obtained. This current he sent through the armature of another Siemens machine in the lecture theatre, and the armature rotated with much force and rapidity; by means of an endless band it was made to drive a circular saw, and Professor Tyndall therewith sawed up a deal plank an inch thick. He explained that the power to do such work could be conveyed dozens or hundreds of miles by means of a wire, and that there was very little less of energy, as compared with other vehicles of power. On the same principle a car could be made to run on rails, as at Berlin and at the Crystal Palace.

In the course of the lecture he used the large, old electro-magnet of the Royal Institution, made of a piece of chain cable, and once the largest electro-magnet known. He sent an electrical current from 4300 cells of Mr. Warren De La Rue's chloride of silver battery, through some vacuum tubes about 3ft. long, and then proceeded to show the effect of the magnetism upon the luminous discharges in the rarified media in the tubes. Very beautiful effects in the shape of luminous striæ were thus produced, and he said that little was known as to the causes of the effects witnessed. Professor Tyndall closed by explaining the use and construction of the induction balance, in which indications were given by telephonic means.

STEAM FIRE ENGINES IN THE NORTH OF EUROPE.

As timber enters largely into the construction of buildings in these countries, considerable attention is paid to the means of extinguishing fire, and as early as 1862 one of Messrs. Shand, Mason, and Co.'s steam fire engines was procured for the city of Gothenburg, and up to the present time the same firm has supplied in all twenty-five steam fire engines to Christiania, Stockholm, Copenhagen, and the chief towns in Scandinavia.

In 1877 the Ljusne Company, of Soderhamm, Sweden, imported an American engine on the Gould pattern for the purpose of making similar engines in Sweden, and in November last this firm got up a competition at Stockholm with an engine by Messrs. Merryweather and Sons, left in charge of their agent. Unfortunately for Messrs. Merryweather their engine was managed badly, and ths trial resulted in an advantage to the Ljusne engine.

Guided by this, the Town Council of Karlskrona were about purchasing an engine from the Ljusne Company, but Messrs. Shand, Mason, and Co.'s agent at Gothenburg hearing of this induced the Karlskrona authorities to delay coming to a decision until they had seen the most improved form of engine made by the firm they represent. Messrs. Merryweather and Sons also feeling that their reputation was at stake, asked for an opportunity of exhibiting one of their engines in proper working order. A competition was arranged and took place at Karlskrona on Monday, the 11th April, and two following days. A committee of nine gentlemen was formed to conduct the proceedings, the chairman being Mr. H. Nerman, chief magistrate; and in order that they might be assisted by scientific advice, they elected Count H. A. Mörner, marine engineer; and engineer F. H. Ringström, both of the Royal Dockyard, as judges.

The competing engines were:—Messrs. Shand, Mason, and Co.'s No. 1 London Brigade vertical, weighing 3108 English pounds; Messrs. Merryweather and Sons' single horizontal, weighing 3328 English pounds; Messrs. Shand, Mason, and Co., No. 2 equilibrium, weighing 3615 English pounds; and the Ljusne Co.'s single vertical, weighing 4214 English pounds.

During the trials on the first day the Ljusne Co.'s boiler was so badly burnt that considerable repairs would have to be made before it could again be used. No official report was given of that day's trial, since the town agreed to allow the Ljusne Company to enter another engine, and decided to recommence the competition with a new programme when the engine appeared. On the 12th April, Messrs. Merryweather and Sons and Messrs. Shand, Mason, and Co.'s engines went through the test of finding how great a quantity of water their respective engines could deliver through a double line of 2¾in. hose to a distance of 1000ft. with an elevation of about 50ft.; the results were accepted for the later competition and are given in the judges' report of the 4th inst. The adjourned trials were concluded on the 2nd inst., the three London engines being the same as before; but the Ljusne Company appeared with another engine weighing 185 lb. more than the concluding former one. The following is a literal translation of the report of the committee, addressed to the Fire Commissioners:—"The undersigned, appointed by the Commissioners to be present at the trials of the steam fire engines in Karlskrona, must, as the trial has taken place according to the programme of the 24th April, give the following report:—The trial took place on the 26th, 27th, 28th, 29th, 30th April, and the 2nd May. It comprised the 1st, 2nd, 3rd, 6th, 7th, and 8th trials of the programme. The boilers of Shand, Mason, and Co.'s two S. F. E. proved tight for the water test of 240 lb. per square inch, which they were subjected to. The highest steam pressure permitted under the following trials was fixed at 160 lb. per square inch, or as the engineer had appointed:—The boiler of the Ljusne S. F. E. was tight for the water pressure of 200 lb. per square inch, with which it was said to be tried. The highest steam pressure for the boiler was 133 lb. per square inch. The steam fire engine of Merryweather had the boiler leaking on the first trial; one of the screw bolts in the top joint was taken out, and after being set in order a new test was made, when the water pressure was raised to 200 lb. per square inch, and the boiler was found to be tight. The engine is, therefore, authorised to work with the highest steam pressure given by the engineers, or 133 lb. per square inch.

"The sixth trial was gone through by Ljusne's S. F. E. alone, as the engineers of Shand, Mason, and Co. and Merryweather, declared they were satisfied with the results obtained on the 12th of April. The trial gone through, as directed in the programme, showed that Shand, Mason and Co.'s S. F. E. No. 1 pumped 479 cans of water per minute; Shand, Mason, and Co.'s Equilibrium No. 2 pumped 604 cans of water per minute; Ljusne's S. F. E. No. 4 A pumped 436 cans of water per minute; Merryweather's single-cylinder S. F. E. pumped 356 cans of water per minute. The time required for obtaining 100 lb. of steam, counted from the moment the smoke is first seen from the chimney, is for Shand, Mason, and Co.'s vertical engine, 9 minutes 35 seconds; Shand, Mason, and Co.'s Equilibrium, 9 minutes 42 seconds; Ljusne's S. F. E., 9 minutes 48 seconds; Merryweather's S. F. E. 14 minutes 25 seconds. The state of the wind during the third trial has made it impossible to decide, on account of the results obtained, how far, or to what extent, the competitors surpass one another; and, again, the seventh trial places them in the following order:—No. 1 Equilibrium of Shand, Mason, and Co.; No. 2, Ljusne S. F. E.; No. 3, Shand and Mason's vertical S. F. E.; No. 4, Merryweather's S. F. E., as No. 1 obtained a jet of 166ft. in length and 112ft. in height, No. 2 obtained a jet of 130ft. in length and 85ft. in height, No. 3 obtained a jet of 124ft. in length and 78ft. in height, and No. 4 obtained a jet of 117ft. in length and 74ft. in height.

"These differences alone appearing at the trials of the different types of steam fire engines does not appear to be satisfactory, and prevents us being able to decide which of the engines, on the whole, should have the preference. The construction of the boiler is undeniably a very important point in the choice of a steam fire engine. After mature consideration we must confess that both the boilers of Shand, Mason, and Co., offer the greatest advantages. Simple and easily repaired, they have proved to be very strong and good. The boiler of Merryweather's is not, on account of the form of part of its tubes, so easy for the workmen here to repair as the former ones. The strength of the materials appears also in certain parts reduced to a minimum. The boiler of the Ljusne S. F. E. is, in its inner parts, so inaccessible, that in case the set of tubes becomes leaky in the tube-plate, one or several joints must be broken before the tubes can be mended. There is much to be remarked both against the carriage and the boiler.

"Concerning the machines themselves, Merryweather's is the most simple, those of Ljusne and Shand and Mason resemble in construction the usual vertical steam engine—donkey feed pump. Any difficulty for a man to learn to work them after a little practice is not to be feared. All the four competing engines show careful workmanship, and they are all provided with the necessary warming or frost-proof arrangement.

"In consequence of the above, and as we consider ourselves bound to put the greatest importance on the future durability and serviceableness of the S. F. E., we must place them in the following order:—(1) Shand, Mason, and Co.'s Equilibrium No. 2; (2) Shand, Mason, and Co.'s vertical S. F. E. No. 1; (3) Merryweather and Son's single-cylinder steam fire engine; (4) Ljusne steam fire engine No. 4 A.

"Karlskrona, 4th of May, 1881.

"F. H. Ringström. "H. A. MORNER."

Extract from the Minutes of Fire Commissioners' Meeting.

"After the discussion about the purchase of a steam fire-engine, it was decided that the Fire Commissioners could not receive the offer to buy Messrs. Shand and Mason's steam fire engine, called Equilibrium No. 2, as it exceeded the price the town had fixed for that purpose. Concerning the other proffered steam fire engines, the Commissioners have found the opinion of the engineers to be of use in the chief points, excepting the special point that none of the steam fire engines have given the desired quantity of water, and upon that ground and under other difficulties that here exist. The Fire Commissioners in considering the question have found themselves unable to accept any of the engines offered."

"Karlskrona, 5th May, 1881."

SANITARY INSTITUTE OF GREAT BRITAIN.—At the annual general meeting of the Sanitary Institute of Great Britain, held at 9, Conduit-street, on Wednesday, May 25th, Dr. B. W. Richardson, F.R.S., in the chair, a favourable report was presented by the council on the progress made by the Institute during the past year. Particular attention was drawn to the ordinary meetings held by the Institute for the reading of papers and discussion upon subjects relating to sanitary science, which papers and discussions are published in the yearly volume of Transactions. Dr. B. W. Richardson gave an interesting address on the "Incubation of Infectious Diseases," and the council and officers for the ensuing year were elected, his Grace the Duke of Northumberland being president.

TRIAL TRIP OF THE STEEL STEAMER ARISTIDES.—On Saturday, the 21st inst., this steamer was taken for a run outside the Mersey. She has been built to the order of Messrs. Layborne and Legge, steamship owners, by Messrs. T. Royden and Sons, and engined by Messrs. J. Jack and Co. Her carrying capacity is 2300 tons, and she is fitted with all approved modern appliances. The speed on the measured mile was 10½ knots, which was considered very good for the power employed; and the consumption of fuel will also be small. A novelty in her machinery is the split boss propeller, intended to overcome the loss of time usually taken up in overhauling, and at the same time giving greater security against becoming loose while working. After the trial the steamer was placed on her berth for loading, and will be immediately despatched to Rangoon.

A SECOND BRIDGE BETWEEN NEW YORK AND BROOKLYN.—The bridge from New York to Brooklyn, crossing Blackwell's Island, is under contract, and the contractors are now busy on the iron work of the pier foundations. The estimated cost of the bridge is 5,000,000 dols.; the time fixed for its completion is three years. There will be four piers, one at Ravenswood, another at the coal dock on Blackwell's Island, a third on the west side of the Island, and the fourth on the New York side, between Seventy-sixth and Seventy-seventh streets. It is intended that the New York approach shall form a junction with the railroads in the Fourth-avenue tunnel, a mile and a-quarter above the Grand Central Depôt, and that the Long Island approach shall connect with a spur of the Long Island railroad. The bridge will be 74ft. wide, and will be arranged for two side-walks, two carriage-ways, and two railway tracks. The span over the water from Ravenswood to Blackwell's Island will be 618ft., that across the island 700ft., and that over the river to New York 734ft. Each pier will rest on bed rock, the dip of whose strata at all points is nearly vertical. The Ravenswood pier only will stand in the water, and a coffer dam will be placed in position next week to prepare the rock for its reception. One corner only of the New York pier will touch the water. The roadway will be 154ft. above the river at high tide, and 160ft. at low tide. A commission to appraise the land needed on Blackwell's Island has been appointed by the Supreme Court.

THE NEW DOCK AT SUTTON BRIDGE.—On Saturday afternoon, the 14th inst., the first ship entered the new dock at Sutton Bridge, this being the Garland, owned by Messrs. English, of Wisbech, bringing 1150 tons of pitch pine from Pensacola, and chartered to take out a cargo of the coal which will be henceforth shipped to this dock by the Great Northern Railway Company. The occasion was made one of great rejoicing, as it is expected that this provision of a fine dock of 13 acres of water, into which a vessel of 450ft. length can steam direct, with extensive warehouses, and very complete arrangements of hydraulic machinery, will open up a considerable internal traffic, and lead to the establishment of manufacturing works and the development of a populous seaport in this favourable situation at the mouth of the river Nene. Projected by Mr. G. F. Yonng, of Sutton Bridge, and earnestly supported throughout by the Messrs. English, the scheme has been brought to a successful conclusion in a little over three years. The work included the excavation of 600,000 cubic yards of soil, and the use of 32,000 cubic yards of cement concrete, one million and a-half of bricks, and 150,000 cubic feet of pitch pine and Memel timber. Each of the four lock-gates has a weight of 35 tons, and a 50-horse power steam engine works tbe Armstrong hydraulic apparatus. The storage ground is 70 acres with railway connecting the docks with the Great Northern and Midland Railway Company's lines. The engineers are Messrs. Brunlees and M'Kerrow, Mr. Herbert Neal, C.E., being the resident engineer. The works have been executed by Messrs. Benton and Woodiwiss, of Derby, and carried out under the superintendence of their agent, Mr. Philip Ayres.

RAILWAY MATTERS.

THE Select Committee of the House of Lords has thrown out that portion of the Metropolitan District Railway Bill which recently passed the House of Commons, authorising the company to extend its line from Ealing to Uxbridge.

THE down mixed train, which left Perth for Inverness at three o'clock on the 23rd inst., ran off the metals between Dunphail and Dava, and before it could be pulled up, fully a mile of the permanent way had been cut up, the train going at full speed when the accident happened. All the vehicles, except the engine and tender, were off the line, and the line was blocked for several hours.

THE passenger traffic by the Paris tramways seems to indicate that this mode of travelling threatens the omnibus trade with extinction. The published accounts of the Paris Omnibus Company for the year 1880 show that the working of their 635 omnibuses resulted in a loss of 1,753,287f., but the profit made upon the tramway lines owned and worked by them was sufficient to cover that loss and leave a balance of profit amounting to 1,415,051f. Such a result can hardly come about in London, because of the impossibility of working several of the routes by tramway.

THE Wolverhampton Tramways Company begun last week to run its cars upon the Tettenhall route by the aid of steam. The engine is from the works of Messrs. Hughes and Co., Limited, Loughborough. It is completely enclosed in a wooden car about the same length as the body of a tramcar, and has a platform at each end. The fuel used is the best Lancashire coke, so that neither smoke nor sulphur are given off. The car is connected by a strong rod about a yard in length. The journeys will be made in about half the time which would be occupied with horse-power.

IN recording the opening on March 1st of the first section of the Eastern Railway to Guildford, Western Australia, and speaking of the attention now being directed to the completion of the line to York, and eventually to Newcastle, the *Colonies and India* remarks that if railway construction in Western Australia has not been very rapid, it at least has the advantage of being cheap. The average cost per mile incurred in building the existing railways in Western Australia has been £5600; in New Zealand it has been £7437; in New South Wales, £16,579; in Victoria, £19,658; in Cape Colony, £10,437. South Australia is the only Australian colony whose railways have cost less than those of her western neighbour, viz., £5328 per mile.

THE *Railroad Gazette* publishes a tabular statement of American and foreign steel rails broken in the Lehigh Valley Railway track during the year ending November 30th, 1879. On 338 miles of track laid with American steel forty-nine rails broke, and out of 73¼ miles laid with foreign steel forty-one rails broke—one out of 624 foreign rails and one out of 2453 American rails. No statement is given of the length of time any of these rails had been in the track when they broke, but a separate statement is made of the breakages of the two sizes of rails used. Of the rails weighing 58 lb. per yard, with which 229 miles of track are laid, 0·60096 per cent. broke; of the 66 lb. rails, laid on 182 miles, only 0·00017 per cent.—less than one-fifth the proportion of the 58 lb. rails.

ONE of the great advantages of an automatic brake over a non-automatic is that the power can be brought to bear much more simultaneously throughout long trains. Hitherto, however, there has been a limit to the length of trains over which even the Westinghouse brake could be easily worked in practice, and this has prevented its being as extensively used on long goods trains as it is on passenger trains in the United States. We learn that Mr. Westinghouse has recently perfected a special brake for use on such trains, and that a train of fifty long freight cars, in all over 2000ft. in length, was recently tried with most successful results. Part of the run was down an incline of 1 in 50 for eleven miles, the brake controlling the train perfectly. Fears have sometimes been expressed that the ordinary air pump was too small for such a purpose, but the result proves such doubts are groundless.

THE following items in detail of the cost of material and labour in the shop, of one of the drawing-room cars built in 1880 at the Allston shops of the Boston and Albany Railroad, and under the supervision of Mr. F. D. Adams, the general master car builder, are given by the *American Manufacturer*:—Cost of trucks: Steel axles (8) standard, weighing 2292 lb., at 0·07 dols. = 160·44 dols.; Allen paper wheels 42in., 12, at 100·00 dols., 1200·00 dols.; equalisers (8) 1225 lb., 171·50 dols.; elliptic bolster springs 2066 lb., at 9 dols., 185·94 dols.; Vose's equaliser springs 8, 85·00 dols.; brasses, standard 117 lb., at 23 dols., 26·91 dols.; channel iron 1105 lb., 36·47 dols.; pieces beam iron 4, 1·98 dols.; box covers, spring and bolts 12, 26 dols., 3·12; wrought washers and nuts, 4·70; wrought iron 2999 lb., 77·00 dols.; brake springs (8), 57 lb., at 6c. = 3·42 dols.; ⅝in. chain 108, 5¼c., 5·67 dols.; screws, 0·23 dols.; rubber tubing 16ft., 0·75 dols.; castings 3476 lb., at 3 dols., 104·28 dols.; pine lumber 6ft., 0·18 dols.; oak 868ft. at 25·00 dols., 21·70 dols.; paint stock, 5·00 dols.; labour and freight on wheels and machine shop bill, 43·60 dols.; labour on trucks, 125 dols.; total, 2262·89 dols. or £452 11s.

PROGRESS is being made with the construction of the new Hull and Barnsley Railway in the South Yorkshire district, although short time has elapsed since the contractors obtained possession of the land. A good deal of work has been done in connection with the tunnel at Bearwell Hill, between Brierley and Hansworth. The course of the line has been staked out in the Cudworth district, and a junction formed with the Midland main line, almost opposite to the Charlton Main Colliery, so as to enable the contractors to run their stores over a temporary line to Brierley, if not to South Kirby, where a second tunnel will have to be constructed. The extension of a short but important line, belonging to the Manchester, Sheffield, and Lincolnshire Railway Company, is going on rapidly near Barnsley. The new addition is an extension of the Barnsley coal railway, which at present only extends to Lee-lane, in the township of Roystone, but which is being constructed to join the Great Northern line at Westel, near Wakefield. This will enable the Manchester, Sheffield, and Lincolnshire Railway Company to run both mineral and passenger trains from Wombwell and other parts of the South Yorkshire coalfield to Leeds and the West Riding by an almost direct route over the branch which joins the Doncaster line at Stairfoot, where improvements are being made in order to facilitate the traffic.

THE Portskewett pier, which has been in use 16 years as a means of direct communication between Bristol and the whole of South Wales, was destroyed by fire early on Monday morning under circumstances which lead to the suspicion that the disaster was the work of an incendiary. The river at the point known as the New Passage is two and a-half miles broad, and by a ferry service of steamers not only the passager, but the heavy goods traffic of the Great Western Railway system is carried through from the Gloucestershire side to Portskewett on the Monmouthshire side, and thence into South Wales. The pier at Portskewett is between 200 and 300 yards long, and stands between 60ft. and 70ft. above the bed of the river. Three hundred men struck work on Saturday at the tunnel works, close to the pier, but there is no evidence yet of a connection between the two events. Inspector Tanner, rousing two of his men, hastened to the pier, and, as the wind was blowing the flames clear of one side, he daringly tried to get through to the pier head to try to save the pontoon and engine. The men refused to follow him, but Inspector Tanner's bold effort succeeded. By using the fire buckets, he prevented the flames reaching the pontoon moored off the pier-head, and alone worth about £1000. The fire at the pier-head was prevented extending further than the two tow stages, but an engine, two boilers, the heavy lifting apparatus and cranes fell into the river. The damage amounts to several thousand pounds, and the young night watchman was so seriously burned that he has since died. As the piles below water are uninjured, it is thought that a pier can be constructed in a month which will enable traffic to be reopened.

NOTES AND MEMORANDA.

AN increase in the quantity of the fulminating charge has been recommended as a means of avoiding the necessity for thawing dynamite cartridges.

A COMPETITOR in the Spence's metal field is made by M. Potel, and consists of gelatine, glycerine, and tannin, for sealing bottles, &c., and for making ornamental articles sulphate of baryta or zinc white are added with any ordinary colouring matter.

THE *American Machinist* says:—"A Dresden man has made a good lubricant for shafts by mixing the whites of eggs with the finest graphite powder, until of the consistency of firm dough. This is kept in boiling water till the whole is coagulated. The mass is then reduced to powder."

AT a Berlin feather-dyeing establishment an ostrich feather dyed in shades with methyl-violet was laid upon a paper upon which some ammonia had been poured but had dried up again. After a time the feather became partially green, the green passing gradually into violet. That reaction is now being utilised.

FOR a material somewhat resembling ivory, and useful for some ornamental work, make isinglass and brandy into a paste, with powdered eggshell, very finely ground. Give it any desired colour. Oil the moulds into which the paste must be poured, which must then be slightly warmed. Leave it in the mould until dry.

TO make a cement for joining gutta-percha belts, the following has been given:—Melt two parts common black pitch to one part gutta-percha. Make ready the two ends of belt to be joined; heat them by holding a red-hot iron over them; then smear both ends with the hot cement; stick them together, and apply a heavy pressure for several hours.

JAPANESE cement is made by mixing powdered rice with a little cold water, and then gradually adding boiling water until a proper consistence is acquired, being careful to keep it continuously stirred; lastly, it must be boiled for one minute in a clean saucepan. This glue is white and almost transparent, and well adapted for work which requires a strong and colourless cement.

FOR a waterproof cement, the following has been given:—Boil 1 lb. of best glue in two quarts skimmed milk instead of water. This will be proof against damp or moisture. Another good cement for this purpose is made by boiling a pound in weight of linseed oil, stirring in quicklime till a good thickness, then pour out on a flat slab or tin plate, keeping in the shade; the cakes will become hard, and are easily melted like common glue.

DR. J. E. MILLS recently read a paper before the Physical Society "On the Ascent of Hollow Glass Bulbs through a Liquid." According to his experiments, these bulbs rapidly acquired a uniform velocity of ascent. The time of ascent was found proportional to the square of the diameter of the containing vessel in his experiments, and as it depended also on the density of the contents of the bulb, it afforded a means of measuring that property. This is in accordance with the investigations of Professor G. G. Stokes on the terminal velocities of drops of liquid in air and water.

AN old electric motor is thus described in the *Engineering News*:—"In the year 1839 there was a printing press operated in this city—New York—by electricity. The motor consisted of a working beam about 4ft. in length; from one end descended the connecting-rod to the crank. A rod from the other end terminated in a soft piece of iron, which fitted loosely in a coil of insulated copper wire. The battery consisted of a trough of wood about 3ft. long, 2ft. wide, and 1ft. deep, and was hung with alternate sheets of copper and zinc. These were arranged so that they could be raised from the bath of dilute sulphuric acid when the machine was idle. When the current was on the piece of soft iron was drawn into the coil, the current was then broken, when the fly-wheel carried the rod until the current was again engaged. The extreme end of the working beam would lift about 130 lb."

AT the Observatory of Campidoglio Prof. Respighi has been lately conducting a series of experiments for the determination of gravity. The data are not as yet fully reduced, but the author has described his method—*Atti della R. Acc. dei Lincei*, vol. v. fasc. 5—which consists in the use of a pendulum with a lead ball about 9½ kg. in weight, and a steel wire 0·6 mm. in diameter; a sharp iron point at the extremity dips in mercury each oscillation, so as to give passage to the current of a chronograph. Five different lengths of pendulum were used, between 7·90 m. and 5·16 m.; and with all these lengths the pendulum, on account of its weight, the fineness of the wire, and the convenient mode of suspension, proved independent of the rotatory motion of the earth, presenting Foucault's well-known phenomenon—an essential condition, in the author's opinion, but not verified in Borda's or Bessel's apparatus. The number and duration of the oscillations were registered by the chronograph with greater exactness, says *Nature*, than is attainable by the method of coincidence.

IN his report on an explosion at a gunpowder factory at Haverthwaite, in March last, Major Majendie says, with respect to a suggestion that an explosion could hardly be brought about with a wooden tool, "that the explosion at the Herodsfoot factory was undoubtedly so caused, the man who had caused it having lived long enough to state plainly and emphatically more than once that he caused it with his wooden mallet in breaking up the press cake. At Bassinghyll Gunpowder Factory, on the 12th October, 1875, two men where removing indurated powder from a mill bed by striking it with a wooden mallet, and it exploded and killed them; and at Gatebeck, on the 2nd June, 1877, a precisely similar accident, attended with the loss of one life, occurred. At the Lindal Moor Mine a charge of gunpowder was exploded while a man was forcing it into a hole in ironstone with a wooden mallet. A formidable explosion which occurred at the Royal Gunpowder Mills, Wetteren, in Belgium, on the 29th May, 1880, is attributed in the official report to a man dragging a wooden vessel full of powder over a powder-begrimed floor." This last accident was not, however, we should think, due to a blow with a piece of wood, but was apparently due to friction.

AT a recent meeting of the Royal Society a paper on "The Influence of Stress and Strain on the Action of Physical Forces" was read by Prof. W. Grylls Adams, M.A., F.R.S. It was Part I., and related to elasticity: "Young's Modulus." A large number of experiments with different loads were made, and after many unsuccessful attempts to account for certain discrepancies which could not be explained away as errors of observation, the following facts were elicited:—(1) After a wire has suffered permanent extension, the temporary elongation which can be produced by any load becomes less as the interval between the period of permanent extension and that of applying the load becomes greater. (2) This increase of elasticity is greater in proportion for large loads than for small ones. (3) The increase of elasticity takes place whether the wire be allowed to remain loaded or unloaded between the period of permanent extension and that of the testing for the elasticity. (4) The rate of increase of elasticity varies considerably with different metals; with some the maximum elasticity is apparently attained in a few minutes, and with others not till some days have elapsed, iron and steel being in this last respect very remarkable. (5) The elasticity can also be increased by heavily loading and unloading several times, the rate of increase diminishing with each loading and unloading. (6) A departure from "Hooke's law" more or less decided always attends recent permanent extension, even when the weights employed to test the elasticity do not exceed one-tenth of the breaking weight. (7) This departure is diminished very noticeably in the case of iron, and much less so in the case of other metals, by allowing the wire to rest for some time either loaded or unloaded; it is also diminished by repeated loading and unloading. The effect of permanent extension on the value of "Young's modulus" was tried according to the direct method for iron and copper, and indirectly for most of the metals.

MISCELLANEA.

THE Kidderminster Town Council are contemplating the purchase of the gas works from the private company which now owns them.

MESSRS. A. SHIRLAW AND CO., of Broad-srreet, Birmingham, inform us that in addition to a first award they have obtained a silver medal at the Melbourne Exhibition for their screwing tackle and engineers' tools.

A MEDAL and diploma of the first class has, we understand, been awarded to Mr. John Spencer, of Spon-lane, West Bromwich, for his collection of gas and water tubes and fittings exhibited by him at the Melbourne Exhibition.

A COMPETITIVE exhibition of ships' models and designs will be held in the hall of the Fishmongers' Company about May, 1882. Prizes will be offered for models and designs, and the competition is open to English and foreign naval architects and shipbuilders. The honorary secretary is Mr. A. D. Lewis, at the Fishmongers' Hall.

MR. KIRKHOUSE, of Penarth, and Mr. H. W. Lewis, of Treherhert, have patented an automatic carriage for attachment to trains in collieries and keeping the roads sprinkled with water. It is also useful for other purposes, but the chief object aimed at is to lessen the number of colliery explosions on the assumption that coal dust materially increases them in numbers and extent.

THE Employers' Liability Assurance Corporation has notified the rates which have been fixed. Employers or classes of employment of those paid by the assured are divided into six principal classes, and the premium to cover all employers' risks under the Act varies from 2s. to 7s. 6d. per £100 paid in wages per annum. The average rate at which the owner of large works could insure, so as to cover accidents to large numbers of workmen engaged in different trades, is given.

THE Bell-Coleman Mechanical Refrigeration Company has just received from the commissioners of the Sydney Exhibition a first special award and certificate for refrigerating machines. These machines have made several voyages to Australia and Calcutta and back with uniform success in keeping meat, fish, and provisions in a frozen state during the whole of the voyage, and we understand that a number of machines are being built for cooling ship's provisions, and powerful machines for meat importation from the colonies, which discharge air cooled to 50 deg. to 100 deg. below zero at the rate of 60,000 cubic feet per hour.

THERE is now under construction at the yard of Mr. John Roach, at Chester, Pa., one of the largest passenger boats ever built in America. It is, the *Railroad Gazette* says, for the Old Colony Steamboat Company, and will be called the Puritan. The vessel will cost about 1,000,000 dols., will have 300 state-rooms, and accommodation for carrying 1000 passengers; is to be 384ft. long—370ft. long at water line—87ft. wide over guards, and 17ft. 6in. deep at sides. The double hulls will be divided into ninety-six water-tight compartments, bearing a pressure of 5 lb. per square inch. Steam will be supplied from four Redfield boilers, and there will be one immense beam engine, having a cylinder 110in. in diameter, with 14ft. stroke. American papers do not, however, agree about this cylinder. The *Scientific American* gives its length as 16ft. 1½in., and the above-quoted paper, in another paragraph, gives it as 18ft.; but all give its weight at 90,000 lb. This cylinder was cast at Mr. Roach's Morgan Ironworks, in New York, and it is said to be the largest cylinder ever cast in America. The two main shafts for this engine will be wrought iron, 40ft. long and 27in. in diameter, and each will weigh 85,000 lb.

THE paper on the "Question of the Reduction of the Present Postal Telegraph Tariff," read by Mr. Price Williams, M. Inst. C.E., before the Statistical Society, is now published by Mr. Stanford, Charing-cross. Mr. Williams suggests that the charge should be reduced to sixpence for twenty words, including the addresses, and twopence for each additional five words. Were this scale adopted Mr. Price Williams calculates there would be an increase of 53 per cent. in the annual number of messages sent and an addition of only 22½ per cent. to the number of words transmitted. The net revenue derived by the Government from the telegraph service would not be affected by these charges. Telegraph messages may be sent at very small cost in Berlin, the charge being about 2½d. for a foundation charge, and 50 pfg., or say 0·6d. for every word in the message. If it pays in Berlin, where also the Rohr or blow post is available for sending letters quickly for 3½d., why should it not pay here? Mr. Williams' arguments in favour of reductions are summarised in tables and coloured diagrams, with which the author is ever able to represent graphically the dry parts of the subjects of which he seems to be the master.

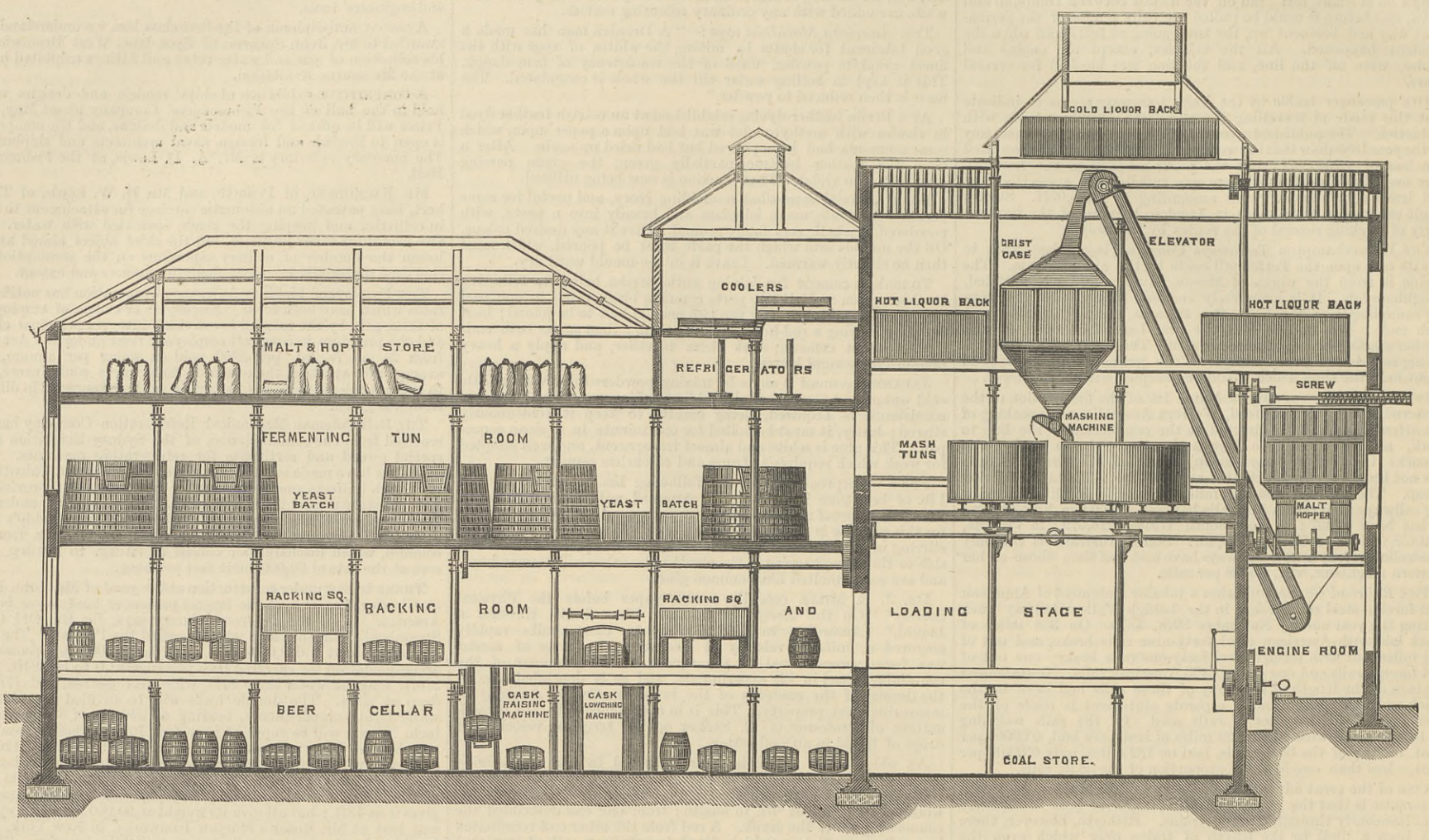
A PRELIMINARY report as to the condition of the American iron trade has been issued, founded upon the inquiries made in connection with the United States Census. It appears that the total number of iron-making establishments, including blast-furnaces, steel works, Bessemer converters, rolling and puddling mills, was as follows:—Blast-furnaces establishments, 1870, 386; 1880, 490. Blast furnaces, 1870, 574; 1880, 681. Rolling-mill, establishments, 1870, 310; 1880, 324. Steel works, 1870, 82; 1880, 118. The percentage of increase in the ten years in the total of iron and steel works was 24·38, but this does not take into consideration that the size and capacity were generally much greater in 1880 than in 1870. The capital invested in these industries was 230,671,884 dols. in 1880, against 121,772,074 dols. in 1870, or an increase of 89·68 per cent. The production of iron and steel of all kinds was 7,265,140 tons in 1880, against 3,655,215 in 1870, or an increase of 98·76 per cent. Under this head the Bessemer steel products show the most astonishing development, being 889,896 tons in 1880, against 19,403 in 1870, an increase of 4486 per cent. The geographical distribution of the iron trade in the United States has also considerably extended, twenty-five States having been engaged in the manufacture in 1870, while thirty are now occupied with it; the new areas being Colorado, Kansas, Nebraska States, and the two Territories of Utah and Wyoming. Pennsylvania, as usual, stands at the head of the ironmaking States, with a production of 3,616,668 tons for 1880, being about 49 per cent. of the whole American production.

ON the 20th ult. the census returns for Edinburgh were lodged with the Town Clerk. They show that the total population of the city is 228,075 as compared with 201,052 in 1871, being an increase of 27,023 during the past ten years. The population of Edinburgh in 1861 was 170,414. The returns for Leith show that the population of that town is 60,032, being an increase since 1871 of 14,141. The population of Hull is 153,353, an increase of 31,461 over that of 1871. Leicester has 122,351 inhabitants, or 27,131 more than it had in 1871; Preston, 96,525, or about 11,098 more than in 1871; Barrow-in-Furness, 47,093, or about 20,000 more than in 1871; Lincoln, 37,312, or 10,550 more than in 1871; Wolverhampton, 75,576, or 7297 more than in 1871; Southampton, 52,541, or 4999 more than in 1871; Burnley, 69,110, or 19,662 more than in 1871; Eastbourne, 21,510, or 11,168 more than in 1871; the Scarborough district, 30,236, or 7845 more than in 1871; Accrington, 31,340, or 9500 more than in 1871; Lancaster, 20,700, or 3455 more than in 1871; Mid-Lothian, 100,892, or 26,518 more than in 1871. The census of 1881 reveals the startling fact that a decrease in the population of rural parishes in the West of England is going on with a rapidity which threatens almost entire depopulation. Towns are becoming villages and villages hamlets, while hamlets are passing out of existence. Here are some figures:—Town or village—Bridport, population in 1871, 4643, population in 1881, 3921; Brympton, in 1871, 129, in 1881, 107; Hinton St. George, in 1871, 742, in 1881, 681; Langport, in 1871, 1018, in 1881, 896; Lopen, in 1871, 369, in 1881, 353; Merriott, in 1871, 1451, in 1881, 1375; Middle Chinnock, in 1871, 191, in 1881, 150; Mudford, in 1871, 401, in 1881, 382; Preston Plucknett, in 1871, 305, in 1881, 245; Uffculme, in 1871, 1880, in 1881, 1811.

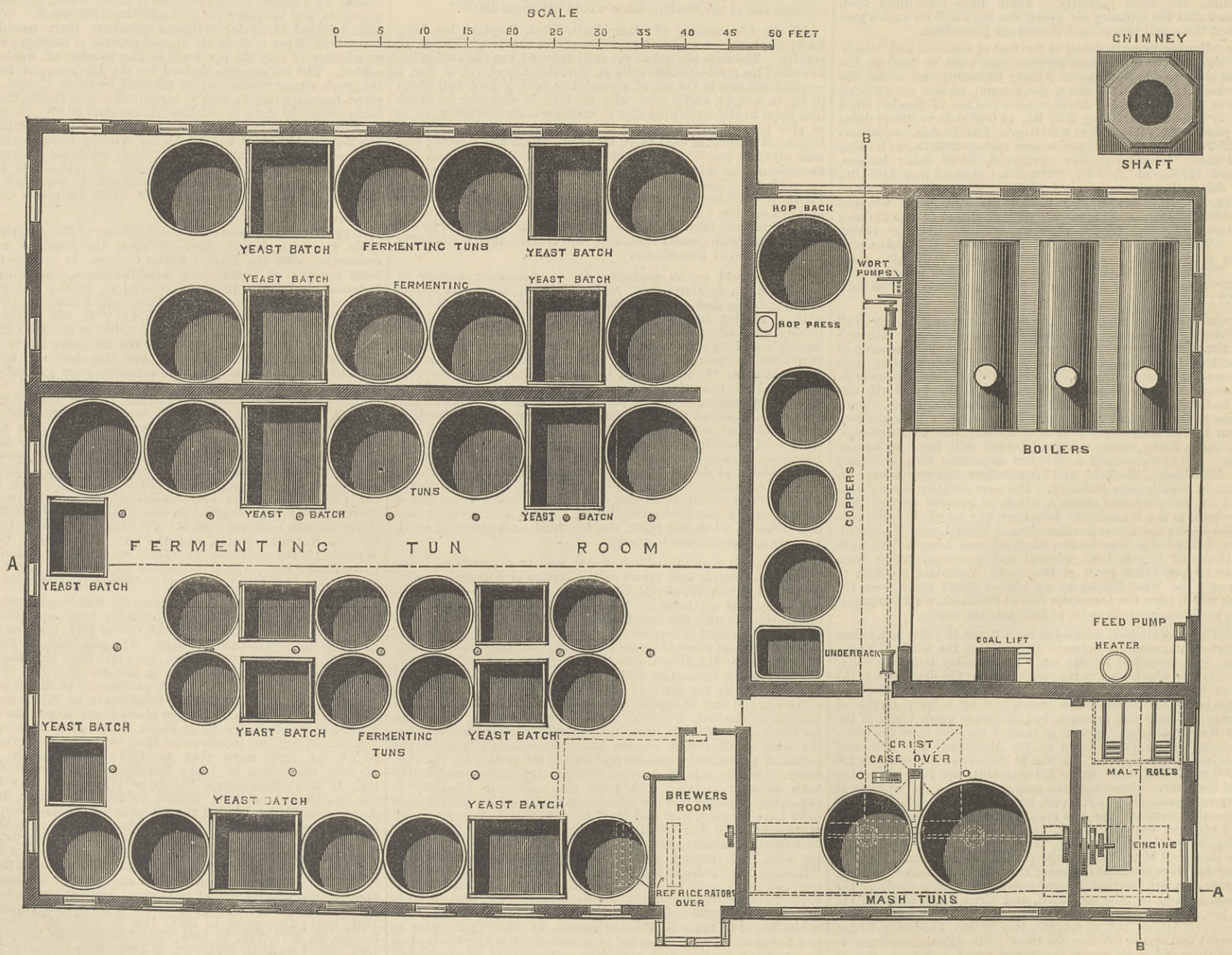
FIFTY-QUARTER BREWERY, MESSRS. ELDRIDGE, POPE AND CO., DORCHESTER.

MESSRS. SCAMELL AND COLYER, WESTMINSTER, ENGINEERS, AND MR. G. R. CRICKMAY, WEYMOUTH, ARCHITECT.

(*For description see page* 395.)



LONGITUDINAL SECTION ON LINE A. A. IN PLAN



PLAN

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.*

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

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

J. J. (Doncaster).—*The Hydraulic Engineering Company, Chester, may be able to supply what you want.*

MAQUINISTA.—*A water trap at the place indicated in your sketch would be of service. You cannot take the drainage water back to the boiler in the way you propose, as the pressure in the steam pipe will always be less than that in the boiler.*

G. W. W.—*To obtain a numerical expression for the quality of hardness, a sample of water containing carbonate of lime, or its equivalent in other hardening salts, at the rate of 1 lb. in 100,000 lb., is said to have 1 degree of hardness. To find the number of degrees of hardness you must therefore analyse for these salts.*

A. G. (Summer-street).—*For general knowledge of electrical science the best first book is, perhaps, that of Professor Ferguson, published by Messrs. Chambers; then that of Professor F. Jenkin, published by Messrs. Longmans. Mr. Culley's "Practical Hand-book," published by Longmans, deals principally with the application to telegraphy. Mr. J. E. H. Gordon's work, 2 vols.—Marston, Low, and Co.—deals with recent memoirs of original investigations.*

W. M. P. (Erith).—*You cannot treat the water in the well. You must treat it in a tank into which you would pump it from the well. If this tank is, say, 4ft. square and 4ft. deep, it would hold 400 gallons; and supposing the water to be the same as that of the chalk wells round London, it would contain 1 lb. of chalk. To separate this by deposition you would take 9 oz. of burnt lime made from soft chalk, and slake it into a hydrate by adding a little water. Put this slaked lime into the tank and gradually add at least 40 gallons of water, stirring as it is added. After this has been done and the lime mixture has stood an hour or so, you may pump the tank full, and if it is for drinking, you must let it stand, say, twelve hours; nearly the whole of the lime will then have deposited and the softened water may be drawn off. Or you may make the 40 gallons of lime water in a separate tank, allow the lime to settle, and then run the lime water into 320 gallons of the hard water in the large tank. In this way the large tank will not so often need clearing of deposit, most of it being in the small tank.*

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MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, May 31st, at 8 p.m.: Paper to be read and discussed, "The Production of Paraffine and Paraffine Oil," by Mr. Richard Henry Brunton, M. Inst. C.E.

CHEMICAL SOCIETY.—Thursday, June 2nd, at 8 p.m.: "On the Saponification of Fatty Oils and Waxes," by Messrs. A. H. Allen and W. Thomson, "On the Sulphides of Copper and a Determination of their Molecular Weight," by Mr. E. Spencer Pickering.

DEATH.

On the 20th inst., at 37, Hamilton-terrace, N.W., after an illness of six months, RICHARD JAMES WARD, C.E.

THE ENGINEER.

MAY 27, 1881.

THE VALUE OF STEAM JACKETS.

IF it were possible to construct a steam engine with a cylinder, piston, piston rods, &c., of perfectly non-conducting material, and if compression at each end of the stroke sufficed to fill all the clearance space with steam of the initial cylinder pressure, then would the whole quantity of steam entering the engine be accounted for by the indicator, and a very high degree of economy might be attained. In practice it is impossible to secure this stated condition, and we can realise our object only by adopting one or both of two expedients. We may superheat the steam, or we may jacket the cylinder with its lids and piston. We have had occasion to re-explain recently that unless steam is superheated it is impossible to prevent it from condensing in the performance of work. Rankine and Clausius have long ago called attention to the same thing. We have also stated the precise *rationale* of this condensation is not understood. When steam expands without performing work it becomes superheated, because the sum of the sensible and latent heats of steam at any given pressure is greater than the sum of the sensible and latent heat of steam at any lower pressure. Thus the total heat of steam from 32 deg. with an absolute pressure of 100 lb. on the square inch is 1181·4 deg.; while the total heat of steam with an absolute pressure of 20 lb. is 1150·9. Therefore, if steam of 100 lb. pressure were suffered to expand adiabatically down to 20 lb., it would be superheated by 1181·4 − 1150·9 = 33·5 deg. Expansion *per se* therefore does not induce condensation. But expansion cools the steam, for the sensible temperature of steam at 100 lb. pressure is 327·9 deg., while that of 20 lb. steam is 228 deg. Thus in being expanded five times the temperature drops 327·9 deg. − 228·0 deg. = 99·9 deg.; but, as we have said, this cooling is not attended by any condensation. On the contrary, if no work is done the steam becomes superheated, and its temperature after expansion would have been 228 deg. + 33·5 deg. = 261·5 deg. Care must be taken in dealing with this question not to confound quantity of heat with intensity. When steam is expanded and does work some of the total heat which it contains is converted into mechanical energy, and so far as is known the process is carried out somewhat in the following way:—Although it is very convenient to speak of the latent heat of steam, the quantity of heat in steam, &c., it is tolerably certain that what is known as latent heat has no existence whatever. The only heat, properly so called, in steam is represented by its sensible temperature. The remainder has been converted into energy expended in overcoming of the force of cohesion tending to hold the molecules of water together. As soon as the exciting cause is removed, the molecules will fall together again; and in doing so the work performed in forcing them apart will be all restored in the form of heat. To apply Sir W. Thompson's phraseology, the molecules in the form of steam have acquired an energy of position, which they lack when in closer proximity in the form of water. It would appear moreover that it is essential that the sensible heat of steam should be abstracted from it before the molecules will again fall together, and thus in the performance of work it is probable that first the sensible heat is drawn on and converted into work, then that the molecules fall together, and the work done on them previously, reappears in the form of heat, which heat is in time reconverted into work; and in consequence, as every degree of latent heat is equivalent of a degree of sensible heat, it is convenient and accurate enough to say that it is the sensible heat of steam which is drawn on for the performance of work. We have been somewhat explicit on this point, because when the nature of the process which takes place comes to be realised, it will be the more readily understood that the liquefaction of the steam in a cylinder due to the transfer of energy takes place through the whole mass of the fluid in the cylinder, and is not localised; consequently the heating of the cylinder by jacketting or otherwise can exert little or no influence in preventing this liquefaction. The steam in the cylinder becomes charged with vesicular moisture, and the maintenance of a high temperature in the metal cannot prevent this, especially in large cylinders containing a great body of steam. It may be taken for granted then, that jacketting cannot arrest the liquefaction due to the transfer of energy from the steam to the machinery put in motion. The jacket can, however, apparently interfere to check another form of condensation, namely, that due to the cooling down of the metal of the cylinder at each stroke. Before proceeding to consider this aspect of the question, however, it will be well to explain that if carried far enough superheating can prevent every possible form of condensation. We have seen that before the latent heat of steam can be touched, its sensible heat must be reduced below that proper to its pressure and volume. Each degree of superheat represents much less than a British unit. The specific heat of saturated steam is ·305, that of water being unity. The specific heat of steam gas is ·475. It may be taken for granted therefore that each degree of superheat represents 772 × ·475 = 366·7 foot-pounds. In an engine using 20 lb. of steam per horse per hour all cylinder condensation due to the performance of work would be stopped by superheating the steam about 270 deg. In the case of a condensing engine much of the superheat would, however, be taken out of the steam at the beginning of each stroke to warm up the cylinder. No doubt the use of such high temperature steam would be attended with great economy, especially if the superheat was obtained from the products of combustion after they left the boiler flues. But all attempts to use steam gas have failed hitherto because it has been found impossible to maintain efficient lubrication. But superheating is in theory far more efficient as a means of economy than jacketting.

It is not a little remarkable that the accurate experiments which have been made to determine the true value of jacketting have been few in number. Those experiments which have been made have too often been vitiated by neglecting the conditions of strict parallelism. It should be obvious that to determine the value of a jacket the engine should be worked at the same speed, point of cut-off, pressure, and load, with steam circulating through the jacket and not; and, furthermore, the weight of steam condensed in the jacket should be carefully noted. These conditions have not always been observed, and, as we have said, the results obtained are not satisfactory. A notable exception to this rule is supplied by an experiment carried out last year by a committee of engineers with a Corliss engine at Mulhouse, Alsace, at the factory of Messrs. Schlumberger, Son, and Co. The engine was one of a pair driving the same crank-shaft. Each engine was supplied, for the purpose of the experiment, by a separate boiler. The engines are of the Corliss type. The cylinders are 24in. diameter, and 4ft. stroke. They are jacketted all over, lids and all, and steam is also conveyed to the interior of the piston. The experiments have been analysed by Mr. Isherwood, and the figures have been converted into their English equivalents by him. Mr. Isherwood's analysis has been published in the last number of the *Journal of the Franklin Institute*, to which we are indebted for the following particulars. Twelve experiments were made; three without steam in either the cylinder jackets or piston; one, accidentally, with the jackets partly filled with steam and partly filled with the water of its condensation, owing to the incomplete drainage of the latter; two with steam in the jackets of the cylinder but not in the piston; and six with steam in the cylinder jackets and piston. The measure of expansion with which the steam was used varied from 5·7037 to 12·3978 times. The boiler pressure averaged 68·2480 lb. per square inch above the atmosphere, and the number of double strokes made by the piston averaged 49·8925 per minute for the different experiments. The steam pressure in the valve chest of the cylinder averaged 3·5 lb. per square inch less than in the boiler, and the steam pressure in the cylinder at the commencement of the stroke of the piston averaged 6·827 lb. per square inch less than in the valve chest, owing to the smallness of the steam ports, making the pressure on the piston at the commencement of its stroke 10·327 lb. per square inch less than in the boiler. This considerable difference of pressure must have given the steam on entering the cylinder about 8·5 deg. Fah. of superheating. Each experiment was intended to continue one working day of the factory, and such was the case with nine of them, which averaged 10·6371 hours; the remaining three, however, owing to accidents, continued only half days each, averaging 5·4765 hours.

As the results of such experiments must all be ultimately expressed in terms of the feed-water—or in other words, of the weight of steam used per horse per hour, we may omit other matter given with much care by Mr. Isherwood in the form of a large table, and say that with no steam in the jackets or piston, the engine required on the first day 28·3 lb., on the next 26·2 lb., and on the third day 25·6 lb. of steam per indicated horse-power per hour. On the first day the steam was expanded 12·39 times, on the second 7·9 times, and on the third day 7·9 times. The condenser pressure was on all days, 2 lb. on the square inch within a fraction. It will thus be seen that the high ratio of expansion was adverse to economy. On the fourth day the steam was admitted to the cylinder jackets, which, however, were not drained, and the consumption was 20·7 lb. of steam per horse per hour, the steam being expanded 5·7 times. Here we are at a loss to know how much of the economy was due to the less expansion of the steam, and how much to the steam in the jacket. On the following day, April 11th, the jackets were properly drained, and the consumption of steam was at the rate of 19·94 lb., the expansion being 5·7 times, or the same as on the previous day. On the 6th of May a similar experiment was made, save that the steam was expanded 10·82 times, and the consumption was at the rate of 19·88 lb. per horse per hour. Thus it will be seen that jacketting rendered a high measure of expansion economical. This result can be compared with that obtained on the first day as given above. On the 12th of April, boiler steam was admitted to the piston as well as the cylinder jacket, and with an expansion of 5·7 times, the consumption was at the rate of 20·37 lb. On five days in May under similar conditions of jacketting, the consumption was at the rate of (1) 19·34 lb.; (2) 19·4 lb.; (3) 19·75 lb.; (4) 19·78 lb.; and (5) 19·61 lb.; the expansion being 10·82, 7·9, 6·8, 6·4, and 5·8 times, the most noteworthy fact being that with an expansion of 5·8 times, the result obtained was practically just as good as with an expansion nearly twice as great. In the latter case the engine developed but 103·6-horse power, while in the former it gave out 156 indicated horse-power. It is needless to do more than remark that as a steam user wants to get all the power he can for the first cost of his engine, the advantage was all on the side of the low grade of expansion. It is also worth notice that the condensation in the jacket was in all cases very large, amounting to no less than from 6·4 lb. with the higher grade of expansion, to 4·6 lb. per horse per hour with the lowest grade of expansion used, namely 5·7 times on the 12th of April.

These figures are all very suggestive, and apparently conclusively prove that jacketting was decidedly conducive to economy when the steam was much expanded in this particular engine, but with the low grades of expansion it did less good. Whether the results would have been the same with a larger engine is not so clear. It is interesting to note that of the whole quantity condensed in the jacket and piston, a considerable quota was supplied from the piston. The condensation in it ranged from 1·34 lb. per horse per hour with the high grades of expansion, to ·98 lb. with the low grade. The result as a whole confirms the statement we have often made, that maximum economy is to be obtained by expanding steam somewhere between 5 and 8 times, according to the conditions under which the engine is working. Furthermore they show that if proper precautions be taken, the simple engine compares very favourably with the compound engine, especially if the first cost of the machine and the expense of repairs be considered, as they certainly will be by millowners.

MILD STEEL *versus* IRON FOR SHIPBUILDING.

IN the course of his presidential address to the members of the Iron and Steel Institute, at their recent meeting in London, Mr. Josiah T. Smith made the following observations:—"The future of steel for shipbuilding must depend greatly on cheapening the cost of manufacturing plates, so as to bring them more nearly on a level with iron; and when we recall to mind the history of the steel rail manufacture, it is impossible to doubt that such a result will, before long, be accomplished." Just before, Mr. Smith had been comparing the relative commercial merits of steel and iron rails, and, quoting conclusions which had been arrived at by Mr. Price Williams, he announced that "the average life of a steel rail was, *cæteris paribus*, just nine times that of an iron rail." Mr. Smith's argument with respect to steel for shipbuilding purposes, although expressed in rather vague and general terms, would be understood by most of his audience to mean something like the following more definite statement:—Steel rails are nine times as valuable as iron. When the prices became equalised, iron rails were no longer used. Steel is, by inference, as superior to iron for ship construction

as for rail manufacture. Therefore, if the prices be equalised, the former material will supersede the latter. Here are four plain propositions. With the first and second we find no fault at the moment, though we doubt if they are altogether established. With the third we altogether disagree; and the fourth, which depends upon it, we shall consider further on.

Let us inquire, in the first place, why steel rails are nine times as valuable as iron rails. It is not on account of superior tensile strength or ductility of the material; for neither the one nor the other is at all severely tested in practical use. It is not that steel rails are the less brittle of the two; for experience shows that the reverse is ather the fact. It is not a less liability to corrosion; for when the scale is removed steel corrodes under some conditions 19 per cent. faster than common iron. Why is it then? Simply on account of one quality which is of paramount importance in rails, and that is resistance to wear under the continual action of heavy rolling weights. The undoubted superiority of steel to iron rails in this respect is the real and only reason why they have so largely, if not entirely, superseded them. And this quality is the consequence of the homogeneity which results from the mode of manufacture adopted for steel. Returning to the third proposition, the first thing which forcibly strikes us is, that the quality which we have seen to be paramount for rails is of no importance whatever in shipbuilding material. No ship or ship plate ever yet wore out by friction or abrasion, as rails wear out; and therefore we hold that there is no analogy whatever between rails and ship plates, and that proposition 3 must be dismissed as untenable. But it will no doubt be contended, and fairly, by some who admit the completeness and force of our arguments as above, that steel is nevertheless destined to supersede iron for shipbuilding purposes by reason of its superiority to the iron at present in use in respect of those other qualities which we have seen to be quite subordinate in the case of rails. Let us compare the two in respect of—Tensile strength; bending hot; bending cold; corrosion; cost of production.

The ultimate tensile strength of mild steel is from 28 tons to 32 tons per square inch, and of iron from 20 tons to 24 tons. Indeed the ratio 22 : 30 pretty fairly represents the difference. But this is only up to thicknesses of ¾in. or ⅞in. For 1in. thick or over mild steel must not be relied upon, as at present produced, as giving any greater tensile strength than iron. This, so far as our present knowledge goes, is on account of the impossibilty of doing sufficient work upon thick steel plates. For justification of this serious conclusion we must refer to the recent discussions on Professor Kennedy's paper at the Institution of Mechanical Engineers, and on Mr. Denny's paper at the Iron and Steel Institute. We say serious conclusion, because it is clear that one of the main temptations to use steel instead of iron is when the latter would otherwise have to be used in great thicknesses, as for the shells of large marine boilers, or for the lower strakes of vessels of great tonnage. In such cases it now appears that no less thickness can safely be used in steel than in iron. But there are other peculiarities of steel recently brought to light by Professor Kennedy, which suggest the possibility that its superiority in tensile strength is more apparent than real. These are two, namely, that permanent set begins at about 8 tons per square inch, against 10 or 11 tons for ordinary shipbuilding iron; and that at about 18 tons a "breaking down," or considerable readjustment of molecules takes place, which has no parallel in iron plates until they finally give way. This breaking down in any member of a structure might, of course, mean a ruinous distortion or collapse of some other member on which undue stress was in consequence thrown. Reaching the "breaking down" strain at any important point would generally be equivalent to a final collapse, as complete as where the ultimate breaking strain was reached in an iron structure. Again, the inferiority of mild steel to common iron in taking earlier permanent set is also a very serious matter. For permanent set is permanent alteration of form; and in all structural designs this point must not be nearly approached. The designer of a steel structure is therefore, even with equal sections of material, nearer to his permanent set limit in the ratio of, say, 8 to 10½ than if he were dealing with ordinary iron. Nor can this be remedied by making the steel harder. It is but a year since many steel makers and others were crying out against the rigidity of the testing regulations of the Board of Trade, Lloyd's surveyors, and the Admiralty. They wanted to be allowed to make and use harder steel. Now, however, owing to the failure of the Livadia's boilers, and the case referred to by Mr. Denny as having occurred at his yard, there is no more talk of harder steel, nor of relaxing tests, but, on the contrary, an apparent consensus of opinion that steel must be mild at all hazards, and tests must be made yet more rigid. So that we are driven to this position: Steel must not be made harder, but if anything milder; and if that be so, no greater tensile strength can be relied on than with iron, if, indeed, so much.

In hot bending at a red heat steel has some advantages over iron, especially across the fibre. Here its superior homogeneity helps it. On the other hand, at a black heat, which is so useful in assisting to bend iron to a moderate extent, steel seems, according to Mr. Adamson, Mr. Denny, and a recently issued Government circular to be liable to break short if any attempt be made to manipulate it at all. Then, again, there are the dangers of cracking during cooling to consider; the well-known liability to break after welding, not so much at the weld as immediately behind it; the extra cost of annealing, where this is done, together with the extreme care required; the delay attending it, and the still somewhat uncertain result, as exemplified in the case of the Livadia's boilers. The hot worked plates required about the shell of a ship form but a small proportion compared with those which are manipulated cold. There is no difficulty whatever in getting iron to stand the bending at right angles needed for the garboard strake. It is true that a little extra care is necessary, and a little more costly material must be used in the manufacture of these, and of the oxter, boss, and in some cases the bilge plates, than of the rest; but when this is done, there is no difficulty in getting iron plates to stand. In cold bending mild steel has an advantage over iron; and, again, this is most marked across the fibre. This is no doubt due to the very cause which makes its superior ultimate tensile strength practically unavailable, viz., its low limit of elasticity, and its low breaking down limit. It must not, however, be forgotten that its greater readiness to allow itself to be forced into a new shape when cold is subject to the condition that the skin on the convex side must be free from the slightest cut, flaw, or indentation. If there be anything of that nature, then its homogenity again becomes a disadvantage, and tearing results when bending is attempted.

Concerning corrosion we shall now say but little. We need only refer our readers to Mr. Parker's recent experiments upon the relative liability to corrosion of iron and steel plates, and our own article thereon—in THE ENGINEER for May 13th. They will there find that clean scaled plates when subjected to the ordinary conditions affecting the hull of a vessel, are likely to corrode 19 per cent. faster if of mild steel than if of the iron now ordinarily used for this purpose. Corrosion though of some importance in rails is of infinitely more importance in ship plates. In the former case it is of importance because by means of it many tons of metal disappear from off our leading railways daily; but that is all. Rails never disappear totally or become useless from rusting. In the case, however, of the skins of ships, corrosion may go on locally and unobserved, and may soon imperil the whole structure. In ships built of ordinary iron, and reasonably cared for, the risk is very slight; but if a material be employed which corrodes 19 per cent. faster, and especially if it be made originally 20 per cent. thinner, the risk may become very serious. As was well shown by Mr. Parker, the liability to corrode is not diminished, but rather increased, by leaving the scale on, for then galvanic action followed by local pitting ensues; and in this case the variability or fickleness of steel was shown to be twice as great as of iron. It may be well to point out here that all the information concerning the corrosion of steel now being utilised is of the most recent date. It is quite true that many experiments have been made by Mallet and others, and of these more will be heard, but it is not the results of these experiments which are being dealt with. The inquiries carried on by the Admiralty in connection especially with the Iris may be named as among those which have excited most attention. It is satisfactory to know that the whole of the destructive black oxide can be got off steel plates, as Mr. Barnaby has assured the world, but the cost of the process must be charged against steel.

Lastly, as to cost of production, the only steel plates which so far as we can learn seem to be sufficiently in favour with shipbuilders, shipowners, and Lloyd's surveyors, to induce them to favour their use in quantity, and without undue nervousness and hesitation, are those which have been made at Landore, at the Steel Company of Scotland's works, and latterly at Parkhead, Glasgow. In all these cases the process is that of Dr. Siemens. All the ingots are hammered, and the system of testing is elaborate and costly. Recent revelations confirm the belief that hammering cannot be done without, and testing must be made even more elaborate and irksome. The purest materials are alone used, and no plan is as yet developed by which any other can be adopted with safety. With hematite pig iron at 55s. per ton at the furnaces, as at present, and steel plates at £10 10s., there does not seem to be much chance of their coming down to the price of iron ship-plates, which are at £6 5s., unless the method of manufacture be altogether changed. There is of course the Bessemer basic process looming in the future. It is claimed that by it steel plates can be made much more cheaply than by the Siemens process; and that the necessary soft and uniform quality can be obtained out of variable and impure material. If that be so, let it be so, and we will consider it when it becomes a fact. In the meantime it is clear that no steel can be trusted for extensive use except that furnished by a very few makers made from picked materials, and under an almost nervously anxious and elaborate system of inspection. While this material has undoubtedly some wonderful qualities, these qualities are not to any great extent of commercial value in the construction of ships, and any value there may be is, it seems to us, counterbalanced by corresponding disadvantages.

It is, perhaps, only natural that those directly interested in the steel industry should feel somewhat elated at the sudden and nearly complete victory their material has gained in the case of rails, and should hastily predict a similar victory in the case of shipbuilding material. But we think we have succeeded in showing that the two cases are in no sense comparable. We are prepared to go further, and say that it is by no means, as indicated by Mr. Smith, merely a question of cheapening the cost of steel plates. It is quite clear that steel is not better than iron for shipbuilding, in the sense, nor in the degree, that it is for rails. On the contrary, whilst admittedly better in some particulars, it is clearly worse in others.

It is the shipowners, advised no doubt by shipbuilders, on whom the responsibility of the change, whenever it comes, must fall; and they must clearly see that they will be benefitted thereby. We do not now refer to the three or four large and wealthy companies whose vessels are never deeply loaded, and who can afford to build their vessels in a yacht-like, luxurious style, and with whom speed is a first consideration. We refer to the far more numerous and in the aggregate important class of owners of trading ships, which must be made to pay under severe competition. Such owners must see their way to benefit much more clearly than they now do before they will forsake a material they know, for one they do not—even at the same price. With the knowledge that there are still several iron vessels afloat of thirty years of age or thereabouts, and apparently no worse, they may be excused for agreeing heartily with Mr. Denny when he admitted reluctantly that iron was good enough for the hull of a ship, so long as it kept afloat; and they can hardly be expected to listen to his persuasions when he tells them how much better steel is than iron in case their vessels ever come to bump about on rocks. That they will consider a question for the underwriters, and perhaps some of them would even rather that their vessels were not saved than returned in a battered condition, after considerable delay and at considerable cost to them. Finally, if steel is better than iron for shipbuilding, by all means let it supersede it as quickly as may be; but we trust that we have at all events heard the last of such fallacious reasoning as that what may be true of it under one set of conditions must of necessity be true under another and entirely dissimilar set.

THE STOCKTON BRIDGE.

A PRIVATE bill has just passed through Parliament authorising the construction of a new bridge spanning the river Tees at Stockton. The bill, which was promoted by the Corporation of Stockton-on-Tees and the Local Board of South Stockton, met with very serious opposition from the justices of the peace of the North Riding of Yorkshire and the county of Durham. The cause of that opposition was the proposal to compel the justices named to contribute in equal shares the sum of £15,000 towards the cost of the new bridge. The justices denied their liability to contribute any more than the capitalised cost of the annual repairs, alleging that the present bridge was sufficient for all county purposes. A good deal of interest attaches to the question, which has been fought out on several grounds. The liability of county authorities to construct new bridges has for some time been a moot point. It cannot be said that the decision of the Parliamentary Committee of the House of Lords, before which the bill in question was heard, will tend to set up any definite precedent, because the contribution of the counties towards the proposed new bridge has resulted from a suggestion, and not from an order. When county authorities undertook the erection and keeping in repair of bridges, they evidently had not in contemplation such a contingency as the necessity for the erection of a bridge to cost £40,000. The rapid development, however, of the iron industry in the regions of the lower reaches of the river Tees, has produced a wonderful vitality in the tract of country which, though situated in two counties, is generally spoken of in one breath—the district of South Durham and Cleveland. Up to 1764 the town of Stockton-on-Tees had no means of communicating with the Yorkshire side of the river except by ferryboat. There was no bridge nearer than at Yarm, a town situated nine miles from Stockton by the river, though only about four miles by the high road. The inconvenience was then very greatly felt, although the new town of South Stockton and the large towns and villages of Cleveland had then no existence. The present bridge is the bridge which was commenced to be built in 1764. It was built by private subscription, the subscribers being recouped by tolls, which were levied for many years. A few years ago, with the view of enlarging the footpaths, the walls of the bridge were considerably reduced in thickness, and in this respect the rapid increase of traffic has tended to make the bridge unsafe; but viewed as a structure, no valid objection could be urged against it. In recent years the Tees Conservancy Commissioners, a corporate body whose functions are the governance of the river Tees, have expended large sums of money upon the improvement of the navigable channel of the river. Not only have they erected a large and important breakwater, but they have removed a rock which made the entrance to the river, except at high water, most dangerous, and at all times hazardous, and have deepened the channel, so as to make it possible for ocean-line steamers to enter or leave fully laden. For some time the commissioners have complained that the piers of the bridge have prevented the upper water from having that scouring effect upon the navigable channel which it otherwise would have had. It seems also that to support the piers large quantities of stone and rubble have had to be thrown into the river, and the dredging operations of the commissioners have thus been to a considerable extent nullified. With a view to help forward the scheme, the commissioners offered to contribute towards the cost of a new bridge the sum of £5000. The first estimates of engineering work, unless very carefully based, are frequently misleading. It was at first supposed that £30,000 would cover the required outlay. That sum, however, has during the progress of the scheme rapidly swollen to £40,000, although at the time of the proposal for the two county authorities to contribute each the sum of £7500, the estimate had not gone beyond £35,000. The position now is that each county authority will contribute £5000, and the Tees Conservancy Commissioners £5000, leaving the heavy burden of £25,000 to be paid by a community, whose rateable value falls considerably short of a quarter of a million pounds sterling. The desirability of a better bridge no one would deny. But it does seem incongruous that a comparatively small community should, because of its geographical situation, be saddled with such a heavy cost. Mortgaged as the resources of the district are by previous expensive schemes, it is difficult to see how any advantage, commensurate to the cost, is to be derived from the new bridge.

NAME PLATES ON ENGINES LET OUT ON HIRE.

A CASE of considerable interest to the owners of engines and thrashing machines let out on hire or sold on deferred payment was tried this week. It showed that the name of the proprietor should not under any circumstances be omitted from such engines. The action was by Messrs. Eddington and Co., Chelmsford, to recover the value of a portable engine from the trustee of a bankrupt. The engine had originally belonged to the bankrupt, and the plaintiffs alleged that the bankrupt had sold it to them in 1879 in satisfaction of a debt, and had afterwards hired it from them on the terms that when he had paid £90 for hire, it should belong to him again. After having been twice tried, and the last time with a verdict for the defendant, a rule for a third trial was obtained. On the part of the plaintiffs, it was contended that although the engine was at the commencement of the bankruptcy in the possession of the bankrupt, they had proved at the trial a custom to let engines of this description on hire which prevented the bankrupt from being the reputed owner. For the defendant, it was urged that no custom had been proved; that if any had, it was a custom to let engines with the name of the real owner, as owner, put upon them, and that as this engine had originally belonged to the bankrupt, the plaintiffs should have proved a custom by owners of engines to sell them to engineers and then purchase them back on the hire system. The court, in the result, were of opinion that the verdict should stand on the ground that the plaintiffs had proved no custom which would cause the bankrupt to be

other than the reputed owner. Thus Messrs. Eddington and Co. lost their engine because their name was not upon it as owners.

LITERATURE.

Horticultural Buildings; their Construction, Heating, Interior, Fittings, &c., with Remarks on Some of the Principles Involved, and their Application. By F. A. FAWKES. London: J. T. Batsford, High Holborn. 1881.

IN this book the author has collected together, and presented in a very complete form, that information which it can be readily understood one versed in the practice of constructing horticultural buildings has found it necessary to acquire and employ in their design and arrangement. The work of the builder or draughtsman does not receive that sort of treatment which would enable a builder of ordinary structures, or a draughtsman, to make a conservatory, greenhouse, or hothouse for the first time; but special care is devoted to a full consideration of that information with which an architect or builder must or should be familiar, and should apply in making any of these structures, and those points which should be carefully weighed by the horticulturist in selecting the site, form, and character of building, and the arrangements for heating, which shall be best suited to the purposes to which it is proposed it shall be put. The illustrations of conservatories are for instance few in number, and are rather sketches than drawings which could convey any idea of structural details; but inasmuch as a builder does not learn this information from books, and special drawings have always to be made by experienced architects or builders' draughtsmen, the author may be allowed to be correct in assuming that it is upon the principles which should be observed in order to secure the best results structurally and horticulturally that information is most required. The contents of Mr. Fawkes's book deal with the following subjects:—Astronomical, inclination of roofs, aspect and site, drainage, growing-houses, show-houses, garden frames and subsidiary buildings, brickwork, timber, glass, ventilation, shading and lighting, forcing beds, borders, paths, condensation and drip, notes on construction, various modes of heating, water supply, meteorological, and legal.

In the introduction some useful general hints for amateurs and some interesting historical notes are given. In the section headed "Astronomical," is a short discussion of the causes of the seasons for the purpose of showing the angles of the sun's rays at different periods, so as to lead up to the section dealing with the sun's rays and the best angles for the inclination of roofs. The information contained in the part dealing with aspect and site relates chiefly to the selection of the best form of house, and especially of the roof, when circumstances impose certain restrictions as to position, and height or description of plants to be grown. Under the head "Levelling," some space is needlessly occupied, as no one to whom any levelling would be trusted would, in the brief outline which is given of the subject, add to his knowledge, and no one not accustomed to levelling could proceed without further information. Some remarks are made on levels in regard to horticultural buildings, to which no objection can be made. The various questions involved in the selection of form and dimensions of houses of different kinds are carefully considered in the part on Growing Houses. Curvilinear roofs are separately dealt with, some diagrams with explanations being given with the intention of showing that these roofs do not, taking the whole year round, give much advantage in the admission of solar rays; but this case is hardly made out, though some structural objections, more especially as to the difficulty of glazing, may be admitted. There is no truth, however, in the remark which is made that training wires are less easily fixed, or that the curvilinear framing is necessarily more costly, for the curved roof framing made by the method invented by Mr. Lascelles is not at all costly. The relative advantages of iron and wood for horticultural buildings are impartially considered, and the author's conclusion that, on the whole, wood is the more suitable material, is in accordance with the opinions of most experienced horticulturists. Iron houses cost more than those of wood, are with more difficulty maintained at a uniform temperature in winter, and glass for some reason frequently breaks in the hard iron framing than in wood. Several pleasing general designs for conservatories are given, and a great deal of useful and suggestive information which must be the result of extended experience and observation accompanies them. The hints for the guidance of those intending to erect one of any of the different kinds of greenhouses are also very numerous, and if horticulturists do not care to trouble themselves with a study of these before building, they are very likely to find themselves glad to do so afterwards. Though numerous forms of mechanical glazing have been proposed and tried, the putty glazing seems to hold its ground with most horticulturists, and Mr. Fawkes, after extended experience with various systems, concludes that good putty glazing is best for growing houses. All who have had experience of the effects on the tender leaves of some plants of the drip from a leaking roof will concur in this. The information given by the author on ventilation is rather suggestive than exhaustive, but with heating he deals much more comprehensively, and gives information as useful for the guidance of the conservatory and hothouse builder as for the horticulturist. Heating by gas he considers inadmissible with any apparatus yet brought out, as, without the greatest care, the products of combustion are likely to get into the house, and gas is much more costly for the purpose than ordinary fuel, though small apparatus is frequently heated by gas.

Evidences of great painstaking characterise the book throughout, and its high value to architects and horticulturists is enhanced by the very ample tables of contents, analyses of these, and index. Mr. Fawkes is a member of the firm of T. H. P. Dennis and Co.; but this fact has not affected the impartiality of his treatment of his subjects, the few references to his firm being almost wholly confined to one special form of greenhouse and a few of their boilers.

BREWING IN ENGLAND.

No. III.

IN previous impressions* we have illustrated and described a design for a brewery made with a view to the employment of raw grain for the production of wort, together with plant designed for that purpose, and what may be looked upon as a model brewery illustrative of the most recent English practice on a small scale.

We now give a sectional elevation and plan of a fifty-quarter brewery recently completed for Messrs. Eldridge, Pope, and Co., of Dorchester, as a good example of a large brewery. A perspective view and transverse section were given in our last impression.

The brewery was constructed from the joint design and under the superintendence of Mr. G. R. Crickmay, architect, Weymouth, and of Messrs. Scamell and Colyer, brewery engineers and architects, Westminster. It is situated on a commanding site close to the Dorchester station of the London and South-Western Railway, with which it is in direct communication by rails laid into the brewery yard. The building adjoins a lately completed sixty-quarter malting, under which is a large beer store communicating with the brewery cellars by a tunnel under the roadway. The materials used for the brewery are brick and Portland stone; the plinth is of Portland roach, the work beneath being Portland spawls in random range. The brickwork is executed in Broadmayne bricks, with piers of red bricks, and white and Broadmayne arches over the windows, &c. The roof is covered with Bangor slates; the cellars are arched, and the racking floor, tun room, and vat store are laid with Claridge's patent Seyssel asphalte. The plant is for 50 qr., but ample room is left for future extension, and it is worked upon the "skimming" principle. The water tank or cold liquor back is of cast iron and placed at the top of the building to command all the other apparatus—as seen on page 372. The hot liquor backs are wrought iron, and are heated by steam coils of copper. The mash tuns are respectively twenty and thirty quarters, of cast iron, fitted with internal mashing machines and Conron's rakes. The malt is stored in the malt-house referred to, and is brought across to the hoppers in the brewery, as required, by a screw. After grinding, the elevator—indicated on page 372—takes up the grist to the grist case on the second floor, thus commanding the mash tuns. The coppers are steam jacketted, and heated by steam. They are in a separate building, with the boilers and hop back, to keep the brewery free from vapour and dirt, as will be best gathered from the plan, page 392. The coolers are placed at the top of the building—see longitudinal section, page 392—commanding two of Lawrence's patent refrigerators, ample ventilation being provided, as indicated at page 372. The fermenting tuns are of wood, with slate yeast batches and racking squares. The hoisting machinery, provided for raising the malt and hops, and coals from the stores, is not shown, but is of the usual character. The casks, when filled on the racking floor, are lowered to the cellars by a self-acting lowering machine. The beer in casks is brought up from the cellar by an endless cask chain lift to the level of the loading floor. Grains are let out at the bottom of the mash tuns through valves, and are carried by a conveyor to a tank outside the building, where they are measured and delivered either into carts or direct into the railway trucks.

The engine for driving the machinery is a 12-horse power horizontal. The well pumps are driven direct, the shafting for the various apparatus being driven in the ordinary way. The boilers, as before stated, are placed in a separate building, and are of the Lancashire type, fitted with smoke-consuming apparatus. The cooperage and washing shed are on the opposite side of the yard, ample provision being made for receiving, washing, and re-delivery of the casks to the racking-room. The stables and the sheds for vans and drays are situated close to the cooperage. It is proposed to use well water obtained by means of an artesian well sunk into the chalk. For this purpose Messrs. Le Grand and Sutcliffe are engaged in boring a well by the well-known method with which their name is associated. The boring is in the chalk the whole depth from the surface. After passing the land springs the chalk was found to be practically waterless until 450ft. was reached, after which some water was struck, but not sufficient for the requirements of the brewery, so the work of going deeper is being proceeded with, and it is hoped an ample supply will ere long be obtained. The present depth of the boring is 586ft.

The offices and manager's residence are contained in a fine block of buildings, and face the main road; they are of handsome design, and more than usual accommodation is afforded for the official routine of the brewery. Particular attention has been directed to the adoption of the most modern and effective apparatus and plant, in order that labour may be saved by the use of machinery as much as possible. In another impression we shall deal with some of the machinery as constructed by those engineers who have made this their special study.

The general design of Messrs. Eldridge, Pope, and Co.'s brewery is so clearly shown by the perspective view on page 372, that it is unnecessary to remark upon it further than it shows Mr. Crickmay's ability in giving a pleasing appearance to a building the purposes of which seldom afford opportunity for securing architectural effect. The plan and sections on the other hand show that the extended experience of Messrs. Scamell and Colyer has been utilised in the arrangement of the building and plant so as to prevent any unnecessary expenditure of power or labour.

The contractors for the work were:—Buildings for the brewery, Messrs. Bull and Sons, of Southampton; for the malting, Mr. E. J. Gregory; and for the offices, Messrs. Guy and Sons, of Dorchester; for the plant, engines, boilers, pumps, and all the millwright's work, together with the columns and girders for the building, the copper and iron pipes, &c., Messrs. Thornewill and Warham, of Burton-on-Trent and Derby. The steam coppers, hop back, &c., are by Messrs. H. Pontifex and Sons, King's cross, London; the refrigerators by Messrs. Lawrence and Co., London; the slate back work by Messrs. J. and J. Sharp, London: and the fermenting tuns by Messrs. J. Colyer and Co., London.

* See THE ENGINEER for 14th January, 1881, and for the 11th February, 1881.

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

(*From our own Correspondent.*)

SLIGHTLY more work is being done this week at the mills and forges in Staffordshire. Plates, sheets, and bars are all in a little more demand, but there is no improvement in prices.

To-day—Thursday—in Birmingham, and yesterday in Wolverhampton, bars were procurable freely at as low as £5 15s. for common qualities; and there was a sale of 200 tons at well under that figure. Good bars were to be had at £6, and the price was given; but marked bars were quoted firm at £7, and Earl Dudley's at £7 12s. 6d. per ton. The marked bar houses were unable to report an active demand; indeed, half work was difficult to get, yet £7 10s. was asked in one or two instances.

Angle bars were selling at rates varying with the necessities of the makers. The same has to be said of rods. These, for nail-making purposes at home, were slow of demand, but they were in a little better request for export to the East mainly. Strips and hoops were only quiet; and for good qualities, from £6 2s. 6d. to £6 5s. was quoted. On United States account this week purchases have not been conspicuous.

Sheets sold a little better to-day, consequent upon the orders received by this week's bi-monthly Australian mail. The buying was not large, as the reports from antipodean agents spoke of only a steady business doing, without any disposition shown to speculate; but as credit kept good and money less difficult to get in, exporters are prepared to send out in advance of requirement. The iron will go out mostly in a galvanised state, and if the rates which ruled at date of mail should be obtained, a profit will be realised. Galvanised corrugated sheets were selling in Melbourne at £20 10s. for 26 gauge, ordinary brands; and best brands were to be had at £21 10s. to £22. Ungalvanised sheets were going at £11, in assortments of Nos. 8 to 18, and at £13 for Nos. 20 to 26. Plates were firm at £10 to £11. Hoop iron was also to be had at £11. Drawn fencing wire was £12 10s. for No. 6, £13 for No. 7, and £13 10s. for No. 8.

There were very general complaints to-day at the prices which are being taken in London for sheets of the commonest possible description, that have been denominated "Indian sheets," which are used, it is believed, mainly about the tea and coffee plantations. Less than £6 15s., delivered in London, is known to have been accepted for such iron. The complaint was that those prices were being quoted against makers by London exporters when they wanted such iron as makers could not afford to sell even at £9 at the works, and that figure for latens was refused in Wolverhampton yesterday. The price sought was from £9 5s. to £9 10s. For doubles of the same quality £8 5s. was asked, and—dependent upon the proportion of doubles and trebles in the order—from £7 5s. to £7 10s. for singles. Less valuable iron, which is not needed for galvanising, but which is much more valuable than "Indian sheets," was procurable to-day at from 5s. to 15s. under the prices asked for galvanising sheets. Some sales were reported mostly to the iron braziers and to the merchants.

A little more was done in plates of the higher qualities. Boiler plates sold better at from £8 to £9, according to brand. The less valuable kinds were open to a little negotiation by consumers; but first-class descriptions were strong at makers' quotations. Some firms, who make merchant plates and plates for girder and bridge building, were to-day taking as low as £7 per ton; and at that figure they were not indisposed to accept more orders than they could get.

The pigs which were mostly selling were the best brands of Derbyshire, Northamptonshire, and Lincolnshire. For all these the price which mainly ruled was £2 2s. 6d. per ton. Less valuable kinds were easy to buy at from 6d. to 1s. per ton under that quotation. Consumers would buy only for current requirement, for they are looking for lower prices to rule in all descriptions of crude iron. All-mine pigs were difficult to sell at £3 to £3 2s. 6d.; part-mine were more open to business at from £2 to £2 10s.; and so too was cinder iron at from £1 15s. to £1 17s. 6d. Tredegar hematite pigs were again held for £3 7s. 6d.; but there were West-coast hematites which some old and good customers succeeded in getting down to £3 5s. per ton. Yet the agent's quotations were from 2s. 6d. to 5s. in advance of that price.

Coal was plentiful at the prices which have lately prevailed, but in good sales colliery owners are slightly more liberal as to weights.

There is much expectation of good from the Select Committee upon Railway Rates; and the committee have been prevailed upon to accept more evidence from the Birmingham and Staffordshire district than they had at first stipulated. Mr. Richard Heathfield, of Messrs. Morewood and Co., Soho, Birmingham, has succeeded in securing an appointment from the committee. He will advocate the cause primarily of the galvanising trade, of which he is a leading member; and additional weight will be given to his representations by his having been made president of an association of galvanisers which has just been formed in Birmingham. Mr. Heathfield will give evidence also touching the nail and spike business, in which likewise he is engaged.

This week I have seen at the engineering yard of the Lilleshall Iron Company, Oaken Gates, Shropshire, a pair of vertical differential pumping engines, that will be erected at the Aston pumping station of the Birmingham Corporation. The high-pressure cylinders are 16in. diameter, the low-pressure 32in., and all have a 5ft. stroke. A 20in. ram pump is placed under each piston; they are of wrought iron, are in two parts, have a 5ft. stroke, and for each of them two clacks are provided. There are two air vessels, 4ft. diameter by 15ft. high, the bases of which are now being built into the engine house. Each engine has an air pump 18in. diameter, provided with a hot well on top, and a pair of surface condensers, each containing ninety-six tubes, also form part of the plant. All the cylinders and covers are carefully steam jacketted and covered with felt and polished mahogany. The piston rods are of Landore-Siemens steel. The engine house at Aston is being so built that one-half of the engines will be below a stone flooring, to support which columns and girders have been founded at the Lilleshall Works, as also have two entablatures, each of which will support the cylinders of one engine. The whole weight of ironwork in the plant, exclusive of the boilers, is 140 tons. The pair of Cornish engines that are now working at the Aston pumping station are nearly four times as powerful as the additional plant, and were built by the Lilleshall Company about nine years ago.

Horizontal steam pumps are being sent from the Wolverhampton manufactories in fair numbers to several of the countries on the European Continent. Horse and hand-power pumps are going to the Antipodes, the Cape, and India. The home demand is reported to be dull.

To the many gas governors or regulating burners upon the market another has just been added by Messrs. Messenger and Sons, Birmingham. The chief advantages claimed for it are that the variation of consumption at different pressures is less than with any other governor, and that clogging—the weak point in many governors—is virtually impossible.

The operative nut and bolt makers around Darlaston and Smethwick are threatening to strike.

The Staffordshire Potteries Waterworks Company has made a

profit on the year of £5650, and the directors recommend a dividend at the rate of 6 per cent. per annum. They propose to raise £26,250 additional capital to enable them to carry out various new works and extensions, contracts for which have already been entered into. These include the erection of an additional permanent pumping plant at the Meir, the sinking of a well at Stockton Brook, and the laying down of numerous additional mains to supply outlying districts.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—The iron trade of this district continues to drag on in a most depressed manner, without any present prospect of improvement. The new work coming into the hands of users of iron is generally so small in bulk that consumers have no large requirements to cover, and speculative transactions are out of the question so long as prices are being continually forced downwards by the present excessive production of the raw material. The Manchester market on Tuesday presented no material change as compared with previous markets for the past month or so, and the slightly stronger tone reported from Glasgow had little perceptible effect. I did hear of one or two orders being placed, the going out of which at the moment might possibly be traceable to the slight upward movement in Scotch iron, but no better price whatever was obtainable, and iron could have been bought at prices quite as low if not lower than any that have been ruling of late.

Pig iron is scarcely inquired after except for very small parcels, and even then sellers have to take the lowest possible market price. Lancashire makers are still fairly off so far as deliveries on account of contracts are concerned, and they are putting very little into stock out of their present output; but their old orders are not being replaced as they work off, and either a reduced production or heavy stocks would seem to be in prospect before very long. For delivery into the Manchester district the prices quoted remain at about 43s. for forge, and 44s. for foundry less 2½, but these are open to offers, and in reality there are no price list rates. Some of the outside brands held in second hands are being pressed upon this market at very low figures, and I have heard of Lincolnshire forge iron having been quoted at a price equal to about 41s. 6d. per ton, less 2½, delivered into the Manchester district. The average prices quoted by makers are, however, about 42s. 6d. to 43s. for forge, and 43s. 6d. to 44s. foundry, with Derbyshire iron averaging about 44s., less 2½, and g.m.b. Middlesbrough about 45s. 4d. to 45s. 10d. per ton net cash delivered equal to Manchester.

Hematite pig iron held in second hands is also being offered here at low prices, but buyers are not induced to operate to any extent.

A Norwegian tool steel manufactured throughout with charcoal is being introduced into this market, and I understand that it can be produced at a lower price than that asked for English makes, whilst samples which have been tried have given satisfactory results.

The finished iron trade is generally dull; the only material change has been a rather better demand for sheets, for which some makers are this week asking an advance upon late rates, but other descriptions of manufactured iron are only in very limited request, and orders are keenly sought after. The average prices for delivery into the Manchester district are about as under: ordinary bars, £5 12s. 6d. to £5 15s.; hoops, about £6 5s.; common plates, £6 12s. 6d. to £6 15s.; and sheets from £7 10s. up to £7 17s. 6d. per ton.

The adoption of phosphor bronze as a bearing metal has hitherto been only carried out to a limited extent, owing to the extra cost of this material as compared with gun-metal, and to meet this objection Messrs. Johnson, Clapham, and Morris, of Manchester, have just brought out a patented process for the union of phosphor bronze with cast iron, whereby bearings can be produced with the wearing surfaces only constructed of phosphor bronze and the remaining portion of cast iron.

I still receive very unsatisfactory reports as to the condition of the engineering branches of trade throughout the district. In some cases firms are kept busy on specialities, and there is still plenty of activity in the shipbuilding yards, and amongst the marine engineers at Liverpool and Birkenhead, where recently many of the principal firms have conceded an advance in wages of from 1s. to 2s. per week. With these exceptions, however, the general complaint is that where works are not already slack they have but few new orders in prospect, and these have to be very keenly competed for. The last returns from the various branches of the Amalgamated Society of Engineers, which have just been issued, corroborate what I hear from the employers. The number of men on donation throughout the Manchester district remains about stationary, but in several large towns, such as Bolton and Blackburn, less activity is reported, and generally the condition of trade is regarded as less encouraging than was anticipated at the commencement of the year.

In connection with the extensions which are being carried out at engineering works in this district, to which I have been recently alluding. I may mention that Messrs. John Musgrave and Sons are at present building a large new erecting shop at their works in Bolton, but the work is not yet sufficiently completed to give details.

The Bolton Iron and Steel Works were last week visited by a party of mining students from Wigan, some of whom are this week being examined in "iron and steel," and they had an opportunity of inspecting the fine Bessemer and Siemens-Martin plant at the above works, as well as a massive steam hammer which is known by the name of "David," which can administer a blow equal to the descent of 50 tons for 10ft., and was at the time employed in forging a heavy crank-shaft.

The coal trade all through continues to quiet down, and with the accumulation of stocks there is more pressure to sell at gradually receding prices. House coals range from 6s. 6d. to 7s. for the lower qualities, and up to 8s. and 8s. 6d. for the better sorts at the pit. Steam and forge coals, which are a drug, average about 5s. to 5s. 6d. at the pit. Some business has been done in gas coal at about 6s. 6d. to 7s. for good screened qualities at the pit mouth. Engine fuel is in less demand for mill use and for chemical purposes, and supplies are moderately plentiful, but prices are maintained at about 4s. to 4s. 6d. for burgy, and 3s. 9d. to 4s. 3d. for slack at the pit mouth.

Coke is in less demand, but prices generally are steady at about late rates.

Recently an agitation has been going on amongst the miners in the Manchester district for payment by weight instead of by measure, and as the result of this, in order to comply with the weighing clauses of the Mines Regulation Act, arrangements are being made to put down weighing machines at the pits where they have not previously been adopted. Partly in connection with this change in the method of paying, Messrs. Henry Pooley and Son, of Manchester and Liverpool, are bringing out a new pit-bank weighing machine, in which, by a hydraulic arrangement, to indicate the load passing over the machine, the use of springs, racks, pinions, and wheels is entirely dispensed with. One of these machines is at present being constructed for the Manchester gasworks.

Barrow-in-Furness.—The chief feature in connection with the hematite pig iron trade of this district at present is that referring to the heavy stocks held at the various works throughout the district. It is significant that at a time when prices are exceedingly low, stocks should have accumulated to so great an extent; but from what I can see, this is caused by the fact that makers are declining to sell except at better prices, and prefer to allow the iron to run into stock rather than to sell at values which they say are unremunerative. The yield of the furnaces is heavy, but deliveries have not been on a large scale recently, and stocks have therefore increased. Not less than 100,000 tons of pig iron are at present held in the district. Prices are easier, and average qualities represent a value of about 56s. 6d. for Bessemer, and 56s. for forge qualities. My opinion is that a reduction of output is necessary, for the longer a heavy production is maintained the longer will it be before values can be expected to advance. The steel trade is very briskly employed, and orders are not difficult to get, but sales have lately been at such low prices that makers hesitated about entering into negotiations. Shipbuilders have booked no new contracts. There is a steady consumption of finished iron, and also of finished steel for shipbuilding purposes. Iron ore is not in as full demand as was the case a short time ago, and old contracts are not in many cases renewed. This in itself has a significant look about it. Coal and coke are in fair request.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

THE mild weather has had the effect of still further lessening the demand for house coals, and at several of the pits the miners are now only partially employed. Ordinary operations have ceased at the Manson's Field Colliery, Ilkeston. A few men are engaged on the surface removing stones and doing other necessary work, on the completion of which the colliery will be permanently closed. The Cotmanhay Pit, belonging to the same company, was set down at the beginning of the year.

Messrs. Brown, Bayley, and Dixon, Limited, the Sheffield Steel and Ironworks, will probably be reconstructed. Sir John Brown, a creditor for a balance of £15,000, has consented to take a similar composition—6s. 8d. in the pound—to that agreed to by the other creditors, and a scheme for the reconstruction of the concern is now being submitted to the shareholders.

The Hallamshire Steel and Iron Company, Limited, have had a fairly successful year. The profit available for dividend is £4819, and this permits of 7½ per cent. for the year.

Late mails, I understand, have brought in better advices from Australia and other markets for files, edge tools, and similar goods. Some excellent orders for cutlery have also been obtained. A better inquiry is maintained for agricultural implements, which were a very heavy sale last season. The leading firms inform me that the home markets are "picking up" in a gratifying degree.

Steel rails, tires, axles, springs, and, indeed, all sorts of railway material, continue in active request, both on home and foreign account. Bessemer blooms, to be rolled into rails, are also being sent to the States to a considerable extent. The iron trade, in all its departments, is very languid.

The silver and electro-plated establishments are but indifferently employed. Two houses are well off for work, but generally there is very little doing, and I hear complaints on almost every side.

The Sheffield Chamber of Commerce have resolved to urge upon the Government in any commercial negotiations with France to secure the permanent protection of English trade marks in that country. Mr. W. K. Peace, J.P., one of our principal manufacturers, has received letters from correspondents in Paris on this subject, as well as a report from the British Chamber of Commerce. The representation to the Government is in consequence of what was contained in these communications.

Councillor J. W. Dixon is actively interesting himself in the great question of railway rates. He has received from an eminent canal engineer in Berlin a proposal for the construction of a new and independent modern canal down to the Humber. "Speaking generally," says this engineer, "the cost, 7s. 4d. per ton for sixty-eight miles of water carriage, is excessive. On German waterways—rivers and canals—the total cost would be about 1s. 5d. per ton as far as Goole, and the towing down the Humber to Hull should not cost more than 4d. a ton, exclusive of tolls, dues or charges on the Humber and town or harbour dues at Hull." The canal, he estimates, would take three years to build, and cost about one million, including traffic plant and tug service down to Hull. Working expenses, maintenance, repairs, &c., would amount to £55,000 per annum; interest charge, 5 per cent. on capital, £50,000. This would make a total of £105,000 to be covered annually by tolls and charges. Presuming the canal traffic to be 300 tons daily towards the Humber, and 400 tons daily from the Humber, or 1,020,000 tons annually, this would necessitate a charge of about 2s. 1d. per ton for the carriage of goods in covered barges from Sheffield to Hull alongside ship—exclusive of tolls or charges noted. Time, eighteen to twenty-four hours. This is the substance of the Berlin engineer's scale, the mention of which will probably cause the railway companies to believe that our manufacturers are in earnest in this great business of keeping the heavy trades in Sheffield.

The annual conference of the National Federation of Enginemen's Protective Association has been held at Barnsley since my last letter. A significant feature of the meeting was a resolution in favour of the sliding scale as being the best means of regulating wages and working hours and preventing strikes.

The resolutions recently passed in favour of the federation of the West and South Yorkshire Associations have been confirmed. About ninety lodges express willingness to join the federation.

At the annual meeting of the Parkgate Iron Company, Limited, held on the 25th, a very encouraging report was read, and favourable expectations held out for the future. Mr. Charles Markham, the chairman, in reply to questions, said the directors had not yet decided what they should do with the iron rail mill, which is now disused, owing to the general substitution of steel rails.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THERE has been a slightly more cheerful feeling in the warrant market this week owing to a considerable quantity of iron having changed hands, but the demand for iron for shipment and consumption at home has not in the least degree improved. When prices of warrants touched 45s. on Monday, a large speculative business was induced; but unless the demand speedily gets more active or the production is curtailed, it may be taken for granted that prices will recede still further. The shipments during the past week did not come up to expectations, chiefly on account of a cargo at Leith not being cleared in order to be included in the list of exports. There are still 122 furnaces in blast against 114 at the same date last year. Six of these are engaged making hematite, a considerable proportion of which will likely have to be stored at the works, because of a strike of the Steel Company of Scotland's *employés*, which will greatly reduce the consumption while it lasts. Less pig iron than usual has been sent into the public stores during the week, but as a consequence a larger quantity must have been added to stock at makers' works. The aggregate stock in Messrs. Connal and Co.'s Glasgow stores now amounts to 559,263 tons.

Business was done on Friday morning at 45s. 5d. to 45s. 3d. cash, and 45s. 6½d. to 45s. 8d. one month, the afternoon's quotations being 45s. 1½d. to 45s. 2½d. cash, and 45s. 4½d. to 45s. 2½d. one month. On Monday forenoon transactions were effected at from 45s. to 45s. 4d. seven days, and in the afternoon from 45s. 4½d. to 45s. 6d. cash, and from 45s. 6d. to 45s. 7½d. one month. A large speculative business was done on Tuesday, at 45s. 9d. one month and 45s. 8d. cash, to 46s. 0½d. one month and 45s. 11d. cash. The market was flat on Wednesday, when business was done at 45s. 8d. one month and 45s. 6d. cash, to 45s. 6d. one month and 45s. 4½d. cash. There was no market to-day—Thursday—as it was a holiday in Glasgow, in honour of the Queen's birthday.

Makers' iron is again selling at lower prices in second hands. Messrs. Merry and Cuninghame intimated on Tuesday a reduction of 1s. on their Carnbroe No. 1 brands, and 6d. on No. 3; and the following are the quotations at which pig iron is sold by merchants:—G.m.b., f.o.b., at Glasgow, per ton, No. 1, 46s. 6d.; No. 3, 44s. 6d.; Gartsherrie, No. 1, 55s. 6d.; No. 3, 47s. 6d.; Coltness, 55s. 9d. and 48s.; Summerlee, 55s. and 47s.; Langloan, 56s. and 47s. 9d.; Carnbroe, 51s. and 47s.; Clyde, 47s. and 45s.; Calder, 55s. 6d. and 47s. 6d.; Glengarnock, at Ardrossan, 51s. 6d. and 47s. 6d.; Eglinton, 46s. and 44s.; Dalmellington, 46s. 3d. and 44s. 3d.; Shotts, at Leith, 56s. and 49s.; Kinneil, at Bo'ness, 47s. and 45s.; Carron, at Grangemouth, 48s. 6d. and 47s. 6d.

There is still a fair amount of employment in the manufactured ironworks. Some fresh orders for sugar-making machinery have been received, and the Glasgow and South-Western Railway Company has given an order for 1400 tons of castings. The foundries are moderately active, and marine engineers are busy. Messrs. Beard are erecting powerful additions to their plant at the Parkhead forge, where a large amount of work is being done for the shipbuilders.

A very good shipping trade is being done in coals.

The affairs of the Monkland Iron and Coal Company, Limited, are not yet arranged, and a meeting of the shareholders has been called for Monday next, at which it is believed a motion will be submitted to place the concern in liquidation.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

CARDIFF is deliberating upon a scheme which I must take credit for having first broached in your columns, that of getting its water supply from the Taff river, six miles to the north from Merthyr. The Merthyr supply is in a neighbouring valley, and so far as volume and purity are concerned, there need be no cause for doubt but that Cardiff could be equally well supplied. The engineering facilities, too, are great, the fall regular, and the only difficulty is the question of expense, thirty miles of pipes and the construction of an extensive reservoir. Landowners, too, will require compensation. The expense Merthyr incurred was about £80,000, and the distance twelve miles. This week the Cardiff officials have been taking plans, measurements, &c., so the scheme is in a fair way of being entertained.

Two of the Ynysfach furnaces at Cyfarthfa are now out, the others and mills are working as usual. It is expected that four furnaces only will be required—say three for making Bessemer pig and one for spiegel. I am inclined to think, looking at modernised furnaces, that those at Cyfarthfa will have to be razed to the ground. This will pay better in the end than patching and building up on ancient foundations.

There is no change of any account in the condition of the iron trade. All the works appear to be well off for orders, and at Dowlais, Rhymney, and Tredegar a good deal is being efficiently done. Rhymney, I see, is going in for the Coppee coke ovens, and therein showing wisdom. Better the old beehive than the square ovens of the later build, when the cooling surface is so great. Dowlais coke ovens on the Coppee patent work well. Ironmasters are beginning to see the importance of coke arrangements. There is one furnace at Dowlais where 22 cwt. of coke is used per ton of iron. Even this is beaten at Treforest, where the average is one ton of coke to make one ton of iron. This admirable furnace is one of the largest, and of the latest design, and has done good work for the Steel and Iron Company.

The demand for steel rails is well kept up, and, in thorough correspondence that for iron is on the wane. Steel seems to be in demand now for almost everything.

The coal shipments last week at Newport and Swansea showed a slight falling off.

An amalgamation is to be carried out between the Lewis's Merthyr, Coedcae, and Harfod Collieries, all in the Rhondda Valley. The whole will be worked by a company to be called Lewis's Merthyr Navigation Colliery Company, Limited. It was registered last week. Capital £500,000 in £100 shares. Mr. W. T. Lewis has accepted the chairmanship of the Miners' Permanent Fund.

MR. JOHN HEAD.—We deeply regret to have to record the death of Mr. John Head, of the firm of Ransomes, Head, and Jeffries, in his fifty-first year. Mr. Head has long been known and very highly esteemed as a most energetic partner of this eminent firm. His loss is a most serious one, and will be very severely felt by a very large circle of relatives and friends. To the part he took in agricultural engineering we shall refer on another occasion.

A NEW HIGH-SPEED MOTOR.—The Hon. R. C. Parsons has invented a new engine which is manufactured by Messrs. Kitson and Co., of Leeds. Externally it consists of a closed cylindrical vessel, from one side of which the end of the crank shaft protrudes. The interior of the closed cylindrical vessel contains a steam engine having four single-acting cylinders arranged radially round the crank-shaft, the centre line of which is normal to the plane in which they lie. Mr. Parsons contents himself with a moderate speed for the reciprocating parts, viz., pistons and connecting-rods. He does not allow for them a greater number of reciprocations than corresponds with, say, 450 revolutions per minute, and therefore keeps down the tendency to rattle, hammer, and disintegrate to a minimum. But he doubles the number of revolutions for the crank shaft by the simple expedient of causing the casting forming the united four cylinders also to rotate in the same direction as the shaft. Of course the casting referred to must be carefully balanced, but the radial arrangement makes this quite easy. And thus the high speed of 900 revolutions per minute is, it is claimed, attainable, and steadily maintainable, without noise, shake, undue wear and tear, or any known disadvantage beyond such as any other similar engine would be liable to when running at 450 revolutions. The object of the closed cylinder casing is obviously to collect the exhaust steam which clears itself away from the cylinders in succession the instant release takes place. It further serves the purpose of maintaining the temperature of the cylinders at at least 212 deg:, and of enabling the exhaust steam, and any intermixed lubricants, to get at all enclosed moving parts. It also acts as a dust excluder and safety-guard. There is yet another new feature included in Mr. Parson's engine. We have for some time become familiarised with the use of small pumps, attached to certain machines, for pumping oil or a soap-and-water solution upon or under the cutting edge of a tool. The oil or solution afterwards flows away into a collecting reservoir, and is again utilised and re-utilised indefinitely. Mr. Parsons adopts this principle for lubricating the rapidly-revolving parts of his engine. He then makes sure of a continuous flow of oil at a sufficient pressure to keep apart the wearing surfaces, which ought, therefore, to remain cool and uninjured for any length of time, provided the small pump is kept in operation. The possible disadvantages which may attach to the new motor seem to us to be three-fold, viz.:—(1) It may prove to be heavy and expensive as to first cost, in proportion to power developed. There is obviously the cost of the cylindrical enclosing vessel, of the extra mechanism for rotating the cylinders, and of the oil-circulating machinery to provide. On the other hand, double the power is gained by double the speed, and this will "cover a multitude of sins." To credit there is also the bed-plate and supports of some kind, which, but for the casing, would be necessary. (2) Like all single-acting engines, the pistons are working during half only of each revolution. This means extra weight and original cost per foot-pound of power developed, as compared with double-acting cylinders. (3) It cannot be an economical engine if the pistons be made to act inwards, because that would manifestly involve the usual long steam passages to convey the steam for the central distributing valve to the outer ends of the cylinders. The large obnoxious spaces thereby formed prevent all chance of economy. It is, however, not clear whether the steam may not now or might not possibly be made to act outwards in connection with the large surrounding exhaust chamber, and whether in such case large obnoxious spaces may not be used. It is understood that Messrs. Kitson and Co. are manufacturing this motor for Mr. Parsons, and that modifications have already been designed for other purposes as well as for driving dynamo-electric machines.

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.

17th May, 1880.

2135. HEATING APPARATUS, R. H. Abrey, London.
2136. ARTIFICIAL ALIZARINE, J. A. Dixon.—(*Dr. C. Kœnig, Germany.*)
2137. SUPPORTING LASTS, J. Southwood, Leeds.
2138. LOOMS, J. Holding, Manchester.
2139. LAMP BURNERS, T. Rowatt, Kew.
2140. VENTILLATING, E. Hatton, Manchester.
2141. BROOCHES, W. H. Taylor, Birmingham.
2142. PRINTING FRAME, W. Beck.—(*P. Piquepé, Paris.*)
2143. TIME INDICATOR, E. Nayler, Dudley.
2144. BLASTING, &c., W. E. Gedge.—(*L. Favre, France.*)
2745. SEWING MACHINES, W. Lake.—(*D. Campbell, U.S.*)
2146. SEWING MACHINES, W. Lake.—(*D. Campbell, U.S.*)
2147. WATER-WASTE PREVENTERS, W. Bartholomew, Albert Embankment, London.
2148. STEAM ENGINES, H. Lake.—(*W. Chisholm, U.S.*)
2149. FIRE-PLACES, T. F. Shillington, Belfast.
2150. TRUNKS, W. R. Lake.—(*F. H. Ransom, U.S.*)
2151. LOOMS, A. Flather, Bradford.
2152. PUMPING LIQUIDS, B. Mills.—(*E. Hazélle, Paris.*)
2153. STOVES, J. Sawyer, Alma-street, London.
2154. HORSE-RAKES, W. Brenton, Polbathic St. Germans.
2155. PLOUGHS, W. H. Sleep, Crofthole.
2156. TORPEDO BOATS, J. Johnson.—(*A. Lagane, Paris.*)
2157. CALENDERING, &c., PAPER, A. J. Boult.—(*Messrs. J. Eck and Sons, Germany.*)
2158. VESSELS for HOLDING, &c., MILK, H. Fox, Oxton.

18th May, 1881.

2159. RAILWAY BRAKES, C. Abel.—(*J. Hardy, Vienna.*)
2160. ATTACHING KNOBS to SPINDLES, E. S. Harvey and J. Brodie, London.
2161. TRICYCLES, A. Burdess, Coventry.
2162. PREPARING WIRE, E. Fox, London.
2163. FASTENING BRACELETS, T. Champion, London.
2164. ROLLER SKATES, W. Lake.—(*C. Raymond, U.S.*)
2165. LUBRICATORS, F. Wolff.—(*C. Mollerup, Denmark.*)
2166. SPRING MATTRESSES, &c., D. Peters, London.
2167. VALVES, W. Askew and A. Aird, Manchester.
2168. PORTABLE EASELS, E. J. Chabrell, Withington.
2169. DISTILLING SHALE, G. T. Beilby, Mid Calder.
2170. SEPARATING LIQUIDS, H. J. Smith, Glasgow.
2171. EXTRACTION of METALS, R. Stone, London.
2172. FIRE-ESCAPE LADDERS, &c., A. M. Clark.—(*J. R. Winters, Chambersburgh, U.S.*)
2173. SADDLES, R. Walters and J. Hewitt, London.
2174. BRICKS, &c., J. Walker, Leeds.
2175. REGENERATING, &c., ELECTRIC BATTERIES, W. R. Lake.—(*L. Maiche, Paris.*)
2176. EXTRACTION of GLYCERINE, W. R. Lake.—(*P. J. B. Depoully and L. Droux, Paris.*)
2177. SOCK SUSPENDER CLASPS, E. Blinkhorn and F. A. C. Grœbert.—(*H. Axmann, Vienna.*)
2178. MOTIVE POWER, B. Mills.—(*A. Di Viani, Genoa.*)
2179. METAOXYBENZALDEHYDE, &c., J. A. Dixon.—(*Dr. K. Koenig, & Meister, Lucius, & Bruning, Germany.*)
2180. DISTILLING, A. L. Normandy, London.

19th May, 1881.

2181. FIRE-ARMS, W. W. Morton, London.
2182. TREATING ORES, &c., J. Hargreaves and T. Robinson, Widnes.
2183. SEWING MACHINES, C. Pieper.—(*J. Stern, Russia.*)
2184. AMALGAMATION of GOLD, F. Campbell, London.
2185. CHRONOGRAPHS, &c., L. A. Groth.—(*H. A. Lugrin and P. Nordmann.*)
2186. REMOVING WATER from PEAT, M. Bauer.—(*R. Fölsche, Germany.*)
2187. MARINE ENGINES, W. Allan, Sunderland.
2188. CARDING ENGINES, J. Ramage, Alva, N.B.
2189. GOVERNORS, &c., J. H. Hughes, Birkenhead.
2190. PAPER BAGS, E. P. Alexander.—(*L. Fisher, U.S.*)
2191. LOCK BOLTS, H. F. Hailes & A. S. Bishop, London.
2192. MOTIVE-POWER ENGINES, J. Cartwright, Idle.
2193. ROUNDABOUTS, F. Engel.—(*W. Stuhr, Hamburg.*)
2194. LOOMS, J. Leeming and R. Wilkinson, Bradford.
2195. FIGURED CLOTH, J. Warburton, Bolton.
2196. FIGURED CLOTH, T. Taylor & J. Warburton, Bolton.
2197. ECONOMISING FUEL, A. Boudeville, Rouen.
2198. ELECTRIC LAMPS, C. D. Abel.—(*W. Tschikoleff and H. Kleiber, St. Petersburg.*)
2199. TIN, &c., PLATES, E. Trubshaw, Llanelly, and G. Leyshon, Tipton.
2200. EXHIBITING ADVERTISEMENTS, A. Judge, London.
2201. RAILWAY LAMPS, I. Blake, Birmingham.
2202. BICYCLES, &c., E. Marshall, Birmingham.
2203. BEVELLING ANGLE BARS, J. H. Johnson.—(*W. Highfield, Philadelphia, U.S.*)

20th May, 1881.

2204. LATHES, H. Haddan.—(*E. Kretschmann, Saxony.*)
2205. HARPOONS, H. Haddan.—(*O. C. Bjerge, Norway.*)
2206. CIGARS, A. M. Clarke.—(*O. Hammerstein, U.S.*)
2207. WORKING BRAKES, J. Armstrong, Swindon.
2208. IRONING, W. H. Davey and H. Fabian.
2209. GUNPOWDER FLASKS, F. W. Ticehurst, Warwick.
2210. PAPER, T. Wilson, Hollingbourne.
2211. BUFFER, &c., GEARING, I. A. Timmis, London.
2212. DYNAMO-ELECTRIC MACHINES, C. A. Barlow.—(*M. A. de Meritens, Paris.*)
2213. HYDROGEN GAS, E. S. Samuell, Liverpool.
2214. UMBRELLA FURNITURE, W. G. Denham and F. A. Ellis, London.
2215. COUPLINGS, P. R. Allen, Southwark.
2216. SEWING MACHINES, J. Imray.—(*H. Buckofzer, Berlin.*)
2217. ELECTRICAL CABLES, W. Lake.—(*P. Delany, U.S.*)
2218. PADLOCKS, T. Harby, Liverpool.
2219. STEEL, J. Imray.—(*P. E. Martin, Paris.*)
2220. FUEL, H. Baggeley, London.

21st May, 1881.

2221. DRESSING &c., FABRICS, J. W. Bannister and W. Bywater, Leeds.
2222. APPLYING SPRINGS to DOORS, A. McMillan, Thornliebank.
2223. STEAM GENERATORS, N. G. Kimberley, London.
2224. SWEETMEATS, S. P. Wilding.—(*Thiele and Holzhause, Magdeberg, Germany.*)
2225. HAIR, P. M. Justice.—(*J. G. Stevens, U.S.*)
2226. NITRO-GLYCERINE COMPOUNDS, G. S. Dean, U.S.
2227. SUPPLYING GAS, F. W. Crossley, Manchester.
2228. DOCK WORKS, S. Day.—(*W. Kinipple, Canada.*)
2229. FIRE-GRATE SCREENS, S. H. Ogden, Manchester.
2230. AIR COMPRESSERS, H Fletcher, Bolton-le-Moors.
2231. WASHING GLASSES, T. Wood, Newton Heath.
2232. PIANOFORTE FRAMES, T. J. Brinsmead, London.
2234. PIGEON SHOOTING TRAP, A. Holledge, Beckenham.
2234. AXLE BOXES, W. G. Raoul, Macon, U.S.
2235. UTILISING PURPLE ORE, &c., J. H. Sanders.—(*E. Samuel, Philadelphia, U.S.*)
2236. PORTEMONNAIES, F. Wirth.—(*G. Brumm and P. Luft, Germany.*)

23rd May, 1881.

2237. DISPLAYING CLOTHING, W. P. Thompson.—(*P. de Ligne, Brussels.*)
2238. RESPIRATOR, I. A. Best.
2239. SHAVING SKINS, E. P. Alexander.—(*H. A. House and S. D. Castle, Bridgeport, U.S.*)
2240. PROPELLING VESSELS, &c., L. A. Groth.—(*A. E. Muller, Passau, Germany.*)
2241. FURNITURE, G. Octave, Geneva.
2242. TRANSPOSING MUSIC, A. Digeon, Toulon, France.
2243. DRAW-OFF VALVES, W. C. Brett, Homerton.
2244. LATHE CUTTERS, H. Lindley, Salford.
2245. ADJUSTABLE APPARATUS for INVALIDS, T. Hort, Ealing.
2246. VELOCIPEDES, G. Singer, Coventry.
2247. CARPETS, &c., A. Webb, Worcester.
2248. ROTARY ENGINES, H. E. Newton.—(*Messrs. Cloarec and Cocharaud, Paris.*)

Inventions Protected for Six Months on deposit of Complete Specifications.

2134. CUTTING CYLINDRICAL CORES, J. Gazeley, Watervleit.—*16th May*, 1881.
2145. WAX-THREAD SEWING MACHINES, W. R. Lake, Southampton-buildings, London.—A communication from D. H. Campbell, Pawtucket, Rhode Island, U.S.—*17th May*, 1881.
2146. WAX-THREAD SEWING MACHINES, W. R. Lake, Southampton-buildings, London.—A communication from D. H. Campbell, Pawtucket, Rhode Island, U.S.—*17th May*, 1881.
2206. MAKING CIGARS, A. M. Clark, Chancery-lane, London.—A communication from O. Hammerstein, New York.—*20th May*, 1881.
2217. ELECTRICAL CABLES, &c., W. R. Lake, Southampton-buildings, London.—A communication from P. B. Delany, New York.—*20th May*, 1881.

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

1963. VALVES, C. W. King, Chester, and A. Cliff, Liverpool.—*16th May*, 1878.
1978. INCREASING UP-DRAUGHT in CHIMNEYS, J. Beattie, Westminster.—*17th May*, 1878.
2156 GLASS, J. G. Sowerby, Gateshead.—*29th May*, 1878.
2187. BRUSHES, J. L. Hind and W. L. B. Hinde, Birmingham.—*31st May*, 1878.
2010. CUTTING PAPER, E. Partington, Manchester.—*20th May*, 1878.
2011. DRESSING FLOUR, W. Houghton and A. J. Houghton, Great Grimsby.—*20th May*, 1878.
2017. REFINING IMPURE LEAD, W. R. Lake, London.—*20th May*, 1878.
2073. WATER-CLOSETS, C. Winn, Birmingham.—*23rd May*, 1878.
2084. TRIPOD HEADS, A. Davis, Newgate-street, London.—*24th May*, 1878.
2092. REGULATING the SPEED of ENGINES, B. Hunt, London.—*24th May*, 1878.
2150. SELF-ACTING GRAPPLE BUCKETS, W. D. Priestman and S. Priestman, Kingston-upon-Hull.—*29th May*, 1878.
2218. COMPRESSING CONCRETE, W. R. Lake, London.—*3rd June*, 1878.
2009. SEAMLESS METAL PIPES, E. Quadling, Cannon-street, London.—*20th May*, 1878.
2039. AERIAL BALLOONS, E. P. H. Vaughan, London.—*22nd May*, 1878.
2131. ELASTIC WEB, W. E. Jefferson, Leicester.—*28th May*, 1878.
2147. BALING HAY, &c., W. R. Lake, London.—*29th May*, 1878.
2173. UMBRELLAS, J. Minière, Bordeaux, France.—*30th May*, 1878.
2265. BRACKETS of ROLLER SKATES, J. Mackay, Liverpool.—*6th June*, 1878.
2288. REFRACTING, &c., SOUND, A. C. Engert, Bromley-by-Bow.—*7th June*, 1878.
2042. CONSTRUCTION of YARNS, &c., J. Clapham, Leeds.—*22nd May*, 1878.
2048. COOLING AIR, &c., H. Aydon, Whitton.—*22nd May*, 1878.
2069. GAS, R. S. Ripley, New-inn, London.—*23rd May*, 1878.
2183. COATING WIRE, P. M. Justice, London.—*31st May*, 1878.
2302. BUTTON-HOLE SEWING MACHINE, F. Simmons, London.—*8th June*, 1878.

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

1827. BOLTS, &c., J. Scattergood and B. Wilkes, West Bromwich.—*22rd May*, 1874.
2150. DRYING, &c., WOOL, F. Moore, Trowbridge.—*20th June*, 1874.
1784. PRODUCTION of HEAT, W. S. Sutherland, Halesowen.—*20th May*, 1874.
1835. PREPARING, &c., FIBROUS MATERIALS, J. B. Booth, Preston.—*23rd May*, 1874.
1870. PURIFICATION of SUGAR, J. Duncan, Mincing-lane, London.—*28th May*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 10*th June*, 1881.

179. PRESERVING FOOD E. Jackson, Brixton, and J. Kershaw, London.—*14th January*, 1881.
190. TREATING CAOUTCHOUC, &c., E. Edmonds, London.—A communication from G. M. Mowbray.—*14th January*, 1881.
201. GRINDING MILLS, H. J. Haddan, Strand, London.—Com. from B. Touya.—*15th January*, 1881.
204. BRAKE GEAR, B. Lefebure, South Lambeth.—*15th January*, 1881.
216. TRACTION or ROAD ENGINES, J. F. Dyson, Stainland. near Halifax.—*17th January*, 1881.
217. SEPARATING ASHES, T. H. Williams, Long-acre, London.—*17th January*, 1881.
224. POWER HAMMERS, J. F. M. Pollock, Leeds, and T. Beeley, Manchester.—*18th January*, 1881.
230. FOOT-COVERINGS, P. Martin and T. H. Sneyd, Sheffield.—*19th January*, 1881.
236. COLOURING, &c., the BORDERS of PAPER, A. C. Henderson, London.—A communication from A. Duret.—*20th January*, 1881.
242. PURIFYING, &c., FEED WATER, J. H. Dane, San Francisco, U.S.—*20th January*, 1881.
248. HEATING, E. de Pass, London.—A communication from E. Körting.—*20th January*, 1881.
249. HEAT REGULATORS, E. de Pass, London.—Com. from E. Körting.—*20th January*, 1881.
270. HEATING APPARATUS, C. D. Abel, London.—Com. from A. Morel.—*21st January*, 1881.
283. SHAPING PLATES, &c., T. Turton and R. Roberts, Liverpool.—*22nd January*, 1881.
314. GYMNASTIC APPARATUS, G. Zander, Stockholm.—*24th January*, 1881.
316. GYMNASTIC APPARATUS, G. Zander, Stockholm.—*24th January*, 1881.
317. BRAKES, J. A. Steward, Wolverhampton.—*24th January*, 1881.
326. SEWING MACHINES, R. H. Brandon, Paris.—Com. from J. H. Morley.—*25th January*, 1881.
341. ORE, &c., CRUSHERS, J. T. King, Liverpool.—Com. from C. Foster.—*26th January*, 1881.
403. VENTILATING COWLS, T. Bate, Kilburn, London.—*29th January*, 1881.
408. STEAM ENGINE, H. H. Lake, London.—Com. from P. and F. E. Besnard.—*20th January*, 1881.
455. SIGNAL BUOYS, F. Barr, New York.—*3rd February*, 1881.
577. MARINE STEAM ENGINES, A. C. Kirk, Glasgow.—*10th February*, 1881.
974. GAS BRACKETS, F. W. Thorn, Elgin-terrace, London.—*7th March*, 1881.
1247. ICE MACHINES, H. J. Haddan, London.—A communication from O. Kropff.—*22nd March*, 1881.
1286. WARMTH RESERVOIRS, O. Wolff, Dresden.—Com. from A. Nieske.—*23rd March*, 1881.
1312. HOT BLAST STOVES, H. Massicks and W. Crooke, Millom.—*24th March*, 1881.
1383. THERMOMETERS, W. B. Fowle, Newton, U.S.—*29th March*, 1881
1407. PERMANENT WAY of RAILWAYS, C. Bergeron, Westminster.—*30th March*, 1881.
1432. DEODORISING WATER-CLOSETS, W. Morgans, Bristol.—*1st April*, 1881.
1481. RAISING, &c., OBJECTS, G. Behrns and G. Unruh, Lübeck, Germany.—*5th April*, 1881.
1548. SEWING MACHINES, J. W. Ramsden, Leeds.—*8th April*, 1881.
1565. TOBACCO PIPES, J. Trieb, London.—A communication from S. Notton.—*11th April*, 1881.
1614. ROLLER MILLS, W. L. Wise, London.—Com. from Messrs. Seck Brothers.—*13th April*, 1881.
1662. CRATE for PACKING, J. Pullen, Bayswater, London.—*14th April*, 1881.
1691. TRICYCLE, A. Wharton, Snettisham.—*19th April*, 1881.
1717. COMPOUND MARINE STEAM ENGINES, A. C. Kirk, Glasgow.—*20th April*, 1881.
1872. BREECH-LOADING SMALL-ARMS, H. Walker, Birmingham.—*30th April*, 1881.
1894. COMBUSTIBLE GAS, C. D. Abel, London.—A communication from E. Langen.—*2nd May*, 1881.
1898. FOLDING PAPER, J. H. Johnson, London.—A communication from W. C. Cross.—*3rd May*, 1881.
1911. FOOD for CATTLE, A. E. Brooke-Hunt, Peer's Court, Gloucester.—*3rd May*, 1881.
1918. CARBON CONDUCTORS, E. G. Brewer, London.—Com. from T. A. Edison.—*3rd May*, 1881.
1924. DRYING MATRIXES, J. E. Taylor, P. Allen, W. Evans, and D. Braithwaite, Manchester.—*4th May*, 1881.
1940. COMBUSTIBLE GAS, N. A. Otto, Mulheim-on-the-Rhine, Germany.—*4th May*, 1881.
1941. FASTENING the TIRES of RAILWAY WHEELS, A. Longsdon, London.—A communication from A. Krupp.—*4th May*, 1881.
1943. ELECTRIC LIGHTING, E. G. Brewer, London.—Com. from T. A. Edison.—*4th May*, 1881.
1958. CENTRIFUGAL MACHINES, C. D. Abel, London.—Com. from E. Langen.—*5th May*, 1881.
1970. PARANITRO COMPOUNDS, C. D. Abel, London.—Com. from Bindschedler and Busch.—*6th May*, 1881.
2003. BREECH-LOADING FIRE-ARMS, W. W. Greener, Birmingham.—*9th May*, 1881.
2081. FLUID METERS, &c., B. D. Healey, Blackburn.—*12th May*, 1881.

Last day for filing opposition, 14*th June*, 1881.

115. BEARINGS for SHAFTS, L. A. Groth, London.—Com. from A. Gravelin.—*10th January*, 1881.
233. CLOSING, &c., BOTTLES, R. Lanham, Whetstone.—*19th January*, 1881.
234. PREPARING FIBROUS SUBSTANCES, T. C. Fawcett, Leeds.—*19th January*, 1881.
235. SAMPLING LIQUIDS, J. O'N. Mackle, Liverpool.—*20th January*, 1881.
247. ENAMELLING of IRON, &c., F. Winterhoff and H. C. Webb, Worcester.—*20th January*, 1881.
260. SEATS of TRICYCLES, J. Turner, Coventry, and J. A. Lamplugh and G. F. Brown, Birmingham.—*20th January*, 1881.
262. CLASPS, &c., T. Osborn and A. Osborn, Birmingham.—*21st January*, 1881.
271. SYPHON TAP, H. J. Allison, London.—Com. from Clairac, Millot, et Berger.—*21st January*, 1881.
272. RAISING TREES, &c., S. Newington, Ridgeway.—*21st January*, 1881.
276. VALVES, J. H. Harrison, Chester.—*21st January*, 1881.
286. TELEPHONES, F. H. F. Engel, Hamburg.—Com. from J. H. Königslieb.—*22nd January*, 1881.
288. REGULATING the SPEED of ENGINES, J. Richardson, Lincoln.—*22nd January*, 1881.
293. CREAMING MILK, F. W. Unterlip, Düsseldorf.—Com. from C. Becker.—*22nd January*, 1881.
297. STAIR ROD EYES, M. Lenzberg and M. M. Lenzberg, London.—*22nd January*, 1881.
309. CULTIVATING LAND, F. Brütschke, Berlin.—*24th January*, 1881.
324. CARDS, C. M. Sombart, Magdeburg.—A communication from P. Leclerc.—*25th January*, 1881.
330. ROUGHING APPLIANCE, W. Bishop, Lower Edmonton.—*25th January*, 1881.
339. MOWING MACHINE, A. I. Boss, London.—A communication from S. Sudheim.—*26th January*, 1881.
342. HANSOM CABS, W. Johnstone, Edinbugh.—*26th January*, 1881.
367. STARTING, &c., SEWING MACHINES, J. H. Johnson, London.—Com. from V. Jurion.—*27th January*, 1881.
379. DISTRIBUTING SAND, &c., T. E. Golding, London.—*28th January*, 1881.
396. LOOMS for WEAVING, J. Brownlie, Glasgow.—*29th January*, 1881.
413. UNHAIRING HIDES, &c., E. G. Brewer, London.—A communication from A. R. White, J. E. Reid, and E. Potter.—*31st January*, 1881.
421. TOOL HOLDERS for LATHES, H. Sutcliffe and W. Sutcliffe, Halifax.—*1st February*, 1881.
428. SOCK SUSPENDERS, H. M. Knight, Surbiton.—*1st February*, 1881.
484. GRINDING CORN, W. R. Lake, London.—A communication from J. T. Noye, R. K. Noye, and E. H. Noye.—*4th February*, 1881.
507. PACKING for STEAM ENGINES, E. A. Brydges, Upton.—Com. from W. Wolff.—*5th February*, 1881.
918. AUDIBLE SIGNALS, E. Tyer, Old-street, London.—*3rd March*, 1881.
982. POPELLING VESSELS, L. A. Groth, London.—Com. from E. Müller.—*8th March*, 1881.
1100. GIVING MOTION to CARRIAGES, &c., L. A. Groth, London.—A communication from G. Liedman and C. Beger.—*14th March*, 1881.
1325. INDICATOR LOCKS, A. M. Clark, London.—Com. from Eagle Lock Company.—*24th March*, 1881.
1534. MONEY TILLS, F. Hawkins, Disraeli-road, near Stratford.—*7th April*, 1881.
1723. EXPLODING GASES, W. Watson, Leeds.—*20th April*, 1881.
1735. COUPLING APPARATUS, J. M. Head, Reigate.—Com. from J. C. Davidson.—*22nd April*, 1881.
1791. RAISING A NAP on CLOTH, A. M. Clark, London.—Com. from E. Gessner.—*26th April*, 1881.
1800. OYSTER CULTURE, E. Johnson, West Cowes, Isle of Wight.—*26th April*, 1881.
1824. TRICYCLES, T. Banister and S. Lees, Rochdale.—*27th April*, 1881.
1846. ROTARY ENGINES, J. Swalwell, Acre-street, Battersea.—*28th April*, 1881.
1853. PROPELLING, &c., VESSELS, J. I. Thornycroft, London.—*29th April*, 1881.
1875. WINDING, &c., THREADS, G. Bernhardt, Radcliffe.—*2nd May*, 1881.
1891. PERMANENT WAY, A. J. H. Smythe, Athlone, Ireland.—*2nd May*, 1881.
1896 SEPARATING LIME, &c., CONTAINED in DOLOMITE, S. Cliff, Leeds.—*2nd May*, 1881.
1915. WHITE ZINC PIGMENT, W. R. Lake, London.—Com. from J. Cawley.—*3rd May*, 1881.
2039. GATHERING, &c., CUT CROPS, G. A. Walker, Sutton, near Retford.—*10th May*, 1881.
2045. BURNING LIQUID HYDRO-CARBON, W. R. Lake, London.—A communication from R. Lighthall.—*10th May*, 1881.
2134. CUTTING CYLINDRICAL CORES, J. Gazeley, Watervleit.—*16th May*, 1881.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 20th May*, 1881.)

4494. TREATING FERMENTED LIQUIDS, W. R. Lake, London.—*3rd November*, 1880.
4519. OXYDISING FERMENTED LIQUORS, W. R. Lake, London.—*4th November*, 1880.
4672. TWIST LACE FABRICS, G. Bentley, Nottingham.—*13th November*, 1880.
4824. SAUCES, &c., D. Henderson, Birkenhead.—*22nd November*, 1880.
4837. HEATING, &c., METAL PLATES, R. J. Hutchings, Mumbles, and H. F. Taylor and W. P. Struvé, Neath.—*22nd November*, 1880.
4873. BICYCLES, &c., T. J. Palmer and C. F. Dietrich, London.—*24th November*, 1880.
4880. SPINNING MACHINERY, T. Craven, Keighley, and T. Muter, Bradford.—*24th November*, 1880.
4881. GAS MOTOR ENGINES, L. Simon and F. Wertenbruch, Nottingham.—*24th November*, 1880.
4882. REDUCING MINERAL STONES, Sir F. C. Knowles, Lovell Hill.—*24th November*, 1880.
4889. LIFTING HEAVY WEIGHTS, A. Lafargue, Kensington, London.—*24th November*, 1880.
4898. CASTING METALS, L. A. Groth, Finsbury-pavement, London.—*25th November*, 1880.
4905. LIFE BUOYS, E. J. Johnson and J. Clayton, Liverpool.—*25th November*, 1880.
4907. SHARPENING TWIST DRILLS, J. D. Ashworth, Manchester.—*25th November*, 1880.
4915. STEAM STEERING GEAR, W. Clarke and J. B. Furneaux, Gateshead-on-Tyne.—*25th November*, 1880.
4931. MATTRESSES, W. E. Brown, Camden Town, London.—*26th November*, 1880.
4981. TELEPHONIC APPARATUS, W. R. Lake, London.—*30th November*, 1880.
4983. LAMPS, G. Day, Birmingham.—*30th November*, 1880.
4984. TREATING JUTE, &c., C. F. Cross, Brentford.—*30th November*, 1880.
4986. REGULATING the FLOW of WATER, W. Morris, F. P. Preston, J. T. Prestige, and E. J. Preston, Deptford.—*30th November*, 1880.
5085. SORTING, &c., GRAIN, H. H. Lake, London.—*6th December*, 1880.
5107. STEAM PUMPS, G. Tangye, Birmingham, and T. Jefferies, jun., and J. R. Williams, Handsworth.—*7th December*, 1880.
5158. MOULDS for LIQUID METALS, J. T. King, Liverpool.—*10th December*, 1880.
5234. WARPING MACHINES, J. C. Sewel, E. Hulton, and J. Bethel, Manchester.—*14th December*, 1880.
5242. WEIGHING, &c., MACHINES, W. H. Baxter, Brixton-hill.—*14th December*, 1880.
5268. TRANSMITTING DRAWINGS, &c., by ELECTRICITY, A. W. L. Reddie, London.—*15th December*, 1880.
5294. WHEELS, J. Radges, Coventry.—*17th December*, 1880.
5384. MACHINE GUNS, W. Gardner, Hartford, U.S.—*22nd December*, 1880.
5472. GLAZING, C. F. Elliott, Liverpool.—*29th December*, 1880.
70. STOP MOTION for SPREADING, &c., FRAMES, A. T. Lawson & S. Dear, Leeds.—*6th January*, 1881.
85. TREATING PAPER, &c., W. B. Fitch and H. A. Barton, London.—*7th January*, 1881.
153. ELECTRIC LAMPS, A. Muirhead and J. Hopkinson, London.—*12th January*, 1881.
290. SMELTING ZINC, J. B'non and A. Grandfils, Membach, near Dolhain.—*22nd January*, 1881.
434. RAILWAY WHEELS, W. H. Kitson, Leeds.—*1st February*, 1881.
608. GLUE, A. J. Boult, High Holborn, London.—*12th February*, 1881.
704. BOAT DAVITS, &c., R. Burdes, Sunderland.—*24th February*, 1881.
853. LIGHTING RAILWAY CARRIAGES, J. F. Shallis and T. C. J. Thomas, London.—*28th February*, 1881.
1016. VEBERMETERS, E. G. Brewer, Chancery-lane, London.—*9th March*, 1881.
1053. LOZENGES, J. Rough and J. Hurry, Dalkeith.—*11th March*, 1881.
1152. OPENING INTERNALLY STOPPERED BOTTLES, H. Codd, London.—*16th March*, 1881.
1153. STAMPING LETTERS, H. Codd, London.—*16th March*, 1881.
1275. HOPPERS, &c., J. Redgate, Nottingham.—*23rd March*, 1881.

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

4482. CABLES, E. George and J. B. Morgan, Liverpool. *3rd November*, 1880.
4920. EARS for HANDLES of PAINT-POTS, &c., R. Read, Liverpool.—*26th November*, 1880.
4922. PRODUCING COPIES of DESIGNS, E. Edwards, London.—*26th November*, 1880.
4926. BOILING WORTS, T. Bloom, Boston.—*26th November*, 1880.
4930. PLIERS, &c., W. M. Cranston, Worship-street, London.—*26th November*, 1880.
4945. TREATING WORT, B. J. B. Mills, Southampton-building, London.—*27th November*, 1880.
4951. MUSIC SEATS, H. B. Fox, Oxton.—*27th November*, 1880.
4956. SPINNING, &c., B. Brown, Bury.—*29th November*, 1880.
4985. SODA, T. Morgan, Cockspur-street, London.—*30th November*, 1880.
4993. FELTING MACHINES, G. Yule, Newark, U.S.—*1st December*, 1881.
5001. PRINTING, &c., NEWSPAPERS, P. D. Hedderwick, Glasgow.—*1st December*, 1880.
5016. WAXED THREADS, J. C. Mewburn, Fleet-street, London.—*2nd December*, 1880.
5029. RING SPINNING FRAMES, A. M. Clark, Chancery-lane, London.—*2nd December*, 1883.
5045. IRON WIRE, H. E. Newton, Chancery-lane, London.—*3rd December*, 1880.
5051. TIME-PIECES, W. P. Thompson, High Holborn, London.—*4th December*, 1880.
5056. TREATING VARICOSE VEINS, &c., J. R. A. Douglas, Hounslow, London.—*4th December*, 1880.
5171. RAILWAY VEHICLES, W R. Lake, Southampton-buildings, London.—*10th December*, 1880.
5178. HORSESHOE NAILS, H. P. Fenby, Leeds.—*10th December*, 1880.
5195. SMOKE-CONSUMING STOVES, H. S. Snell, London.—*11th December*, 1880.
5245. RECTIFICATION of ALCOHOL, &c., S. Pitt, Sutton.—*14th December*, 1880.
5313. METALLIC ALLOYS, G. A. Dick, Cannon-street, London.—*18th December*, 1880.
5370. DISENGAGING HOOK, &c., J. Brown, Water-street, Liverpool.—*22nd December*, 1880.
2. PLAYING upon PIANOFORTES, E. Underwood, Birmingham.—*1st January*, 1881.
267. TUBING, J. C. Mewburn, Fleet-street, London.—*21st January*, 1881.
358. ROLLING METAL WIRES, A. Hughes, Glasgow.—*27th January*, 1881.
795. WOODEN PACKING CASES, F. Myers, Southampton-buildings, London.—*24th February*, 1881.
854. EXTINGUISHING FIRE, C. Tuchmann, St. Thomas's-street, London.—*28th February*, 1881.
856. STENTERING, &c., TEXTILE FABRICS, W. Mather, Manchester.—*1st March*, 1881.
1083. PERFORATING PAPER, H. H. Lake, Southampton-buildings, London.—*12th March*, 1881.
1211. BUTTON-HOLE SEWING MACHINES, H. Mills, Birmingham.—*19th March*, 1881.
1291. TREATING HOMINY, B. J. B. Mills, Southampton-buildings, London.—*23rd March*, 1881.
1401. STRING ATTACHMENTS for PIANOS, H. J. Haddan, Strand, London.—*30th March*, 1881.

List of Specifications published during the week ending May 21st 1881.

3537, 6d.; 3706, 6d.; 3883, 2d.; 3934, 8d.; 3962, 6d.; 4005, 6d.; 4050, 6d.; 4058, 8d.; 4030, 8d.; 4064, 9d.; 4067, 6d.; 4073, 6d.; 4076, 6d.; 4077, 6d.; 4096, 6d.; 4104, 6d.; 4105, 6d.; 4109, 8d.; 4110, 6d.; 4131, 6d.; 4134, 6d.; 4136, 10d.; 4137, 8d.; 4140, 4d.; 4142, 4d.; 4144, 4d.; 4146, 4d.; 4148, 6d.; 4152, 6d.; 4160, 6d.; 4161, 6d.; 4167, 6d.; 4168, 10d.; 4169, 6d.; 4181, 6d.; 4196, 6d.; 4202, 6d.; 4203, 2d.; 4212, 6d.; 4213, 6d.; 4219, 6d.; 4225, 6d.; 4230, 4d.; 4231, 6d.; 4232, 4d.; 4233, 2d.; 4234, 2d.: 4236, 2d.; 4237, 6d.; 4238, 2d.; 4240, 2d.; 4246, 2d.; 4249, 6d.; 4250, 4d.; 4251, 6d.; 4252, 2d.; 4255, 6d.; 4259, 2d.; 4260, 6d.; 4264, 2d.; 4267, 4d.; 4298, 2d.; 4271, 2d.; 4275, 2d.; 4278, 6d.; 4279, 2d.; 4282, 2d.; 4283, 2d.; 4284, 6d.; 4287, 6d.; 4292, 2d.; 4294, 4d.; 4296, 2d.; 4307, 2d.; 4321, 2d.; 4328, 2d.; 4334, 4d.; 4335, 4d.; 4337, 2d.; 4341, 6d.; 4346, 4d.; 4353, 4d.; 4380, 4d.; 4382, 6d.; 4437, 6d.; 4555, 4d.

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

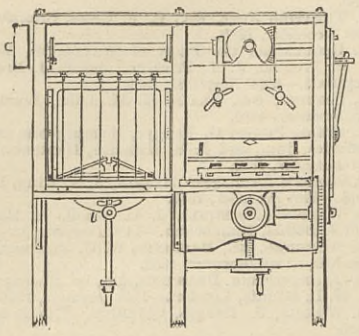
ABSTRACTS OF SPECIFICATIONS.

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

3537. DOVETAILING MACHINERY, *W. T. Mackey.—Dated 1st September*, 1880. 6*d.*

A circular saw and planing machine are combined with a vertical saw frame and saws, a vertical acting

3537.

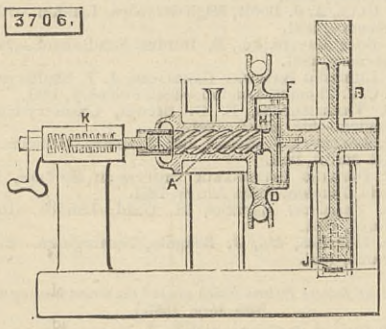


slide forming a press carrying chisels and a horizontal slide with two arms carries fixed cutters. The circular saw bench is provided with a projecting spindle to carry a planing block.

3706. REGULATING THE VELOCITY OF ENGINES, *W. W. Girdwood.—Dated 11th September*, 1880. 6*d.*

A screw A is connected to the fly-wheel B by a crank pin which works freely in a hole in the crank arm. Motion is imparted to the screw by the boss of the driving wheel D. A cylinder F is cast on the face of the driving wheel and covers the crank and stops H. J is a brake attached to the bed plate in order to pre-

3706.



serve the inertness of the fly-wheel, and K a graduated scale to indicate the speed and pressure, being actuated by a spring or weight acted upon by the apparatus. When the driving wheel moves faster than the fly-wheel it imparts a rectilinear motion to the screw which acts on the parts operating on the steam valves.

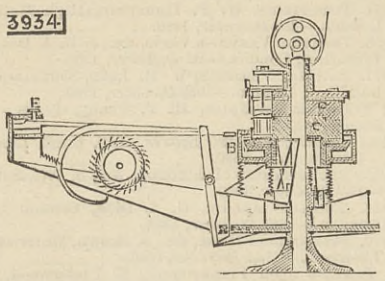
3883. APPARATUS FOR THE PRODUCTION OF MOTIVE POWER, *W. Prowett.—Dated 25th September*, 1880.—(*Not proceeded with.*) 2*d.*

This consists in forming in direct communication with the boiler or steam generator two tubes containing piston-rods, which piston-rods carry upon their outer ends buffers or striking plates, so that when a valve is opened between the boiler and one tube the steam will rush into this tube and force out the one buffer against an impediment upon the carriage or other matter intended to be set in motion.

3934. SETTING AND DISTRIBUTING TYPES, *W. Morgan-Brown.—Dated 28th September*, 1880.—(*A communication from J. Thorne.*)—(*Complete.*) 8*d.*

The type composing mechanism consists of a stationary type case C, with vertical channels arranged tangentially, and open at the upper ends and closed at the bottom by a base having a central chamber to allow the proper movements of bell cranks which actuate the type ejectors. The type conveying mecha-

3934

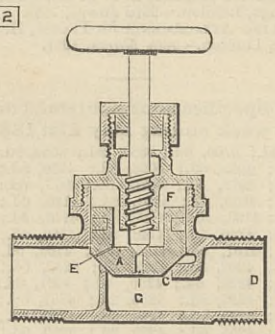


nism consists of a table B, which carries the type round and deposits it on a belt, whence it passes to the line forming mechanism consisting of a type carrying wheel, a type elevator and a setting stick. The type distributing mechanism consists of the type case D, with channels corresponding to the type case C, and revolved with a step-by-step movement. The whole apparatus is worked from the keys E.

3962. CONTROLLING THE PASSAGE OF WATER, &c., *T. H. P. Dennis.—Dated 30th September*, 1880. 6*d.*

According to one arrangement a large valve A is packed to fit a cylinder, in which it can move to and from the valve seat C. The central portion of one surface of this valve when on ts seat closes the outlet

3962



passage D, whilst the entire annular portion around the central portion is acted upon equally by the pressure of the fluid. A small passage E is formed through the annular portion of the valve to a chamber F above the valve, so that the fluid pressure tends to keep the valve closed. A second and larger passage G is formed through the valve, and is fitted with a valve, on raising which for the escape of the fluid in chamber F, the pressure therein is reduced, and the valve A opens by the pressure of the fluid on the annular surface.

3964. IMPROVEMENTS IN MAGNETO OR DYNAMO-ELECTRIC MACHINES, *P. Jensen.—Dated 30th September*, 1880.—(*A communication from T. A. Edison.*) 10*d.*

The principal improvements described relate to (1) the commutator brushes. Each brush or spring is secured at an angle in a holder, so that the brush bears obliquely upon the commutator. The holder is pivotted on a U-shaped jaw. At the pivotted point of the holder is a chamber, in which is a spring, whose force is exerted to throw the brush upon the commutator. Figs. 1, 2, and 3 show the arrangement. (2) Describes how the prime motor is preferably connected directly to the dynamo machine, and both mounted on one base as on Fig. 4. Another part of the invention describes the means of communicating motion from the rotating armature to the driven mechanism without the use of belts, gear or similar

3964

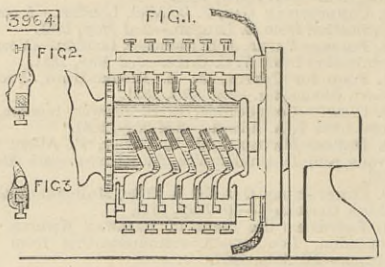
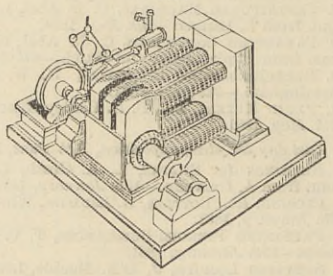


FIG.4.

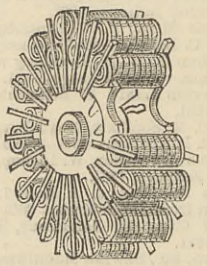


devices. Further, the coil is so made as to be removed or repaired without disturbance of the remainder. This is accomplished by making of wire only that portion of the coil which is upon the operative face, the wires of a coil being connected at the ends by metallic plates, fastened to an insulating base, and insulated from each other.

4005. IMPROVEMENTS IN DYNAMO-ELECTRIC OR MAGNETO-ELECTRIC MACHINES, *E. G. Brewer.—Dated 2nd October*, 1880.—(*A communication from A. J. B. Cance.*) 6*d.*

This apparatus is essentially composed of one or several induction crowns or rings on a support in the

4005

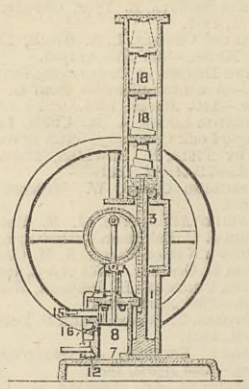


form of a wheel mounted on the shaft of the machine. The figure shows a double crown of these induction coils.

4050. OBTAINING AND APPLYING MOTIVE POWER, *J. Robson.—Dated 5th October*, 1880. 6*d.*

This consists in a cylinder and free piston with a toothed rack gearing with a wheel running free on the fly-wheel shaft when the piston ascends, but which grips by an excentric gripper, and on descent of the piston turns the shaft. The cylinder 1 communicates by port 7 with a charging pump 8, worked from the fly-wheel shaft. On the ascent of the pump piston gas and air are drawn into it through the flap valve 12. When the pump piston arrives at top it covers the escape port 15, and draws in a flame 16, which explodes

4050



the charge and drives up the piston and rack 3, thereby compressing the volute springs 18, which afterwards drive the rack down again, and so impart motion to the fly-wheel and shaft. This invention is also applicable to lifts, hoists, or cranes, pumps, and forging hammers or stamps. The invention further relates to governing and starting gas engines.

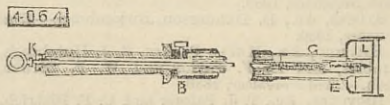
4060. WAGONS FOR CONVEYANCE OF COAL, &c., *P. P. Elwell.—Dated 6th October*, 1880. 8*d.*

A wagon is constructed which consists of a frame mounted upon wheels, the body part of the wagon being formed of a number of movable compartments carried upon the frame aforesaid, and suitably fastened together or otherwise kept in their proper position. Each compartment forms a smaller wagon or cart body, which is capable of being removed from the larger wagon frame on to a smaller frame mounted upon wheels.

4064. APPARATUS FOR MAINTAINING HIGH DEGREES OF HEAT, &c., *J. T. Dann.—Dated 6th October*, 1880.—(*A communication from M. Flurscheim.*) 6*d.*

This relates to means for keeping up an intense heat for working mechanical and chemical apparatus. Liquid fuel is admitted to tube B, within which is

4064

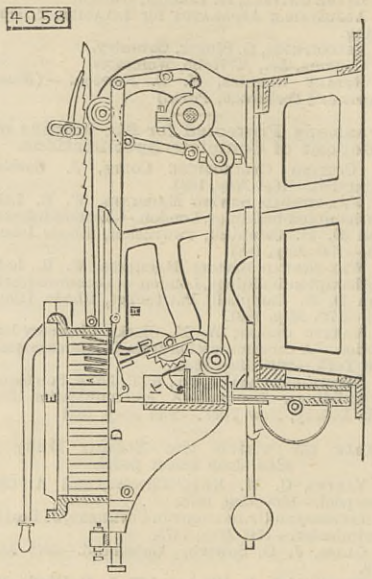


another tube containing a wick, and communicating with a Bunsen burner E, surrounded by an external tube G, and regulated by means of the wire K. The article to be heated is supported in the box L, and is acted upon by the flame issuing from the burner.

4058. LAYING OUT MATCHES FROM THE DIPPING FRAMES, *F. Wirth.—Dated 6th October*, 1880.—(*A communication from G. Sebold.*) 8*d.*

This relates to mechanism to automatically lay out matches so as to do away with hand labour. The matches are placed in the dipping frames with their heads downwards between divisions in the carriage E,

4058



and when released fall on to the plate D as shown. The carriage is then drawn forward by a rack bar, and the matches fall on to a slide, and then into the layer over I, which then makes a quarter of a turn and delivers the matches into the laying-out box K.

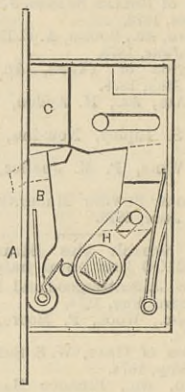
4067. CLOSETS AND ASHPITS, *J. R. Pickard.—Dated 6th October*, 1880. 6*d.*

Closets and ashpits are constructed in such a manner that the main body of the ashes are separated from the refuse without manipulation and additional labour. The whole of the ashes fall on to inclined grates or grate, placed so that the finer ashes or dust fall through the grates on to the excreta and deodorise it, the coarser material being precipitated from the inclined grates into a receptacle provided therefor. The closets and ashpits are made easy of access for emptying and cleaning purposes.

4073. FASTENINGS FOR CARRIAGE DOORS, &c., *W. H. Saint Aubin.—Dated 7th October*, 1880. 6*d.*

The lock for fastening carriage doors is opened by means of the usual handle. According to one modification the lock consists of two main parts, a striking bolt B, and a square-headed bolt C, the former preferably bevelled each way, so as to act either handed, and carried upon a vertical shank working on a stud at the lower end of the case, and at a little distance back from the fore-plate A. When the door is open the

4073

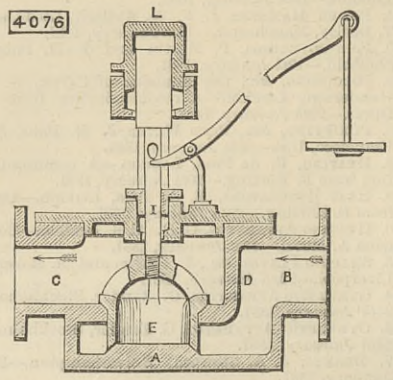


striking bolt is pressed forwards with the bevelled part projecting through the fore-plate. The tail end of the square-headed bolt projects downwards and carries a stud which takes into a slot in the horns of the follower H, this bolt being also forced outwards by a spring. A part behind the head of the striking bolt is formed to a convex curve, and a corresponding curve is formed on the underside of the square-headed bolt immediately behind the part which is shot forwards through the fore-plate to fasten the door.

4076. REGULATOR OR STOP VALVE FOR STEAM ENGINES, &c., *W. H. Thomas.—Dated 7th October*, 1880. 6*d.*

The case A is divided by the partition D, and in the inlet side B is a valve E with two seats, the spindle I of which is prolonged, and carries a ram working in a hydraulic cylinder L, a hole being formed through the spindle, so as to put the cylinder L and outlet C in communication. The spindle is connected to a

4076



weighted lever which keeps the valve open until the pressure increases, when the valve is closed by the pressure of the fluid on the upper part of the plunger in the cylinder L.

4077. PUNCHING AND EYELETTING MACHINES FOR BOOTS AND SHOES, *J. Boothroyd.—Dated 7th October*, 1880. 6*d.*

The particular object is to punch holes in the uppers of boots and shoes to receive eyelets, and afterwards to place the eyelet in such holes and rivet or clench them there; and further to punch all holes in each side, and afterwards rivet or clench the eyelets in them simultaneously.

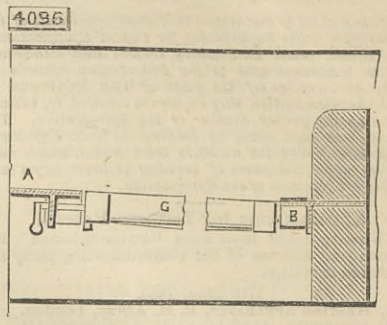
4104. LABELS, &c., *W. R. Harris and J. G. Cooper.—Dated 9th October*, 1880. 6*d.*

This relates principally to the labels, which are each folded at one end, and have metal eyelets fixed in the folded ends. The labels are supplied to a machine, which folds the end of each label and inserts and fixes the eyelet.

4096. GRATE BARS, *J. Dean.—Dated 8th October*, 1880. 6*d.*

This relates to the construction of grate bars to facilitate removal of clinkers and spent ashes without opening the furnace door. The front and back dead plates A and B are formed with journals corresponding to the number of sections of bars G of which the grate is composed. The end of each section has a projection that rests in the journal, the front projection extending the width of the front dead plate and arranged at the end to receive a lever. To clear the

4096

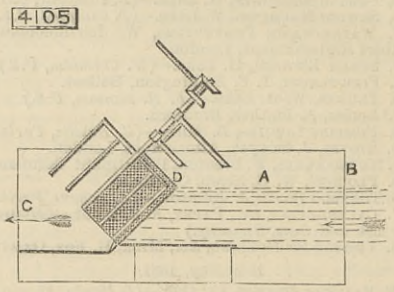


clinkers and spent ashes from any section a lever is applied to the projection and the bar turned, completely overthrowing the clinkers and ashes into the ashpit.

4105. INTERCEPTING AND TREATING SOLID MATTERS SUSPENDED IN WATER, &c., *J. Bannehr.—Dated 9th October*, 1880. 6*d.*

The water enters trough A at B and passes through a strainer D placed at an angle between the inlet B

4105

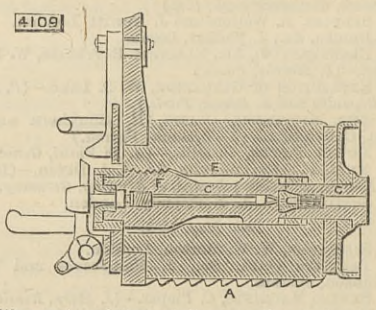


and outlet C, the latter being lower than the inlet. Within the strainer are two sets of blades which can be rotated in opposite directions, so as to force back the water when required to clear the meshes of the strainer.

4109. ORDNANCE, *A. Noble.—Dated 9th October*, 1880. 8*d.*

The invention is applicable to both breech and muzzle-loading guns, and relates to the venting and to the arrangements for the ignition of the charge. The drawing shows the application to a breech-loading gun, the block of which closes in its place with a spaced screw A. The gas check is secured by a bolt

4109



C with a nut, and through it passes the vent passage, which is enlarged at the rear end to receive a gas-tight priming capsule E is the vent chamber, receives the vent block E, also secured in position by a screw, and bored from end to end for the passage of the striker or firing instrument.

4110. COCKS FOR CONTROLLING THE DRAWING-OFF OF LIQUIDS, *T. Easey.—Dated 9th October*, 1880. 6*d.*

This relates to cocks in which a sphere is held by the pressure of the fluid against a ring of elastic material, and it consists in forming the case in two parts screwed together, the upper part being connected to the supply pipe, the lower part having at the bottom a central outlet of smaller diameter than the other part, so as to form a shoulder, on which an elastic ring is placed. A ball rests on this ring and closes the passage. A tube is screwed into the outlet passage, and by turning it the ball is lifted from its seat.

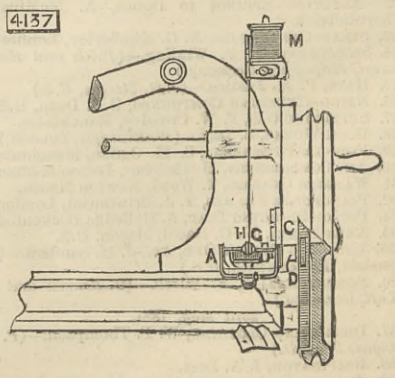
4131. NAVIGABLE VESSELS, *A. W. L. Reddie.—Dated 12th October*, 1880.—(*A communication from R. Mc C. Fryer.*) 6*d.*

The vessel consists of a framework or hull, preferably of iron, in which are arranged and which is supported upon the journals or shafts of three bouyant spheres or drums, which are provided with paddles or floats on their outsides, and the interiors of which are divided into compartments for the purpose of increasing their strength, and providing in case of accident against the entire destruction of their buoyancy. Each sphere or drum serving as a separate paddle wheel is capable of independent rotation, and is provided with an independent engine or means of driving it, so that in the absence of a rudder the vessel may be guided by the relative speed or direction of revolution of the spheres or drums. The drums or spheres are also furnished externally with annular keels, which project beyond the paddles or floats, and are grooved for the purpose of adapting them to a railway on shore, on which railway the vessel may be propelled by using the said annular grooved keels as railway driving wheels.

4137. SEWING MACHINES, *G. Illston.—Dated 12th October*, 1880. 8*d.*

This relates to mechanism for winding the thread on the shuttle spool, and, according to one arrangement it consists of the spool holder A, in which the spool is mounted on a spindle C carrying the wheel D, which gears with a wheel on the axle of the driving

4137



wheel. The spindle C can slide in its bearings, so as to throw the wheel D out of gear when the bobbin is not in the holder A. A rod G carries a small roller H, capable of revolving freely, and of sliding along the

rod G, so as to guide the thread, which passes from the bobbin E through tension plates and on to the spool.

4136. SEPARATION OF ZINC FROM OTHER METALS, &c., *G. Barker.—Dated 12th October*, 1880.—(*A communication from A. Harnickell.*) 10*d*.

This relates to the cheap production of chemically pure and dense zinc, and it consists in taking the raw material and smelting it by simply melting it to a dull red heat in a reverberatory zinc furnace, and removing lead in the usual way, after which sulphur is plunged into the bottom of the bath by means of an iron pipe. Other re-agents may be similarly introduced. The effect of the sulphur in the formation of iron is the formation of sulphurets, also arsenites, combined of metallic elements present, excepting the zinc. These sulphurets are removed, leaving the pure zinc behind, but in an electric state unsuitable for use. This zinc is distilled and cast in the retort furnace shown in the drawing.

4140. STEAM PACKING &c., *J. Briggs.—Dated 12th October*, 1880. 4*d*.

The packing is constructed of an inner hollow core of india-rubber or other elastic or springy substance; this is covered with linen, canvas, or other such material formed in strips, and wrapped upon the core; the strips are interspersed with fine wire gauze for strengthening purposes. The whole is made self-lubricating, by being steeped in a composition consisting of tallow, fine soap, and beeswax, or other suitable lubricating material.

4142. PICKERS for LOOMS, *H. Almond and J. Holding.—Dated 12th October*, 1880. 4*d*.

This consists in constructing the picker so that the "strap" or "band" is attached to a projection or tongue on the top side of the picker, and which projection or tongue can be either made during the formation of the picker or applied afterwards.

4144. SCUTCHING MACHINES, *A. J. Boult.—Dated 12th October*, 1880.—(*A communication from S. S. Fuller.*) 4*d*.

The object of the invention is to clear the tow during the scutching operation, and it consists essentially in

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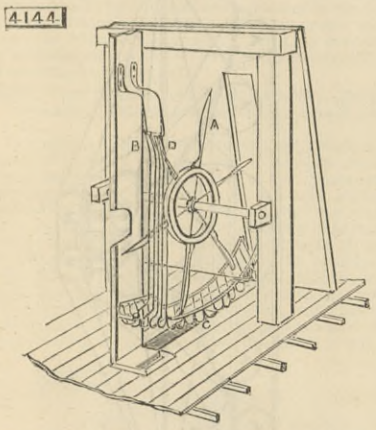


arranging, with the revolving beaters A and scutching board B, a grated or perforated trough C and a vertical grating D.

4146. PISTOLS, &c., *A. J. Boult.—Dated 12th October*, 1880.—(*A communication from M. O'Mahoney.*) 4*d*.

In order to obtain a steady aim the pistol is attached to a walking stick by a clamp or clamps.

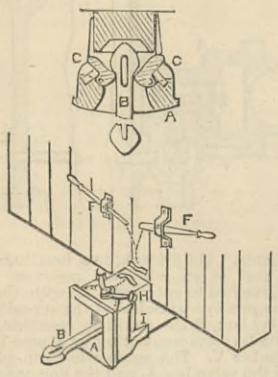
4148. HOLDING OR SUPPORTING SPECTACLES, *J. Betjemann.—Dated 12th October*, 1880. 6*d*.

This relates to means for holding or supporting spectacles, whereby the same can be held in position for use without the necessity for employing the wearer's hands for such purposes, whilst when not required for use the spectacles can be turned up inside the hat of the wearer, and when required can be removed therefrom, and used in lieu of ordinary spectacles or hand frames.

4152. COUPLING APPARATUS FOR RAILWAY VEHICLES, *W. R. Lake.—Dated 13th October*, 1880.—(*A communication from G. W. Bolton, N. Munro, and D. McLeod.* 6*d*.

The draw-head A has a vertically elongated flaring opening at its front end for the introduction of the link B and side openings I, in which work jaws C, which at their outer edges have arms to enter eyes in

4152

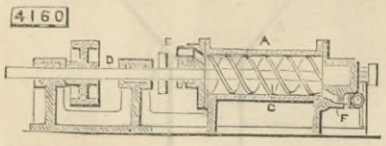


the toggle lever H. The inner faces of the jaws have indentations to direct the link to one of a series of sleeves placed one over the other in the draw-head. The toggle lever is connected by a chain with two levers F, one on each side of the vehicle, by means of which the jaws can be opened to allow the link to pass.

4160. STEAM ENGINES, *W. R. Lake.—Dated 13th October*, 1880.—(*A communication from J. W. Cole.*) 6*d*.

This relates to "direct-acting steam engines," and its object is to increase their efficiency in such manner that a much smaller cylinder will give a much greater power per square inch of piston surface than is at present obtained. A is the cylinder in which works

4160

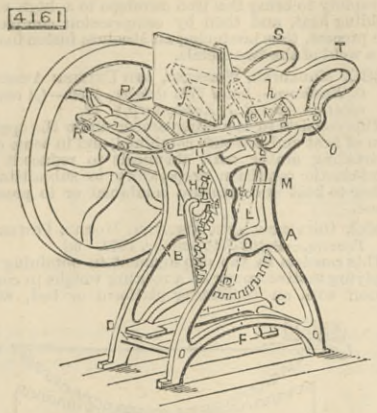


the piston C in the form of a continuous screw. To the piston is connected the rod D, forming also the shaft. At one end of the cylinder is an inlet port E, and at the other an outlet port F, connected to the exhaust. The steam is regulated by a governor arranged in the exhaust pipe.

4161. PRINTING PRESSES, *W. R. Lake.—Dated 13th October*, 1880.—(*A communication from T. Forknall.*) 6*d*.

This relates to printing presses especially adapted to job work. The side frames A and B are connected at bottom by rods C D, and at top by the bed E, which supports the chase holding the type. On rod C is a treadle lever F connected by a rod with the crank shaft H carrying a fly-wheel, and also a wheel K gearing with another wheel L. To the crank pin is connected a rod M, the other end of which is connected to a rod *d*, connecting the inner ends of the arms R, *f g*

4161



and *h* of the toggle joints. The arms *e* and *f* are connected at their outer ends by a rod, and the arms *g* and *h* are connected by another rod N which extends beyond the side frames and is connected to the side arms O and P to the yoke R, to which the platen is connected. On the rod N are rollers supported in or on the stationary guides S and T of the form shown, and which are so formed that the platen rests when down to afford time to remove the printed sheet and put in another sheet, and also rests when up to afford time for a good impression.

4167. EXTRACTING TAR, &c., *P. J. Wates.—Dated 13th October*, 1880. 6*d*.

This relates to the combination of a series of screens formed of parallel wires to admit of their being readily cleaned, and dash plates ranged one behind the other across a box or casing, through which a stream of gas or vapour is caused to pass.

4168. STOPPERS FOR BOTTLES, &c., *A. Kohlhofer.—Dated 13th October*, 1880. 6*d*.

This consists in constructing stoppers for bottles with a band that embraces the neck of the bottle, and is secured thereon by means of a slotted or notched catch engaging with two projecting ears on the band.

4169. CONVERTING GRAINS INTO FLOUR, &c., *F. Wirth.—Dated 13th October*, 1880.—(*A communication from H. Leek.*) 10*d*.

This relates to machinery whereby the process of converting grain into flour is carried out in successive stages, while between each stage the product is subjected to a process of screening or dressing, the novel features being more particularly that several

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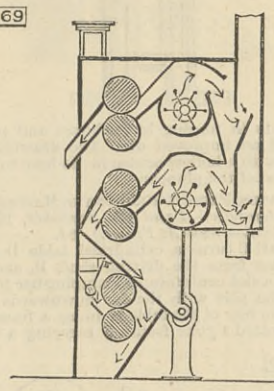

sets of crushing or grinding rollers are so arranged in combination that the grain to be treated passes directly from one set to the other through the intervening screening apparatus, instead of each grinding and screening operation being carried on in a separate machine, and that the supply of grain is only regulated to the first set of grinding rollers by a feed roller.

4181. COMBUSTION OF VOLATILE HYDROCARBONS, *A. M. Clark.—Dated 14th October*, 1880.—(*A communication from L. A. de Coster and T. B. Oakley.*)—(*Not proceeded with.*) 6*d*.

Each complete apparatus comprises an air supply, a carburetter, a burner, and the tool or instrument to be heated, and the invention relates principally to the carburetter which forms the handle of the apparatus, and is provided with a flame regulator, and also to a combustion chamber which may or may not form part of the burner, and whereby the combustion of the gaseous mixture is effected and maintained without employing an auxiliary flame or other means for relighting the combustible mixture in the case of extinction.

4196. HEATING AND VENTILATING BY OIL OR GAS, &c., *W. Love.—Dated 15th October*, 1880. 6*d*.

Air is led into the apparatus from the external atmosphere and is made to pass over extended and circuitous metallic surfaces, which are heated by the gaseous combustion products, but so that these products do not mix with the air that is being heated, and the air when heated is delivered into the apartment or interior to be heated and ventilated through suitable openings or passages provided in or in connection with the heating apparatus.

4202. FINISHING CASHMERE GOODS, &c., *J., J. W. and J. Reffitt.—Dated 15th October*, 1880. 6*d*.

Within suitable framework is mounted a hollow shaft B; to it are attached radially any required number of pairs of arms provided with suitable bearings for the reception of steaming cylinders H. These steaming cylinders are hollow and of ordinary con-

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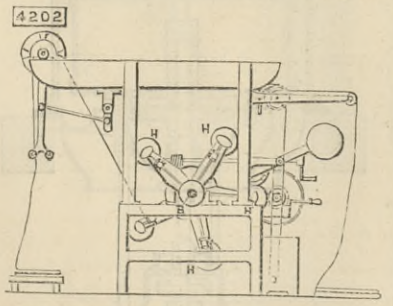

struction; a steam way is provided between the hollow shaft and the bearings on the drums, in each of which there is fitted a stop cock to regulate the flow of steam.

4203. LINING FOR FURNACES FOR DEPHOSPHORISING IRON, *H. C. Bull.—Dated 15th October*, 1880. 2*d*.

This consists in providing a cupola furnace with a lining of plumbago in the form of bricks, or otherwise, for the purpose of melting the crude iron in contact with oxide of iron, such as hematite or "blue billey."

4212. APPARATUS FOR COOKING, *S. J. V. Day.—Dated 16th October*, 1880.—(*A communication from D. MacAlpin.*) 6*d*.

A portable furnace of the usual construction, having above the fire pot a flue communicating with the stove pipe, and having in the top plates the usual opening for the reception of a culinary vessel, has fitted in this opening the lower end of an outer cylindrical casing, the upper end of which is closed by a cap, the lower end being open to the flue. To a flange surrounding the upper edge of the fire pot is fitted the lower end of an inner cylindrical casing open at the lower end to the fire, and in the upper end of which is an opening communicating with the space between itself and the outer casing, which is concentric with, but somewhat less in diameter than the outer casing, so that when the two casings are applied to the furnaces the products of combustion are compelled to ascend the chamber enclosed by the inner casing, and then to descend the annular chamber between the two casings before they reach the flue and the discharge pipe.

4213. CLIPS, STOPPERS, OR BRAKES FOR STEEL WIRE ROPES, &c., *R. B. Jones and J. Hughes.—Dated 16th October*, 1880. 6*d*.

This invention is designed to check the rope without any of the severe punishment caused by hard compression or attrition and without sensible wearing friction on the rope. To effect this a brake is used, not on the rope itself, but on mechanism connected with

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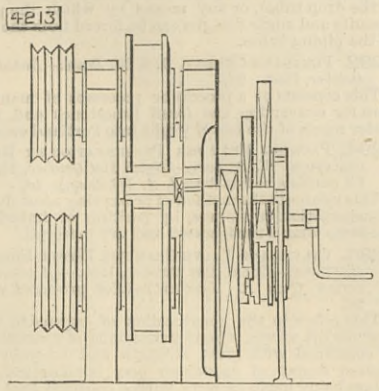

sheaves or V pulleys, round which the rope is twined in the form of a figure of eight. The friction on the V pulleys is so great by reason of the turn round each pulley given to the rope, that no appreciable relative motion can take place between the V pulleys of the rope.

4219. PIANOFORTES, *H. R. Schreiber.—Dated 16th October*, 1880. 6*d*.

According to the First part of the invention the wires are arranged in a novel and peculiar manner; they are strung crosswise, so that the full power of the sound board is utilised. It consists, Secondly, in the employment of supplementary bridges constructed so that the same will rest at intervals only on the sound board, and that to a small extent, in order that the vibration may not be hindered in combination with four or more sets of wires laid crosswise.

4225. RUNNERS AND FERULES FOR UMBRELLAS, &c., *A. C. Wright and R. R. Newton.—Dated 16th October*, 1880. 6*d*.

This consists, First, in making on the end of the tubular part of the runners a conical flange, and forming on the base of the notch part of the runner a short tubular socket and shoulder, and connecting the two parts together by closing the socket of the notch part upon the flange of the tubular part. It consists, Secondly, in the method for retaining the iron or other hard metal tip of the ferule in the end of the ferule tube.

4230. EXPLOSIVE COMPOUNDS, *S. J. Mackie.—Dated 18th October*, 1880. 4*d*.

This consists, First, in the manufacture of an explosive compound by compounding chemically dry nitrate of soda with finely divided, pulped, or crushed gun-cotton by incorporation effected in an incorporating mill, or by other mechanical means; Secondly, in the manufacture of the improved explosive compound in solid forms by moulding the materials and coating the same in their state of damp, solid charges with waterproof composition, in order to prevent the evaporation of the moisture, as also to prevent loss of the nitrate of solution when the charges are applied in water or wet places; Thirdly, the application of a metal tube or coil to such solid charges for gripping the firing fuse.

4231. SWEEPING AND CLEANING TRAMWAY AND RAILWAY TRACKS, *H. A. Bonneville.—Dated 18th October*, 1880.—(*A communication from M. Laporte.*) 6*d*.

This consists in constantly maintaining the longitudinal axis of the cleaning apparatus in a vertical plane parallel to the car frame sleepers, and imparting to

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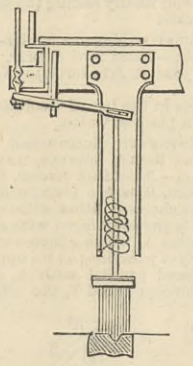

the said cleaning apparatus a transversa motion and lateral displacement according to the smaller axis of the machine. The drawing shows one type of apparatus.

4232. FRINGES OR TRIMMINGS, &c., *J. Wrenshaw and T. P. Dunkerley.—Dated 18th October*, 1880.—(*Not proceeded with.*) 4*d*.

This relates to an apparatus for the combined purpose of manufacturing fringes or trimmings to various articles, and in connecting them thereto by aid of the sewing machine, to which the apparatus serves as a feeder of the material from which the fringe is to be made.

4233. LETTER-BOXES, *P. Lawrence.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates partly to an electric letter-box for the reception of letters, and it is so arranged that the opening of the lid or door for the insertion of such will operate to complete an electric circuit, and will strike and sound a bell or alarum in the office, or at any desired point.

4234. LOOMS, *J. Leeming.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates partly to the shelves of the shuttle-box, the outer edge of which is bent or cranked downwards so as to prevent the weft being trapped or caught and broken between the shelf and the plate on the shuttle. The shuttle by this arrangement may be worked either with or without the usual shuttle plate. Various other improvements are described.

4236. MITRAILLEUSE BURNERS FOR LAMPS, *F. Knopp.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

Instead of moving wicks for regulating the flame, the wicks are left stationary, and the tubes which enclose the upper part of the wicks are moved, the burner being composed of a fixed and a movable part.

4237. SETTING SWING LOOKING GLASSES, &c., *J. Whitfield and H. W. Atkins.—Dated 18th October*, 1880 6*d*.

This consists essentially of a spring sliding bolt, a case, and pin or axis, carried by one part of the mechanism, and a circular box with an inner undulating or serrated surface, against which undulating surface travelling over the end of the said spring bolt when the looking-glass or other swinging article is turned on its axis, the setting, fixing, or adjusting of the looking-glass or other swinging article being effected by the engagement of the end of the spring bolt with a depression in the said undulating surface.

4238. RIVETTING MACHINES, *W. Bowker.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates more particularly to steam rivetting machines, and has for its object to obtain a determined pressure upon each rivet, and to maintain such pressure for a suitable period.

4240. HYDRO-EXTRACTORS OR CENTRIFUGAL MACHINES, &c., *T. Broadbent.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates, First, to the method of supporting or upholding the machines, and consists in keeping them clear of any foundation, and in suspending or hanging them so as to swing; Secondly, it relates to that class of centrifugal machines supported and driven from below, and consists in arranging the parts so that the machines will be direct-acting and self-balancing.

4246. VENTILATING, &c., BUILDINGS, *C. Giuliano.—Dated 18th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to means for escape in case of fire, and also to ventilation. At one or more corners of the building are vertical shafts extending from top to bottom of the building. Fixed to one or more sides of the interior of this shaft or passage are ladder steps or bars, by means of which persons may go up and down the shaft. At each storey is a fire-proof door in which are ventilators.

4249. GLAZING AND PRESSING PAPERS ROLLED ROUND BOBBINS, *A. J. Deblon.—Dated 19th October*, 1880 6*d*.

The calender comprises three cylinders A A^1 A^2, between which is placed the roller bearing the paper to be glazed A^3. The lower cylinders A A^1 have their axes turning in cushions invariably fixed to the frame of the machine. The upper cylinder A^2 is the pressing cylinder, and can be raised or lowered as desired; its axis turns in cushions P adjusted and sliding in bearings of the frame, For moving the

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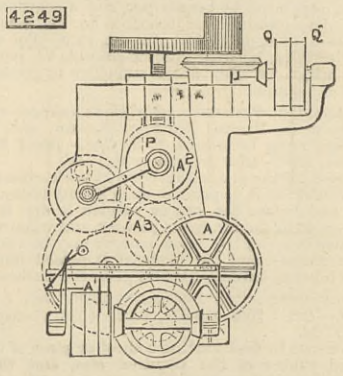

cushions P two pulleys Q Q^1 are placed at the side, over these two straps are passed moving in contrary directions; these bands are stretched by stretchers, so that it is easy to actuate one or other of these pulleys, and consequently to turn the shaft to which they are keyed either in one direction or the other.

4250. STEAM ENGINES, *K. W. Jurisch and J. H. Lewis.—Dated 19th October*, 1880.—(*Partly a communication from Dr. W. R. Proell and C. J. Scharowsky.*)—(*Not proceeded with.*) 4*d*.

This relates to a system of steam engines, in which the waste steam is partly returned to the steam boiler from which the engine is supplied, such return being effected by means of an injector worked by steam from a high-pressure boiler.

4251. PORTABLE HYDRANT, *J. H. Greathead.—Dated 10th October*, 1880. 6*d*.

This relates to a modification of apparatus described in patent No. 4728, dated 21st November, 1878, and forms a portable hydrant, applicable in cases where there is no low-pressure main but where there is a supply of water, as in a dock or at a wharf. A pipe is

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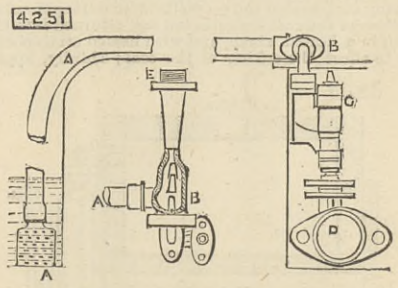

provided having three nozzles, one of these is fitted to receive a hose or suction pipe A provided with a strainer A^1. The suction pipe is connected to one nozzle of the injector B. Another nozzle of the injector pipe is connected to the valve C of the high-pressure main D and the end nozzle of the injector pipe at E is connected to the fire hose.

4252. GLASS ORNAMENTS &c., *R. Sonnenthal.—Dated 19th October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to the method of securing glass ornaments or stones on to the metal plates which serve for their attachment.

4255. BILLIARD AND BAGATELLE TABLES, *W. Buttery.—Dated 19th October*, 1880. 6*d*.

This relates to improvements in the construction of billiard tables, whereby a billiard table is rendered convertible into an ordinary or dining table, and reconvertible for billiards with great facility and rapidity; and it consists essentially in the use of sliding blocks so arranged as to automatically fix the table to the proper level for playing at billiards, supporting it solidly and securely in that position, and to be easily removed when it is desired to lower the table.

4259. UTILISING PHOSPHATE OF ALUMINA TO OBTAIN PHOSPHORIC ACID, *A. Gutensohn.—Dated 19th October*, 1880. 2*d*.

This consists in the method of separating and utilising phosphoric acid from phosphate of alumina by heating the latter in contact with metallic tin, such as tin plate cuttings.

4260. GAS MOTOR ENGINES, *H. Robinson.—Dated 19th October*, 1880. 6*d*.

This relates to improvements in the means of igniting the charge of gas, or gas and atmospheric air, in gas motor engines, and is especially applicable to engines described in patent No. 117, dated January 10th, 1880. Fig. 1 is a sectional plan of one arrangement of the ignition valve and casing, and Fig. 2 is a vertical section. A is the ignition valve or plug, preferably of cylindrical form, which is caused to work longitudinally in the valve casing B by an excentric or other suitable connection with the engine. The valve A has a recess A^1 formed in it; one end of this recess is formed of a conical shape, the other end may be

hemispherical. At the apex of the said conical-shaped end of the recess is a small aperture or passage B^2, which allows a small quantity of the mixture of gas or gases and atmospheric air which is to be ignited to escape from the ignition chamber or cylinder E^1 of the engine into the recess of the valve A at that part of the stroke of the valve when the said recess is in communication with the open air through an opening in the recess and opening B^1 in the valve casing. A second

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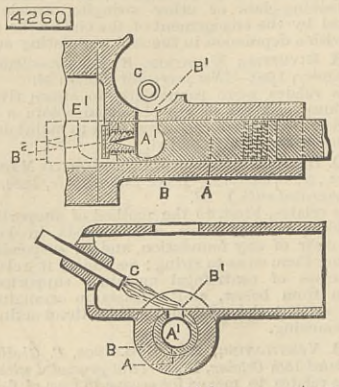

passage may also be formed, which passage at certain times also allows a small quantity of the mixture which is to be ignited to flow or escape into the recess A^1, while the said recess is in communication with the open air; C is the flame kept burning in the open air.

4264. STEEL AND IRON INGOTS, *A. Wilson.—Dated 19th October*, 1880.—(*Not proceeded with.*) 2*d*.

To prevent the drawing or clinking of the ingots, a cast iron ingot mould is employed large enough for the purpose, or a sand mould which has been previously rammed and formed in the interior of an ordinary moulding-box, or in the sand floor of a moulding shop, and it is lined with charred wood, pulverised charcoal, graphite, asbestos, or other non-conducting material which will not fuse when subjected to the heat of the molten steel.

4267. IMPROVEMENTS IN GALVANIC BATTERIES, *R. C. Anderson.—Dated 20th October*, 1880. 4*d*.

The inventor employs the usual elements, carbon and zinc, separated by porous pot, and a solution of chloride of magnesium as described in his former specification, 3436, dated 26th August, 1879. For the negative solution he uses chromo-chloride of potassium, to which he adds water sufficient to produce a saturated solution.

4268. COATING, FINISHING, AND ORNAMENTING THE SURFACE OF PAPER, TEXTILE FABRICS, &c., TO RENDER THEM LUMINOUS, *T. H. Rees.—Dated 20th October*, 1880.—(*Not proceeded with.*) 2*d*.

The surface of the material is covered with adhesive size or varnish, or it is printed upon in any ordinary method, and before the size or varnish is dry it is dusted over with the luminous powder, and when the size or varnish is dry the loose powder may be swept from the surface, and the material is passed under a smooth roller to harden, fix, and glaze the surface.

4271. ORNAMENTING OR LETTERING MATS, &c., *J. G. Laird.—Dated 20th October*, 1880.—(*Not proceeded with.*) 2*d*.

This consists in first cutting a sheet or piece of unvulcanised rubber of the required size, and then cutting or forming another piece or pieces of a different colour or colours adapted for a border or other design, and subsequently placing or insecurely fixing the last-mentioned piece or pieces on the said sheet or piece of unvulcanised rubber in the position or positions required, and finally subjecting the whole to strong pressure in a steam-heated press, thereby embedding the coloured border or design in the sheet or piece of rubber in the position or positions in which it was originally placed or insecurely fixed thereon.

4275. CAPS FOR BOTTLES, &c., *J. Laycock.—Dated 20th October*, 1880.—(*Not proceeded with.*) 2*d*.

This consists in the application of a glass or porcelain cap, having its interior screwed or threaded to fit the external screwed or threaded necks of bottles, &c.

4278. COKE, &c., *H. C. Bull.—Dated 20th October*, 1880. 6*d*.

This consists, First, in constructing and arranging settling tanks for separating and washing coal used in the manufacture of coke with weirs to induce fast down currents with slow uprise in the setting tanks; Secondly, constructing and arranging ovens for coking coal, so that the gases liberated during the combustion of the coal are collected and returned into the oven in a heated stake, and with heated atmospheric air to effect the coking of the coal; Thirdly, apply-

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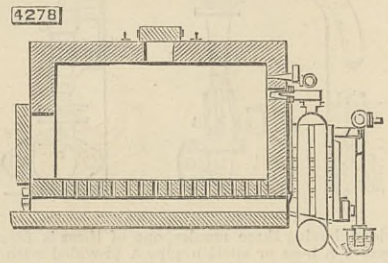

ing gaseous fuel to ovens used for the manufacture of coke; Fourthly, arranging and constructing ovens used in the manufacture of coke with apparatus for collecting the residuary products given off in the manufacture and applying the system of combustion by gaseous fuel; Fifthly, arranging and constructing ovens used in the manufacture of coke with apparatus for collecting the residuary products, and applying gaseous fuel, and with a water jet for cooling down and generating water gas. The drawing is a sectional elevation of a coke oven and apparatus referred to.

4279. SACKS, BAGS, &c., *A. and W. Briggs.—Dated 20th October*, 1880.—(*Not proceeded with.*) 2*d*.

The object is to manufacture sacks, bags, and other similar articles in a loom without seams or joinings either at the sides or bottom, and it consists in employing at least four healds in the loom, and in so arranging the warps in the same that what may be termed the two sides of the sack or other article are woven simultaneously one over the other.

4282. DRYING, MIXING, AND SIFTING COAL, &c., *W. R. Lake.—Dated 20th October*, 1880.—(*A communication from E. D. Farcot.*)—(*Not proceeded with.*) 2*d*.

A cylinder is supported along its length upon rollers. At its centre longitudinally this cylinder is provided with a toothed rim or wheel, which gears with a worm mounted on a horizontal shaft, which by means of a pulley receives motion from any suitable motor. In the interior of the cylinder, and concentrically to the axis thereof, is arranged a tube, and a screw or spiral blade is wound between the said tube and the cylinder, and is attached to the latter in such a manner that the said screw or blade extends from the tube completely to the inner surface of the cylinder, and from end to end of the latter. The small coal leaving the washing apparatus is brought by trucks, thrown into heaps, and is thrown into a vat or receptacle into which a chain of buckets dip, and these buckets lift the coal to a hopper. The bottom of the latter is inclined and carries a shaft, which descends obliquely to one end of the cylinder. When the cylinder rotates, the coal is carried along by the blades of the screw, and having been exposed to hot air in its passage, is delivered dry at the opposite end.

4283. BRAKES FOR RAILWAYS, &c., *S. B. and W. J. Perrett.—Dated 21st October*, 1880.—(*Not proceeded with.*) 2*d*.

This relates to the mechanical arrangements designed to be worked by steam, air, water, gas, or other similar power.

4284. INDIA-RUBBER MATTING, TREADS, CUSHIONS, &c., *P. MacLellan and W. Jones.—Dated 21st October*, 1880. 6*d*.

This consists in mattings, &c., composed of a sheet of india-rubber, on which an undulated, fluted, or corrugated surface is produced by cutting a series of slits through the sheets, and alternately raising and depressing the parts between the slits by insertion of mandrils or rods previous to vulcanising the articles.

4287. DROPPING AND PIPING MACHINES FOR BISCUIT MAKING, &c., *C. Harvey.—Dated 21st October*, 1880. 6*d*.

This consists essentially of an ejection plate or arrangement by which the drops can be made upon single sheets of loose paper and pulled from the ends of the drop tubes, or any means by which the piped biscuits and sugar designs can be forced from the ends of the piping tubes.

4292. PORTLAND CEMENT, *D. S. W. Dawe.—Dated 21st October*, 1880. 2*d*.

This consists of a process or processes of manufacture for converting the fossil limestones and fresh water marls of the Isle of Wight into Portland cement.

4294. PACKING MEAT FOR PRESERVATION BY REFRIGERATION, *W. R. Lake.—Dated 21st October*, 1880.—(*A communication from J. A. Whitney.*) 4*d*.

This relates to the method of preserving meat during transportation or storage, by packing or imbedding the same with a refrigerated and dry material.

4296. VALVES AND VALVE GEAR FOR MOTOR ENGINES, *H. Simon.—Dated 21st October*, 1880.—(*A communication from R. Kuechen.*)—(*Not proceeded with.*) 2*d*.

This refers to the construction of expansive valve gear for lift valves, whereby simplicity of construction is combined with great strength and whereby any desired degree of expansion may be obtained, the valves being made to work with a constant lead with very small dead space, and to open rapidly to full steam.

4307. AXLES, *H. Richards —Dated 22nd October*, 1880.—(*A communication from W. Wynn.*)—(*Not proceeded with.*) 2*d*.

The arm of the axle is formed of tough steel rounded at the outer end and welded to the shaft, round which shaft is a collar with a raised flange curved on the side next the arm to act as a dust guard. Over this arm is fitted a bush, which is a cast cylinder smooth on the inside, and with its inner edges rounded off where they fit upon the collar on the shaft; this bush has a thread cut upon its outer end to receive a cap to be screwed upon it. Between the bush and the arm is a space to receive rollers which are to reduce the friction; these consist of smooth round metal bars of a somewhat softer nature than the metal forming the arm.

4321. BICYCLE LAMPS, *W. C. Errington.—Dated 23rd October*, 1880.—(*Not proceeded with.*) 2*d*.

This consists in the construction of a duplex or double lamp, in or of one piece of frame, and in two compartments, the upper to be placed over the axle of the bicycle and the lower under.

4328. MEASURING AND PACKING SEEDS, GRAINS, &c., *H. M. Clements.—Dated 23rd October*, 1880.—(*Not proceeded with.*) 2*d*.

The apparatus consists of a box standing upon four legs. The back of the box is made sloping towards the front where the operator stands, the bottom edge thereof being in close contact with the smooth surface of a longitudinal cylinder. The front of the box has a closely-fitting sliding door to enable the operator to adjust the capacity of the measures. The inside of the box is thus fashioned as a rectangular hopper with a cylinder slightly protruding thereunto at the bottom.

4334. PRODUCTION OF SACCHARINE SUBSTANCES, *S. H. Johnson.—Dated 23rd October*, 1880. 4*d*.

This consists in the treatment of acidified grain in a permeable condition, or acidified brewers' or distillers' grains, or other acidified vegetable tissue containing but little or no starch, by the injection into them of superheated water without any previous injection of steam, to obtain saccharine substances therefrom.

4335. ARTIFICIAL STONE FOR GRINDING, *W. R. Lake.—Dated 23rd October*, 1880.—(*A communication from the Genuine Naxos Emery Company.*) 4*d*.

This consists in binding or cementing together particles of corundum, emery, flint, quartz, and the like by india-rubber, and then pressing and heating or baking the mass so formed in hermetically closed iron moulds, and finally baking the same after removal from the moulds.

4337. CIRCULATING MEDIUM FOR HEATING APPARATUS, *W. R. Lake.—Dated 23rd October*, 1880.—(*A communication from B. Bernhardi.*)—(*Not proceeded with.*) 2*d*.

This consists in the use of a solution of chloride of magnesium in place of water.

4341. AN IMPROVED ELECTRICAL APPARATUS FOR OPERATING BELLS, SIGNALS, AND TELEGRAPHS, *G. Skrivanoff.—Dated 25th October*, 1880. 6*d*.

In the figure, B is the ebonite cover, C the back plate of retort charcoal fitted within B, and fixed to the wall. C is partially faced with a layer of blotting paper or asbestos A, which adheres to C by means of a small quantity of paraffine; at its upper part a plate of zinc Z is placed parallel with A, as shown, and is soldered to the copper rod T, the other end of which

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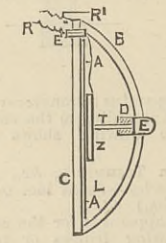

passes through the spiral spring D, and is attached to knob E. Near the edge of C is a hole through which a split copper tube is passed, at one end of which a long tongue of copper is left, which is kept in place by a hollow ebonite cylinder E^1; to the free end of the tongue the negative wire R is attached. To copper rod T is attached strip of copper, to which is secured electro-positive wire R, which passes through E^1. These wires are carried to the bell or signal to be operated. Before uniting C to B, the inventor puts into the lower part at L, crystals of chlorochromate of potass strengthened by an eighth part of sulphuric acid.

4346. GLASS, *C. N. Blumberg.—Dated 25th October*, 1880.—(*A communication from W. Kralik.*) 4*d*.

This consists in the decoration of glass by means of the application of filaments or other fragments analogous in composition, and of any colours, fixed by fusion upon the surface of the glass to be decorated.

4353. WORKING OF COMBINED IRON AND STEEL, *J. H. Johnson.—Dated 25th October*, 1880.—(*A communication from J. Haldeman.*) 4*d*.

This consists in the mode of heating piles or boxes composed of a steel core surrounded by an envelope of puddled or other iron, viz., by first subjecting these piles to a low slow heat, such as will not injuriously affect the iron, until the heat penetrates the whole body of the steel degree by degree, so as to reduce it to a partially or wholly molten condition, and then, in the second place, changing the character of the heat so as rapidly to bring the iron envelope to a high white welding heat, and then by compression completing the process, thus producing an absolute fusion instead of a weld of the two metals.

4380. MOULDING, WORKING, AND UNITING AMBER, *J. C. Newburn.—Dated 27th October*, 1880.—(*A communication from F. J. Kaldenberg.*) 4*d*.

This consists in moulding amber under the application of heat and pressure combined, and in some cases in treating amber with chemicals to reduce it to a semi-elastic condition preparatory to submitting it either to heat and pressure combined or to pressure alone.

4382. OBTAINING AND APPLYING MOTIVE POWER, *M. Travers.—Dated 27th October*, 1880. 6*d*.

This consists in the employment in obtaining and applying motive power of a rocking weight in combination with an oscillating platform or bed, which

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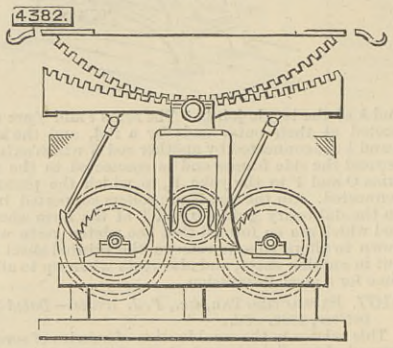

receives its motion from the said rocking weight, and communicates such motion to machinery or apparatus to be driven, the said rocking weight being actuated and maintained in motion by external or independent aid.

4437. BUFFER BOXES AND PLUNGERS, *W. Eyre.—Dated 30th October*, 1880. 6*d*.

This relates to the manufacture of buffer boxes and plungers in such a manner as to dispense with the ordinary use of rivets for fixing the parts together,

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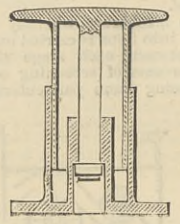

and it consists in forging buffer boxes and plungers by means of an improved die. The drawing represents a box with a hollow centre in its base to receive the centre rod of the plunger.

4529. TREATING PELTS TO REMOVE THE MASTER HAIRS, *E. P. Alexander.—Dated 4th November*, 1880.—(*A communication from A. Fraser.*) 6*d*.

On the shaft C turns a cylindrical table D rotated by worm gear from the driving shaft B, and in its periphery is a slot containing a clamping bar to secure one end of the pelt with the fur downwards on the table. At the rear of the table is hung a frame E, to which is pivotted a yoke frame F carrying a tube G,

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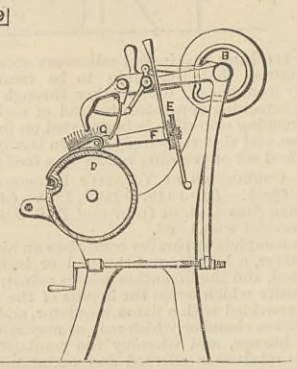

through which a current of steam is passed. Above the tube is a mechanical picker of any suitable construction, and connected with such adjusting and operating devices as will ensure the gripping by the same of the long master hairs that project beyond the finer body of fur, and the extracting of such hairs by pulling them out by their roots. The pelt passes over the tube G from the table D as shown.

4555. CENTRIFUGAL MACHINE, *C. D. Abel.—Dated 6th November*, 1880.—(*A communication from E. Langen.*) 6*d*.

The main feature consists in not connecting the centrifugal drum rigidly to its driving shaft, but by means of frictional contact surfaces, so arranged that when the shaft, together with the drum, is lowered

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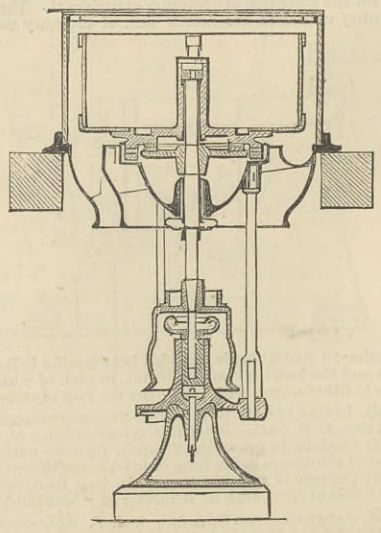

so as to bring the latter in contact with a stationary frictional surface, the frictional contact between the drum and its shaft is made to cease, so that the shaft then continues to revolve independently of the drum, which revolves upon the frictional surface by virtue of its momentum until brought to a standstill by the frictional resistance.

4561. FURNACES FOR STEAM BOILERS, &c., *F. J. Cheesbrough.—Dated 6th November*, 1880.—(*A communication from F. Jauner.*) 6*d*.

A portion of the air supplied to support combustion is heated in its passage through the furnace and fire

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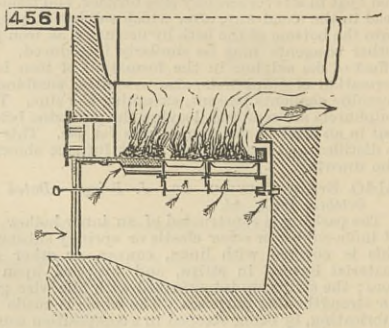

bars. The fire-grate is composed of a series of deep hollow fire bars, through which a portion of the air passes, and continuing up a passage at the back of the furnace, is introduced into the furnace at a point above the fire bars and fuel.

4701. BALLOON, *H. A. Bonneville.—Dated 15th November*, 1880.—(*A communication from A. de Schuttenbach.*)—(*Complete.*) 6*d*.

The form of the balloon is that of an open parachute. A are gas reservoirs, two of which are in the form of

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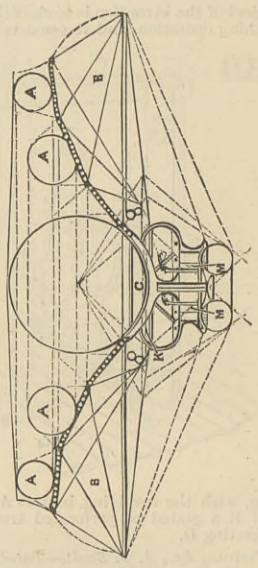

concentric rings in regard to each other; B the parachute made of cloth impermeable to air or water and fireproof; C the place of the ballast; K the reservoir for compressed air; M the place for the engines.

5129. WORKING BRAKES BY FLUID PRESSURE, *C. D. Abel.—Dated 8th December*, 1880.—(*A communication from G. Westinghouse, jun.*) 6*d*.

This relates to improvements on former patents of the inventor, and consists in combining with those arrangements an arrangement for working the brakes also by compressed air, conducted directly from the main reservoir on the locomotive by an additional pipe, which may be called the non-automatic train pipe; and modifications are made in the triple valve in the construction and connection to the brake cylinders and auxiliary reservoirs, and in the couplings of the pipes, so as to adapt them to the combined

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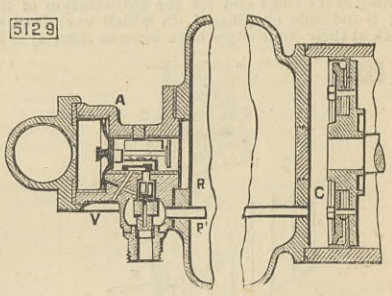

arrangements. The drawing is a longitudinal section showing part of an auxiliary reservoir and brake cylinder attached to one end of it, with the modified valve arrangements attached at the opposite ends. A is the valve box, R the auxiliary reservoir, and C the brake cylinder, communicating by a pipe P^1 with the valve chamber V. The automatic train pipe is connected to the valve box A, and the non-automatic pipe is connected to the valve chamber V.

5160. EVACUATING FIRE DAMP FROM COAL MINES, *F. Wodiczka.—Dated 10th December*, 1880.—(*Complete.*) 6*d*.

This consists essentially in the separation of the explosive gases of less specific gravity from the gases

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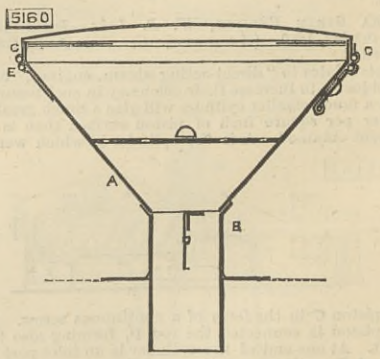
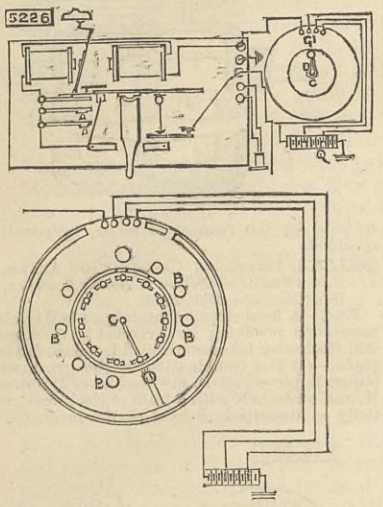


of greater specific gravity or atmospheric air in the mines, and in the separate drawing off or removal of the lighter gases immediately after their formation by a suitable exhaust apparatus. The drawing represents a vertical section of a gas exhaust funnel for drawing off the gases. A is the gas chimney: B the main gas channel; C the side gas channel; E gas exhaust funnels.

5226. TRANSMITTING TELEPHONIC MESSAGES, &c., *A. M. Frankenburg.—Dated 14th December*, 1880. 8*d*.

The apparatus described in this patent is intended

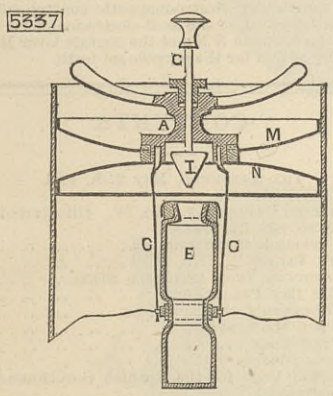
to admit of district and other telephones being controlled in their functions, use, and adjustments, by means of a battery and transmitter at the central station. The operating devices of the transmitter are mounted on a suitable carrier, and consist of a series of push buttons equal to the number of stations, and circularly arranged on a support with stems passing through support and pressing in springs underneath. There is a double set of springs, one set in contact



with an outer segment the other with an inner. The outer segment is connected with whole battery, the other with part of battery only. A vertical shaft C carries arm D, by which means contact is made and broken. The circuit to main office is made through line wire to transmitter post F, then to arm D, and to binding post G1 and on to Q. The figure will assist in showing arrangement.

5337. FIRE EXTINCTEURS, *E. D. Bruneel.—Dated 20th December*, 1880.—(*A communication from H. Gubler.*) 6*d*.

This relates to extincteurs for extinguishing fires by means of carbonic acid gas, and it consists chiefly in the arrangement of that portion of the apparatus used for supporting the bottle of sulphuric acid, and in the method of releasing and discharging the contents when required. The case is of ordinary construction, but the top cover is concave on the outside M, with a circular central hole to enable it to be readily filled with water, and also concave on the inside N, so that it can be readily emptied. The hole is screw threaded to receive the apparatus for supporting and discharging the bottle of acid E. This botttle is suspended below its centre of gravity, so that when released it will turn



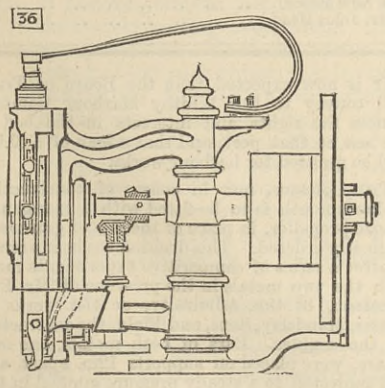
over and discharge its contents. The apparatus to hold the bottle consists of a plug A which screws into the hole in the cover, and from its underside depend two arms C, between the lower ends of which is pivotted an open sided spring clip, which takes into a groove in the bottle. Through the plug passes a rod G, the lower end of which carries a leaden stopper I to fit into the mouth of the acid bottle, acting as a stopper, and at the same time retaining the bottle in a vertical position.

5416. COMPRESSED TOBACCO, &c., *W. R. Lake.—Dated 24th December*, 1880.—(*A communication from I. Lindsley.*)—(*Complete.*) 6*d*.

This consists of a machine for forming bars of compressed tobacco, by forcing the tobacco in consecutively compressed adjoining charges through a die open at both ends, the impression made by the face of the plunger upon the outer surface of each separate charge as it is fed to the die tending to produce in the resulting product separable joints, whereby the bar may be divided transversely into sections corresponding to the original charges.

36. MANUFACTURE OF WIRE NAILS FOR BOOTS AND SHOES, *H. H. Lake.—Dated 4th January*, 1881.—(*A communication from J. Hitchcock and D. C. Knowlton.*)—(*Complete.*) 6*d*.

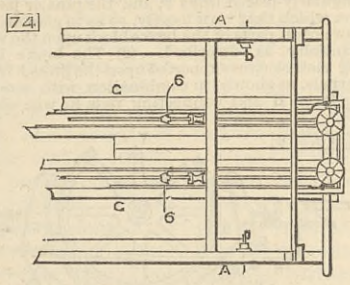
This consists partly in the combination of three cutters, the first of which is formed with two holes for the wire and the driver, the second with a groove, and the third with two grooves, one groove in connection with the groove of the second cutter forming cutters



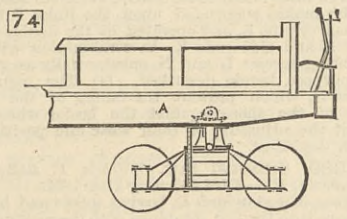
or cutting away a portion of the wire to shape the nail, and the second groove in the third cutter and the groove in the second cutter forming a throat from which the finished nail is driven. The drawing shows a side elevation of the machine.

74. RAILWAY DUMPING WAGONS, *W. R. Lake.—Dated 6th January*, 1881.—(*A communication from W. H. Paige.*)—(*Complete.*) 6*d*.

A represents the two side sills of the wagon, and C two inside sills of timber, all extending in a direction lengthwise of the wagon. To these sills the cross timbers and floor boards of the wagon are secured, and to the lower side of the wagon or beneath the floor are secured suitable bearings, in which are arranged to revolve easily the shafts 14, one on each side, and extending lengthwise of the wagon. On each side of these shafts is a drum 8 arranged to revolve freely on the same. Two clutches, one of which, 6, is arranged on one side of the drum, and the other on the other side of the drum, and are so keyed to the shaft



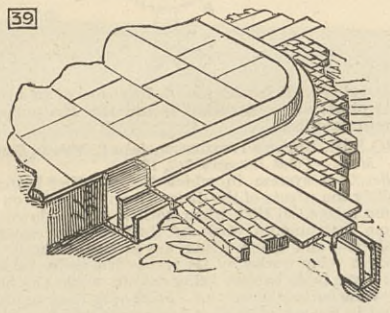
as to revolve with it, and to slide to and fro along the said shaft and engage with the drum by teeth or projections on the clutch, and also on the sides of the



drum, and cause the latter to revolve according as one or the other clutch is brought up against the drum.

39. STREET CURBS AND GUTTERS FOR THE RECEPTION OF TELEGRAPH WIRES, *H. J. Haddan.—Dated 4th January*, 1881.—(*A communication from J. D. Townsend.*)—(*Complete.*) 4*d*.

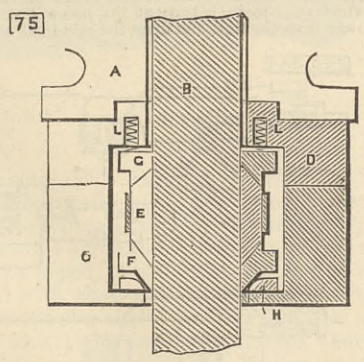
This relates to a conduit for telegraph and other conductors, consisting of a flanged case or chamber



forming a street curb, a parallel flanged chamber forming the gutter, the chamber being suitably connected together at the side and ends, and covered with a removable cover forming a step and gutter piece for the curb and gutter.

75. METALLIC PACKINGS, *T. Tripp.—Dated 6th January*, 1881.—(*Complete.*) 6*d*.

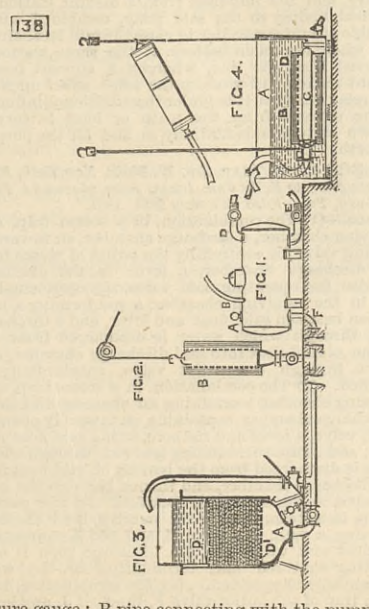
The piston rod B passes loosely through the end of the cylinder A, to which is rigidly secured the inner end of a cylindrical case or cup C by means of a ring D. The case C forms the stuffing, and it contains the sectional packing constituting this invention. It consists of a flexible or contractile packing ring E composed of two sets of plates, one set being right angled triangles in cross section with their inner faces of a segment of a circle equal to one-fourth the circumference of the rod B. The outer series are also four in



number, and have flat faces to conform to the outer faces of the first plates, and cover the joint between each pair. The outer plates are surrounded by a band. The ends of the ring E thus formed are bevelled and surrounded by discs F and G, the former bearing with a bevelled surface on a corresponding bevelled ring H resting on the end of the case C, and the other being acted upon by springs L.

138. TREATMENT OF TEXTILE MATERIALS FOR EXTRACTING FAT OR LIQUIDS, &c., *H. J. Haddan.—Dated 12th January*, 1881.—(*A communication from S. Godchaux.*)—(*Complete.*) 6*d*.

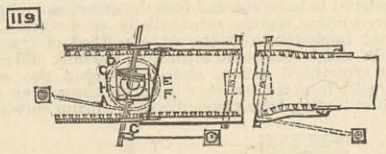
Fig. 1 represents a tight vessel in which vacuum is produced by any suitable means. A is a vacuum or



pressure gauge; B pipe connecting with the pump, D suction tap for the bath, E discharge tap for the bath, F pipe connecting the vessel with the apparatus Figs. 2 and 3. Fig. 2 represents a perforated cylinder upon which the damp material B is wound, and which can be put in communication with the vessel Fig. 1. Fig. 3 shows a receiver A, in which the materials to be treated are placed, the said material consisting of hairs, threads, or woven fabric, and being compressed between two sieves or perforated plates D and D1. Fig. 4 shows a tank A containing a hot or cold bath B prepared in any convenient manner, and into which is plunged a perforated cylinder C, upon which is wound the fabric D.

119. CLOTH TENTERING MACHINES, *H. H. Lake.—Dated 10th January*, 1881.—(*A communication from G. P. Wood.*—(*Complete.*) 6*d*.

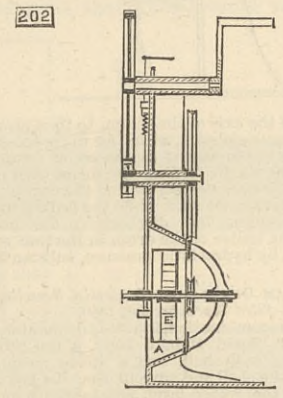
This consists in a cloth-tentering machine of the combination of a pinion C, the vibrating shaft A, an upright shaft, and the gear wheels E and F, with a second pinion, the sleeves D, and the connecting gear



wheel G and H, with the means for driving the upright shaft and its sleeve separately, and mechanism for regulating the said driving means, whereby the relative movements of the pinions C may be varied with respect to each other.

202. FOG-SIGNALS, *H. A. Bonneville.—Dated 15th January*, 1881.—(*A communication from F. Brown.*)—(*Complete.*) 6*d*.

This relates to an improvement in fog-signals known as "sirens," and it consists in combining therewith a casing A with openings to admit and other openings to discharge air supplied to it by a fan E mounted within the casing, such fan serving to draw in the air through one set of openings, and to discharge it in



intermittent currents through the other set, thus producing a loud tone to act as a signal. The fan is made adjustable in relation to the air escape openings so as to vary the tone.

229. RESTORING WASTE VULCANISED INDIA-RUBBER OR GUTTA-PERCHA &c., *H. H. Lake.—Dated 18th January*, 1881.—(*A communication from H. A. Clark.*)—(*Complete.*) 6*d*.

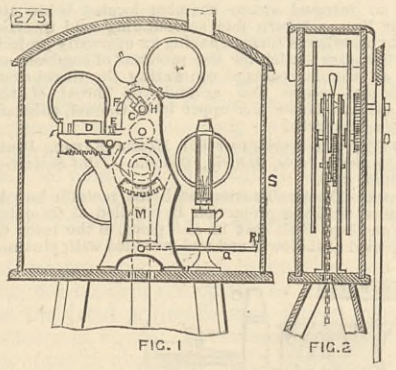
This consists, First, in restoring waste vulcanised india-rubber by first moistening and dampening the material with water and evaporating such water, and then moistening and dampening the material with turpentine, camphene, or equivalent substances, and subsequently heating or evaporating the turpentine or the like; Secondly, in the treatment of waste vulcanised india-rubber or gutta-percha and the compounding of a vegetable oil or oils, or a resinous material or materials, or both with the same; Thirdly, of an insulated wire wrapped with a strip or sheet of tin foil or other suitable material in such a manner that it runs in the direction of and parallel with the length of the wire, and is surrounded by an insulating material.

274. WATCHES, *W. R. Lake.—Dated 21st January*, 1881.—(*A communication from T. C. Comstock.*)—(*Complete.*) 6*d*.

This relates to improvements in watches in which a worm and spur wheel operate in conjunction with a pitman or crank, and the regulating point, and the works are all enclosed in a dust-proof case, springs being used to guide certain levers into their respective sockets on the stems of the watch; and it consists, First, in a dust-proof inner case with glass or metal panels at top and bottom to receive and hold the works of the watch; Secondly, in providing the outer case with a stationary bezel on one side against which one edge of the case rests, and in affording means for securing the inner case inside the outer one, and at the same time secure the two sections of the inner case firmly sogether; Thirdly, in providing means for regulating the watch from the outside, without exposing the works to dust and dirt; and Fourthly, in providing means for holding the L-shaped lever in position, so that when the stem for winding the watch is inserted in the case the lever is always in position to enter a retaining groove formed in the stem.

275. IMPROVEMENTS IN ELECTRIC SEMAPHORES FOR RAILWAYS, *W. R. Lake.—Dated 21st January*, 1881.—(*A communication from F. R. F. Brown.*) 6*d*.

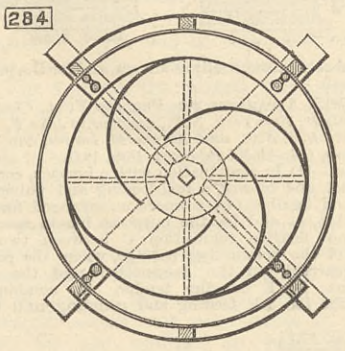
The object of the inventor is to provide simple and effective mechanism for operating railway signals, and consists partly in a simple combination of gearing operated by a weight, and so arranged that the strength of the electro-magnet need not be in proportion to the said weight. D is the electro-magnet suitably located to actuate a properly magnetised lever



E, which is so placed that when in a certain position it supports the arm F on the plate G, holding the dog H in gear with the ratchet wheel, and thereby supporting the weight without sustaining any strain therefrom. Thus a very weak electro-magnet will answer the purpose, while at the same time as heavy a weight as the material of the gearing will sustain may be hung upon the chain M. Thus the motion of the semaphore can be depended upon, provided the weight is wound up, to ensure which he pivots to the lamp stand or any other suitable place a lever Q, one end of which is forked to allow the chain to pass freely through it, the other end being crooked, so as to engage with the catch R secured to the door S, as shown. When S is closed the lever Q securely locks it, as the forked end of Q is heavier than the other. Fig. 1 gives a side elevation; Fig. 2, a cross section of apparatus. In Fig. 2 O is the semaphore arm.

284. WIND ENGINE OR MOTOR, *A. M. Clark.—Dated 22nd January*, 1881.—(*A communication from M. E. de la Torre.*)—(*Complete.*) 4*d*.

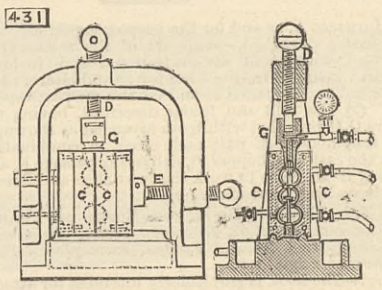
This consists of a wheel provided with curved vanes rotating on a vertical axis within a cylindrical frame, which frame is closed on two opposite sides and opened



on two opposite sides, so that the wind entering the wheel at one side shall escape at the other side. The said frame is revolved, or adjusted to the wind by vanes fixed on its top, one of which vanes is adjustable, and may be moved to regulate the supply of wind to the wheel.

431. MOULDING HOLLOW ARTICLES OF CELLULOID, &c., *W. R. Lake.—Dated 1st February*, 1881.—(*A communication from W. B. Carpenter.*)—(*Complete.*) 6*d*.

This consists in moulding the article from a blank tube which is clamped in a separate die, each end of the tube being provided with a plug adapted to be tightened by degrees, and a current of steam is caused to circulate through the tube while the dies are heated by a circulation in their interior. When the



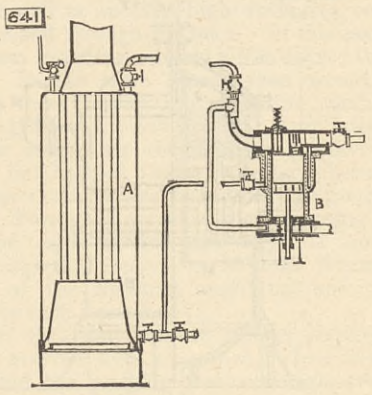
tube is sufficiently heated the ends are stopped, and an internal pressure applied to force the tube into the mould, after which a cooling fluid is circulated through the dies to harden the moulded article. In the drawings, C are the dies; D a screw to operate the plugging device G; and E the screw to clamp the dies together.

563. FILTER PRESSES, *H. E. Newton.—Dated 9th February*, 1881.—(*A communication from A. L. G. Dehne.*)—(*Complete.*) 4*d*.

This relates to presses with chambers to receive the liquid formed by placing together a number of filter frames and press plates, with a filtering medium between, the frames and plates being tightened up by screw pressure. To remove the frames the screw has to be withdrawn a considerable distance, which causes great loss of time, to avoid which the crosshead of the press in which the screw takes is arranged to turn on its horizontal axis, so that by unscrewing the screw about two turns, it will be withdrawn from the movable head plate of the press a sufficient distance to allow of its being brought into a vertical position by turning the crosshead on its axis, when the filter frames and press plates may be easily removed or shifted.

641. MOTOR ENGINES, *E. M. Strange.—Dated 15th February*, 1881.—(*Complete.*) 6*d*.

The object of the invention is to utilise atmospheric air with the steam generated or expanded by the heat evolved in the compression of the air as an expansive medium for producing motion. A is a steam boiler; B, an engine cylinder, the lower end of which is connected to the boiler, so that one side of the piston is



acted on by the steam, while the other side is used to compress air, which passes into the steam pipes, and mixing with the steam is utilised to drive the piston. The upper end of the cylinder is jacketted, and is supplied with water, which the heat evolved in compressing the air converts to steam, such steam then mixing with the compressed air and proceeding to the lower end of the cylinder to act upon the underside of the piston.

676. UNITING THE BARRELS OF DOUBLE-BARRELLED GUNS, *R. H. Brandon.—16th February*, 1881.—(*A communication from H. Pieper.*)—(*Complete.*) 4*d*.

Connecting hooks are attached to the breech piece, which is of steel, and through it are bored two conical holes to receive the two barrels turned conically at their breech ends to fit these holes. The holes are bored so that when the barrels are introduced they touch each other at their muzzle ends, where they are united by being inserted into a double link, the barrels being reduced at this point. Two strips fill up the open space between the barrels and are secured to the breech piece and the double link by screws.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

240,220. FEED-WATER HEATER, *Edward H. Ashcroft, Lynn, and Samuel Tucker, Boston, Mass.; said Tucker assignor to said Ashcroft.—Filed February 26th*, 1881.

Claim.—A shell or casing for feed-water heaters, condensers, or similar apparatus, provided with a separable annular ring, recessed, as shown, interposed and

joined to the shell or casing and bonnet or head by a bevelled joint, and forming a support to the

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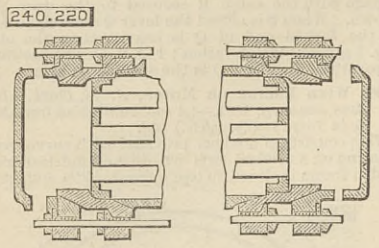

tube sheet, substantially as shown, and for the purpose set forth.

240,265. APPARATUS FOR FEEDING FUEL, *Charles H. Palmer, New York, N.Y., assignor to John P. Jones, Gold Hill, Nev., and Abram M. Loryea, San Francisco, Cal.—Filed February 18th*, 1881.

Claim.—(1) In combination with a furnace, connecting-duct, and blower, a fuel-feeding and pulverising mill and flexible pipe connection, arranged for joint operation, as and for the purposes herein specified. (2) The flexible connection C between two sections of the conducting passage, when the portion B is carried on the locomotive and the other portions D E on the tender, in combination with the fan D¹, feeding and grinding mill G H,

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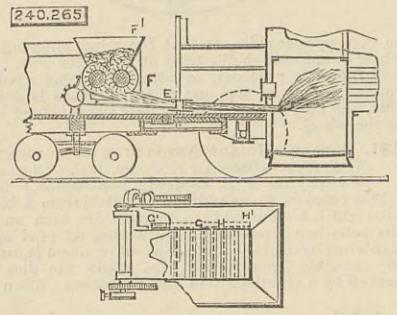

and furnaces A, as and for the purposes specified. (3) The feeder described, composed of the rollers G H provided with teeth or projections, and inclosed within a casing F having a hopper F¹ and clearers I all combined and arranged as and for the purposes specified. (4) The mill and feeder described, having the rollers G H provided with teeth arranged as shown, so that they may work past each other, in combination with the casing F, hopper F¹, delivering passage E, and gearing G¹ H¹, so as to work the two rollers at different speeds, as herein specified.

240,271. TAKE-UP HOOK FOR ROPES OR CHAINS, *Lawrence Rawcliffe, Lawrence, Mass., assignor to himself and Richard Preston, same place.—Filed November 29th*, 1880.

Brief.—The hook is particularly intended for attaching a weight to the rope that passes around the end of the warp beam of a loom. The base portion of the link is received in a recess at the back of the hook and the rope is passed between the binding cam of the hook and the upper portion of the link, and is there clamped. Ths link and hook are adjusted by slipping

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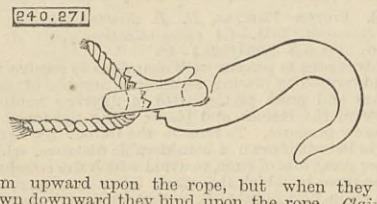

them upward upon the rope, but when they are drawn downward they bind upon the rope. *Claim.*—(1) The hook provided with the binding cam and the link receiving recess, as set forth. (2) The combination of the solid link with the hook, provided with the binding cam, and the recess for reception of the link, all as specified.

240,278. FEED-WATER HEATER, *Frederick Shickle, St. Louis, Mo.—Filed January 29th*, 1881.

Claim.—(1) The herein-described feed-water heater, consisting of the chamber B, the tubes D, chamber J, tube F, fixed in the shell of the chamber J, and held loosely in the shell of the chamber G, inlets E G, and outlet H, substantially as described. (2) The combi-

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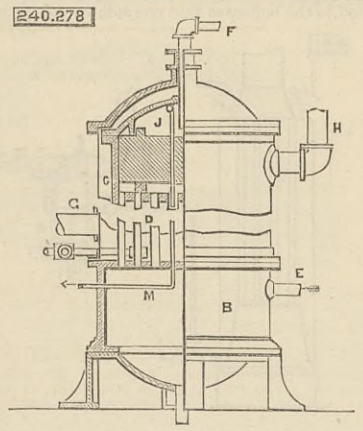

nation of the chamber C, tubes D, chamber J, and pipe F, the latter being held firmly in the chamber J, and loosely in the chamber C, substantially as described. (3) The combination of the chamber B, tubes D, chamber J, and blow-off tube M, substantially as described.

240,288. MACHINE FOR BENDING SPRING HARROW TEETH, *Jacob K. Wagner, Kalamazoo, Mich.—Filed October 29th*, 1880.

Claim.—(1) The combination, with the stationary

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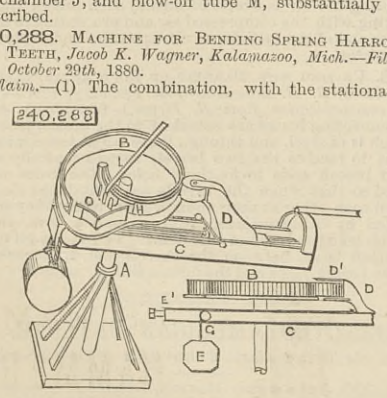

former B and rotary frame C provided with the sliding block D and presser-roller D¹, of the clamping plate H and lever L, having a cam formed on its lower end, substantially as set forth. (2) The combination with the stationary former B, rotary frame C, provided with the sliding block D and presser-roller D¹, of the weight E, and cord and pulleys and curved rest O, substantially as set forth. (3) The combination, with a supporting standard A having a stationary former B secured thereto, of a rotary frame C journalled on the said standard A, a sliding block D carrying presser roller D¹, and weight E, pulleys F, and cord G, connecting the weight and sliding frame, substantially as set forth. (4) In combination with the weight E and frame C, the guide stem E¹ and the lifting-cord G, substantially as and for the purposes shown.

240,293. MILK-CREAMING APPARATUS, *David M. Weston, Boston, Mass.—Filed February 23rd*, 1881.

Claim.—(1) The covered rotating drum provided with the axial outlets L for the material of least specific gravity, and with an outlet at its outer side for the material of greatest specific gravity, combined with the inlet pipe, to permit the milk or other material to be introduced into the drum, and with the surrounding casing, substantially as described. (2) That improvement in the art or method of creaming milk which consists in separating the milk and cream by centrifugal action, and discharging the cream directly from the centre of the drum through an axial outlet leading from the centre of the drum outward in

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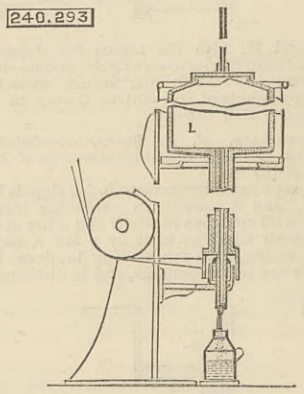

the direction of the axis of the drum, to thus prevent breaking the cream globules, as and for the purpose set forth. (3) That improvement in the art of creaming milk which consists in feeding the drum with milk under hydrostatic pressure, separating the cream from the milk by centrifugal action while the milk is under hydrostatic pressure, and discharging the cream directly from the centre of the drum in the line of its axis of rotation by hydrostatic pressure, substantially as described.

240,299. STEAM GENERATOR, *Benjamin Brazelle, St. Louis, Mo.—Filed September 1st*, 1880.

Claim.—(1) The combination, in a steam generator, of a cylindrical shell, closed at both ends, a fire tube or tubes traversing said shell, and a steam receptacle located within the shell and surrounding the fire tube or tubes below the water level, substantially as set forth. (2) The combination, in a steam generator, of a cylindrical closed-ended shell, a series of fire tubes traversing said shell, a steam chamber located within said shell below the water line, and a series of water tubes traversing said steam chamber, substantially as set forth. (3) The combination, in a steam generator, of an upper and a lower water chamber, a series of fire tubes traversing said chambers, a series of water tubes connecting said chambers, each forming an annular water passage around one of the fire tubes, and a series of return water tubes, each presenting its entire cross section for the passage of water from one to the other chamber, substantially as set forth. (4) The combination, in a steam generator, of a cylindrical closed-ended shell, a steam chamber having its upper and lower walls formed by two flanged heads secured to the

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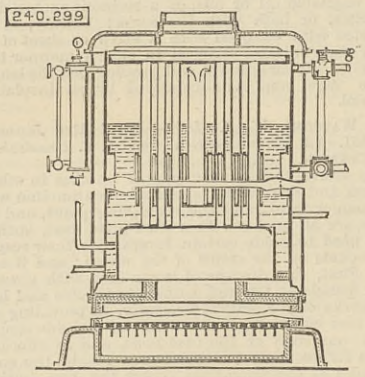

shell below the water level, a series of fire tubes connecting the heads of the cylindrical shell, a series of water tubes connecting the heads of the steam chamber, each surrounding one of the fire tubes and presenting an annular section for the passage of water, a series of return tubes connecting the heads of the steam chamber, each open through its entire extent for the passage of water, and a pipe establishing communication between the steam chambers and the steam space above its upper head, substantially as set forth. (5) The combination, in a steam generator, of a furnace having an upwardly projecting throat or outlet for the products of combustion, a vertical shell inclosing steam and water receptacles and located above said furnace, a fire tube or tubes traversing said shell, and a return flue or flues communicating with the fire tubes around the throat of the furnace and below the upper level thereof, substantially as set forth. (6) The combination, in a steam generator, of a vertical shell having a series of direct-draft fire tubes and an internal steam chamber located below the water line, a return flue surrounding said internal steam chamber, a furnace having an upwardly projecting throat or outlet for the products of combustion, and an annular passage connecting the direct-draft tubes and return flue around the throat of the furnace and below the upper level thereof, substantially as set forth.

240,321. FRICTION-DUMP FOR HORSE RAKES, *David Maxwell, Paris, Ontario, Canada.—Filed September 10th*, 1880.

Claim.—The combination, with the metallic hub A, provided with the projection B, bevelled at its outer end, and boss F all cast in one piece, of the lever G, bifurcated at its lower end and provided with pins and

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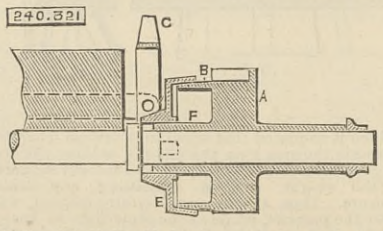

conically-dished disc E, having sockets, and adapted to be supported and guided in its movements by the boss, substantially as described, and for the purpose set forth.

240,329. HOISTING MACHINE BRAKE, *Eugene O'Neill, San Francisco, Cal.—Filed February 26th*, 1881.

Claim.—(1) The brakes C B, centrally supported by the angularly-placed links F, and the pins or journals L upon which they turn loosely, so as to give an equal pressure of all parts of the brake block upon the wheel, substantially as described. (2) The brake blocks having their centres supported upon the links F by pins or journals, as shown, in combination with a double-acting lever H and connecting rods K, whereby the

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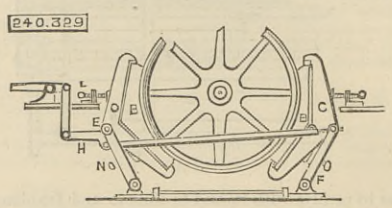

brakes are caused to approach to or recede from the wheel in lines radial to its centre, as herein described. (3) The brakes suspended upon the links F by the journals or pins E, and operated by the double-acting lever H and side rods K, in combination with the regulating screws L and N, substantially as and for the purpose herein described. (4) The regulating screws N, which prevent the falling of the upper parts of the shoes against the brake wheel, and permit the adjusting of their wear and position, as herein described.

240,339. SWINGING SAW, *William F. Rothenberg, Lincoln, Ill.—Filed February 21st*, 1881.

Claim.—The standard D, having spikes and hook F to secure it to the log, combined with the rocking lever

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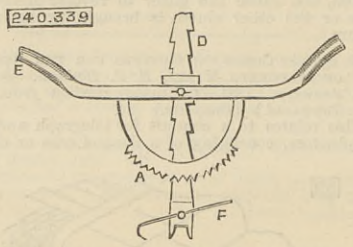

E carrying semicircular saw A, by means of an adjustable pivot, all constructed as and for the purposes herein described.

240,349. DUPLEX TELEGRAPH, *John C. Wilson, Boston, Mass.—Filed January 5th*, 1881.

Brief.—A system in which the equating batteries nullify the effects of the distant main batteries on the home relays, so that when both keys are down the home instruments work by their local or equating batteries, and when either key is closed singly the distant relay works by its respective main battery, the home main battery being cut out while the home equating battery is cut in. *Claim.*—(1) That improvement in the art of duplex telegraphy which consists in maintaining a relay unaffected by the currents transmitted from the same station therewith for signalling a distant station, as hereinbefore described, by closing an independent local battery circuit through the said relay when the main battery current is removed therefrom, and opening the said local circuit when the main battery current is thrown on, the said local current being equivalent to the main current in its effect on the relay at that station, but having no appreciable effect on other relays in the main circuit, substantially as and for the purpose described. (2) In a duplex telegraph system, the main battery and line and relay therein, and a local battery and circuit passing through the said relay and adjusted to produce an effect upon the said relay substantially equal and of the same character with that of the main battery, combined with a transmitting instrument provided with closing points arranged to close the local circuit in the movement by which the main battery at the home station is removed from the line, and open the said local circuit

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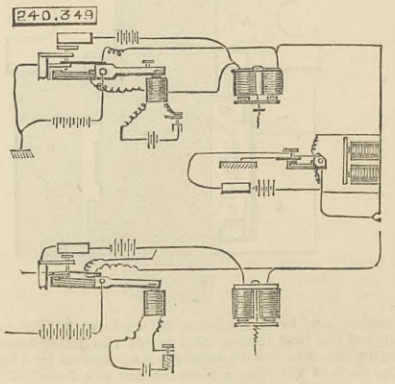

by the movement that puts the main home battery to line, substantially as and for the purpose described. (3) In a duplex telegraph system, the main battery and its circuit and relay therein, and the local circuit joining the said main circuit on either side of the said relay, the coils of which are thus common to both the said circuits, and a battery and rheostat in the said local circuit, whereby its effect on the relay is made substantially the same as that of the main battery, and the impulses from a distant station are confined mainly to the said relay, combined with a suitable circuit-controller to close the said local circuit only when the main battery at the same station is removed from the line, whereby a current from a distant station will produce the same effect upon the said relay whether it is under the additional influence of the current from the main or local battery at its own station, substantially as and for the purpose set forth.

240,368. STEAM TRAP, *Geo. W. Blake, New York, N.Y., assignor to Kelly and Jones, same place and Pittsburg, Pa.—Filed January 29th*, 1881.

Claim.—(1) The combination, in a steam trap, of a receiving chamber, a discharge chamber, an inwardly-opening valve for controlling the outlet of water from the discharge chamber, a lever in the discharge chamber for operating said valve, an open cup-like float in the receiving chamber, a rod forming a connection between said float and lever, and a discharge pipe, through which water is discharged from the bottom of said float into said discharge chamber, and thence through the outlet valve, substantially as specified. (2) The combination, in a steam trap, of a receiving chamber containing an open cup-like float, a discharge chamber containing an inwardly-opening outlet valve, a lever and rod connecting said float and valve, and a pipe surrounding said rod, through which water is discharged from the bottom of said float into said discharge chamber, and thence through the outlet valve, substantially as specified. (3) The combination, in a steam trap, of the outlet valve F the float J, having a well, the lever H and rod K connecting said float and valve, and the discharge pipe D surrounding said rod and terminating in the well, substantially as specified. (4) The combination, in a steam trap of the outlet valve F, the float J, and lever H and rod K, connecting said float and valve, and the push-piece L, substantially as specified. (5) The combination of the valve F and the seat-piece G, having a hole forming a guide for the valve, and openings in

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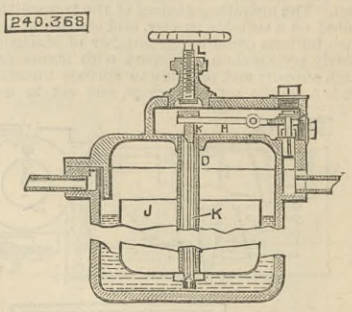

its side for the passage of water, substantially as specified.

240,383. TELEPHONE CALL-BELL OR ALARM, *George A. Cardwell and Nelson L. North, Brooklyn, N.Y.—Filed November 13th*, 1880.

Brief.—A local circuit containing a bell is closed by means of a revolving lever carried by clockwork, the said clockwork being controlled by an electro-magnet. *Claim.*—(1) The combination of the great wheel C, pinion E, pin-wheel D, pivotted lever I, contact lever M, and contacts N with a train of clockwork, substantially as described, a local electro-magnetic alarm,

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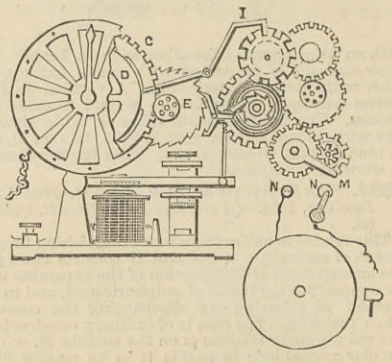

controlled through the medium of said clockwork, and an electro-magnetic detent, through which the clockwork is controlled, substantially as and for the purpose set forth. (2) In a telephonic or telegraphic call or alarm, the combination with the clockwork mechanism under electro-magnetic control, substantially as described, of the local electro-magnetic call or alarm, the contacts N N and the contact lever M, substantially as and for the purpose set forth.

CONTENTS.

THE ENGINEER, May 27th, 1881.

IT is now expected that the Board of Trade will convey to the Whitby Harbour Commissioners the rights and interests in the bed of the sea at that port, and that a loan of £40,000 will be granted for harbour works.

THE Colossus, now in course of construction at Portsmouth is to be fitted with a manganese bronze propeller, in place of the one of gun-metal originally ordered. This decision has been arrived at after a series of comparitive experiments made with the two metals in the presence of Mr. Farquharson, of the Admiralty, at the works of Messrs. Maudslay, Sons, and Field, the contractors for the engines. Bars of both metals, one inch square, were placed on supports 12in. apart, and first subjected to a steady pressure applied in the middle of the bars, and afterwards to impact by a weight of 50 lb. falling from a height of 5ft. With a steady pressure the gun-metal bars slipped between the supports or broke with a strain of 28 cwt., while the manganese bronze bars required 54 cwt. to break them. Tested by impact, the gun-metal bars broke with from seven to eight blows, while it took from thirteen to seventeen blows to break the manganese bronze bars. The ultimate bend of the latter was also in both cases more than that of the gun-metal, thus showing fully double the strength with superior toughness. The advantage claimed for the manganese bronze is that it enables a thinner and better blade to be used.