THE INSTITUTION OF NAVAL ARCHITECTS.

THE annual meetings of the Institution of Naval Architects began on Wednesday; the Earl of Ravensworth, president, in the chair. The meetings are held, as usual, in the Hall of the Society of Arts, John-street, Adelphi. The attendance was smaller than usual. The report of the Council was read, from which it appears that the finances of the Institution are in a satisfactory state. The balance in hand on general account at the end of the year 1882, viz., £338 16s., was smaller than at the corresponding period of the previous year. The diminution was due to an exceptional cause, namely, the large expenditure of £253 18s. 2d. on the printing of the general index of the first twenty-one volumes of the Transactions. This item is of an altogether exceptional nature, and the Council is able to state that the estimates of expenditure for the current year show that in all probability the balance will be more than restored to its previous figure by the end of the year. On the other hand, the balance in hand to the credit of the library fund, £279 19s. 3d., shows a satisfactory increase. Attention was drawn to the two exhibitions—one at Fishmongers' Hall and the other to the Tynemouth Exhibition—but nothing was said of the at least as important exhibition held at Islington, and which directly suggested the Tynemouth undertaking. The Council regretted the absence of Mr. Merrifield, who is ill. His name is added to the list of vice-presidents. In order better to meet the convenience of those members who reside at a distance, it has been determined for the future to post to all members and associates immediately after the meetings, copies of all the papers read, in lieu of the newspaper abstract which has now for some years been published. By this arrangement members will be enabled to obtain copies of the papers while interest in the proceedings is still fresh. It will also enable the volume of Transactions to appear at a much earlier date than usual. This last innovation, we may add, is just half a step in the right direction. If the reputation of the Institution for its discussions is to be maintained, the papers should be sent out long before the meetings, that they may be mastered and discussed instead of being talked about, as is now the case.

After the formal business had been transacted, Lord Ravensworth delivered what may be called his annual address, which was unusually able and interesting; indeed, at times, Lord Ravensworth rose to eloquence. He began by a reference to our "naval operations" in Egypt. This, he understood, was the right term, as our attack on the forts at Alexandria was not, he was told, naval warfare. He held that up to the present the gun had the best of it against the ship; and that a continued and very rapid fire from a number of moderately heavy guns would prove better than the slower and fewer discharges of the tremendous ordnance recently made. It must not be forgotten that smoke would, in all cases, play a most important part; and that the greater the number of blows that could be delivered before smoke interfered, the better. He held that a fair proportion of ships of moderate size—say 10,000 tons—ought to be built, but very few, if any, monsters like the Inflexible. He then spoke of the great prosperity of the shipping trade throughout the past year, and he pointed out that no less than 554,000 tons net, after all deductions were made, had been added to our roll of British-built ships. The Clyde again came first, with, in 1882, 297 vessels of 395,149 tons—the largest total ever recorded, and nearly double that of 1879; the Wear next, with 123 vessels of 212,464 tons; the Hartlepools, 39 vessels of 68,067 tons; and the Tees, 40 vessels of 65,048 tons. The alarming loss of ships and lives from collisions claimed the deepest attention, and more care should be devoted to the construction of bulkheads. The electric light had been suggested for use for ships for signalling, but he was told that it had been tried, and failed, being mistaken by other ships for lighthouse lights. All ships ought, however, if possible, be made to show their lights at such angles that the course they were steering would be clearly indicated. He concluded by an eloquent exhortation to his hearers to bear well in mind that the very prosperity of our shipping trade and its vast importance was a source of weakness, because even a moderately successful blow struck at it by a foe would produce effects, the magnitude of which no man dare estimate, on the prosperity and well-being of this country; and he deeply regretted that the present year's Navy estimates only included a sum of £8,500,000, for the Navy proper, after what he termed "dead weight" charges had been deducted. Admiralty programmes, he added, are always unsatisfactory, because they only set forth what may be had in five or six years; and, besides, they never were adhered to or carried out in full. Concerning the vexed question of load line, he found that the Board of Trade would lay down no rules, and it was, indeed, next to impossible to lay down any, as the conditions varied with the season of the year and the cargo.

The first paper read was by Captain G. H. Noel, R.N.,

ON CERTAIN POINTS OF IMPORTANCE IN THE CONSTRUCTION OF SHIPS OF WAR.

The author confined himself to certain points:—(I.) On the strength and height of the bow necessary for ramming. (II.) On water-tight compartments. (III.) On armoured conning towers. (IV.) On torpedo defence. The nature of the strains brought on a bow when ramming is patent. The dangers which would arise from imperfect construction or design may be classed as follows:—(1) Of the ram bow being actually forced in; (2) of the bow being twisted and the stem broken; (3) of the vessel being herself sunk, which might result from two causes—either the want of height in her bow and freeboard, causing her to lurch over and so capsize, or to go down head first; or else, owing to weakness in the bow upper works, which, breaking away, might lock with those of the enemy's ship, and so cause both vessels to sink together. With reference to the first danger, there was no difficulty to be apprehended in obtaining the desired strength in the bows of comparatively small vessels, so long as wrought iron or steel stems can be used; but with increase of size and weight we get an increase in the momentum, and in some cases a reduction in the cushioning effect, which so much lessens the enormous strains consequent on ramming. For these reasons great additional strength is required in heavy vessels. It is questionable whether this is fully appreciated in the construction of citadel ships, where the stem—though to a small extent backed up by an armoured deck—is unsupported by side armour, and the principal weights are concentrated in the centre of the vessel some distance from the bow, upon which the whole effort of bringing this mass to rest devolves when the ramming is direct. Secondly, as regards the twisting of the bow and breaking of the stem. The constructors of English ships of war have wisely curtailed the length of the ram bows of our ships, a measure calculated to give them greater power to resist oblique or twisting strains; but is it not desirable in our heavier ironclads that a more secure root be constructed to the ram? This might be accomplished by building its point on to a cigar-end-shaped structure worked smoothly into the bow, and giving the sharpness requisite for the speed of the ship by its horizontal as well as its vertical entrance; in fact, like the lower part of the stem of the Polyphemus, without its torpedo discharge pipe. Thirdly, as to the height of the bow required for efficiency as a ram, and the strength of the bow upper works. No vessel of this type can give her captain the confidence he would possess were he commanding a ship with a high well-constructed bow, which would ensure the enemy he had rammed being thrown off clear, and at the same time would cause him no misgivings as to the result of entanglement with his foe, or of a heavy and severe lurch after drawing clear of her. Water-tight compartments in a ship of war are required to prevent her from sinking after being severely wounded in battle, as well as, in common with other ships, when harmed by collision or grounding. Were it possible to abolish all such dangerous appliances as water-tight doors, the safety of ships would be vastly increased. This is, of course, impossible in central citadel ships constructed with armoured decks before and abaft the citadel a few feet below water, and may be considered to detract in some degree from the value of this type of ship. In belted ironclads there is no reason why the only communication with the principal compartments should not be from above, for where there is a convenient deck fore and aft above the water line, the communications with and stowage of these compartments must be a simple matter enough. In armoured vessels of the central citadel type, where it is imperative that the armoured deck be intact, the only plan which seems to carry with it any degree of security is that of constructing before and abaft the citadel "passages" or "shafts" in the centre line of the ship immediately under the armoured deck, having one end opening upwards into the inside of the citadel above the water-line; these passages extending as far as the last compartment at each extremity of the vessel, and being the only means of communication with the lower compartments aft and forward. The entrance to each separate compartment would have its water-tight door, and the pumping out and ventilating pipes of each compartment would also be led directly into the passage. A shaft so placed would be in as secure a position as possible from the disruptive effects of a successful ram or torpedo attack. Another source of danger which may appear in action and which requires attention is a panic in the stokehole. This may be said to apply principally, if not only, to ships fitted for forced draught, where the stokehole is closed in air-tight, and the pressure in it raised above atmospheric pressure by means of fans. It should be considered essential in all ships that a means of escape be provided for the stokers up the funnel casing, or some convenient passage; if this is not done, the knowledge that they are hopelessly shut in may lead to a panic, and cause great confusion, if not actual disaster. One of the chief anxieties to a commanding officer in battle will be to keep the necessary command of speed on his ship, as the failure of the engines at a critical moment might be fatal. This failure could result from several causes, not the least serious of which would be a panic in the stokehole. The conning tower, or captain's turret, is the place from which the ship herself is managed, and from which the various weapons are directed. A ship without an efficient conning tower may be compared to a man without an efficient head-piece; and yet, until quite recently, few matters affecting the fighting efficiency of the ship have had less attention paid to them. The essentials for efficient conning and directing arrangements may be thus summarised. A strong armoured tower with armoured wings at its corners, as complete as possible in all its internal communications and appliances, with a clear serviceable bridge or platform round it, from the position of which the captain has full control of the armoured tower, and is best placed for manœuvring and fighting his ship. As a matter of actual construction the conning tower with its bridge may be considered of comparatively minor importance; but in the design of a ship of war its position should be early decided upon, and to it all other external arrangements, whether with reference to guns, funnels, boats, or masts, should be subservient. He had said a good deal on this subject because it so greatly affects the fighting efficiency of the ship from the captain's point of view. The protection against torpedoes, which comes most directly under the heading of the paper, the author stated to be that obtained by giving greater strength to the bottom of the ship with a view to its resisting the destructive effects of submarine explosions. So long ago as 1869, Sir Edward Reed propounded and established the principle of constructing the hulls of armoured ships as lightly as possible, so that a greater proportion of the weight of displacement might be devoted to armour, armament, equipment, &c. Torpedoes were then in their infancy, and the idea was to submit to having the outer skin of the ship blown in by a torpedo, and to trust to double-bottom and other compartments to prevent her being seriously damaged. This principle appeared to be still in vogue; but since locomotive torpedo attack has now so greatly developed, would it not be prudent to reconsider the question, and put more strength into the construction of the ship's bottom, even at the expense of reducing the weight of armour to be carried? We cannot hope to obtain sufficient strength to resist the effect of a charge of dynamite or gun-cotton ignited when actually in contact, but with stronger bottoms, and perhaps the introduction of some plan by which the blow on the outer skin might be cushioned, a fair amount of safety would be secured against such explosions when the mine is not in contact.

The discussion which followed was opened by Sir E. J. Reed, who spoke in high terms of the paper, the rather, as it appeared, because there was nothing in it which he had not himself suggested long before. He hardly agreed, however, with Captain Noel as to the advantage of carrying armour plates forward to strengthen the ram. They might, on the contrary, be a source of weakness, as in the case of the sinking of the Grösser Kürfurst by the König Wilhelm. The bow of the latter ship was caught in the side of the former and wrenched to one side. The armour plates acted as a fulcrum, and the ram was literally rooted out of the ship with a fearful destruction of the bows. Brass stems were quite as strong as iron stems. The galvanic action was, however, to be looked on with doubt; and while on the point he might say that he did not like coppering iron ships. He added a hint, that as regarded water-tight doors, ships of war were becoming so complex, and there was so much to be thought of about them, that they were really getting beyond the control of men; and it was too much to expect that nothing would be forgotten in times of danger and excitement. Concerning conning towers, he liked Captain Noel's ideas; for twenty years he had been trying to get the notions of naval men on the subject, but no two of them agreed as to what they wanted. There were plenty of suggestions, but no definite expressions of opinion. A very able Prussian officer held that external shelters were essential. As to torpedo attack, he would be disposed to make the inner skins of double-bottomed ships thicker than usual, the outer thinner, so as to explode torpedoes as far from the ship's true side as possible.

Mr. Samuda spoke in favour of gun-metal. He was testing a ram just then, and its tensile strength was 18 tons to the inch, and it was much more elastic than iron. He held that the ram would be very little used in modern warfare, because few officers would take the responsibility of sending a great ship and hundreds of men at one stroke to the bottom of the sea. The moral influence would be too great to admit this. The attacks of torpedoes must be prevented by auxiliary craft such as those suggested by Captain Noel.

Mr. Barnaby said there were three or four cases in which ships had been rammed, and had not sunk. As to the strength of skins, a keen discussion had been raised concerning the Iron Duke and the Vanguard. But the former had been ashore twice, and yet she was tight and strong, though her outer skin had been much injured. H.M.S. Iris had been ashore recently and damaged her outer skin, but she was quite tight, and would be easily repaired at Malta. As for the small ships wanted for torpedo defence, he advocated their construction, but Parliament would not vote the money.

Mr. White praised the paper, and commenting on water-tight doors, he said that the great difficulty was to keep them out of a ship, openings were so much wanted; and in the time of danger they were sources of weakness. The loss of the Vanguard had done much good, by stimulating improved drill constantly practised. He liked Capt. Noel's conning tower, but he feared its weight would be more than could be allowed in an ironclad. After a few words from Admiral de Horsey—who held that ramming would be the great feature in future warfare—and Captain Noel had briefly replied, and a vote of thanks had been passed, a paper was read by Mr. James Dunn

ON BULKHEADS.

The author dealt with vessels of the mercantile marine, and submitted three propositions for consideration:—(1) Is the subdivision of a merchant ship by watertight bulkheads practicable, and consistent with commercial requirements? (2) Can these bulkheads be made sufficiently strong to withstand the pressure of water under all circumstances? (3) Are bulkheads of any value in securing floating powers for the ship in the event of damage from collision or other causes? He began by sketching the history of bulkheads, and went on to consider the forces acting on bulkheads. He assumed one compartment laid open to the sea by the tearing of the side plating, and we shall have—(1) The statical pressure due to the given depth of water in the hold when the ship is at rest and no cargo on board. (2) That due to the pressure when the holds are wholly or partially filled with cargo, and the ship still at rest. (3) That due to the extra pressure when the ship is under way, or alternately rising on the crest or falling to the hollow of a wave. (4) That due to the rolling, pitching, and 'scending of the ship herself. He then considered the effect of these strains, and said that in constructing bulkheads the very general practice is to adopt the rules laid down by Lloyd's Registry, which provide for plating $\frac{4}{16}$in. in thickness for a 1000 ton ship, to $\frac{7}{16}$in. in thickness for the largest class. In the smaller ship the plating is stiffened with vertical angle bars, with flanges of 3in. and $2\frac{1}{2}$in. in width, and $\frac{5}{16}$in. in thickness, placed 30in. apart; and for the largest type of ship, with the thicker plating, these vertical stiffening bars are still placed 30in. apart, but the flanges are each $4\frac{1}{2}$in. wide, and their thickness is increased to $\frac{7}{16}$in. Where a deck exists, it of course acts as a longitudinal stiffener or prop; and where the internal arrangements dispense with a deck, but where the distance between the horizontal angle bar at the head of the bulkhead and the floor exceeds 8ft., an angle bar equal to the main frame of the ship is rivetted to the bulkhead on the opposite side to that on which the vertical stiffeners are placed and arranged horizontally; and where this distance exceeds 12ft., two such stiffeners are provided, and so on, the number of them being added to as the depth increases.

These arrangements, he submitted, if efficiently carried out, should be sufficient to enable the bulkheads to hold their own in ships of the narrower type; and, as a fact, we know they have actually withstood the test under severe trials. Three years ago 50ft. was a great beam, but we have now an Atlantic liner, with a beam of 57ft.; and the time had come for us to consider what additional means must be adopted to secure the safety of bulkheads. He urged now for ships of great breadth, and for bulkheads of great area, that a vertical web-plate should be fitted at the middle line, say, from 12in. to 24in. in depth, with angle bar flanges, and secured to the bulkhead and to the several decks and the floors; and some of the angle-bars between it and the sides of the ship replaced by good stiff bars of a Z section. He next contended that bulkheads are useless if not wisely placed, nor carried high enough, nor efficiently cared for; they are useless when found, as he had found them, with stiffeners cut, with rivets omitted, with caulking neglected, with plates removed, with large holes cut for small pipes to pass through, with sluice holes and no covers, with doors and worthless securities, or with open doors rusted and unmanageable, or with doors in the holes fastened open in such a way that they cannot be closed without "handling," and are out of reach at the moment of danger. He would go further, and say that they are not only useless, but that under some circumstances they are positively dangerous. This might, perhaps, be thought a serious and startling assertion; but he would take the case of a ship illustrated by Fig. 1—and there are many such ships now afloat—in which a good number, a really large number of bulkheads, are provided and distributed as shown, but three of which, it will be seen, are stopped at the deck, which is awash. The bottom gets damaged and springs a leak, say in No. 1 hold, or in No. 2 hold, or in both; and how many such cases had they known where the water enters and gains on the pumps, and slowly, but surely, rises to the top of the dwarf bulkhead, causing the ship to trim as indicated in Fig. 2. The water is then free to flow over the top of the bulkhead and pour into the next hold, the effect of which is inevitably to send her head first to the bottom. The author held that such a ship would keep afloat with the water in No. 1 hold and in No. 2 hold, provided it is confined by the bounding bulkheads being carried a few feet higher than the natural level. What this natural level is, and to what height the bulkhead should be carried, are points readily determined by the naval architect. But if they are not carried up, but are left as shown—and in too many cases they are so left—then the author held they had better not be in the ship at all, as they would contribute to her loss by keeping the water at one end of the ship and carrying her bows under; whereas, if they are not fitted, the same volume of water entering as is indicated in the preceding diagram, and not being confined to one end, will distribute itself through the ship all fore and aft, in which case the trim is preserved, and she will still float in the position indicated in Fig. 3. Here, although the freeboard is reduced, she will still be seaworthy; the fires may be kept burning and the machinery going sufficiently long to bridge over the space dividing life from untimely death. Taking two other cases, in one of which the bulk-heads were well placed and cared for, and proved that under such conditions they may be of the greatest value; the other case is in all respects a contrast. In the first case they were placed in the positions and carried to the height indicated in Fig. 4. A steamer of nearly 5000 tons ran into this ship in a fog, struck her abreast No. 3 bulkhead, opening up two compartments to the sea; but, fortunately, the bulkheads had been carried to a reasonable height, and the water could not get beyond them; they stood the test, she did not sink, but she kept afloat at the trim shown in Fig. 5, and in this condition steamed 300 miles safely into port. Happily, they are now getting a number of such ships, and many similar facts giving actual beneficial results might be placed before them if time would permit, so he would consider the next case, where we have the same number and a similar disposition of bulkheads as in the previous case; but, unfortunately, some of them are rendered valueless by being stopped at or about the water-line, as indicated in Fig. 6. This sketch represents a large number of first-class steamers now afloat, and should such an accident happen to any of them as has just been described, they would certainly not have the good fortune to complete their journey, as in the last case; but the water, not being confined to the two holds numbered 2 and 3, as it was in the previous case—which is an actual one—will pour over the top of the dwarf bulkhead into the foremost hold, and the ship will soon get into the position indicated in Fig. 7. Water will then be reported to be making in the engine-room, if, indeed, she should not disappear before then. The author then referred to models exhibited at Spring-gardens. The models are loaded with weighted wood blocks, the blocks being of a bulk to represent the cargo in a passenger ship floating at an ordinary load draught with each compartment below the upper 'tween decks appropriated to cargo, having one half its space occupied—a condition ordinarily assumed at the Admiralty when determining whether a ship is qualified for the Admiralty List—and they fairly represent such a ship as regards their measure of stability. A hole is made through the bottom plating, to represent an actual hole about one square foot in area, and eight feet below the water surface in each compartment, and a plug is placed in it, so that by removing a plug any part of the model may be laid open to the water. The first, which we will call B, or the badly bulkheaded model, very soon disappears after the withdrawal of any one of the plugs, because the water rushing in soon rises to the level of the water outside, and is then, or before then, free to flow over the top bulkhead into the adjoining hold. Take, for example, the plug out of the bottom in way of No. 1 hold. But if the corresponding hole in the good, or G, model is opened up, the water soon gets in and finds its level, but it is then confined between the bulkheads, and the model remains afloat in the position indicated in G_1. Whatever experiment is made in this direction with the B model, the result is the same, viz., she goes down; so we will dismiss her from further consideration, and go back to the G model. Her position with the forward compartment filled is shown in sketch G_1, and that sketch also represents the trim she would take if the damage were to occur in the second hold from forward instead of the first, because, although this No. hold may be and often is the larger, it is nearer the centre of gravity of the water plane, the leverage is less, and the effect on the trim is modified. Take another case, and open up both the forward holds, Nos. 1 and 2. Of course, we expect that the ship will then go down, because the alteration of trim will be so great that the top of the boiler-room bulkhead, although carried to the upper deck, is dragged below water, and the engine-room becomes filled; and thus we have the forward three compartments full, which would undoubtedly sink her. But suppose we keep the water out of the engine-room, which we can do by making water-tight the casing round the funnel and engine-room hatch to, say, 8ft. above the deck. In smooth water the ship would have buoyancy and stability, even when in this damaged state, and would float, as indicated in sketch G_{11}. As an illustration of the great general importance of the subject of bulkheads in merchant steamers, the following statistical details and deductions should be of interest. The advantages of good subdivision are broadly indicated in the annexed table :—

	Average number in existence during six years ended December, 1882.	Average annual loss from all causes during six years ended December, 1882.	Average loss per annum.
Ships qualified for the Admiralty List	157	$1\frac{5}{6}$	1 in 86
Ships not qualified for the Admiralty List	3483	136	1 in 25

These figures are very significant. It appears from them that the chances of loss from any cause are nearly four times as great for a ship not constructed to qualify for the Admiralty List as for a ship entered on that List. This proportion is greatly due to the almost absolute immunity from loss by collision of ships on the List, for during the first four and a-half years of its existence not one ship was lost from it by collision, although a considerable number of the qualified ships had been in collision, and escaped foundering on account of the safety afforded by their bulkheads. Within the last year, however, They had had six casualties to ships on the List, and among them was our only loss by collision. In that case the whole of the ship—a small one—was flooded abaft the engine-room, the two after holds being opened to the sea. This was a case such as they have no merchant steamers afloat capable of surviving. During this time the whole of the losses from the Admiralty List—eleven in number—have been from drifting on rocks, or otherwise drifting on shore, with the solitary exception above quoted. In the same period seventy-six ships have been lost which had been offered for admission to the Admiralty list, but had not been found qualified; of these, seventeen, or $22\frac{1}{2}$ per cent., were lost by collision, and ten, or $13\frac{1}{4}$ per cent., were lost by foundering; most of the rest stranded or broke up on rocks. That the general superior character of the ships on the List is of no value in reducing the risk of collision is shown by the following comparison. It can be proved that of the entire British mercantile fleet of steamers, about 1 per cent., without distinction, receive damage of a fatal character by collision during the year. Of the number thus damaged, those on the List remain afloat, while those not on the List are lost. This is deduced from the following figures:—Referring to the table given above, he would take only those cases of collision to ships on the List which would have proved fatal but for their compliance with Admiralty requirements. These are 9, or an average of $1\frac{1}{2}$ per year, giving $1\frac{1}{2}$ in 157, or 1 per cent. of prevented fatal cases. Again, the average number of ships sunk by collision per year from the unqualified part of the fleet is 35, and the average annual record of the fleet for the six years is about 3500, also giving 1 per cent. of—in this case—fatal cases. Thus the risk of fatal collision is about 1 to 100, irrespective of the class of ship, and thus ships on the Admiralty List enjoy almost absolute immunity from loss by this cause. It is therefore proper to consider that the vessels on the List have no natural advantage with regard to their safety beyond that due to their bulkheads.

This was one of the most important and suggestive papers ever read before the Institution of Naval Architects, and it is much to be regretted that it was followed by a discussion quite unworthy of it. Mr. Samuda began by advocating bulkheads, and attacking Lloyds' action in the matter; it was, he said, a noteworthy fact that out of the ships which the Government were led to class as suitable for giving the country aid in case of war, not more than thirty would be found, out of some thousands, which complied with the very reasonable conditions laid down. It was a tremendous fact that no fewer than 550 ships had been lost in 1882 from preventable causes; and even if bulkheads do cost money and are inconvenient, the Government ought to insist on their presence in all ships carrying passengers. Statistics proved that ships properly provided with them were four times as safe as those without. If Lloyds did their duty they would take care that ships had enough bulkheads.

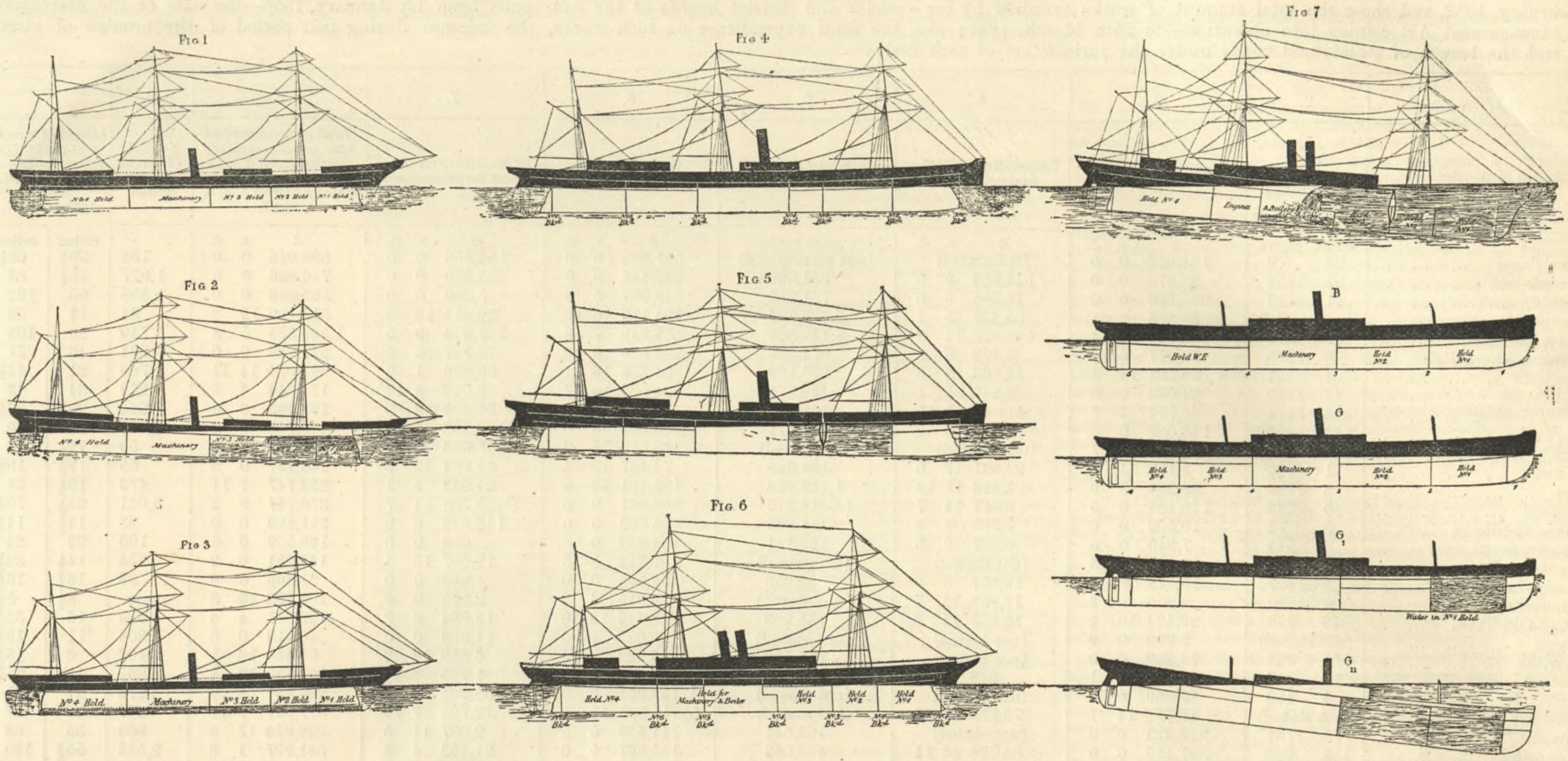
This statement brought Mr. Martell to his feet in defence of Lloyds, and he attacked Mr. Samuda so fiercely that the meeting good-humouredly called him to order. Mr. Martell held that the figures given by Mr. Dunn were misleading, and he used the old argument that the bulkheads would interfere with cargo, affect the ship-owner, and so on; and he attempted to defend the want of bulkheads—on the principle, we suppose, that two wrongs make a right—by pointing out that sailing ships, although they carry emigrants, have but one, or at most two, bulkheads in them. Mr. Martell's defence was lame, and he appeared to think so himself. Mr. Barnaby followed, and pointed out that it was quite possible to put in enough bulkheads, and that Messrs. Harland and Woolf, of Belfast, were building ocean steamers with as many as twelve compartments. So far from Mr. Martell's argument being sound, that because there was a great tonnage of sailing ships afloat without bulkheads, therefore we need not be particular with steamers, he regarded the statement as revealing a most alarming state of affairs, the case being, on Mr. Martell's own showing, much worse than Mr. Dunn had made out. As to statistics, there was no getting over the fact that of thirty-six ships built in 1876 with an 11-knot speed which had been offered for Admiralty classification, only six could be accepted; of the remainder ten had been sunk by collision, six by springing leaks. Of the six selected four had been lost, but that was because they went ashore. After some remarks, more or less desultory, by Mr. Raylton Dixon, Mr. Withy, and others, Mr. Biles explained that there was no difficulty in building ships with plenty of compartments, in which, nevertheless, it would be possible to stow steel rails 40ft. long. This was effected by making the bulkhead divide a hatch, and the top part of the bulkhead in the wake of the hatch removable. The firm he served were then building ships thus arranged. He did not think pumping power would do much good, as the "ceiling" of ships had to be made watertight to keep the cargo from bilge water, and there was no means by which the water in a compartment could get into the bilge to flow to the pumps. Mr. John held that this was a shipowners', not a shipbuilders' question, and that the value of Mr. Dunn's paper would be great, as it would educate shipowners. But he did not think the Government could interfere with emigrant sailing ships. Mr. Macginess gave an interesting account of the effects of a leak on a ship with which he had something to do; she was laden with grain, and coming out of an Indian harbour, bumped on a rock, owing to a heavy ground swell, in a shallow place. The grain swelled when it got wet and started one bulkhead and crushed in the screw shaft tunnel. The water got into two compartments, but the engine-room bulkhead, sprang so much as to relieve the pressure, and the ship steamed ninety miles to another port and was saved.

Mr. Dunn having replied briefly, a vote of thanks was passed, and Mr. Thornycroft read his paper

ON EFFICIENCY OF GUIDE-BLADE PROPELLERS.

During the years 1879 and 1880 the author said he had made experiments with guide-blade and other propellers, using models of small dimensions. These models indicated some advantages to be derived from the use of guide-blade propellers, and his firm has since fitted H.M. torpedo vessel Lightning with a propeller of that kind, and built a shallow steamer for the Congo, with a hull specially formed to suit the requirements of the propeller when used for very shallow draught. He now proposed to give a short account of the results obtained with the models, and afterwards with the propellers as fitted to the vessels before named. The models used were from 5in. to 11in. diameter, and were adapted to use from $\frac{1}{4}$ to 1-horse power, at a speed of $4\frac{1}{2}$ knots. In order to experiment with these models, a launch was fitted with a small shaft projecting directly forward from the bow into water which might be considered as almost undisturbed by the motion of the launch through the water, and the small shaft was driven by an engine with suitable gearing, to allow the turning moment exerted on the shaft to be continuously recorded, the shaft at the same time being free to move lengthwise a short distance, without hindrance, and allow the thrust of the propeller to be measured simultaneously. The launch was propelled principally by another engine, driving a screw at the stern, and the speed of this latter was found to measure the speed of the launch very nearly. A distance of 300ft. was measured on the bank of the river; the time running this distance, the revolutions of the main and experimental propellers, the turning moment and thrust of the model were all recorded on a sheet of paper held on the drum, which was independently driven, while short intervals of time were marked on the paper by a clock. A great many experiments were made with this apparatus, which was found to work well, and in order to compare the efficiency of the guide-blade models with simple screws under as near as possible similar conditions, models of screws were made of larger diameter than their rivals, in a proportion that would use about the same power when working at their best speed. The results obtained will be found in the Table No. 1. In this table the particulars of some of the propellers tried are arranged for each propeller in vertical columns, and headed by a number by which each propeller will be known. Nos. 2 and 11 are described as common propellers, and are of uniform pitch throughout their propelling surface, having an oval-shaped blade as in common use, and these were made for comparison with the other propellers tried, as a sort of standard by which the merits of the other propellers could be measured. Nos. 3 and 10 are screw propellers with the blades thrown back, and the radial centre line of the blade is convex on the driving face. These are described on the table as Thornycroft No. 1. Nos. 6, 7, and 9 are guide-blade propellers, having blades and guides much like those proposed by the Hon. Richard Parsons, but having also another feature which is important to ensure success. This consists in a large boss, which gradually contracts the area of the stream flowing through the propeller, and is followed by a body which gradually allows the accelerated stream to unite. This table only contains the results of a portion of the models tried, but they have been selected as being those of the greatest interest, and giving the highest efficiency. The first column in the table will, the author hoped, explain itself for the most part, but in it there are some terms used which require explanation. He believed Mr. Froude was the first to show that there was a particular speed of running for any screw propeller which gave the best results, and that this speed corresponded to that which gave about 20 per cent. slip. This speed of turning is recorded on the table in the line marked "revolutions at maximum efficiency," and is calculated for a speed of four and a-half knots, at which speed the launch

DIAGRAMS OF BULKHEADS.



was run in the experiments given. The line "thrust at maximum efficiency" is the thrust of the propeller available for propulsion at the before-named rate of turning and speed through the water. But the figures in this line refer to propellers of various diameters, and cannot therefore directly give any relative idea of the thrust of the several propellers. Another line has therefore been prepared, marked "thrust due to 12in. diameter," and gives the relative performance when the diameters are equal. The line marked "velocity due to pitch of leading edge" is of interest, as it shows how far the idea has been realised of making the leading edge of the propeller cut the water without striking it. In comparing the three types at 910 revolutions instead of 600, and the efficiency will be only ·36, or about half its proper value for the propeller. In examining the velocity due to the leading edge of the various propellers, No. 10 has a slight excess over the undisturbed stream, which stream is equal to 4½ knots, and in No. 10_3, in which the form is changed so as to give a greater increase of pitch in the width of the blade, the speed of the forward edge is less than 4½ knots, but the efficiency is reduced. In the guide blade propeller the speed of forward edges is greatly less than the initial speed of the stream in which they work, except in one of large diameter—No. 7—designed for a lower thrust, the contraction of the stream being less as the same size of boss was placed in a larger tube. It would appear that the amount of contraction obtained in the models 6 and 9 is that best suited to propellers where a high efficiency is required, which cannot be sacrificed to give increased thrust. Table No. 2 gives some particulars of the Lightning. The first column relates to the vessel when fitted with No. 3 propeller, and the other columns to the same vessel as afterwards fitted with No. 6_9 propeller, No. 6_5 in the second column having three blades instead of two. It will be observed that co-efficient obtained with the new propeller is good, except in the last experiment; and the Admiralty intend repeating this experiment, as there appeared to be some considerable falling-off in speed

TABLE I.

Dimensions of Model Propellers, and Results obtained.

Name of propeller.	No. 2.	No. 11.	No. 3.	No. 3_1.	No. 10.	No. 10_2.	No. 10_3.	No. 10_4.	No. 10_5.	No. 10.	No. 6_4.	No. 6_5.	No. 7_1.	No. 9_0.	No. 9_2.	No. 6_9.
Date of experiment	July, '79	July, '80	July, '79	—	June, '80	July, '80	July, '80	Aug., '80	Aug., '80	Aug., '80	Sept., '79	Sept., '79	Nov., '79	April, '80	April, '80	June, '80
Type of propeller	Common.				Thornycroft first patent.						Thornycroft second patent.					
Diameter of propeller ... ...in inches	7¾	11·32	9	9	11·32	11·32	11·32	11·32	11·32	11·32	8	8	8⅞	8	8	8
Pitch on forward edge ... ... ,,	10½	14	9·42	9·42	11	12	11	11	11	11	10	10	17·75	12·23	12·23	10
Pitch on after edge ... ... ,,	10½	14	11·14	11·14	13·64	15	14½	13·64	13·64	13·64	19½	19½	21·25	71·6	71·6	19½
Number of blades	3	3	3	3	3	3	3	3	3	3	2	3	3	2	4	2
Length of blades ... ...in inches	1½	—	1	1	2½	2½	2½	2½	2½	2½	3½	3½	2½	5	5	3½
Obliquity of guides... ... ... ,,	—	—	—	—	—	—	—	—	—	—	½	½	¼	7/16	7/16	⅜
Number of guides	—	—	—	—	—	—	—	—	—	—	6	6	6	6	6	6
Length of guides ... ...in inches	—	—	—	—	—	—	—	—	—	—	2	2	1¾	1¾	1¾	1 15/16
Length of casing ... ... ,,	—	—	—	—	—	—	—	—	—	—	4¾	4¾	3¼	6¾	6¾	6¼
Diameter of boss ... ... ,,	2¼	2¼	2¼	2¼	2¼	2¼	2¼	4½	3	2¼	4⅛	4⅛	4⅛	4⅛	4⅜	4⅛
Length of body from maximum diameter... ... ...in inches	—	—	—	—	—	—	—	7	3¼	—	12¾	12¾	12¾	12¾	12¾	8
Velocity due to pitch of leading edge... ... ... in knots	6·04	5·17	4·65	—	4·62	4·7	4·43	5·2	4·75	4·6	4·1	3·62	5·83	3·52	3·77	3·7
Thrust in pounds due to 12in. diameter	12·6	12·1	12	—	16·3	23·4	16·8	22·5	19·1	16·3	31·5	26·4	21	32·6	50·6	22·5
Revolutions at maximum efficiency ...	700	450	600	1100	510	475	490	575	525	510	500	440	400	350	375	450
Thrust at ditto... ... ... in lbs.	5¼	10¾	6¾	17¼	14½	20½	15	20	17	14½	14	11¾	11½	14½	22·5	10
Maximum efficiency	·659	·616	·705	·49	·635	·63	·614	·56	·63	·64	·665	·663	·645	·577	·53	·644

of propellers experimented on, it will be seen that the efficiency does not vary much between them, the lowest being the simple screw with uniform pitch. The experiments, however, do not show clearly which propeller should take the highest place in efficiency, for although No. 3 propeller gives ·705, No. 10 of the same type gives only ·635 on one hand, and ·64 when tried again; while No. 6_4, 6_5, and 6_9 give respectively ·665, ·663, and ·644. The propeller No. 3 had long narrow blades, which were inconvenient, and did not allow the engines to be run as fast as has since been found necessary to fully utilise the capacity of the engines in the first-class torpedo boats, which are now fitted with propellers having wider and shorter blades, giving greater speed for the same boat and engines. No. 10 is a model of the propeller now used in the second-class torpedo boats built by his firm, and was tried against a model of the common screw of the same size, No. 11 in the table; the result being considerably in favour of No. 10, which gave an efficiency of over ·635. In the comparison of efficiency if we may exclude No. 3 and take only those propellers that may be run at a high turning velocity, the guide blade propellers are the best, and Nos. 6_4 6_5 give above ·66. These propellers require to run too fast for the engines if fitted to the first-class torpedo boats, and the Lightning was fitted with one of the form of which 69 is a model, the efficiency in this case being about ·64. The experiments on No. 3 in table indicate the same propeller as No. 3, but the trim of the experimental launch was altered so as to allow the ends of the blades to just break the surface of the water, as described by Professor Reynolds in one of his papers read at this Institution. If this propeller is used to do the amount of work it can do best, when properly immersed (namely, exert a thrust of 6¾ lb. at 4½ knots), when breaking the surface of the water and giving the same thrust, it will require to run

TABLE II.

H.M. Steam Torpedo Vessel Lightning.

	Stokes Bay.	Thames.		Stokes Bay.
	May 22, 1877, No. 3 Propeller.	No. 6_5 Propeller. April 26, 1881.	No. 6_9 Propeller. June 2, 1881.	Jan. 1880, No. 6_9 Propeller.
Displacement ..	28 tons	34 } tons about	34 } tons about	34 tons
Indicated H.P. ..	400·8	384	477	428
$\frac{V^3 D^{\frac{2}{3}}}{I.H.P.}$	147	151	151	113
Revolutions of engines per minute	354	390	423	—
Speed in knots ..	18·54	17·7	19 02	16·65
Time required to make complete circle	S 3 – 50, P 3 – 50 } Full Power; S 3 – 13, P 3 – 48 } Half Power	—	—	S 1 – 53, P 1 – 34, S 1 – 3, P 1 – 3
Diameter of circle in yards	155, 155 } Half Power	—	—	104, 92 } Full Power; 94, 94 } Half Power
Diameter of propeller	5ft. 10in.	3ft.	3ft.	3ft.
Number of blades	3	3	2	2
Immersed surface per ton displacement at 34 tons displacement ..	—	24·1	24·1	24·1

TABLE III.

Shallow Draught River Steamer.

Date	October, 1882	18 October, 1882
Displacement	9·23 tons	9·2
Slip	44·1 p.c.	—
$\frac{V^3 D^{\frac{2}{3}}}{I.H.P.}$	85·2	112
Revolutions per minute	480	—
Speed in knots	10·49	8·8
Diameter of propeller No. 9_0 ..	16in.	16in.
Number of blades	2	2
Immersed surface per ton displacement at 9·8 tons displacement	61·3 sq. ft.	61·3 sq. ft.

during this trial. With regard to steering, the improvement is very marked, and the power of turning the boat against any extra resistance, which the trials do not show, is even more marked. The author called attention also to the great reduction in the diameter of the propeller used, 5ft. 10in. reduced to 3ft. In the Lightning the propeller is enclosed in a tube which carries the guide blades within its after-end, and the part which has been described as the body is carried by the rudder, of which it forms a part. In order to ensure ample steering power, the tube was fitted with two curved pieces fitting against the outside on either side, and these were so actuated as to come out and form an additional rudder when the helm was put over to any considerable angle, remaining in their places, however, for small angles of the tiller. The author then described a shallow river steamer, propelled by two guide blade propellers, the hull being specially formed to adapt the propellers to a very shallow draught. A hull of such dimensions has a very large immersed surface for the displacement, being in this case 61·3 square feet per ton, and very unfavourable to the displacement co-efficient. When this fact is allowed for, he thought we must consider that this boat gives a good result, but the most curious thing connected with this shallow steamer is that when one engine and propeller only are used, and the other propeller is still on the boat, and not turning, the performance of the vessel with one propeller appears to be better than when both are used; at the same time, their very small diameter must be remarked, and also the moderate speed of engines required. But in order to attain this last result, it was necessary to use a form of blades with exceedingly long pitch—see col. 6_9 in table; this entailed reduced efficiency only ·577, and rendered the action of the propeller very imperfect when going astern, but the way of the boat could be stopped in about two lengths.

LONDON STREETS AND SEWERS.

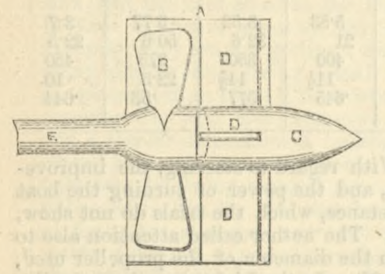
We give the following figures because they supply information often wanted and not easily obtained. They illustrate very fully the enormous growth of the metropolis. It will be understood that they do not include "the City." They are taken from a return made to an order of the Metropolitan Board of Works of the 3rd February, 1882, and show the total amount of works executed by the vestries and district boards of the metropolis from 1st January, 1856—the date of the Metropolis Local Management Act coming into operation—to 25th March, 1881; also the total expenditure on such works, the increase during that period of the number of street lamps, and the length of streets and roads under the jurisdiction of each body:—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	
Parish or district.	New sewers constructed.	Cost of new sewers constructed.	Expenditure on other sanitary works.	Superficial area of paving laid down.	Cost of paving works.	Expenditure on other street improvements.	Total expenditure on new sewers, sanitary works, paving, and other improvements (from columns 3, 4, 6, and 7.	Number of street lamps added.	Length of streets and roadways under control of vestry or district board. 1856.	1881.
	miles. yards.	£ s. d.	£ s. d.	square yards.	£ s. d.	£ s. d.	£ s. d.		miles.	miles.
St. Marylebone	28 0	161,616 0 0	(not stated)	(not ascertained)	567,632 0 0	156,800 0 0	886,048 0 0	138	59½	60¼
St. Pancras	22 1656	85,670 0 0	344,923 0 0	854,560	280,444 0 0	35,859 0 0	746,896 0 0	1,977	46¼	85
Lambeth...	71 1143	235,796 0 0	13,396 0 0	751,999	248,904 0 0	5,300 0 0	503,396 0 0	1,898	65	122
St. George, Hanover-square...	(not stated)	33,263 9 1	23,433 5 1	(c)85,795	438,109 10 10	22,314 10 2	517,120 15 2	64	14	42
St. Mary, Islington	59 420	109,888 16 4	980,823 12 3	1,439,860	389,849 7 8	327,316 9 5	1,807,878 5 8	1,740	50	103
St. Leonard, Shoreditch ...	9 1138	16,977 0 0	5,422 0 0	874,565	236,090 0 0	18,797 0 0	277,286 0 0	294	46	51
Paddington	21 431	90,064 18 8	48,863 18 2	250,196	64,336 16 11	60,809 1 2	264,074 14 11	700	21	44½
Bethnal Green	15 1122	24,636 0 0	3,289 5 1	428,871	144,905 10 7	2,018 8 10	174,849 4 6	272	34	43
St. Mary, Newington	24 1514	46,773 4 8	41,082 8 11	168,680	60,839 1 10	50,400 8 3	199,095 3 8	264	26¼	36⅓
Camberwell	82 0	143,000 0 0	2,500 0 0	271,371	106,000 0 0	198,258 0 0	449,758 0 0	1,609	32	70
St. James, Westminster ...	(not stated)	24,654 2 7	(not stated)	(not stated)	138,510 15 9	5,083 0 2	168,247 18 6	50	12½	13
Clerkenwell	1 1736	3,122 14 7	24,691 17 0	198,368	74,437 10 4	45,984 18 3	148,237 0 2	55	19½	19¾
Chelsea	5 1726	28,203 3 9	3,313 17 10	1,108,688	198,181 12 3	24,048 8 1	253,747 1 11	473	19½	31
Kensington	40 220	140,136 0 0	3,011 14 7	(a)318,315	200,861 0 0	(b)26,738 14 7	370,747 9 2	3,021	23½	70⅓
St. Luke, Middlesex	5 72	10,509 0 0	1,900 0 0	111,525	56,892 0 0	142,588 0 0	211,889 0 0	28	14½	14½
St. George, Southwark... ...	5 565	7,940 0 0	6,387 0 0	169,141	105,632 0 0	600 0 0	120,559 0 0	100	22	24
Bermondsey	12 364	26,231 1 5	(not stated)	(see note d)	106,412 8 5	12,607 10 4	145,251 0 2	278	14½	32½
St. George-in-the-East	4 1627	10,878 0 0	19,867 0 0	302,295	56,833 0 0	4,288 0 0	91,866 0 0	96	16¾	16½
St. Martin-in-the-Fields ...	0 1200	2,350 9 6	11,969 16 7	(not stated)	86,610 4 2	2,900 0 0	103,830 10 3	none	8½	8½
Mile End Old Town	(f)15 950	25,404 10 1	18,855 14 3	188,292	68,342 13 10	13,984 6 2	126,587 4 4	300	16	33⅓
Woolwich	(not stated)	5,990 0 0	(not stated)	(not stated)	29,025 0 0	11,398 0 0	46,413 0 0	206	11	19½
Rotherhithe	14 324	19,259 0 0	(not stated)	216,560	65,622 2 4	6,559 13 9	91,440 16 1	107	6	15¼
Hampstead	16 487	65,727 1 1	218 4 0	107,633	36,020 2 8	1,765 4 11	103,730 12 8	967	18½	35¾
Whitechapel	5 403	29,069 0 0	(not stated)	(not stated)	139,204 0 0	88,268 0 0	256,541 0 0	176	21	21
Westminster	(not stated)	15,778 14 7	72,779 15 11	(not stated)	(e)215,806 11 7	12,722 7 10	317,087 9 11	435	24	27
Greenwich	78 1751	219,328 0 9	(not stated)	122,641	141,549 5 6	2,097 11 5	362,974 17 8	968	35	68
Wandsworth	183 260	327,150 0 0	86,776 16 11	480,363	146,667 0 0	21,403 4 4	581,997 1 3	2,585	55¾	120
Hackney...	34 385	66,245 0 0	130,150 0 0	452,700	181,300 0 0	3,638 0 0	381,333 0 0	1,244	30½	89¾
St. Giles	5 515	29,351 0 0	181,668 0 0	284,061	173,697 0 0	5,988 0 0	390,704 0 0	57	17	15¾
Holborn	3 1742	28,550 1 4	(not stated)	370,629	72,299 3 2	1,765 11 3	102,614 15 9	93	11⅛	11⅜
Strand	2 641	9,938 0 0	7,111 0 0	157,525	79,918 12 10	14,109 0 0	111,076 12 10	none	10½	10½
Fulham	56 440	97,701 0 0	53,698 0 0	228,029	72,035 0 0	9,393 0 0	232,827 0 0	1,114	16¼	48½
Limehouse	9 989	9,964 17 3	(not stated)	(not stated)	117,513 9 6	87,180 18 9	214,659 5 6	187	22	25
Poplar	28 390	41,230 5 1	24,100 1 5	320,964	156,316 6 6	25,231 5 3	246,877 18 3	771	20¼	52
St. Saviour's, Southwark ...	1 573	6,888 16 5	1,164 14 9	409,845	77,636 7 2	2,644 0 0	88,333 18 4	117	6	8
Plumstead	29 0	53,970 0 0	20,000 0 0	404,360	47,154 0 0	11,052 0 0	132,176 0 0	1,261	27⅛	61
Lewisham	23 644	56,771 0 0	(not stated)	266,810	98,726 0 0	22,649 0 0	178,146 0 0	2,749	26	53
St. Olave, Southwark	0 1281	864 0 0	31,372 17 0	401,234	54,759 13 7	20,712 3 2	107,267 13 9	50	6½	6
Totals	919 309	2,310,890 7 2	2,162,769 19 9	11,745,875	5,535,073 7 5	1,504,831 16 1	11,513,565 10 5	26,444	925½	1607⅝

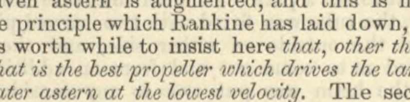
(a) Exclusive of macadam and gravel roadways. (b) Further improvements now in progress, authorised by the Kensington Improvement Act, 1880, not included. (c) Total for wood paving only laid since 1874. (d) Superficial area not given; length of streets, &c., repaved, 34 miles 1729 yards. (e) Includes cost of road repairing. (f) Up to 25th March, 1882.

No discussion followed; the paper was read too late in the day and to a thin audience. Several persons thanked Mr. Thornycroft, and Mr. F. C. Marshall expressed the sense of the meeting when he said that such papers could not be discussed offhand, and hoped that in future the papers would be in the members' hands a few days before they were read, so that they might be mastered and checked. This concluded Wednesday's business. Our account of yesterday's proceedings we must reserve for our next impression.

It may be well to explain that Mr. Thorneycroft's deflector consists of a tube with a projection behind, in which tube the screw is placed, as shown in the annexed sketch. Here A is the tube fixed in the dead wood, or in the rear of the stern front; B is the screw; E screw shaft; D D deflectable blades fixed in the tube; C a fixed solid block, same diameter as the screw boss. It will be noticed that the increase



of thrust obtained was very great, but the advantage was to a large extent neutralised by the friction of the water passing through the ring A. The velocity of the water driven astern is augmented, and this is flatly opposed to the principle which Rankine has laid down, and on which it is worth while to insist here *that, other things being equal, that is the best propeller which drives the largest quantity of water astern at the lowest velocity.* The second sketch shows the cross section of the Congo river steamer.



This remarkable craft draws but 12in. of water, and yet steams at 12 miles an hour, propelled by two tiny screws. The remarkable fact is that she gets on as well with one screw as with them both—at least, so Mr. Thorneycroft gave his hearers to understand. Possibly he meant not that her speed was so high, but that her coefficient was as good.

THE "LAWRENCE" ENGINE.

In our issue of February 23rd we mentioned that the Edison Electric Light Company, which is about to light the corridors of the House of Commons, would use for that purpose an American engine, and we learn on inquiry that this will be one of the Lawrence engines, made by Messrs. Armington and Sims, and by the Builders' Ironfoundry Company, both of Providence, Rhode Island. These companies are now making nearly all the engines required by the Edison Company in America, and they are kept at their utmost capacity in doing so.

The Lawrence engine has found particular favour with Mr. Edison, who has in conjunction with the patentees, Messrs. Armington and Sims, introduced modifications which, we are informed, render it perfectly steady in speed under the greatest variations of load and steam pressure. Fig. 1, page 208, is a perspective view of the "Lawrence" engine, which is made in all sizes up to 225-horse power single, and double up to 450-horse power. The cylinder diameters vary by half-inches, the smallest being 6½in., several of the strokes being what may be called "square" stroke and diameter being equal, and thus the piston speed in sizes below 9½in. by 12in. is kept below 550ft. Above that size a speed of 600ft. is arranged for all. The bed-plate is of the bent girder type, but in certain of the small sizes is of the double bearing shape, with double fly-wheels, and is only remarkable for its stiffness, the ribs being 2¼in. thick, following the best practice in high-speed engine building in which the best results are obtained from what might appear disproportionately heavy castings.

The cylinder is illustrated in section in Figs. 2 and 3, and a clear view of the piston valve and short ports is given, while the valve itself is shown in perspective in Fig. 4 and the steam chest in Fig. 5. The valve has no packing rings, but is a tube enlarged at each end, and after being turned and having the steam edges finished, it is ground to size with a lead lap. Steam is taken around the outer middle part of the valve, which is thus in equilibrium, the exhaust taking place over the ends and into a Y branch pipe that is led vertically downwards. The small bonnets at each end of valve chest enable the valve to be got at without removing the main cover. The valve in the 125-horse power engine is 5¼in. diameter, and having double admission opening, gives a port opening equivalent to 30in. long by 2⅛in. in width. The working travel of this size would be 3in., with an extreme of 5⅝in. The valve motion is so arranged that the steam admission can be varied by the governor from the lead of $\frac{3}{32}$in. to the ⅝th of the stroke. The piston is made very light and has two rings. The crosshead, Fig. 6, is of cast iron with gibs at bottom, which are to be set out with liners as wear takes place. The crosshead pin is of steel, running through a steel bush flattened top and bottom. The crank disc is shown in section in Fig. 7. It is shrunk on to the shaft with $\frac{3}{1000}$ths of an inch per inch of diameter allowed in making it. The shaft is of "gun iron" or air furnace cast iron, and the disc is shrunk upon it before finally being trued up. The Builders' Ironfoundry Co. use this gun iron for all the castings of these engines, having made considerable use of the material for many years past.

The governing arrangements consist of two excentrics on the main shafts, each of which is movable and controlled by the action of two suspended weights contained in a drum—see Figs. 8 and 9. These parts are all carried on the main shaft, C and B being movable on the shaft itself, and the weight E carried on a pin going through a hole at A by the regulator drum. When the weight E is by the rotation thrown outwards it carries by means of the link the outer excentric B in the direction indicated by the arrow. But the inner excentric is by the outward motion of the opposite weight carried in the opposite direction. Thus the one excentric changes the throw and the other the real centre of the combined or double excentric. Another weight on the opposite side is used merely for balance, and is fastened to the inner excentric C. The returning or balancing springs are not shown, but are arranged to be always in compression, always being seated upon a small bracket through which a rod passes and takes hold of a cap on the opposite end.

The lubricating arrangements are worked out with considerable care, as is necessary in high-speed engines of any kind, their success in continuous running depending largely upon this detail. The oiler used is one shown in Figs. 10 and 11, the former for the guides, the latter for the crank pin. The supply of oil may be regulated by merely screwing up or down the cover, and fresh oil inserted through the small hole in the cover. The crank pin oiling arrangement is shown in Fig. 12. The cup is mounted on a stirrup of steel carried by an arm in a bracket, and around the outside of this stirrup are stretched two thicknesses of fine lamp wick. Each time the connecting-rod head comes up, the blade in the oil cup on it wipes along the unsupported lamp-wick and takes a small portion off it. The crosshead pin is similarly lubricated. The lubricator shown on the steam pipe in the perspective view is one that we believe has not been previously illustrated, and is the Siebert "sight-feed" lubricator—see Figs. 14 and 15—made by the Siebert Cylinder Oil Cup Company, Water-street, Boston.

A horizontal pipe A is brought from the main steam pipe outwards, then fitted with cock L and turned down as at F. In this unprotected pipe the steam condenses, and the water column thus formed is admitted by valve J to the under side of a cup D filled with oil, the only escape being at the top through a central vertical pipe leading to gauge glass E, which communicates by pipe B and valve K with a lower part of the main steam pipe. The gauge glass being also filled with "condense water," the oil passes from the small interior pipe with a velocity due to the head of water in pipe F up through the water in the gauge glass, being readily seen in doing so, and being capable of all ranges of regulation from a steady stream to one drop in three minutes.

There is now running at the Waterloo Terminus of the South-Western Railway a Lawrence engine driving two Edison 60-light dynamos and lighting some 120 Edison incandescent lamps. This machine, which is 15-horse power nominal, is running 300 revolutions per minute, and at that rather trying speed is perfectly satisfactory and steady. It has a double disc crank and a bearing on either side of remarkable length, as are all the bearing parts, and the governor is fitted to the arms of one of the two fly-wheels, actuating a single excentric with apparently excellent results. A 20-horse power Field vertical boiler supplies the motive-power, and the whole installation is in one-half of an arch under the Windsor side of the station, the other half of the arch being occupied by the Brush dynamo and Wallis and Steeven's semi-portable employed in lighting the main line and new station.

It seems a pity that American, instead of English engines, should be used for these purposes.

LAUNCH.—The s.s. Kowshing was launched from the Barrow Shipbuilding Company's yard on Saturday last. The boat is the property of the Hindoo and China Steam Packet Company, is 250ft. long, 39ft. beam, and 28ft. depth of hold, with a gross tonnage of 2150. She will accommodate sixteen first-class, 154 intermediate, and 142 steerage passengers. Her cylinders are 38in. by 76in., and the stroke 45in. Her nominal horse-power is 2000.

RAILWAY MATTERS.

AMONG Turkish projected lines are a railway line between Antioch and Sonedie, on the Mediterranean, and one between Saint Jean d'Acre and Djisri-Mudjaina, on the Jordan.

THE London and North-Western Railway Company is going to erect a new city station at Lichfield, on the South Staffordshire branch, which will be adapted to the increasing requirements of the city.

THE Chicago *Railway Age* says that enterprises now under way indicate that at least 1000 miles of new track will be laid during 1883 in Dakota and Western Minnesota alone. "Anything like a similar rate of construction throughout the West would increase the total mileage for the year over the remarkable record of 1882.

THERE is a stationary engine at the Baldwin Locomotive Works which was built by Mr. Baldwin nearly fifty years ago. The guide bars are of cast iron, and have been in use ever since the engine was built. Those who have noticed the bars for many years past say that no preceptible wear is apparent, and that they will probably last a long time yet. The engine is running regularly, and drives a part of the machinery in the boiler shop.

MESSRS. JOHN A. ROEBLING, SONS, AND CO., recently sent from Trenton, N.J., to San Francisco, a wire rope, $1\frac{1}{2}$in. in diameter and over four miles long. It is for a cable street railroad in San Francisco, and, it is claimed, is the longest and heaviest wire rope ever made in the United States. The rope weighed about twenty-five tons, and was loaded on two flat cars secured together by chains, in addition to the usual coupling. It was sent over the Pennsylvania Railroad.

ON the Paris, Lyons, and Mediterranean line, an express from Marseilles to Paris makes 863 kilometres, or 535·06 miles in 17 hours 9 minutes, losing 1 hour 10 minutes standing at stations, which leaves 15 hours 59 minutes for actual running time, with an average speed of $33\frac{1}{2}$ miles per hour. Its best time is between Avignon and Marseilles, where it makes 44·2 miles per hour. On the Chemin de fer d'Orleans, the express Paris-Bordeaux makes 44·7 miles per hour between Angouleme and Coutras.

THE *Railway Age* publishes a summary of railway construction in the United States for the year 1882. The account covers only the main track and shows the construction in States and territories. On 342 lines the aggregate is 11,343 miles, or about 2000 miles more than in 1881, which exceeded any previous year by 2000 miles. The construction is divided as follows:—Five New England States, $53\frac{1}{2}$ miles; four Middle States, $1315\frac{1}{2}$ miles; five Middle Western States, $2077\frac{1}{2}$ miles; eleven Southern States, $1490\frac{1}{2}$ miles; four in Missouri river belt, $2063\frac{1}{2}$ miles; five in Kansas belt, $2157\frac{1}{4}$ miles; five in Colorado belt, 1165 miles; six in Pacific belt, 1020 miles.

A BILL providing for the construction of a new direct railway line between Calais and Marseilles has been laid before the French Chamber of Deputies. It is proposed that the line shall run from Calais, *viâ* Boulogne, Abbeville, Beauvais, Pontoise, Paris, Nevers, Lyons, and Avignon, to Marseilles, with branch lines to Genf, Cette, &c. The promoters recommend their bill to the Chamber on the ground that the opening of the Gothard line has seriously threatened the traffic throughout France with Italy, and that it is urgently necessary that France should take prompt steps to re-establish the claims of Marseilles over those of Genoa as a shipping port.

ACCORDING to the German press, a committee, established at Kempten, has, in conjunction with several Bavarian corporations, urged upon the Austrian Government the construction of the proposed railway from Innsbruck to Imst, on the Bavarian frontier. The extension of the line to Augsburg, *viâ* Partenkirchen, and to Ulm, *viâ* Kempten, is also spoken of. The section from Innsbruck to Imst is about 56 miles long, and is estimated to cost slightly over £1,000,000. It is remarked that this new line and its connections would probably regain for the Austrian lines a good portion of the through traffic for the East, which the opening of the St. Gothard tunnel has lately diverted from them.

TREE planting by railroad companies formed the subject of an interesting paper recently read at the American Forestry Congress, at Montreal, by Professor Hough. It was stated that since there were in the United States about 100,000 miles of railway, the advisability of tree planting by railway companies for construction and maintenance was an important question, from 2200 to 3000, and ever 3500, ties being used in a mile of rails. The average duration of sleepers is from five to eight years, and consequently from 30,000,000 to 50,000,000 a-year will be required for 100,000 miles of railway. Putting 500 as the product of an acre of woodland, from 60,000 to 100,000 acres will have to be cut every year, and as it takes thirty years for a tree to grow to the right size, the railways will require from 2,000,000 to 3,000,000 acres—or 3126 to 4687 square miles—of forest to keep up the supply.

THE *Wochenblatt*, of the Austrian Architects' and Engineers' Association, remarks that during the present winter the Gothard Railway has had ample opportunities of experiencing the attack of the elements. Apprehensions would seem to have been at one time entertained that during snowy weather the traffic would be found to be seriously impeded in the northern portion, but so far this would seem not to have been the case. The large snow ploughs have demonstrated their utility, and when the masses of snow were too large to be thus overcome, hundreds of labourers have rapidly cleared away such impediments. Though the snow has been more than 3ft. deep, no interruption of the traffic has taken place it would seem. Strange to say the snow has been in greater quantity on the Italian than on the Swiss portion of the line. The semaphores do no appear, however, to have worked satisfactorily, and it is in contemplation to establish for the winter service some different arrangements in this respect.

THE extensions which are now being rapidly carried out at the New-street Railway Station, Birmingham, of the London and North-Western and Midland Railway Companies, will, it is claimed, when complete, render it the largest station in the world. The station will cover more than eleven acres, and the cost of the alterations is estimated at £250,000. There will be two main roofs of curved shape, constructed on the arched principle, and they will be about 600ft. in length and 70ft. in width. The roofs will cover an area of 40,000 square feet, in which there will be three platforms. The new platform accommodatlon will be nearly 3000ft. in length. The mouth of the tunnel on the side of the Market Hall is carried some 240 yards further away from the station, and a series of girder bridges is to be erected between the different streets. The plan of the extension has been designed by Mr. Francis Stevenson, the London and North-Western Company's engineer-in-chief. The contract is in the hands of Messrs. Nelson and Co., of York.

THE transfer steamboat Maryland has recently been thoroughly overhauled, and has received many improvements, and has again been put on the transfer ferry between Harlem River station and the Pennsylvania Railroad station, in Jersey City, by the New York and New England Company. According to *The Railroad Gazette*, the old Maryland is now over thirty years old, and will be remembered by many thousands of travellers and old soldiers. The boat was built in 1852 for the Philadelphia, Wilmington, and Baltimore Company, and at that time was believed to be the largest ferry-boat in the world. For a number of years she was used to transfer trains across the Susquehanna, between Perryville and Havre de Grace. When the war first broke out, and the railroad between Baltimore and Philadelphia was broken by the burning of the bridges near Baltimore, the boat was for some time in very active service, transporting troops and stores from Perryville to Annapolis. After the bridge over the Susquehanna at Havre de Grace was built, she was laid up for several years, and in 1876 was bought by the New York and New England Company, and placed on the route between the Harlem River and Jersey City, and has since been actively employed until laid up for repairs a short time ago.

NOTES AND MEMORANDA.

LAST year France imported 481,084 tons more, and exported 161,475 tons less coal than in 1881, so that her consumption of foreign fuel has increased by 642,559 tons.

THE process of desilverising lead ores has greatly increased the production of lead in the United States, which has increased—not, however, entirely owing to this cause—during the last forty years from 30,000 tons in 1842 to about 138,000 tons in 1882.

AT a recent meeting of the *Académié des Sciences*, M. Boussingault showed the members an old bronze chisel found in Peru, of the Incarial period, remarking that he had never been able to produce the hardening to which the old bronze was supposed to be subjected.

THE colour industry utilises practically all the benzene, a large proportion of the solvent naphtha, all the anthracene, and a portion of the naphthaline resulting from the distillation of coal-tar; and the value of the colouring matter thus produced is estimated by Mr. Perkin at £3,350,000.

THE iron steamer Bangor was built for the Bangor U.S.A. Steam Navigation Company to run between Bangor and Boston as an outside freight and passenger boat in 1844, by Messrs. Betts, Harlan, and Hollingsworth. She had three masts, was schooner rigged, and had twin screws. She was the first iron steamer built in America, and the first iron steamer to enter Boston Harbour.

FOR cleaning a greasy finishing file there is nothing better than a burning over the forge fire, in the flame of an alcohol lamp, or of a gas blaze. The burning should be done by a gentle passage to and fro through the flame, until the grease on the file burns with a blaze. Then the blaze should be blown out and the file be carded. When cleaned, dip the file into a jar of lye, and clean in pure water.

THE amount of light given out by a gas flame depends upon the temperature to which the particles of solid carbon in the flame are raised, and Dr. Tyndall has shown that of the radiant energy set up in such a flame, only the $\frac{1}{25}$th part is luminous; the hot products of combustion carry off at least four times as much energy as is radiated, so that not more than one-hundredth part of the heat evolved in combustion is converted into light.

THE *Chemiker Zeitung* quotes from a German journal devoted to the sugar industry an advertisement asking for the services of an "academically educated chemist, fully acquainted with the manufacture of sugar, who can undertake in summer the coppersmith's work, or the oversight of the teams of draught oxen." This is a little worse than an American ironmaster, who wanted a chemist capable of keeping a watch on his phosphorus and teaching the cornet for labourer's wages.

IN the first machines by which ice was successfully made to any extent, ether was the agent by which the heat was abstracted. In 1850 to 1853, Professor A. C. Twining, of Hudson, Ohio, succeeded in practically demonstrating the feasibility of this process, and in 1858 an inventor named Harrison, of Geelong, Australia, made similar experiments in London with the same substance, he having produced from 5000 lb. to 6000 lb. of ice per day with an engine of 10-horse power.

THE great efficiency of gas as a fuel results chiefly from the circumstances that a pound of gas yields in combustion 22,000 heat units, or exactly double the heat produced by combustion of a pound of ordinary coal. This extra heating power is due partly to the freedom of the gas from earthy constituents, but chiefly to the heat imparted to it in effecting its distillation. Recent experiments with gas-burners have shown that in this direction also there is much room for improvement.

AN ounce of coal represents an amount of energy which, if entirely expended in doing work would raise 695,000 lb. one foot high against the force of gravity, or would do 695,000 foot-pounds of work. In an ounce of gunpowder is stored about 100,000 foot-pounds of energy. An ounce of zinc represents a store of only 113,000 foot-pounds. An ounce of copper represents a store of about 69,000 foot-pounds only. An ounce of hydrogen gas will yield, by combining with oxygen, 2,925,000 foot-pounds of work.

THE first spinning frame made in the United States, which is in the care of J. W. P. Jenks, the curator of the Brown University, Rhode Island, was not the invention of Samuel Slater, as has previously been stated, but was constructed by him from a model of the old Arkwright frame used at that time in England. Professor Jenks is on the point of negotiating with the Rhode Island Society for the Encouragement of Domestic Industry, to whom the machine belongs, to allow it to be sent to the American Museum of the Smithsonian Institute at Washington, as the place it now occupies in the basement of Rhode Island Hall is not suitable, and in a short time it will be destroyed by rust and rot. One of the three carding machines, together with a cotton wheel used by Mr. Slater in 1790, are also in the Museum.

FOR resharpening file teeth acids have been employed, and to a certain and limited extent they are valuable. For this process the file must be chemically clean. This is insured by a soluble alkali, as lye, or an immersion in benzine, or naphtha, or spirits of turpentine, then a bath in clean warm water. The cleansed file may be placed point down in a jar of acid made up of half nitric acid, half sulphuric acid, and the combined amount of water—that is, as much water as the quantity of the two acids. The file, resting toe down, may remain in this solution an hour or more, according to the depth of the teeth. But a much simpler method is to wash the cleansed file with the pickle at the foundry, and when it dries off wash it again, repeating the process several times, and finally washing off with clear water or with lye water and clear water.

THERE is an automatic clock at the Stock Exchange, which has now performed very well for six months, invented by a M. Dardeme. The winding apparatus consists of a small windmill, fixed in a chimney, or any other place where a tolerably constant current of air can be relied upon. By means of a reversed train of multiplying wheels this windmill is continually driving a Hughens's endless chain remontoire, a device well-known to clock makers. A pawl acting on a wheel prevents the motor from turning the wrong way, and, by a simple arrangement, whenever the weight is wound up right to the top, the motion is checked by a friction brake automatically applied to the anemometer by the raised weight lifting a lever. When the weight is thus raised to the top the clock has a sufficient store of energy to go for eight days or more, so that it will be seen that it is by no means dependent on a regular current of air. The Belgian Government has for the past two years adopted this system of clocks on the State railways, and we are informed that they are now being tested by certain English railway companies with a view to their adoption.

MR. G. F. KUNZ, in a paper read before the New York Academy of Sciences, describes a mass of amber 20in. long, 6in. wide, and 1in. thick, and weighing 64 oz., found at Kirby's marl pit, on Old Man's Creek, near Harrisonville, Gloucester County, New Jersey, about twelve months ago. A $\frac{1}{4}$in. section showed a light greyish-yellow colour. A section $1\frac{1}{4}$in. thick showed a light, very transparent yellowish-brown colour. The entire mass was filled with botryoidal-shaped cavities filled with glauconite or green sand, and a trace of vivianite. The hardness is the same as the Baltic amber, only slightly tougher and cutting more like horn, and the cut surface showing a curious pearly lustre, differing in this respect from any other amber yet examined by Mr. Kunz. This lustre is not produced by the impurities, for the clearest parts show it the best. It admitted of a very good polish. The specific gravity of a very pure piece of the carefully selected amber is 1·061, which is the lowest density on record, the usual amber range being from 1·065 to 1·081. It ignites in the same way as other ambers. It was found at a depth of 28ft., in and under 20ft. of the cretaceous marl, the amber being found in a 6ft. stratum of fossils.

MISCELLANEA.

OUT of the eighteen competitors, the first premium was awarded to Messrs. J. Oswald Gardiner and Co. for their designs for the Spitalfields Market roof competition, advertised in our issue of February 16th.

THE passage of the Alaska, which arrived at Queenstown from New York, early on Wednesday morning, was seven days three hours thirty-six minutes, her runs being as follows for each of the days—304, 410, 393, 410, 355, 399, 395, and 232 miles. Her best run, 410 miles, represents a speed of a little over 17 miles an hour.

THE new lessees of the Theatre-Royal, Edinburgh, have resolved to light up this theatre after June by electricity, and have entrusted the work to Mr. J. E. Jackson, manager of the Electric Carbon Storage and Apparatus Manufacturing Company of Scotland, Leith. The lights will be a combination of the self-regulating dynamo, Forbes accumulators, arc, and incandescent lamps.

ON Tuesday week the Greenock Harbour Trust agreed, by thirteen votes to eleven, to go on with a scheme to bridge over the entrance to the West Harbour, Greenock, so as to render, as far as possible, the line of quay along the foreshore continuous. The cost of the undertaking capitalised will be about £20,000. An influential memorial, and also a letter from the Caledonian Railway Company, were submitted in support of the scheme.

MR. W. H. WHITE has resigned his appointment as Chief Constructor at the Admiralty, and will cease duty on the 31st inst. After that date he will enter upon his new duties with Sir W. G. Armstrong, Mitchell, and Co., of Newcastle-on-Tyne. In accepting his resignation, the Lords of the Admiralty have officially expressed to Mr. White "their appreciation of the valuable services he has rendered to the country, and of the zeal and great ability he has devoted to the very important duties with which he has been entrusted."

A COMPETITIVE trial of stone breakers has been arranged between the Farrell Foundry and Machine Company, makers of the Blake Stone Crusher, and the Gates Ironworks Company, makers of a machine which they call "The Greatest Rock Breaker on Earth." Mr. Marsden, of the first-named concern, and Mr. Gates, president of the latter company, have arranged the details, which provide that the competitive test should take place within sixty days, near New York. Due notice of the time and place selected will probably be given for the information of those interested.

AT a meeting of the Institute of Iron and Steel Works Managers last Saturday, at Dudley, a discussion took place upon fettling in puddling furnaces. Mr. A. H. Hutton observed that the foundation of the whole chemical part of the business was the basic process, and that anything which contained a large quantity of peroxide of iron must make a good fettling. Mr. Joseph G. Wright said the best all-round fettling he could find was ball furnace cinder. Other members showed that where a clean iron of good heating properties was required a clean fettling was also requisite.

A MEETING of the Cleveland Institution of Engineers was held at Middlesbrough on Monday night, when Mr. J. A. Knights, of Stockton, delivered a lecture on "Ice-making Plant." The author had erected at his own works a set of machinery which cost £3000, and is capable of making 10 cwt. of ice per hour. The machinery is of German manufacture, and works by driving off by the application of heat ammonia gas from ammoniacal liquor. The gas is raised to a high pressure and temperature, then cooled in a surface condenser, and then allowed to expand where the freezing action is required. Mr. E. Jones, the president, occupied the chair, and an animated discussion ensued.

MESSRS. BELL BROTHERS, Limited, of Port Clarence, are now putting down a second bore-hole for salt. With the bore-hole which they first sank they are able, we understand, not only to keep their nine ordinary evaporating pans constantly going, but they have a large storage of brine, and also supply two other pans near their blast furnaces. The latter pans are heated by the waste heats from the furnaces, and thus do the work of evaporating the salt free from all cost so far as fuel is concerned. Messrs. Bell are erecting near them several others, which will also be worked on by the waste heat. Part of the foundations for the new chemical works are now in, and very shortly the buildings will be commenced.

AT the February meeting of the trustees of the great Brooklyn Suspension Bridge, engineer Martin reported bids for furnishing electric lights for the bridge as follows:—Arnoux-Hochausen Electric Company, 15,750 dols.; United States Illuminating Company, 18,150 dols.; Schuyler Electric Light Company, 20,000 dols.; Edison Electric Light Company, 21,500 dols.; Brush Swan Electric Light Company, 23,273 dols.; and the Fuller Electric Company, 25,455 dols. The bids were for supplying seventy lights, the proposal to include engines, dynamos, conductors, lamps, lamp-posts, and everything, except the steam, necessary to make a complete plant. Preference was expressed for the acceptance of the second bid, owing to the circumstance that the lowest bidder had had less experience in circuit lighting. The question was referred to a committee. The cost of the bridge to date has been 14,315,686·72 dols.

AN entirely novel cartridge has been tried in America. According to the inventor, the cartridge will not heat the gun, it is self-ejecting, has twice the propelling force of powder, and is much cheaper. It will also cost very much less than metallic cartridges of gunpowder, and will not be injured by water. Its material and mode of preparation are secrets, but in appearance it is like paper pulp soaked in some explosive material, and pressed into a hard roll. The ball is attached to the end of the roll, and the whole thing leaves the gun together, on the sky-rocket principle. It may be adapted to any gun, and is to revolutionise the ordnance departments of the world. At the trial the inventor fired one of the ball cartridges into a spruce log 8in. thick. The ball, it is said, passed entirely through the log and a 2in. plank behind it, and flattened against a wall. After firing twelve rounds out of the same gun, there was no apparent heat and no fouling.

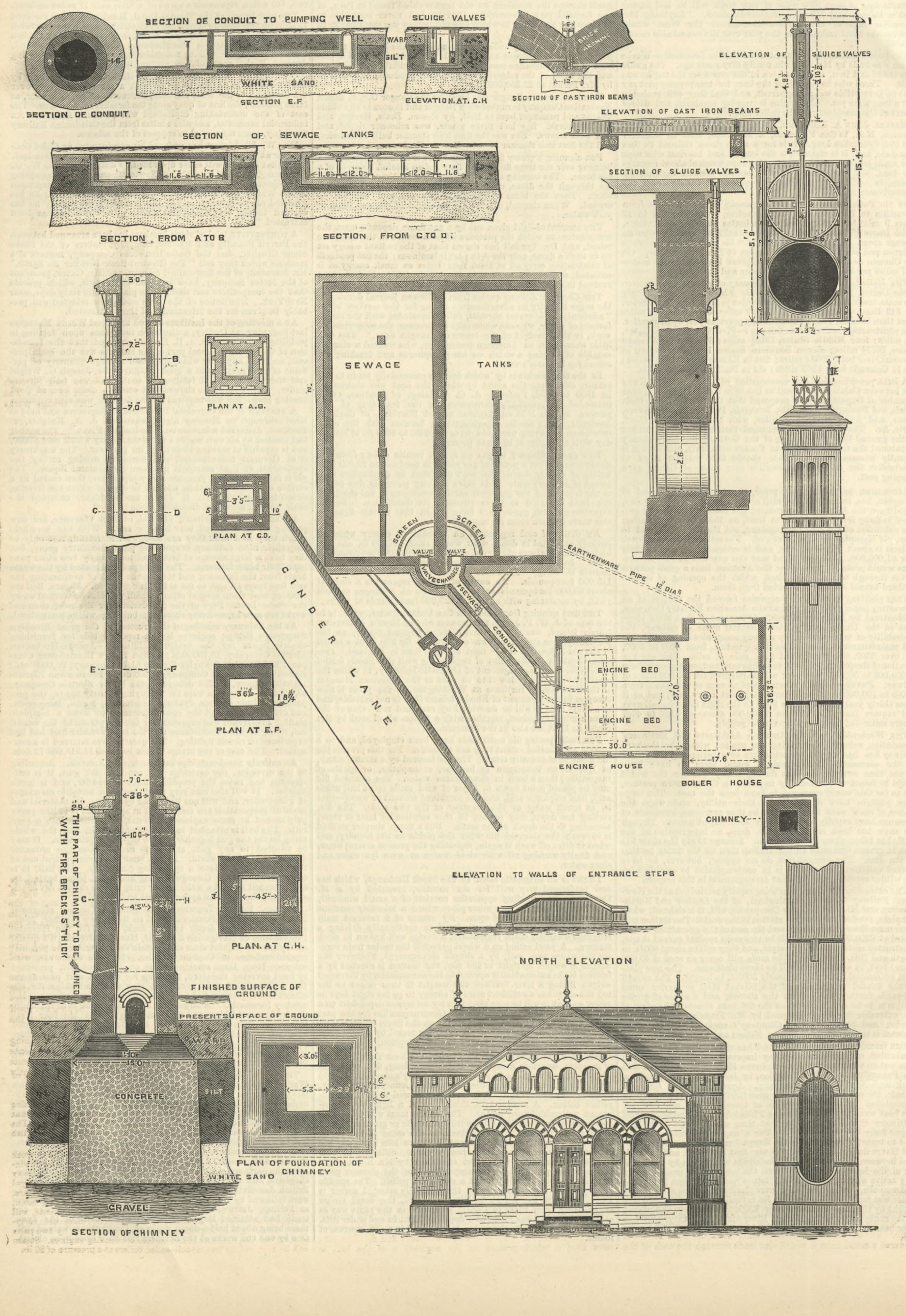
MESSRS. ROBERT THOMPSON AND SONS on Tuesday afternoon launched from their Southwick yard an iron screw steamer, 250ft. by 34ft. by $24\frac{3}{4}$ft. depth to spar deck, built for the Havraise Peninsulaire de Navigation à Vapeur, Havre, under Lloyd's special survey for the highest class and French Veritas, under the personal superintendence of Captain Montier. She has cabin aft, with entrance from large smoking house on spar deck aft, protected by hood covering the stern, fitted up for captain and passengers. The accommodation is under the spar deck amidships for the officers and engineers, and for firemen and crew forward below the monkey forecastle. A large chart and wheel-house is fitted under the bridge amidships and look-out bridge. She has four large hatchways with steam winches and donkey boiler, patented windlass, patent steam quarter-master steering gear amidship, patent screw gear aft, &c. The machinery, of 160-horse power, is to be fitted by Mr. Geo. Clark, Southwick. The vessel on leaving the ways was named the Ville de Cadiz.

THE sale of the site of the works of Messrs. J. and W. Allen, of Wallsend, to a neighbouring shipbuilding firm, is announced. This sale will go far to extinguish the alkali manufacture in Northumberland, this being the last of the works that carry on the manufacture on the north banks of the Tyne. The alkali manufacture is about eighty-seven years old on the Tyne, Mr. W. Losh and Mr. Thomas Doubleday having experimented largely in the last two decades of the last century. Mr. Losh, in 1792, commenced the manufacture at Walker—Lords Dundonald and Dundas, and Messrs. J. and W. Losh, John Surtees, and Aubone being the partners, according to the able paper of Messrs. Richardson, Clapham, and Stevenson, read at the Newcastle meeting of the British Association. Within a very few years the Walker works were followed by Doubleday and Easterby's, at Bill Quay, by others at Felling, Jarrow, and Friar's Goose. Twenty years ago the trade had attained large dimensions on both sides of the Tyne, there being about half-a-dozen works on the Northumberland side. One by one the works at the northern side have since been closed.

WHITWOOD SEWAGE WORKS.—ENGINE-HOUSE AND TANKS.

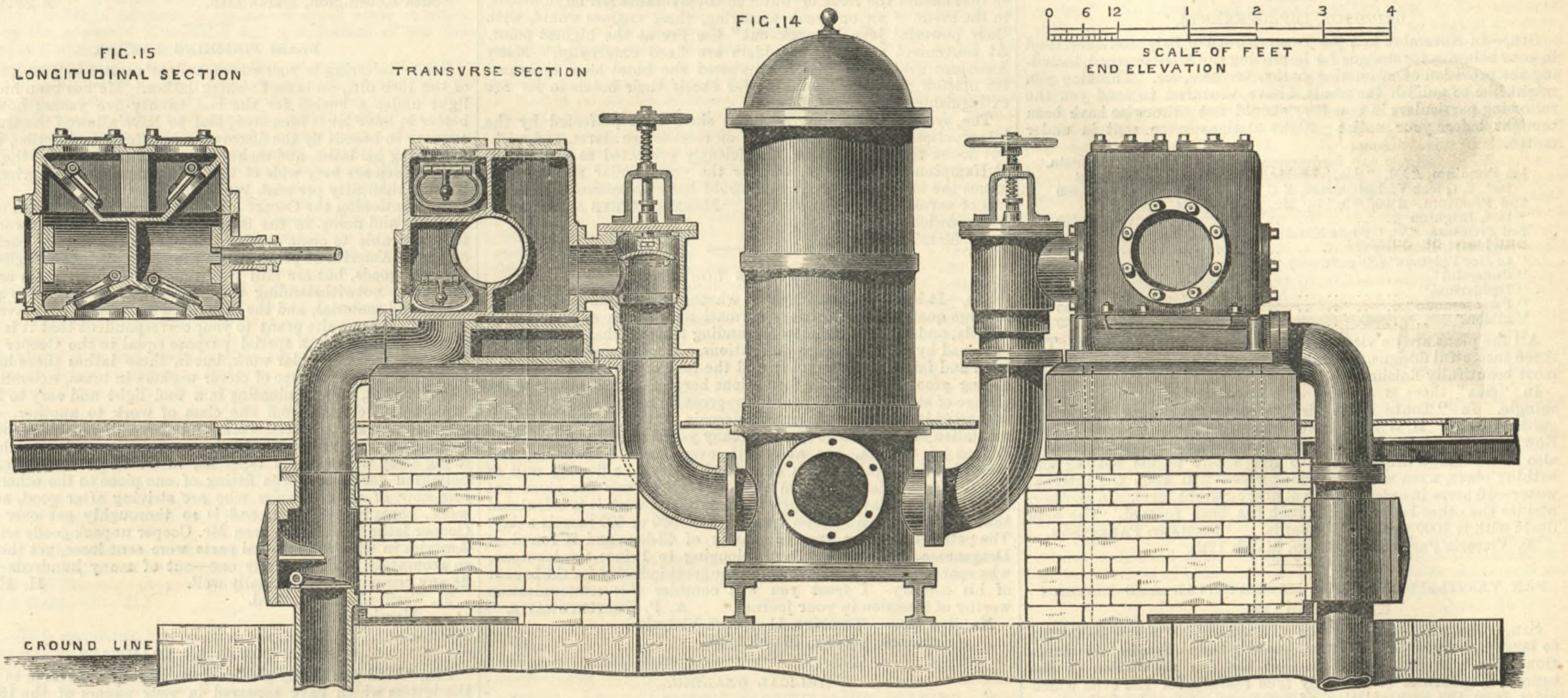
MR. J. RICHARDSON, M.I.C.E., ENGINEER.

(*For description see page 205.*)



WHITWOOD SEWAGE WORKS.—DETAILS OF PUMPS.

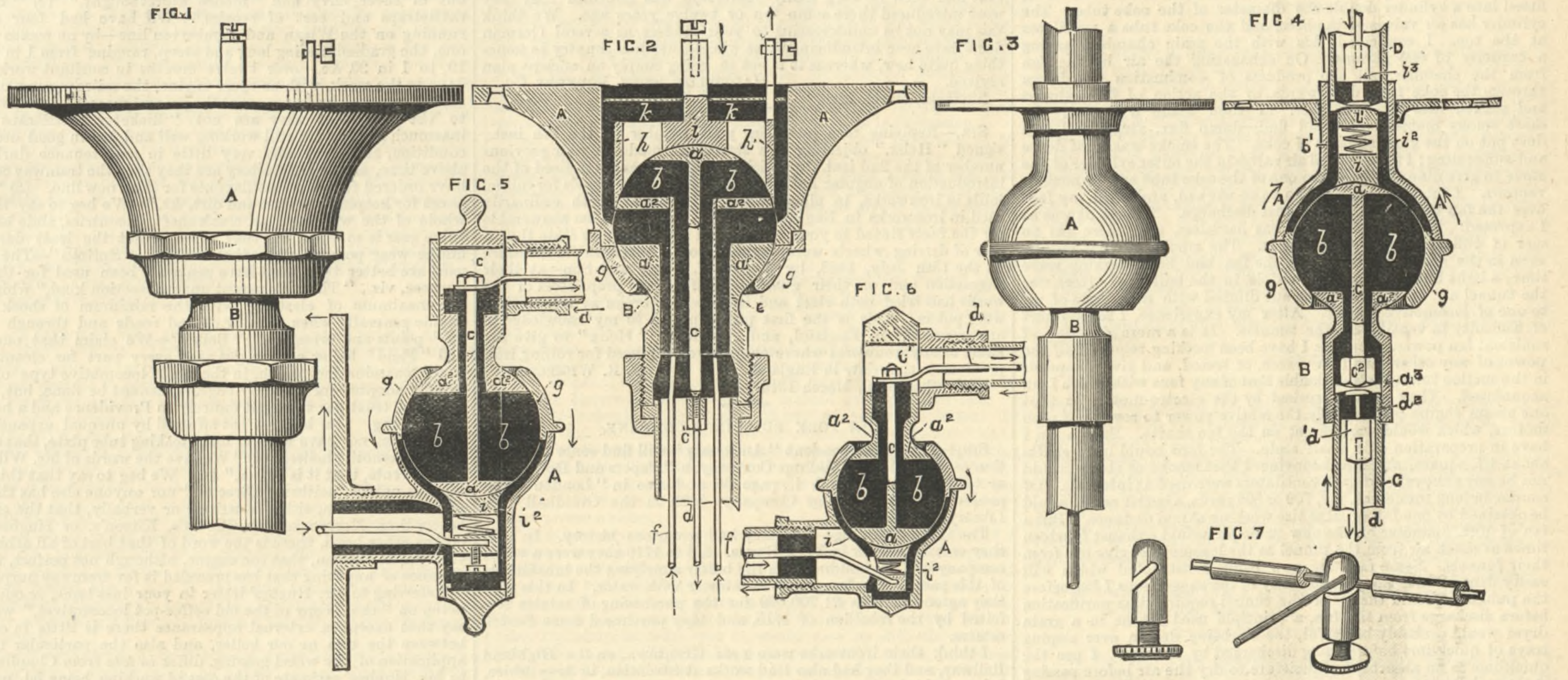
MR. J. HORNE, CASTLEFORD, ENGINEER.



IN our last impression we described the Sewage Works at Whitwood, Yorkshire, and gave illustrations of the pumping engines. We now give above engravings of the sewage pumps, and on page 204 an elevation of the engine-house and plans of the sewage tanks, &c., showing the general arrangement of the works. These explain themselves with what we have already written on the subject.

The sewage pumps are 14in. diameter by 12in. stroke. They deliver 30,000 gallons per hour on the sewage farm through 2300 yards of 12in. main, through an elevation of 68ft. The works form an excellent example of what small sewage works ought to be.

BREWTNALL'S SUSPENSION FOR ELECTROLIERS.



THE object of this invention, by Mr. A. Brewtnall, of Streatham, is to enable the principle of the ball-and-socket joint to be applied to the suspension of electroliers and to the mounting of other swinging or movable fittings for the electric light by providing through the medium of this joint for the maintenance, unbroken, of the electrical circuit, when the electrolier or other fitting is swung or rotated. This is attained by constructing the ball, and its socket, in segments, of metal, separated from one another by segments, zones, or parts of insulating material, the metallic segments or portions of the socket corresponding to similar segments or portions of the ball, and in contact therewith over a sufficient extent of surface to permit of the free motion of the ball in its socket without breaking the electrical connection between the corresponding segments or parts.

The joint is illustrated in the accompanying engraving, in which Fig. 1 is an elevation, and Fig. 2 a central vertical section, of one arrangement of ball-and-socket for the suspension of an electrolier. In this arrangement the ball-and-socket are constructed of a sufficient number of zones or segments to afford a return circuit without using for this purpose the external metal of any part. Figs. 3 and 4 are similar views of a ball-and-socket in which the external metal is used for the return circuit. Figs. 5 and 6 respectively show the application of the ball-and-socket joint to the first and intermediate joints of wall brackets. In these figures the arrangement is similar to Fig. 4, but the arrangement shown in Fig. 2 might equally well be employed if it is not desired to use the external metal for the return circuit. In all these figures the same letters of reference indicate corresponding parts.

A is the socket and B is the ball. In Fig. 2 the ball is composed of three horizontal metallic segments, a, a^1, a^2, separated from one another by two insulating segments b. The segment a is attached to a central stem c, which leads through the neck of the ball, and is connected by a nut c to the wire d leading to the lamp. To the intermediate metallic zone or segment a^1 is soldered a metal tube e, which also leads through the neck of the ball and terminates in tangs, to which are connected the return wires f from the lamp. The segments b of insulating material are also carried through the neck of the ball and surround the rod c and tube e, and insulate them from one another, and from the third segment a^2. This third or lowest segment takes the wear, and rests in the corresponding gland g of the socket A. This third segment a^2 serves for the attachment of the main stem of the electrolier in the ordinary way. This socket contains an annular metallic lining h, which exactly coincides with the zone or segment a^1 of the ball, and is insulated from the outer portion of the socket, as shown. To this lining h the return wire is connected at h^1; i is a central stud, having its lower surface concaved to the radius of the ball, so as to make good contact with the uppermost segment a of the ball. To this stud the positive wire from the generator is attached, and the stud is insulated by a disc of vulcanite, and is pressed into contact with the segment a of the ball by a disc of soft india-rubber k beneath the vulcanite, and bearing upon a shoulder of the stud. This india-rubber disc k also bears at its edges upon the annular lining h, and presses it likewise into contact with the segment a^2. Thus it will be seen that there is perfect freedom for complete rotation, and also for oscillation to any desired extent, of the ball in the socket, without liability of breaking the electrical connection.

In Fig. 4 there are only two metal segments a and a^2, separated by a segment b of insulating material, as shown. The segment a is attached to a central stem c, as before, but the stem terminates in a nut c^2 screwed on it, this nut being a sufficient distance within the socket a^3 of the part a^2 to enable the joint to be made as next described; d is the leading wire, fixed at its upper end into a stud d^1, embedded in a plug d^2 of insulating material, filled into a coned seat in the end of the main stem C of the electrolier, from which the stud d^1 projects slightly, so that when stem C is screwed into its socket a^3, electrical connection will be made between c and d. The concave stud i, which presses on the segment a of the ball, is divided into two parts, i, i^1, connected by a metal spring i^2, which answers the purpose of the india-rubber disc k in Fig. 2. The joint of the leading wire from the positive pole of the generator is made by an insulated stud i^3 pressed against i^1 in the act of screwing the tube D—which incloses said wire—to the socket A. In this arrangement it will be seen by the arrows that tube C, segment a^2 of the ball, gland g, socket A, and tube D serve as the return conductor. The tube D may be replaced when desired by a terminal.

Figs. 5 and 6 show the application of the same joint to the joints of wall brackets. The essential parts of the joint being identical with those before described, need no further description, and the slight modification necessary in the bracket itself to adapt it to receive these joints will be apparent from the drawing without special explanation.

Fig. 7 shows one of Brewtnall's patent connectors for joining branch to main wires, slightly modified to suit the requirements of telegraph offices for connecting up the various instruments both on submarine and land lines. The drawings will sufficiently explain its use.

THE idea of the Elbe and Baltic Canal is gradually ripening toward realisation. Of the two projects for its construction, that of the Hamburg capitalists is regarded with most favour. The rival scheme is promoted by a company mainly composed of English shareholders.

LAUNCH OF THE TWIN-SCREW STEAMER NORWICH.—Last week Messrs. Earle's Shipbuilding Company launched at Hull a fine twin-screw steamer named the Norwich, for the Great Eastern Railway Company's service between Harwich and Antwerp. The principal dimensions of the vessel are:—Length between perpendiculars, 260ft.; beam, 31ft.; and depth of hold, 15ft. The first-class cabin, which is amidship and fitted with all the latest improvements, will accommodate eighty-four passengers, and the second-class cabin forty-two. The ship will be propelled at a speed of 14 knots by two pairs of inverted diagonal compound surface condensing engines. Steam will be supplied by two double-ended boilers at a pressure of 80 lb.

LETTERS TO THE EDITOR.

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

BRIGHTON IMPROVEMENTS.

SIR,—In November last the Town Council of Brighton advertised in your columns for designs for improving the Madeira-road, including the provision of swimming baths, terraces, &c. Thinking you might like to publish the result, I have ventured to send you the following particulars in case they should not otherwise have been brought before your notice. Eight designs were sent in under motto.

	Estimate. £
1st Premium, £200, "Sea," by Mr. J. Johnson, architect, 8, Queen Victoria-street, E.C.	53,000
2nd Premium, £100, "Λ," by Mr. E. E. Scott, architect, Brighton	62,000
3rd Premium, £50, "Toute Ensemble," by Mr. Lainson, architect, Brighton	86,000
"In Deo Fidemus" (No estimate)	
"Undercliff"	53,500
"Tepidarium"	86,375
"Perseverando"	116,450
"Albion"	61,000

All the plans are on view at the Brighton Picture Gallery. The three successful designs, as well as some of the others, are certainly most beautifully finished.

In "Sea" there is a series of terraces and steps down to the shingle. In "Toute Ensemble," to economise filling in, sunken gardens below H.W.S.T. have been provided, and a Rotten Row for equestrians. In my own design, "Perseverando," also to economise filling in and to give a safe public boating and bathing place, a sea wall is provided which will keep the internal water—10 acres in extent—at an almost constant level. In another, besides the other baths, a tidal bath has been formed. The area dealt with is 1000 yards by 100 yards. RICHARD PARKINSON.

29, Victoria Park-road, London, March 12th.

FAN VENTILATION OF THE METROPOLITAN AND DISTRICT RAILWAYS.

SIR,—The ventilation of these railways, which is now occupying so large a share of public notice, has long been engaging my attention. I see in THE ENGINEER that the fan ventilation of the tunnels is spoken of as the only true remedy for the evils which exist from the accumulation of gases and steam from the locomotives. This has long been my opinion, and from the time I constructed the new "double power" fans, giving a suction equal to 9in. of water, and a rush of air of over 10,000ft. per minute by the Casell meter, I have directed my attention to the whole question of tunnel ventilation. I was informed by the engineers of the Metropolitan Railway that the locomotives discharged 10,000 cubic feet of gas per minute. My theory was that if I could dilute those gases with nine times the amount of air, the discharge from the exhaust fan would be harmless. I experimented thus: I made a bright coke fire in a stove of peculiar construction, used by me for drying grain. It consists of a tube filled with coke, fitted into a cylinder double the diameter of the coke tube. The cylinder has air valves at the base, and the coke tube a ventilator at the top. I connected this with the grain chamber, having a capacity of 600 gallons. On exhausting the air by the fan from the chamber, all the products of combustion are drawn through the coke tube downwards by the action of the exhaust and sucked into the chamber. I then made a fire of the most smoky materials I could find—damp flax, straw, and coal dust put on the glowing mass of coke. The smoke was most dense and suffocating; I then opened air valves in the outer cylinder of the stove to give nine of pure air to one of the coke tube and its noxious vapours. I then caused the fan to be worked, and held my face over the fan to breathe the exhaust discharge. The result was as I expected. The air discharged was harmless, and there was no sort of difficulty about breathing it. The smoke was not visible, even in the sunshine; but after the fan had been working some time, a light bluish vapour was visible in the building. Here was the tunnel air as it would come out diluted with nine parts of air to one of locomotive vapour. After my experience, I see no sort of difficulty in ventilating the tunnels. It is a mere question of sufficient fan power. The fans I have been working require half the power of any other fans I have seen or tested, and give air speeds in the suction tubes of about double that of any fans with which I am acquainted. They can be worked by the electro-motor, so that one steam engine could supply the motive power to several of such motors, which would work direct on the fan shafts. Such a fan I have in preparation on a small scale. The fans could be in shafts about 4ft. square, and I feel convinced that smoke or steam would not be any annoyance if such ventilators were used at intervals. Of course, in long tunnels of, say, 700 or 800 yards, a better result would be obtained by one fan of large size working at mid distance. But a fan of 10ft. diameter on the new principle would exhaust fourteen times as much air from the tunnel as the locomotives give out from their funnels. Some fans are now being constructed which will easily demonstrate the practicability of the suggestions I lay before the public. Should the air of the tunnel require lime purification before discharge from the fan, a principle used by me in a grain dryer would probably be useful, the air being drawn over sloping trays of quicklime before being discharged by the fan. I use the quicklime as an absorbent of moisture to dry the air before passing it through grain. G. M. CAPELL.

Passenham Rectory, Stony Stratford, March 14th.

FIRE APPLIANCES AT THE LANGHAM HOTEL.

SIR,—As some reference has been made in THE ENGINEER to the fire-extinguishing arrangements at the Langham Hotel, permit us, as manufacturers and erectors of the same, to give a few supplementary particulars. The building was originally fitted with a fire-main by the contractors, but although the situation of the pipes was, in a measure, correct, it was found, on the occasion of an outbreak of fire in the kitchen—which, but for fortunate circumstances would have destroyed the whole building—that the iron pipes were of insufficient strength; so much so, that one of them on the opening of the hydrants suddenly burst. The hose provided was of india-rubber, and this also failed when put into practical use. Mr. Rouse, the chairman of the company, at once determined to have these matters rectified, and accordingly under his direction—he being a practical and experienced engineer—we erected some fifteen years ago the present fire system. Very strong downright fire-mains are connected in the east and west wings, and are fitted with large copper air vessels, so as to prevent any concussion when the valves are suddenly opened. Each main is connected with a large water tank, holding about 100,000 gallons, placed some 110ft. above the ground. These tanks are supplied from a deep well on the premises. A connection is made to the main from the water company's high-pressure constant surface, so that in case of accident to the pumping machinery a supply from this source may be relied upon. Another pumping engine raises the back-water from the lifts up to tanks on top of the building, and the engine is arranged to pump direct into the fire-mains if required. The mains are 4in. and 5in. in diameter, each with stop and back pressure valves. There are nine floors to the building, and each floor has two fire valves, one on each wing. These hydrants are each supplied with sufficient leather hose—the fire above alluded to having taught the management that no other description of hose is reliable—to meet in the centre of the premises, so that in any room, upon either floor, a fire could be attacked in a few seconds. In addition to these appliances there are two stand-posts in the courtyard, each supplied from the water company's main, and the tanks on the top of the building. The "fire stations" on each storey are provided with London Brigade pattern hand fire pumps, also with felling axes for cutting away, and fire hooks for pricking the ceilings, &c., and alongside each hand pump is a set of leather buckets, always full of water.

Mr. Rouse also made special provision for protecting the roof. On the top floor two powerful manual fire engines are stationed, so that should the force of water in the hydrants not be sufficient, in the event of an outbreak occurring, these engines would, with their powerful jets, "knock out" the fire at the highest point. At convenient spots, iron ladders are fixed externally. Many American gentlemen who have visited the hotel have expressed the opinion that the Langham far excels their hotels in its fire extinguishing arrangements.

The system above described has since been perfected by the introduction—by the manager—of an electric fire alarm, and without doubt the Langham is as efficiently protected as the palace at Hampton Court, where, but for the very similar appliances—minus the tank—the recent fire would have occasioned a national loss of several millions sterling. MERRYWEATHER AND SONS.

Greenwich-road, London.
March 12th.

PETROLEUM IN ROUMANIA.

SIR,—It has long been disputed whether petroleum can be found in large quantities in tertiary formations such as exist in Italy, Galicia, and Roumania, notwithstanding the fact that its existence is proved by large external indications. English companies have tried and failed in Roumania; and the task of boring through the sliding ground, which the formations here present at almost every change of strata, has also proved too great for some Pennsylvanians, who tried in Galicia and left in despair. Mr. Charles Ribighini, an Italian engineer, who has had many years' experience in the oil regions of Canada, has at length overcome all obstacles, and succeeded in striking, at a considerable depth, a flowing well of the finest petroleum. From this well 150 barrels are given out naturally each day, and when the pump is at work it is calculated that the production will be increased to 300 or 400 barrels a day. The petroleum has a specific gravity of 42 deg., and is found at Draganeasa, on a vast territory belonging to Prince Cantacuzene, who spares no money in developing the great industry for the benefit of his country. I trust you will consider this communication worthy of insertion in your journal. A. P. POSTLETHWAITE.

Mansion House-chambers, 11, Queen Victoria-street, London, March 12th.

HELICAL GEARING.

SIR,—Referring to the letter in your last issue under the head of "Wheels with Helical Teeth," we may say that we have for a considerable time past made large quantities of cast steel helical gearing, both machine moulded and from full patterns—in fact, they have been supplied for rolling mill work, gearing purposes, &c., and have given every satisfaction. Their adoption is found highly advantageous, as they are considered to run much quieter and truer than the ordinary straight-faced tooth. From the tone of the letter in your last issue, these wheels are described as if somewhat novel, but this is not so, as one of our firm, who was in the United States a short time ago, saw helical or angular wheels that had been in work many years, and was informed that they were introduced there some ten or twelve years ago. We think this may not be uninteresting to your readers, as several German firms have been introducing these wheels into this country as something quite new, whereas it is not so, being simply an ancient plan revived. HADFIELD'S STEEL FOUNDRY CO.

Sheffield, March 12th.

SIR,—Replying to a letter in your number of the 9th inst., signed "Helix," objecting to a statement made in your previous number of the 2nd inst., in which an improvement is noticed of the introduction of angular helical teeth spur driving wheels for rolling mills in ironworks, in place of the old straight teeth ordinarily used in ironworks in England, I beg to say that I am answerable for the facts stated to your agent; and I may further state that a pair of driving wheels were supplied to an ironworks in Cheshire on the 13th July, 1882, by Messrs. T. Perry and Son—at their suggestion and on their guarantee—after the proprietors of the works had tried both steel and iron, which broke as fast as they were put in. This is the first pair supplied to my knowledge to any ironworks in England, and I challenge "Helix" to give the name of any ironworks where they have been used for rolling iron previous to that date in England. F. R. WHEELDON.

Wolverhampton, March 13th.

THE YORK BUILDINGS COMPANY.

SIR,—Your correspondent "Antiquary" will find some information as to the York Buildings Company in "Papers and Documents as to Waterworks," vol. i., page 55, and also in "London Companies"—York Buildings Company—both in the Guildhall Free Library, London.

The York Buildings Company had a curious history. In 1651 they erected a work in York House. Up to 1719 they were a water company in York-buildings, for the better supplying the inhabitants of this part of London and Westminster with water. In this year they agreed to raise £1,200,000 for the purchasing of estates forfeited by the rebellion of 1715, and they purchased some Scotch estates.

I think their ironworks were near Grantown, on the Highland Railway, and they had also lead works at Strontian, in Argyllshire. I do not think they made iron as early as 1720. Mr. Fordyce, the company's agent in Edinburgh, writes in 1725:—"If he had only £1000, he would oblige himself to have £5000 of bar iron in London before he needed any money, for everything is ready to work, and they have a prodigious stock of excellent charcoal." In a letter dated 4th January, 1731, Mr. Fordyce says:—"I very much approve of your method of stationing the officers at Strontian, for though Mr. Mildmay may be no real miner, he will make a very good superintendent, as Mr. Stephens is at the ironworks." So that they appear to have been going at that time.

After this they appear to have got into difficulties about money, and soon afterwards stopped. They worked coal largely about Tranent, and between 1720 and 1730 made the first railway in Scotland with wooden rails, from Tranent down to Cockensie.

Theirs is a most interesting story, and would well repay an antiquary to hunt it out. R. T. M.

Rutherglen, March 13th.

THE PRINCIPLES OF MODERN PHYSICS.

SIR,—I have read Mr. Browne's "Foundations of Mechanics," also Mr. Mansel's letter in THE ENGINEER of March 2nd. May I venture to request a little information from either of these gentlemen? Mr. Browne holds that all mechanical changes in the condition of matter are due to the operation of "force centres." Mr. Mansel, I take it, does not agree with Mr. Browne.

I take a clock spring and coil it up. In doing so I do 10 foot-pounds of work on it, and I then secure the spring from uncoiling by binding it with a bit of platinum wire. I have now stored up in the spring, according to Rankine, 10 foot-pounds of "potential energy;" but according to Maxwell and the later authorities on physical science, the 10 foot-pounds are due to "energy of position." Somehow or another, the energy is stored up in the spring. I now put the spring in nitric acid, and completely dissolve it.

What has become of Mr. Browne's "force centres?" Have they been annihilated? The spring, with its elasticity, has wholly disappeared. What, under the circumstances, becomes of the conservation of energy, of which we hear so much?

Furthermore, may I ask whether the work done in dissolving the spring is augmented or diminished in amount by the coiling up of the spring?

I will put the question in another way. Twenty pounds of coal are carried to the top room of a house, 50ft., say, from the ground. When the coals are in the top room they have stored in them, we are told, $20 \times 50 = 1000$ foot-pounds of energy. The coals are burned in the top room—What becomes of the energy?

Until it can be shown that this energy is not lost, is it not folly to talk of the conservation of energy as an immutable fact?

South Kensington, March 11th. A STUDENT.

BRASS FINISHING LATHES.

SIR,—Referring to your correspondent's letter in THE ENGINEER of the 16th ult., on brass finishing lathes. He has been hiding his light under a bushel for the last twenty-five years; how much better to have let it been seen, and to have allowed the trade and country to benefit by the discoveries he affects to describe, without describing his lathe, and makes certain assertions as to the Cooper lathe which are very wide of the mark, notably as to price, which is more than fifty per cent. too high.

In mentioning the Cooper lathe I wrote of a tool which is in the market, and doing in the States such things for its owners that they are able to come over to this country and take back large orders to America at prices which are lower than the English rates for such goods, but are still very remunerative to them as manufacturers, notwithstanding the higher rates they have to pay for wages and material, and the distance over which they have to pay freight. I can quite grant to your correspondent that it is easy to design a lathe for a special purpose equal to the Cooper or Fox lathe on that particular work, but in these lathes there has been embodied the experience of clever workers in brass, extending over a long period, and culminating in a tool light and easy to handle, rapid in its change from one class of work to another, quickly adapted and set to special work, and above all capable of being set to give accurate uniformity in size on one piece after another, and doing away with the old taper fit, in which brass finishers have delighted for ages. The fitting of one piece to the other is the *bête noir* of all mechanics who are striving after good, accurate work, cheaply produced, and is so thoroughly got over by the Cooper lathe that I have seen Mr. Cooper unpack goods sent from America in which the several parts were sent loose, yet they were so accurately made that any one—out of many hundreds—would fit any companion part equally well. H. HUNT.

21, Trafford-road, Salford.
March 7th.

STEAM POWER ON TRAMWAYS.

SIR,—Will you kindly give us space in your next issue to answer the letters which have appeared in your papers of the 16th and 23rd February and 2nd March respectively? (1) In reply to "Director's" letter *re* "No illustration or description of this engine has ever been made public," we beg to say that the demand for our engine, which has arisen purely on its merits as a "tramway motor," and the very best testimonials as to its efficiency, viz., the orders in hand and in prospect, are sufficient for the present time for our requirements and powers of production, without our going to the expense of advertising and "puffing" it, and adopting every means in our power, fair and unfair, to run down the good name and performances of other makers' engines, as has been done to us by unprincipled persons out of sheer envy and "malice aforethought." (2) "Ricketty rattletraps and cost of repairs"—We have had four engines running on the Wigan and Pemberton line—by no means a level one, the gradients being long and steep, ranging from 1 in 16, 1 in 19, to 1 in 20, &c.—over twelve months in constant work, seven days to the week, with no spare engine, the mileage run being near 80,000, and which engines are at the present moment dumb witnesses to the fact that they are not "Ricketty rattletraps" yet, inasmuch as they are still working well and are in good order and condition, and have cost very little in maintenance during the above time, and so satisfactory are they that the tramway company have ordered four more similar ones for their new line. (3) "Appliances for keeping out dust and dirt, &c."—We beg to say that the whole of the working gear, crank shaft, excentrics, slide bars, and valve gear is so cased up that there is not the least damage or undue wear possible from that source. "Springs"—The springs used are better than what have generally been used for the same purpose, viz., "Timmis's patent unequal section kind," which gives the maximum of elasticity with the minimum of shock to the engine generally when running on bad roads and through "drop-off" points and crossings. "Boiler"—We claim that our modified "Field" boiler can be got at in every part for cleaning and ocular examination, which, in the small locomotive type of boiler usually adopted for tramway engines, cannot be done, but, on the contrary, trust has to be put entirely to Providence and a hose pipe for cleaning. Our boiler is not affected by unequal expansion and contraction, nor have we ever had a leaking tube plate, that curse of small locomotive boilers. (4) "We have the words of Mr. Wilkinson, at all events, that it is better," &c. We beg to say that this statement is untrue, neither "Director" nor anyone else has the word of Mr. Wilkinson, either in writing or verbally, that the engine is better than Merryweather's, Brown's, Kitson's, or Hughes'; but, on the other hand, there is the word of that best of all arbitrators, viz., public opinion, that the engine, although not perfect, is far in advance of anything that has preceded it for tramway purposes.

Referring to Mr. Hughes' letter in your last issue, *re* our engine being an "exact copy of the old coffee-pot locomotives," we beg to say that except in external appearance there is little in common between the two, as our boiler, and also the particular mode of application of the wheel gearing, differ *in toto* from Chaplin's. As to Mr. Hughes' estimate of the cost of working being 5d. per mile, we quite agree with him that in general, taking everything into consideration, the cost on such a line as Wigan, Huddersfield, or Nottingham, will average that sum. Nevertheless, this does not alter our statement of the facts as gone before, in relation to 3¾d. being the present cost of working at Wigan, whatever it may be in the future.

In reference to one or two remarks in Mr. Batchelor's letter in your current issue, we beg to say—(1) "Curves"—Our engines at Bury have frequently run round a curve of 19ft. radius, with a wheel base as stated, 5ft. 6in., and a gauge of 4ft. 8½in., which is much different to a 40ft. radius mentioned by him. (2) "Increase in consumption of fuel by 50 per cent."—Our engines at Wigan can be seen any day in full work, running cars with often 80 passengers, on heavy gradients with a consumption of under 10 lb. of ordinary coke per car mile run, including what is burned during a stoppage of twenty minutes every five and a-half miles run. We should be glad to hear of the engine that can bring down that figure to 7 lb. on the same line doing the same work, and if Mr. Batchelor will take the trouble to visit us here he can verify this statement any time. Probably being a theoretical, or "paper engineer," he may feel certain he is right in his surmise, but in practice he is wrong entirely. No doubt, being resident in Leeds, he will be familiar with the theoretical evidence given at the Leeds Town Hall before Mr. Stipendiary Bruce, by Professor Thorp, of the Yorkshire College, "that steam cannot be rendered invisible in frosty weather by our method." Now, to show him what theoretical nonsense such people put forth, we beg to say that we have worked our Wigan engines during the few days of exceedingly sharp frost of the past winter, in some instances combined with fog, without showing a breath of visible steam; but to do so with the thermometer—as it was at the time—5 deg. below freezing point, the engines made a little extra noise of blast. Then down come the obstructionists to progress on us, and say, "That having prevented the emission of steam, you are now committing a breach of another bye-law in making a noise." We merely mention this matter to show that theoretical ideas do not always work out in practice.

We notice that on page 170 of your current number someone has gone to the expense and trouble of illustrating our engine from our patent specification, and also publishing a copy of our specification—with what motive or object in view we have some little misgivings; at the same time we beg to say, for the information of persons who seem to take such a kindly and paternal interest in our engine, that we have got provisional protection for, and are now patenting further improvements in details of the greatest importance in reference to the superheating arrangements, governor, wheel gearing, &c., which will bring the engine one great step further in advance of its rather crude state as represented by the aforesaid illustration and specification of our first attempt at a tramway locomotive.

Again referring to Mr. Batchelor's letter, we may safely leave him in Mr. Conradi's hands, in reply to whose letter he has written, and in reference to our allusion to the evidence given by Professor Thorp at the Leeds Town Hall, we would call the attention of the tramway interest to one fact, viz., that five summonses were taken out by a Mr. Edison, a solicitor, of Leeds, against one of our engines, and, on being placed in the witness-box, he—Mr. Edison—admitted that his brother was partner in a firm of Leeds engineers who had brought out a tramway locomotive, which, he also admitted, had so far not been a success. Consequently, under the circumstances, we think we are justified in asserting that this prosecution, like many others before and since, savours somewhat more of selfish vindictiveness and interested motives than of pure philanthropy in the public interest, and also that it is the fate of all good inventions and applications in matters mechanical, which happen to supply a demand successfully, to be assailed on all hands by envious people; and such being the existing state of things, we suppose we must "grin and abide," and in future treat our assailants with the contempt deserved. With our best thanks to you for space in your paper. WM. WILKINSON AND CO., LIMITED.

(Per WM. WILKINSON.)

Holme House Foundry, Wigan, March 5th.

[We publish Mr. Wilkinson's letter in accordance with his request, though after some hesitation. It is not courteous to attribute unworthy motives to scientific opponents, and certainly it is not wise, for readers are apt, not unreasonably, to consider abuse a mere substitute for argument. However, Mr. Wilkinson's letter is before our readers. We may inform him that we ourselves published the illustration of his tramway engine with the simple motive of enabling our readers to form their own opinion of it. When Mr. Wilkinson's improvements are perfected we shall do the same for them.—ED. E.]

SIR,—It is surprising how anxious some makers of, and dealers in, tramway locomotives are to rush into print in order to give startling details as to the merits of their respective machines. Evidence of this description must necessarily be accepted *cum grano salis*.

Referring to the letter of Mr. Hughes in your last issue, the admission that his condenser was constructed on the lines of Kitson's design does not reflect very highly on his mechanical resources, and contrasts unfavourably with the course adopted by Messrs. Merryweather—who, it is stated, have turned out more tramway engines than all the other makers combined—and Messrs. Manning, Wardle, and Co., who have introduced condensing arrangements of novel design and more effective than the others, especially that of the former. As to Mr. Conradi's letter, the only point in it worthy of notice is that with reference to the construction of the permanent way. It is well known that in a good many instances the promoters of tramway companies are also the contractors, consequently lines are laid at the lowest possible cost without adequate regard to durability, and hence in many cases the work is not carried out in a substantial manner. This fact has been evidenced by the admissions made at more than one shareholders' meeting during the past three months.

I fail to see, from the description of the Wilkinson engine in the same number of your journal, that this maker has the least pretension to be termed an inventor. He uses the Field boiler, and calls the application of the movable dish a novelty. The superheating apparatus, however, was patented by Messrs. Merryweather some years ago, but they discarded it, I understand, on adopting a more suitable arrangement; and one has only to read the Leeds and Birmingham papers to learn the number of summonses that have arisen from the recent application of this abandoned "novelty" to the Wilkinson machine. CHAS. CROWDEN.

2, Elmstead Villas, Wakehurst-road,
Wandsworth-common, S.W.

SIR,—I have read with great interest the letters written to you on the above subject. Living near the Birmingham and Aston tramway, I have an opportunity of seeing both the Kitson and Wilkinson engines in regular work. From what I can see I should prefer the Wilkinson for a simple and accessible engine, while to some of your correspondents the above points seems a disadvantage. As to the Wilkinson engine being a copy of Messrs. Chaplin's, of Glasgow, coffee-pot locomotive, I think that is something in its favour, as from my experience Messrs. Chaplin's is a capital engine for what it is intended to do, viz., contractors' work and the like. I have also noticed how easily the Wilkinson engine ascends the long hill at Aston with two cars and one hundred passengers with 120 lb. of steam, whereas it is with difficulty the Kitson ascends with 175 lb., although they have cylinders 2in. larger in diameter than the Wilkinson engine, but the last named has the advantage of being geared about 3 to 2. I should think there must be a considerable back-pressure because the Kitson engine has to exhaust into the condensing tubes, as I presume they do not give the benefit of a vacuum.

Your correspondent, J. S. Batchelor, must have ridden behind a very bad engine driver when he noticed steam blowing-off down hill, as a good engineman would reserve such parts of the road for filling boiler up. I also think he has made a mistake respecting sparks being shown, as the superheater acts as a spark arrester, being placed in the centre of the chimney bottom. On the other hand, Kitson's engines, not having the full benefit of the exhaust from the cylinders, are obliged to use the steam jet to assist the draught when ascending hills, the noise of which I have heard over a-quarter of a mile distant; the consequence is the chimney resembles a huge rocket at night. With regard to steam being shown by the Wilkinson engine, I cannot see the slightest difference between either of them, as they both show steam during heavy weather. ASTON.

Birmingham, March 12th.

SIR,—Your correspondent, Mr. J. S. Batchelor, is not *au fait* with the facts relating to the build of the Wilkinson engine, his letter in your issue of the 2nd inst. being from beginning to end decidedly misleading, and we would beg of him to make himself more familiar with the construction and "real principle" of the engine before he assumes the position of a critic.

We may mention that a few days since one of Kitson's engines came to a standstill on a gradient at Birmingham, and it was not until the arrival of a Wilkinson engine with loaded cars attached, which pushed the Kitson engine and car to the top of the hill, that it could resume its journey. This, we think, speaks volumes as to the superiority of the Wilkinson engine, as all the engines used by the Birmingham and Aston Tramways Company have to work under the same conditions as to load, &c.; moreover, the Wilkinson locomotive, besides being very much lighter and more compact than the Kitson, has a considerably smaller cylinder.

In conclusion, we are most anxious to avoid direct personality, and desire nothing but fair and honest criticism. We would add that THE ENGINEER of the 2nd inst. states:—"The novelty consists in the combination. The idea of using geared tramway engines is, of course, not new; but it has much to recommend it, and the system of disposing of the steam by superheating it, is, it is said, much to be preferred to the plan of condensing it in water tanks." This is sufficient for us. MARPLE AND CO.

London, March 14th.

PATENT LAW.

SIR,—Having read your article on the above subject, and feeling great interest in the matter of the proposed amendment of the present patent law, you will be kind enough to allow me to say a few words. I quite endorse all you propose, and hope that the Bill proposed will become law on the lines of your article. The scale of payments appears to me the most important part of the whole Bill. In fact, the progress of the nation depends on encouragement of the brain workers, and this becomes more apparent every year. We may work hard with our hands and still be left in the rear in competition with the commercial enterprise of the world. I would make it compulsory to grant licences to makers on reasonable terms, say, a percentage; this would not affect the interest of the inventor, and would benefit the nation by doing away with the monopoly of the capitalist, who very often gets more than the inventor, he doing no more than any other maker of articles. The present law checks many from bringing forward their ideas, knowing that they are unable to pay the expenses of a patent right, and they dare not go to a maker or capitalist for fear of losing the benefit of his brain-work by being subject to piracy. I am in the predicament, and have been for some years, having got out an invention which I feel confident will answer the purpose intended. I am not in a position to lay out the necessary money in having it practically tested; because it will be an expensive piece of machinery, and the principle is so simple that it would be as eagerly wanted as electricity is now, for every trade, as a motor; but I will wait until I can securely protect my invention from the sharks who are always ready to swallow up the little fishes. The proposed Bill, I believe, will be a great advantage to the mechanical class, if the time for provisional protection is increased to one year; because the present six months—strictly four—is not long enough for the perfecting of many mechanical inventions, as one is sure to find some little difficulties when the invention is tried the first time, which must be got rid of before he finally succeeds. I have not much belief in the "original" inventor, because all ideas are developed from what we have already seen, and consequently, the new idea is only a new adaptation of older ones, as far as mechanics go. In the sciences it is different; so I would have the declaration omitted. I hope your readers will say something on this all-important subject.

Burton-on-Trent, March 14th. HYDROSTATIC.

THE EFFICIENCY OF TURBINES.

SIR,—I have only to-day seen your issue of the 9th instant containing a letter signed "Aquarius." The same query regarding the coefficient of discharge has been addressed to me on more than one occasion. I regret I have not my papers at hand to answer it more fully, but possibly the following information may be of service; if not, I shall be glad to add to it on my return. I would first say, however, that Mr. Emerson does not now make the tests at the experimental flume belonging to the Water Power Company at Holyoke, these being now made by Mr. Clemens Herschell, and have been so, I believe, since 1880. The water is measured when passing over a tumbling bay in the tail race and placed a considerable distance from the wheel being tested. The sides of this bay are movable, and the length—or rather the width as it is called—of the sill, is reduced for half-gate test or other tests less than full-gate. The coefficient of discharge varies—as is well known to all who have experimented on the discharge of water over sills—according to the width of the sill; and it is also affected by other surrounding circumstances, all of which were taken into consideration by Mr. Francis when tabulating his Lowell experiments, and his tables for widths of sill up to 20ft. are considered to be as correct as any others known; and this at all events is true, that for comparing the efficiency of one turbine with another they serve the purpose to perfection.

The assertions "Aquarius" says I have been bold enough to make are none of my own making. They are simply certified results I have laid before that section of your readers who are interested in the subject, and any more convincing testimony desired by "Aquarius" I shall be pleased to give if at all within my power. JOHN TURNBULL, JUN.

London, March 13th.

SIR,—In reply to Mr. Turnbull's letter of the 5th inst., I must correct his mis-statement, that I have made "an amusing mistake" in quoting Mr. Emerson *verbatim*. This was done intentionally; no portion of the chapter, not even that which appeared to be superfluous, was omitted, lest it might have been supposed that I had clipped the quotation to fit my own contention.

Mr. Turnbull further appears to pity my ignorance in quoting from Mr. Emerson's latest edition, instead of a previous one. I can quite understand Mr. Turnbull's preference for the latter. It appears that Mr. Emerson's latest experience did not induce him to repeat, in the third edition, the pretty encomium on the Hercules wheel which Mr. Turnbull quotes with such apparent gusto. On the contrary, the book after the last revision contains the following caution; which might with advantage be taken to heart by our water power owners.

"It is here necessary to utter a caution against the selection of a turbine from any make, because one of this kind has been reported as giving remarkable results. Mr. Boyden reported in an exceptional case high efficiency, yet the builders refuse to guarantee over 75 per cent., and tests prove many of them to be below that. Stevenson's wheel was reported above 90 per cent. at the Birkinbine, Philadelphia, tests, yet it would now be difficult to find a Stevenson in use. The Risdon, reported so high at the Centennial tests, is little talked of now. The Hercules, reported as giving the highest average results ever obtained with a turbine, often gives less, though remarkably efficient if care be used in the selection. The first Wolf tested gave it a reputation that was soon lost by subsequent tests of others, and particularly larger wheels. The same is true of the Walsh. As to the small Victor, reported in connection with the gear, belt, and draught tube experiments, probably not one in a thousand of that make would repeat these results. Two of the same size, since tested under the same conditions, to fulfil orders, did not reach 80 per cent. in either case. At whole gate the Victor stands unequalled in efficiency; but care is necessary in selection with that as with any other make of turbine, and particularly in the selection of the larger sizes, which have not proved so efficient as the smaller ones."*

I have carefully searched the tests of the "New American" contained in Emerson's work, and cannot find a single instance in which it has failed to give 80 per cent. at its best gate opening. The diagram published on p. 165 of your current volume shows that in many places the Hercules did not give 70 per cent. with the best quantity of water.

Now, I would put it to each of your readers, which type would they sooner take as a precedent—that which has occasionally given an exceptional percentage, but more frequently a very inferior one; or that which has never failed to give 80 per cent. with the best quantity of water.

One word with regard to the anonymous growl of "Aquarius." Although I am a maker of turbines, my own is not now under discussion, American practice only being on the *tapis*. I think your readers will agree with me that in a search after the points of excellence in a turbine—or anything else—the first step is to find the most successful examples, and then to ascertain, as far as possible, wherein their excellence lies. Can "Aquarius" suggest any better mode of procedure? CHARLES L. HETT.

Ancholme Foundry, Brigg, March 14th.

BOILER INSURANCE.

SIR,—Consistently, as you know, with my most modest and retiring disposition, I have been waiting and watching to see if anyone in the engineering world would notice in your columns the late trial of the engineer who was committed for manslaughter in the case of a boiler explosion in this town, and who was acquitted.

If Lord Justice Cotton is right, what is the use now of boiler inspection or boiler "assurance," unless it is for the latter to hold out inducements to carelessness and recklessness, and in the words of the late Sir W. Fairbairn, Bart.—to offer premiums upon neglect? We have it laid down and settled now, by the aforesaid authority, that no matter how much a man may neglect his duty, and persist—in the face of two reports from two undoubted and competent authorities—in working a dangerous boiler, it is simply "an error of judgment" only, for which he is not criminally liable. For the last twenty years, and more, I have been receiving fees and inspecting boilers, and during all that time I have been occasionally in fear and trembling lest I might be brought up before a coroner's jury, to be censured for neglect, and possibly committed for manslaughter for neglect of duty, &c.; but now, according to the learned judge, I may rest at ease; and were I to tell a manufacturer—for the sake of getting a fee—that his boiler was all right, although in a very dangerous condition, I could not be punished at all! It would only be "an error of judgment." Well, Sir, our judges—although I believe "they are all honourable men," and far above all other judges in any other country—they certainly do strange things sometimes, and maybe they are acting up to the strict letter of the law in so doing most strange things. If so, it only proves the necessity for an alteration in the law which allows an engineer and his employer to kill their fellow-creatures by persisting in working an old worn-out boiler, for in so doing they are only guilty of "an error of judgment."

It only remains now for every boiler user to get his boilers insured—which he can easily do irrespective of their condition—ignore the inspection and the reports of the inspectors if it suits his convenience to do so, and no matter what happens or how many poor people are killed, it is only "an error of judgment," and nobody is criminally liable!

I feel, Sir, my occupation gone as an inspector of boilers; and it is fortunate for me, perhaps, that the Lord Justice's ruling was not made known twenty years ago. Such ruling, however, whilst it is dead against inspection, will operate most favourably in the interests of boiler insurance so long as boilers can be and are accepted for insurance irrespective of their condition. JOHN SWIFT.

Iron Exchange, Birmingham, March 14th.

STRENGTHENING BOILERS.

SIR,—A mystery sometimes hangs over a boiler explosion. The following fact is one worthy of notice to engineers:—Finding a weak place in the mud holes of my boiler, I ordered two rings to be forged to strengthen the same. The boiler being near my office I heard this morning an unusual noise, and on opening the office door I found a man setting the rings to the curve by striking with his hammer on the ring on the surface of the boiler, which had 55 lb. per inch of steam in it. Who would think of doing such a thing, as every blow given must take effect on the weakest place, which I was preparing to strengthen? The man calls himself a boiler maker. COMMON SENSE.

Lambeth, March 8th.

THE COST OF POWER.

SIR,—I notice in last week's edition of your valuable paper some notes and memoranda taken from the *Eisen Zeitung* with reference to the cost of power, in which it is stated that the cost of working the Otto gas motor is 3d. per horse-power per hour. Allow me to state that this must be an error in printing, as the cost per indicated horse-power per hour varies from ½d. to 1d. in England, according as the price of gas is 2s. to 4s. per 1000 cubic feet. I also know of "Otto" engines now working with Dowson gas considerably under the cost of the best compound steam engines. I may also state that the "Otto" gas engine is now made reversible, and that its steadiness is such that it is very extensively used for electric lighting. In the Manchester Exchange it has worked perfectly for the restaurant for some time, but at the present moment a larger power is being put in to work from another centre. HY. P. HOLT.

Fairlea, Didsbury, Manchester, March 14th.

[The *Eisen Zeitung* is alone responsible for the statement. Possibly German experience does not quite coincide with that of our correspondent.—ED. E.]

SOAKING STEEL INGOTS.

SIR,—I beg to send you the following particulars relating to the working of the Gjers Soaking Pits, at the above works, which may be interesting to some of your readers.

Last week we put 2572 ingots, weighing 2391 tons, through fourteen soaking pits, and made 2176 tons of rails and 77 tons blooms. The rail mill worked eleven shifts. The ingots put through the soaking pits were cogged direct from them to 8in. blooms, then re-heated and rolled into rails. Three second heating furnaces were used, and the mill work was done with one cogging and one finishing engine. GEO. SNELUS,

General Manager.

West Cumberland Iron and Steel Company, Limited,
Workington, March 9th.

THE REDCAR PIER has sustained considerable damage from the recent storms. One of the spandrils at the extreme end near the landing stage has been completely washed away, and at the opposite corner another has been broken in two places, and several boards have been raised from the deck by the force of the waves beneath. On Sunday night there was the highest tide there ever known. It washed over the esplanade and the piers.

AN AMERICAN ESTIMATE OF AMERICAN PATENT LAW.—This is what the United States *Railway Review* has to say concerning American patent law. It hardly supports the optimist views of some English writers on the subject:—"The coming exhibition of railway appliances to be held in the Exposition Buildings at Chicago will have the effect of calling attention to a large number of patented devices relating to railway operations, and will bring forward many matters of interest both to inventors and users of railway patents. It would seem as if the occasion might be a proper one for concerted action on the part of those interested in any way regarding patents to call for some revision of the United States patent laws. These, in their present condition, are quite unsatisfactory to both inventors and users of patents. The charge for issuing a patent is so high that the department has become a money making affair, which it was never intended to be, while the protection afforded to the inventor by the patent is very slight. The validity of his patent, or the rights of those using it, as against other patents, has in all cases to be finally settled by the courts, the department taking no action except in the matter of the first application. The patent granted therefore, while pretending to cover the priority of the devices claimed, in reality affords but little protection to the inventor aside from being a mere record of his improvement. It has been suggested that the patent issued should be either one or two things. Either it should be an entry of the invention pure and simple, leaving the whole question of its priority or value as a novelty to be settled outside of the department, or it should be of itself a complete guarantee of the standing of the invention from which there would be no appeal except in extreme cases. With this latter method fewer patents would be granted, and the cost of issuing them would be higher, but the benefits derived would more than balance the increased cost. The inventor would have no further trouble in establishing the strength of his claim, while the purchaser or user would know that the device once passed upon by the department had the same backing that a piece of property acquires by a well authenticated abstract of title. With the multiplicity of patents now being issued, relating to every branch of railway operation, some change in methods of patent business seems very desirable."

* Emerson's Hydrodynamics, page 215.

ELECTRIC LIGHT ENGINES AT THE HOUSES OF PARLIAMENT.

(For description see page 202.)

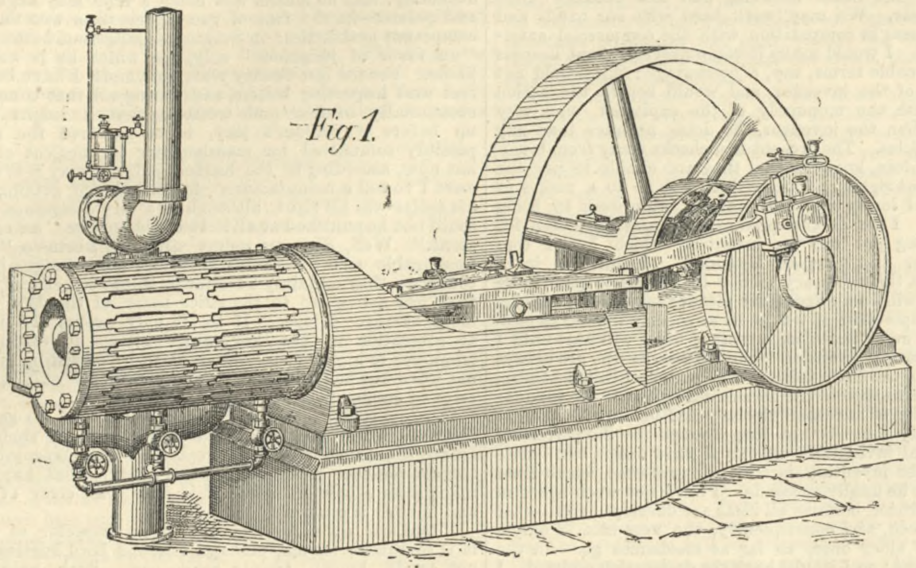


Fig. 1.

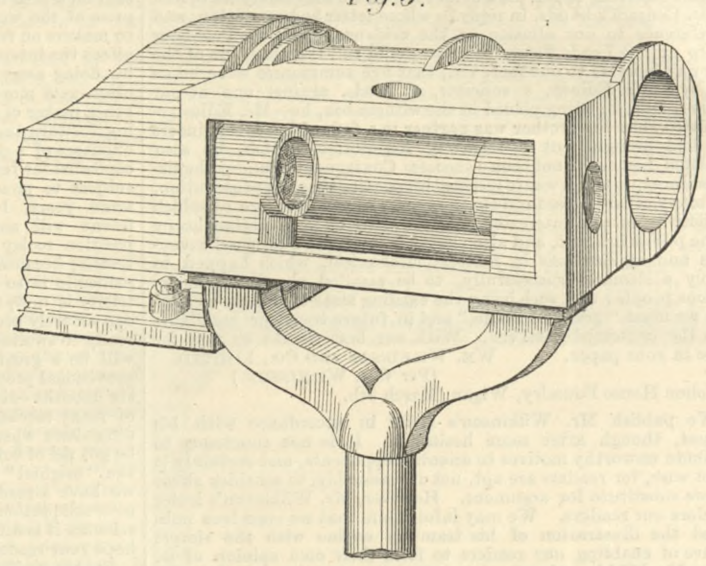


Fig. 5.

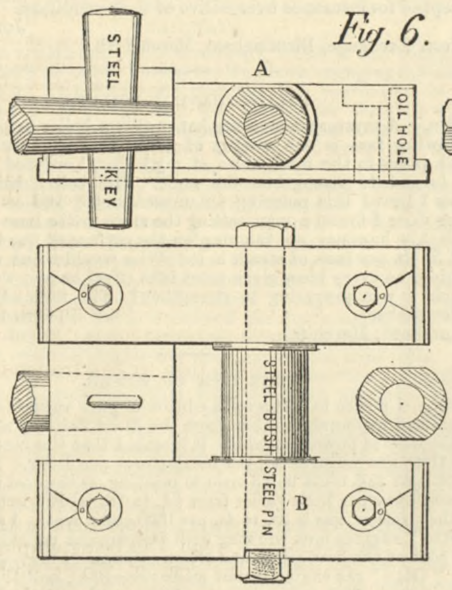
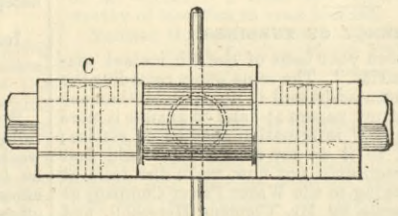



Fig. 6.

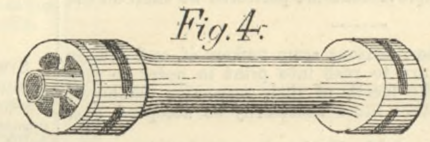


Fig. 4.

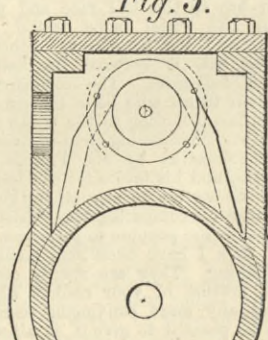


Fig. 3.

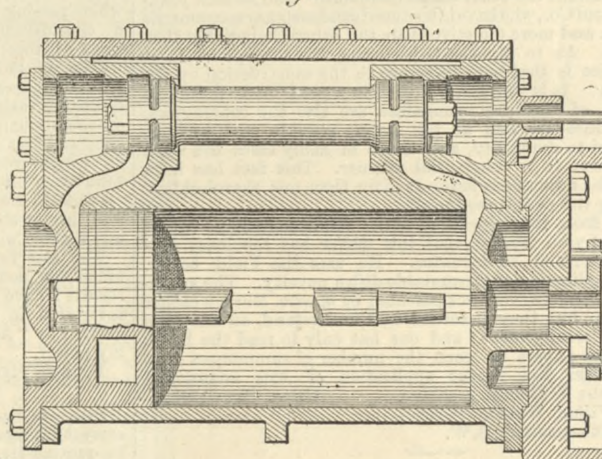


Fig. 2.

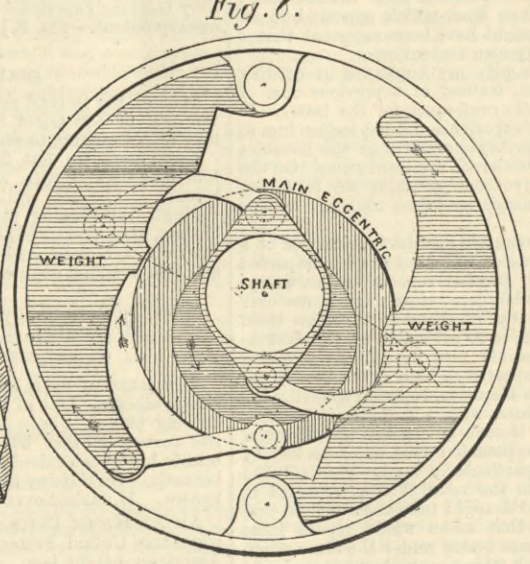


Fig. 8.

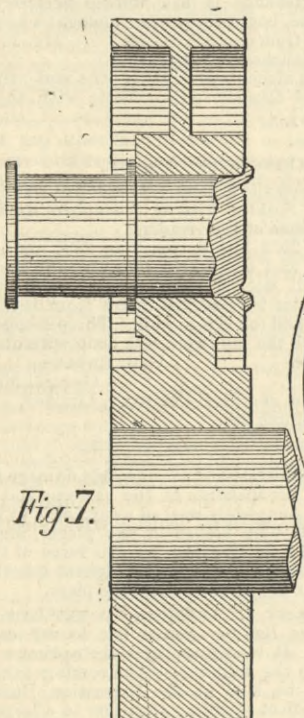


Fig. 7.

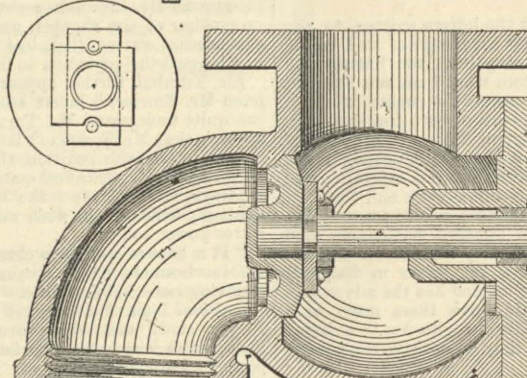


Fig. 13.

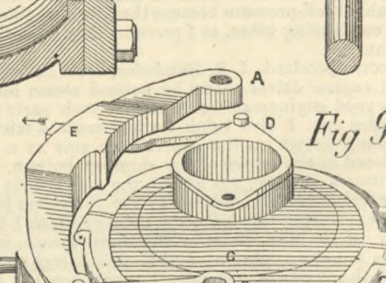


Fig. 9.

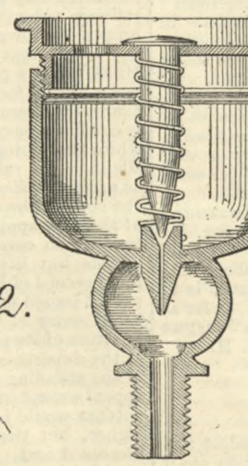


Fig. 10.

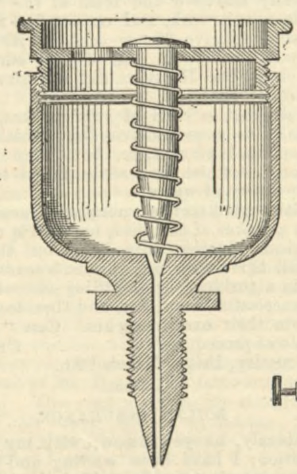


Fig. 11.

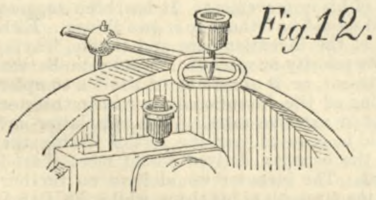


Fig. 12.

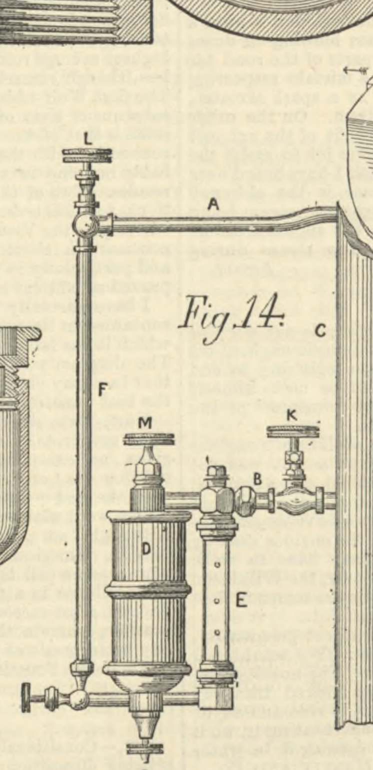


Fig. 14.

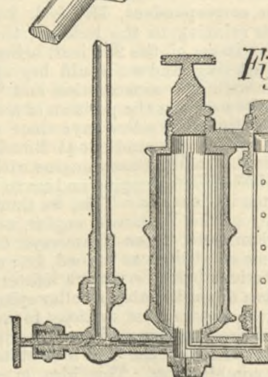


Fig. 15.

J. Swan Eng

PUBLISHER'S NOTICE.

*** *The Publisher begs to announce that next week* THE ENGINEER *will be published on* THURSDAY *instead of* GOOD FRIDAY. *Advertisements intended for that number must be forwarded not later than Six o'clock on Wednesday evening.*

TO CORRESPONDENTS.

*** *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.*

LOEDIS.—*We believe that it is not refunded.*

CHARCOAL.—*A letter lies at our office for this correspondent.*

VORTEX (Birmingham).—*A letter lies at our office for this correspondent.*

A. C. T.—*You cannot get into workshops at all to learn your business without interest, as you do not propose to pay a fee.*

STRENGTH OF SHACKLES AND HOOKS.

(*To the Editor of The Engineer.*)

SIR,—I shall be obliged to any reader who can tell me where I can find published information concerning the properties, strength, and weight of shackle pins and hooks for use with chains. C.

Chesterfield, March 14th.

MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, March 20th, at 8 p.m.: Ordinary meeting. Papers to be discussed, "The Productive Power and Efficiency of Machine Tools and of other Labour-saving Appliances Worked by Hydraulic Pressure," by Mr. Ralph Hart Tweddell, M. Inst. C.E. "Stamping and Welding under the Steam Hammer," by Mr. Alexander McDonnell, M. Inst. C.E. Paper to be read, "Summit-level Tunnel on the Bettws and Festiniog Railway," by Mr. William Smith, M. Inst. C.E.

SOCIETY OF ARTS.—Tuesday, March 20th, at 8 p.m.: Foreign and Colonial Section, "Social and Commercial Aspects of New Zealand," by Mr. William Delisle Hay. Sir Charles Clifford will preside. Thursday, March 22nd, at 8 p.m.: Applied Chemistry and Physics Section, "Self-Purification of River Waters," by Mr. W. N. Hartley, F.R.S.E. Professor F. A. Abel, C.B., F.R.S., will preside.

THE METEOROLOGICAL SOCIETY.—Wednesday, March 21st, at 7 p.m., the following paper will be read:—"Notes on a March to the Hills of Beloochistan in North-West India, with Remarks on the Simoon, and on Dust Storms," by Mr. Henry Cook, M.D., F.R.G.S., F.M.S. At 8 p.m. the meeting will be adjourned, in order to afford the Fellows and their friends an opportunity of inspecting the exhibition of meteorological instruments for travellers, and of such new instruments as have been invented and first constructed since the last exhibition. During the evening the President—Mr. J. K. Laughton, M.A., F.R.A.S.—will give a short discourse on the instruments exhibited.

DEATHS.

On the 10th inst., at 9, Melville-crescent, Edinburgh, JOHN GEDDES, Mining Engineer, in his 83rd year. Friends will please accept this intimation.

On the 10th inst., at Brighton, JOHN PLEWS, C.E., third son of the late John Plews, C.E., aged 58.

THE ENGINEER.

MARCH 16, 1883.

THE TRANSMISSION OF POWER BY ELECTRICITY.

THOSE who have read with due care the series of papers by Professor Oliver Lodge "On the Transmission of Power by Electricity," now in course of publication in our pages, are, no doubt, by this time competent to pronounce an opinion concerning the value of various schemes much talked of for utilising in one locality power generated elsewhere at a distance. It will not be out of place, however, to put what Professor Lodge has told the readers of THE ENGINEER in a somewhat different light. We have nothing to add to what he has said concerning the numerical values of certain results and the mode of calculating the power which may be realised under given conditions. But it may be as well that a few of the general principles involved should be put in a very clear light indeed before a public which, if we are not mistaken, will ere long be tempted to invest money in schemes of no small apparent promise and importance. The prominent idea is the utilisation of water power. Turbines or wheels are to be erected in various parts of the country in all sorts of out-of-the-way and inaccessible places. These wheels are to drive dynamos, and the dynamos are to produce currents of electricity, which are to be employed in actuating motors which are to drive machinery. This, for example, is the foundation of the enterprises of M. Marcel Desprez, concerning which something has already been said in our columns. Nothing will be lost, and something may be gained, by explaining in a few words what all this means. The dynamo depends for its action on the fact that if a coil of insulated wire is carried close past the poles of the magnet, one current of electricity will be generated in the coil as the wire comes under the influence of the magnet, while another and opposite current may be said to flow as the coil goes out of the influence of the magnet. Considerable resistance is offered to the motion of the coil either into the field of influence of the magnet or out of it, and it is in overcoming this resistance that work is done by the engine driving the dynamo, and the resistance bears a certain relation to the current produced. Now, if instead of driving a dynamo with a steam engine we send a current of electricity through its wires, if—that is to say, we reverse the original process—then the dynamo will revolve, and a belt from a pulley on its axis will transmit power and drive machinery. The first question which springs to the lips of the engineer who learns this truth for the first time is, "How much of the power expended in driving the first dynamo can I get back from the second or driven dynamo?" and it is to answering this question that Professor Lodge has mainly addressed himself. It will be seen from what he has said, that the answer depends on many things; but above all, it depends on the dimensions and insulation of the wire by which the current of electricity is led from one machine to the other.

A current of electricity is made up of two factors—first, quantity; secondly, potential, or, as it is now beginning to be called, pressure. There is an analogy between the action of water and that of electricity, in that the power of both to do work depends on the two factors pressure and quantity. A very small quantity of water under great pressure can do much work; so can a large volume of water under a small pressure. In the same way the frictional electrical machine produces an extremely minute quantity of electricity, but at a tremendous pressure. The quantity is, however, so small that it can do little or no work; and the frictional electrical machine has only been utilised in the arts to supply sparks to explode primers in blasting operations. On the other hand, dynamos may be made to supply huge quantities of electricity at so low a tension as to be useless for all purposes of driving machinery. Now the resistance of a wire or other circuit to the flow of a current of electricity is, so far as is known, proportional only to the quantity. Thus, with a given size of wire, and a given impulse or pressure, a given quantity of electricity can be sent. By doubling the wire in sectional area twice the quantity will be transmitted with the same driving power, and so on. When electricity has to be transmitted to a distance it is better to increase its tension than its quantity, because a much smaller wire will suffice. The power being constant, the sectional area of the wire may be continually diminished as the pressure, or tension, or potential, call it what we will, of the current increases. For this and for other reasons very fully explained by Professor Lodge, it is essential that electricity of high tension should be used if the power is to be transmitted without great loss over long distances. Pressure is expressed in terms of volts, current in ampères, or more strictly in coulombs, which mean ampères per second. Thus, in any given case we have first to ascertain the resistance to be overcome by the electricity in passing through the transmitting core. Let us call this, for the sake of illustration, 1000 ohms, although nothing like this resistance will be met with in practice. Next we have to ascertain the pressure. Let us suppose this to be 100 volts, then $\frac{100}{1000} = 0{\cdot}1$, that is to say, 100 volts can only force one-tenth of an ampère per second through a resistance of 1000 ohms. Multiplying our 0·1 ampère by 100, the electro-motive force, we have 10, and dividing this by 746, we have, by a well-known formula, $\frac{10}{746}$ of 1-horse power. If our readers have followed us thus far they will perceive that every wire has a certain co-efficient, as we may term it, which controls the power that can be sent through it, and, the resistance being known, the power transmitted becomes purely a question of volts and of nothing else. Doubling the volts much more than doubles the power, the resistance being a constant. Thus, if, instead of 100 volts, the electro-motive force in the foregoing case, we suppose that we have 1000 volts, then the figures will stand $\frac{1000 \text{ volts}}{1000 \text{ ohms}} = 1$ ampère, which, multiplied by 1000 volts, and divided by 746, gives us $\frac{1000}{746}$, or over 1·34-horse power, and this is just what would be expected; for not only is there a larger quantity of electricity passed through the wire, but that electricity is delivered at a higher pressure at the working end. Just the same result could be achieved by keeping down the resistance. Let us, for example, suppose that we go back to our 100 volts, but that we reduce our resistance from 1000 ohms to 10 ohms, we have then $\frac{100 \text{ volts}}{10 \text{ ohms}} = 10$ ampères, and 10 ampères multiplied by 100 volts gives 1000 and $\frac{1000}{746} = 1{\cdot}34$-horse power as before. Here we see that the same end is attained by augmenting electro-motive force—expressed in terms of volts—ten times, or by reducing the resistance—expressed in terms of ohms—100 times. The reduction in resistance of a wire of any given metal can only be effected either by shortening the wire or by augmenting its thickness, or by doing both. But it is evident that we are prohibited by the conditions from shortening the wire, because we want to transmit power to long distances; and we are prohibited by considerations of expense from augmenting the thickness of the wire. Consequently we must fall back on the dynamo to get us out of the difficulty, and resort to electricity of high tension. Prof. Lodge has shown that to get an efficiency of 90 per cent. it would be necessary to use electricity with a tension of 200,000 volts. So far as is known, it would be absolutely impossible to produce such a tension. Sparks an inch long would fly from the wire, and there would be no practicable method of insulating it. As soon, indeed, as we attempt to produce high-tension electricity from dynamos, we get into difficulties—the risk of burning up the wires on the armature and field magnets being very great.

To sum up, anyone desirous of embarking in such schemes as that for the utilisation of the water-power of the Rhone, will do well to satisfy themselves that there is a dynamo available for the production of high-tension electricity which will not be liable to rapid destruction. We are perfectly aware that many inventors and makers of dynamos assert that there is no difficulty in producing such a machine. Such a statement may, however, be very misleading. It is quite true that high-tension dynamos can be made; but whether they can or cannot is not the question, but whether they can be made to last, and on this subject there is no positive information of much value extant. Nevertheless, it may be taken as certain that no true progress will be attained in the transmission of power until a machine capable of working with perfect safety up to at least 1500 volts has been placed in the market. Even then, for anything like long distances not more than about 40 per cent. of useful effect can be realised at the motor end of the line. Of course this may be well worth having. Thus, if 1000-horse power of water be going to waste, a manufacturer might be well content if he got 400 of it delivered at his mill ten miles off at a price represented by the interest on his outlay in plant. There is no difficulty in transmitting *some* power to a distance; but the questions are how much, and at what price, and these, as we have seen, bear the most intimate possible relation to the tension of the electricity produced by the dynamo, and as that is high or low, so may the results be satisfactory, or the reverse. Furthermore, it is to be noted that the resistance augments exactly as the length of the line does. Thus, if it be 100 ohms for a given mileage, it will be 200 ohms for a double mileage, and so on. Even though this is the case it might be worth while sometimes to put down relay stations when the distance is long. Let us suppose, for example, that we have a line whose resistance is 2000 ohms, and that we work with 1000 volts, then we can transmit $\frac{1000}{2000} = 0{\cdot}5$ $\times 1000 = 500$ and $\frac{500}{746} = {\cdot}67$ = the horse-power which would be transmitted, of which ·33 could be realised. If, however, we cut the line into two lengths, we could halve the resistance and, as we have seen, would be able to transmit with 1000 volts 1·34-horse power; 50 per cent. of this might be realised, or ·67-horse power. This being employed to drive a second dynamo, 50 per cent. of ·67, or ·33-horse power, might be had. We should thus obtain just the same result as can be had from the single machine driving over the whole wire. If, however, we could increase the efficiency of the machines over 50 per cent. then there would be a decided gain. Now the efficiency will augment, other things being equal, as Professor Lodge has shown, with the electro-motive force, potential, or pressure of the current employed. But within certain limits reducing resistance is equivalent to increasing pressure, but the resistance is reduced by halving the length of the current by putting in a relay, for it is a very different thing to send a current of electricity through one wire with a resistance of 2000 ohms, and to send the same current through two lengths of wire, each with a resistance of 1000 ohms. The system of using relays is well known in telegraph engineering, although a telegraph relay is not the same thing as that concerning which we write; and it may be found quite possible to put relays into long transmission lines in other ways than by the insertion of a motor and dynamo. For example, it is by no means clear that the storage battery may not be used with advantage for this very purpose. The thing gained is, of course, the possibility of transmitting more power over a given distance than can otherwise be transmitted with a given electro-motive force, and the more high tension can be dispensed with in dealing with electricity the better.

DOMESTIC FIREPLACES.

THE construction and working of the domestic fireplace is entitled to a great deal of attention. Every one, rich or poor, has at least one fireplace, so that opportunities for observation are not wanting; and so much has been said, and said continually, in season and out of season, concerning the defects of the existing system of warming our homes, that a strong stimulus is supplied to dwellers in London, at all events, to make changes for the better, if possible. The whole question of burning fuel in open grates in our houses is in a very curious condition. It is known that the air of London and other great cities is polluted by the combustion of fuel used in warming and cooking. It does not require the chemist or the man of science to tell us this; but furthermore, we have been assured that not only is it quite possible to prevent this pollution from taking place, but that we now burn our coal in the most wasteful way, so that it would pay well to burn it properly. This last proposition has been dinned into the ears of the London householder, at all events, for more than twenty years, and the London householder "keeps on never minding." Why is this? Are we to assume that he does not want to change his ways, from pure wrong-headed perversity? or is there some latent and occult cause which operates to make him neglect all that he is told, and steadily refuse to change his practice? To arrive at a correct answer, we must take a somewhat comprehensive view of the whole question. It can never be properly dealt with in anything like a narrow or one-sided fashion.

Those who know anything about the chemistry of foods have learned that there are good natural reasons for the way in which men combine these foods. Thus, there is a natural relation between bacon and greens, roast meat and bread, oatmeal porridge and milk. It is by no means a mere whim that induces the rustic to combine beans with his fat bacon. In the animal economy beans are the complement of bacon—each supplies something wanted and lacking in the other. In the same way the desire manifested for pure white bread by every nation which can obtain it, and the rejection of whole meal bread when possible, is an instinct. It is not that which we eat, but that which we digest or assimilate, that nourishes and strengthens the body. It is quite true that whole meal bread contains more nutritive constituents in a given weight than white bread does. But the internal organisation of the ordinary man cannot deal with whole meal bread to advantage, and he rejects it in favour of the food which he can digest. There are, of course, persons with admirable digestions who can manage whole meal bread, but others cannot; and no matter how much the virtues of whole meal bread are preached, men will go on eating white bread. Instinct is in this case a true guide to what is best. Now what is true of food is true of a great many other things. It is true of numerous practices which we are told are wrong, but which instinct, backed up by experience, tells us are right. For example, some advocates of fresh air and ventilation assure us that what are known as "draughts" can do no one any harm, and that it is infinitely better to get plenty of cold air than to breathe air reputedly impure. But instinct and experience tell us that the worst that can be got from breathing the air of a badly ventilated room is a headache, while an open window may give neuralgia, or congestion of the lungs. Applying all this to the open-fire question, we assert that the modern English fireplace, and system of burning coals, is, in a sense, the result of an instinct. In other words, the balance of advantage is in favour of the system adopted; so much in its favour, indeed, that it is next to impossible to see how it can be superseded; and not only is the system eminently convenient, it even possesses, regarded from a scientific point of view, advantages over every other system that has ever been proposed; and we hope to show, before we have done, that the Smoke Abatement Exhibition held in 1881 at South Kensington has done more to prove that existing practice is right than the originators of that exhibition ever intended.

There are only two ways in which dwelling-houses can be heated—namely, by high temperature radiant heat, or by hot air. The former is produced by the open fire, and by it alone. The latter is obtained in various ways too numerous to particularise. We may cite one for convenience, namely, the well-known hot water pipe apparatus of conservatories and churches. The question whether we shall use hot air or radiant heat in our rooms is by no means one to be lightly passed over. Instinct tells us to select radiant heat, and instinct is quite right; and it is so because radiant heat operates in a very peculiar way. It is known that as a matter of health it is best to breathe air considerably below the natural temperature of the body—98 deg.; in air heated to this temperature most persons would in a short time feel stifled. But it is also known that the body likes, as far as sensation is concerned, to be kept at a temperature as near 98 deg. as may be, and that very much higher temperatures can be enjoyed; as, for example, when we sit before a fire, or bask in hot sunshine. Now it so happens that radiant heat will not warm air as it passes through it, and so, at one and the same time, we can enjoy the warmth of a fire and breathe that cool air which is best suited to the wants of our system. Herein lies the secret of the popularity of the open fireplace. But in order that the open fireplace may succeed, it must be worked within the proper limits of temperature. If air falls much below 40 deg. it becomes unpleasant to breathe; and it is also very difficult to keep the body warm enough when at rest by any quantity of clothes. In Russia and Canada the temperature of the air outside the houses often falls far below zero, and in the houses it cannot be much above the freezing point. Here the open fire fails; it can only warm air by first heating the walls, furniture, and other materials in a room, and these, in turn, heat the air with which they come in contact. But this will not do for North American winters; and accordingly in Canada and the United States the stove or some other expedient for warming air by direct contact with heated metal or earthenware is imperatively required. But this is the misfortune of those who live in cold climates, and when they ask us to follow their example and take to close stoves and steam pipes, and such like, they strongly remind us of the fable of the fox who had lost his tail. How accurately instinct works in the selection of the two systems is demonstrated by the fact that a succession of mild winters is always followed in the United States by an extended use of open grates; that is to say, the English system becomes, or tends to become, fashionable, while, on the other hand, a succession of severe winters in this country brings at once into favour with builders and others a whole host of close stoves and similar devices which would not be looked at under more favourable conditions of the weather. While English winters remain moderately temperate the open fireplace will enjoy the favour it deserves, as not only the most attractive, but the most scientific apparatus available for warming houses.

We do not pretend for a moment that it is the most economical method of heating; but it is possible to be penny-wise and pound-foolish, and so long as we have an adequate return from the coal burned, it is not necessary that all that return should be made in the shape of heat. Surely the admirable ventilation caused by the open fire is worth paying a little for? But even on the score of economy the open fire is by no means so wasteful as some persons would have us believe. Mr. D. K. Clark carried out a very elaborate and ably managed series of experiments at the instance of the Smoke Abatement Committee. About these experiments we shall have more to say. They cover a wide field, and some of the results obtained are a little startling. For the present we must confine our attention to the subject in hand, namely, the economy of the open domestic grate. Mr. Clark's experiments show that instead of nine-tenths of the heat going up the chimney, which we have often been assured is the case, about 43 per cent. of the heat from an open fire is disposed of in this way, while in the case of close stoves, about 24 per cent. goes up the chimney. Taking the value of coal at one-tenth of a penny per pound, and assuming that 100 lb. are burned in a close stove, the whole value of the fuel will be 10d., and that of the heat wasted will be 2·4d., while in the case of the open grate it will be 4·3d. Thus, the difference in favour of the close stove will be 1·9d., or, say, 2d.; and assuming that 33 lb. are burned per day, the loss would be ·66 of a penny, or less than three farthings per day; per week it amounts to 4½d. Now, we ask, is it really worth while to give up the cheerful and healthy open fire and substitute for it the close and unhealthy and cheerless stove for the sake of saving 4½d. a week? Three good fires could be kept going with a waste of, say, 1s. a week, or for the winter six months, 25s. It will be seen that the advocates of the close stove system for this country have, to say the least, a very small foundation on which to base their estimates of economical advantage. We may, however, go further than this. It is quite possible to construct open fireplaces which shall heat air directly by contact with metal surfaces and direct that heated air into the room. The comparison between such stoves and the open grate will be even less favourable to the latter. Concerning the prevention of smoke, it does not appear that there is a great deal to choose between them. At least, it seems to be proved by Mr. Clark that it is possible to so make and work an open grate that little or no dark smoke will be produced in it. Whether it is worth while to go to the trouble and expense entailed is quite an open question.

THE SOCIETY OF ARTS AND LONDON FIRES.

SIMULTANEOUSLY with our recent article on "London Fires," the Society of Arts *Journal* published a paper read by Mr. Cornelius Walford at the previous meeting of the Society, on "The Increasing Destruction of Life and Property by Fire," in the course of which certain statistics are cited having the appearance of contradicting some of the figures and arguments which have appeared in these columns. Taking three decades—namely, 1851-60, 1861-70, and 1871-80—Mr. Walford gives the actual number of fires per annum in London as being respectively 977, 1430, and 1795. These numbers, according to our reckoning, to be found in articles which have appeared in THE ENGINEER at different dates, should be 1002, 1480, and 1640. Concerning the last of the three decades, Mr. Walford is clearly in error according to his own showing, for he gives a table taken from Capt. Shaw's returns, in which the total number of fires during 1871-80 is found to be 16,399, giving, therefore, an average of 1639·9 for each year. The importance of being correct in this matter is shown by the conclusion at which Mr. Walford arrives. Taking his erroneous averages as a basis, he calculates that the metropolitan fires per million of inhabitants in the three several decades are in the ascending order of 389, 418, and 465. Thus the fires are represented as increasing more rapidly than the population. We have allowed this to be the case for a certain series of years, but not so more recently. In THE ENGINEER of June 3rd, 1881, we gave a table showing the ratio of fires per 100,000 of the population in several periods, including the three decades mentioned by Mr. Walford. Shifting the decimal point, we find the ratios per million inhabitants to be respectively 391·5, 491·8, and 469·2. It will be seen that the ratio falls off after 1870 instead of rising. In respect to the quinquennial periods ending with 1880, we have shown that the average fire rate increases persistently from 1836 down to 1870, when it becomes 508 per million. In 1871-75 it falls to 477·6, and in 1876-80 it becomes 463. The fact is a remarkable one. It is also encouraging, and ought not to be overlooked. We may add that in all the calculations on this subject in our columns, care has been taken to get correct statistics of the population for each year, so far as these can be estimated for periods between the taking of the census. In what we have said we have no desire to derogate from the general excellence of Mr. Walford's paper, and we trust that the attention which he has called to the subject will promote those measures which are calculated to reduce the ravages of fire in London and elsewhere. We observe that the Metropolitan Board have decided not only to seek for relief from the restriction which now limits them in raising money for the current expenses of the Fire Brigade, but have resolved that any increase of the amount furnished by the ratepayers for this purpose should be accompanied by an increase in the contributions of the fire insurance companies. We are particularly glad to find that the Board have also signified their readiness to bear the expense of the proposed inquiries into the origin of fires in cases where inquiry is considered advisable although no death occurs.

THE USES OF ARSENIC.

A SOCIETY which boasts the grand title of the National Health Society has, it appears, requested the Foreign Office to address a communication to its representatives abroad, desiring them to report on the existing legislation in Continental countries with reference to the precautions and restrictions imposed on the manufacture and sale of articles in which arsenical pigments are employed. A committee, consisting of Members of Parliament and lieutenant-generals to a considerable extent, but in which science is most meagrely represented, and of which Mr. Hart is chairman, has, it is announced, been formed, in connection with the Society, for investigating the subject of arsenical poisoning in respect to the use of arsenical pigments, paper hangings, dress fabrics, and other materials in daily use, and their deleterious effects on health. Reports have been prepared on the medical, chemical, and sanitary aspects of the question, and a Bill has been drafted, with the object of requiring that in the case of articles manufactured with arsenical pigments, due notice shall be given to the purchasers. A considerable body of information has been laid before the commitee, showing that the use of arsenical pigments was not confined, as was popularly supposed, to the preparation of green colours, but that numerous cases of arsenical poisoning had occurred in families living in rooms hung with mauve, red, fawn, and other coloured paper hangings in which arsenic was freely used, and from which arsenical powders floated into the air. The National Health Society does not appear to have got far in this inquiry. It is beyond all manner of doubt that many colours may be found to contain arsenic. The material is so cheap and abundant that it requires special precautions—sometimes costly ones—to avoid using materials which may contain arsenic. Some years ago we received a complete set of tar colours from Rummelsburg, near Berlin, which were prepared without the use of arsenic. This was considered a special virtue in their case, and we infer that the tar colours made by other manufacturers at home and abroad may be expected to contain arsenic. No wonder, then, that mauve and red papers are held to be guilty. Moreover, papers of light and delicate shades, nearly white papers, often contain much arsenic. The *Lancet* has recently been much alarmed at "most mischievous statements" recommending the use of face powders containing arsenic. It considers it its duty to raise a warning cry against such statements, which have recently been circulated, and have already done harm, to the effect that "arsenic in small doses is good for the complexion." It is not difficult to imagine the risks women will incur to preserve or improve their good looks. No more ingenious device for recommending a drug can be hit upon than that which the authors of this most baneful prescription of "arsenic for the complexion" have adopted. Suffice it to recall the fact that, for many years past, chemists and sanitarians have been labouring to discover means of eliminating the arsenical salts from the colouring matter of wall papers and certain dyes once largely used for certain articles of clothing. "It is most unfortunate that this hopelessly antagonistic recommendation of arsenic to improve the complexion should have found its way into print." Those who employ the drug as advised—and there are many either already using it or contemplating the rash act—will do so at their peril. "It is the duty of medical men," writes the *Lancet*, "to warn the public against this pernicious practice, which is only too likely to be carried on secretly." It is not without reason that they are led to speak thus pointedly. While the *Lancet* puts the case thus strongly, it must not be forgotten that about twenty-two years ago the question of arsenic eating in Styria was set at rest. "Hidrach," as arsenious acid is termed in Styria, is unquestionably consumed by the peasants there. To quote one instance, in presence of Dr. Kappe, of Oberzehring, a man, thirty years of age, and in robust health, ate on February 22nd, 1860, a piece of arsenious acid weighing 4½ grains, and on the 23rd another piece weighing 5½ grains. His urine was carefully examined and shown to contain arsenic; the 24th he went away in his usual health. He informed Dr. Kappe that he was in the habit of taking the above quantities three or four times each week. About the same time it was shown that the water in ordinary use at Whitbeck, in Cumberland, contained a good fraction of a grain of arsenic—metallic—in each gallon. It appears to be derived from veins of arsenical cobalt through which it percolates. This water is habitually used for every purpose by the inhabitants of the little village of Whitbeck, and, as far as could be learnt, with beneficial rather than injurious results. It is the only stream in the neighbourhood where trout and ducks cannot thrive. When the railway was being carried past Whitbeck, the first use of the water quickly produced the usual marked effect on the throats of the men and horses employed on the works. The soreness of mouth from which they at first suffered soon, however, disappeared, and in the horses gave place to that sleekness of coat assigned as one of the effects produced by the administration of arsenic. It is a question how far the rosy looks of the children and the old age which a large proportion of the inhabitants of the village—Whitbeck—attain are to be attributed to the arsenic present in the water they drink. We commend these considerations to the attention of the *Lancet* and the committee of the National Health Society. Likewise the presence of arsenic in the white linings of saucepans; for to give the linings the colour which pleases the public eye arsenic is pressed into service.

TYNDALL ON TERRESTRIAL RADIANT HEAT.

LAST month Dr. Tyndall read a paper before the Royal Society on terrestrial radiation. He has recently erected a small iron hut on Hind Head, a fine moorland plateau about three miles from Haslemere, with an elevation of 900ft. above the sea, which forms an extremely suitable station for meteorological observation. Here he has continued to record from time to time the temperature of the earth's surface as compared with that of the air above the surface, the object being to apply the results which experiments had established regarding the action of aqueous vapour upon radiant heat. The air thermometer was suspended with its bulb 4ft. above the earth. The surface thermometer was placed upon a layer of cotton wool, on a spot cleared of heather, which thickly covered the rest of the ground. The outlook from the thermometers was free and extensive. There was no house near, the hut being about fifty yards distant from the thermometers. On the morning of December 10, temperature was very low; snow a foot deep covered the heather; very little movement of air from the north-east. Assuming aqueous vapour to play the part that Dr. Tyndall has ascribed to it, the conditions were exactly such as would give grounds for expecting considerable waste of the earth's heat. At 8.5 a.m. the thermometers were placed in position at a common temperature of 35 deg. A single minute's exposure sufficed to establish a difference of 5 deg.; then at 8.10 a.m., air 29 deg., wool 16 deg.; at 8.15 a.m., air 29 deg., wool 12 deg.; in ten minutes a difference of no less than 17 deg. As the day advanced the difference between air and wool became gradually less. These observations, especially the last, invite attention. There was no visible impediment to terrestrial radiation. The sky was extremely clear, moon shining, the north star, and many others, were visible. On no previous occasion had the firmament been purer; but still the difference between air and wool at 6 p.m. was only 4 deg. December 10th, a striking illustration of the action of that invisible constituent of the atmosphere to which Dr. Tyndall directed attention more than twenty-two years ago. On December 10th the wind was light from the north-east, with a low temperature. On January 16th it was very light from the south-west, with a higher temperature. The one was a dry air, the other was a humid air; the latter therefore, though of great optical transparency, proved competent to arrest the invisible heat of the earth. The advance of temperature from 28 deg. at 5 p.m., to 32 deg. at 6 p.m., was due to the intrusion at 6 p.m. of an invisible screen between the earth and the firmament. As the night advanced the serenity of the air became, if possible, more perfect, and the observations were continued, with the result of a difference of 4 deg. between the temperature of the wool at 8.30 p.m., and its temperature at 10.30 p.m., and which was not to be referred to any sensible change in the atmosphere. Further observations were made in considerable numbers, but they need not be dwelt upon, the object being to illustrate a principle rather than to add to the multitudinous records of meteorology. It is sufficient to say that, with atmospheric conditions sensibly alike, the waste of the heat from the earth varies from day to day, a result due to the action of a body which escapes the sense of vision.

THE WEATHER FORECASTS.

DURING the last week many letters have appeared in the columns of the daily press—and, in fact, are being continued this week—on the weather forecasts. The Rev. A. W. Owen writes that they are perfectly useless to him, and many, we think, will be disposed to endorse his statement. He finds the actual weather by daily comparison is very unfavourable to the trustworthiness of the forecast; and in making this statement he requests to know the experience of others. Mr. Clark, writing from the district "England, E.," says:—"Please allow me space to assure Mr. Owen, of 'England, S.W.' that his experience of the weather forecasts entirely agrees with ours in 'England, E.' In point of fact the prophets at the Meteorological Office certainly do not 'hit it,' on an average, oftener than once a month. The forecasts are absolutely worse than useless, because they are so misleading. Nevertheless, they do serve to amuse us. I think people in this district have fully learned to put no faith whatever in them." Another clergyman, writing from Aldridge Rectory, near Walsall, finds that very little reliance can be placed in the forecasts as prepared daily at the Meteorological Office. He lives in one of the Midland counties—district No. 4—and his experience as regards the centre of England is by no means more favourable than Mr. Owen's. For many years he has kept a record of the actual weather and the varied indications of change, and has come to the conclusion that much more is to be learned from careful observation of the barometer and the wind than from these forecasts. Over and over again has the weather been very unlike what was foretold, and the wind has, as it were, in a spirit of perversity, blown, not only from an opposite quarter, but, instead of a gale, we have had comparatively a calm and a bright day—rare enough of late—to temporarily cheer us in place of the prevalent "overcast." Mr. Finch Smith, who writes this letter, says he remembers just fifty years ago next summer, hearing the late Dr. John Dalton, whose varied attainments makes his opinion worthy of notice, say, in answer to a question put to him, "I have studied the weather for more than half a century, and made observations thereon, and I have come to this conclusion, that it is impossible to forecast, with anything like certainty, what the weather shall be for the next twenty-four hours." Mr. Smith adds, in this very changeable climate of England, he is very much of the same opinion. He agrees with Mr. Owen in pronouncing the forecasts to be, for the most part, very unreliable, and that their publication, consequently, is of little use. Mr. Bigg-Wither, writing from Southsea respecting his experiences of the weather forecasts, says, "I can give you mine, which are very similar to those of Mr. Owen, for, like himself, I depend upon my aneroid, as at least five times out of seven the forecasts are incorrect." While agreeing with these gentlemen that the publication of the forecasts, as at present drawn up, is of little real value, we would again refer to the forecasting the state of the weather by the rain-band—see THE ENGINEER, October 13th, 1882—as developed by Dr. Piazzi Smyth. This seems a perfectly safe indicator of the approach of rain, and we would strongly advocate its introduction among those made at the various stations about the British Isles on which the Meteorological Office found their forecasts. We believe that they would lead to a condition of forecasting which would be found to be trustworthy, and gain the good opinion of the many who make their own observations of the weather, and compare them periodically with the one issued by the Meteorological Office with all the authority of print. We were recently informed by the late chairman of the Meteorological Committee, that of the forecasts sent to us from America, some 40 per cent. proved to be more or less correct.

THE NEW AMERICAN TARIFF.

OUR American cousins who make steel rails, pig iron, and wire rods are crying out against the concessions in the new tariff of duties which comes into force next July. Steel rails are reduced from 28 to 17 dols., and pig iron, rods for wire, saws, files, &c., are also reduced. Pennsylvania is in a sore plight, and yet there is no reason for such complaint. The American Government, finding that their public debt was being diminished too rapidly, made up their minds to give away £15,000,000 out of £28,000,000 of estimated surplus, and they went about it after this fashion. They gave £12,000,000 in exemption to themselves, *i.e.*, for relief of internal revenue, and £3,000,000 in the way of reducing external revenue; that is to say, they put aside these three millions for the reduction of duties on every class of goods which enter America from all parts of the world. It is pretty clear that three millions scattered over the habitable globe, with the exception of Uncle Jonathan's vineyard, will not amount to much; and that is exactly how matters stand. The millions amount to so little to England that it will not benefit trade to any appreciable extent. Take rails as a prominent example, seeing that rails are the goods on which the heaviest reductions have been made. Steel rails are now selling at from 40 to 45 dols. a ton in the States. The reduced duty will be 17 dols.; but does any reasonable man suppose that English makers can produce rails in this country and compete with prices at 40 dols. a ton when the duty of 17 dols. and freight—10s. per ton—have to be added? If rails were to rise to 80 or 90 dols. something might be done, particularly in the case of those American railroad kings who are prepared to pay a preferential price for English productions, on account of their superior quality ensuring longer life in the rail. American manufacturers need not continue their complaints. They profess to be in mortal terror of Sheffield invasion. Their fears, if not altogether feigned, are groundless. After exhaustive inquiries in the Sheffield districts, we are in a position to assure them that not a single manufacturer attaches the slightest importance to the revised tariff as holding out any hope of revived trade with the States. They look upon the concessions as interesting in one respect. The American people, when they get rails at 11 dols. less money, may begin to ask if they are not paying too much for other goods, and in this way a ball may be set rolling which, in the future, may lead to conditions under which something like fair trade may be possible.

SALT WORKS IN SOUTH DURHAM.

SINCE we last referred in THE ENGINEER to the development of the salt industry of South Durham there has been a series of movements developing. The pioneers in the trade—Messrs. Bell Bros.—find that there is an abundant market for their production, and they have, it is stated, commenced to put down a second bore-hole, which will in the course of a few months double the production of brine, and, of course, of salt. Adjoining the works of Messrs. Bell Bros., and between the North-Eastern Railway and the river Tees, is a large area of ground which has been leased from the Ecclesiastical Commissioners by the Newcastle Chemical Works Company, which is to be reconstructed to allow it to mine and manufacture salt. This second attempt to work salt in South Durham will be on a still larger scale, for whilst Messrs. Bell Bros. produce about 350 tons weekly, the Newcastle Company uses and needs 1000 tons of salt weekly. It has already commenced to embank the land on the north bank of the Tees, and it is probable that it will speedily commence boring, so that it is certain that the present year will witness a considerable increase of the tonnage of salt produced. No salt has yet been produced in Cleveland, but there is progress being made with the attempt of Messrs. Bolckow, Vaughan, and Co., to put down a bore hole at their works. The northern shore of the Tees, however, holds out the best inducements, because the surface of the land is comparatively valueless, but that on the Cleveland side is so valuable for various manufacturing purposes that there is only a limited amount of space that could be had. It is probable therefore that there will be a large development of the chemical trade in South Durham, both in the production of brine and probably in its use—in some future that may not be far distant—for the ammonia soda manufacture.

LITERATURE.

Journal of the Society of Telegraph Engineers and of Electricians, including Original Communications on Telegraphy and Electrical Science. Published under the supervision of an editing committee, and edited by PROFESSOR W. E. AYRTON, F.R.S. London: E. and F. N. Spon. No. 45, vol. xi.

THE poverty of the "Journal" of this Society, in spite of the length of its name, impels one to ask, How is it that a body supposed to represent that branch of applied scientific knowledge which has been startling the world by its discoveries and applications every few weeks during the past few years, is unable to make its "Journal" what most people would expect it to be, namely, the one journal of all others which should contain original accounts of the discoveries in electrical science, and the enormous strides in the commercial and industrial applications of electricity which have marked recent years. On the whole it may be said to be one of the last journals to go to for information, instead of the first. Why is it that so many of the best papers on electrical subjects are read before societies which do not pretend to be specially electrical? Why is it that a very few members are so often called upon to occupy the paper-reading evenings, because original communications are not attracted by the Society? There must be some active deterring cause, and to others, as well as ourselves, the question, what is it, or who are they, must present itself.

Elementary Chemical Arithmetic, with 1100 *Problems* By SYDNEY LUPTON, M.A. Macmillan and Co. 1882.

A LARGE proportion of the books published at the present day are not wanted, and it is refreshing to welcome a book that really presents new features and fills a void in literature. Our estimation of this work is, that it is likely to be of great value both to schoolmasters and to practical men. As a rule the latter avoid mathematical puzzles, even when the mathematics used extend only to the rules of simple arithmetic. This is a great mistake, as a man cannot be said to know a subject till he can pretty readily deal with the concrete. So long as one either talks or writes in the abstract, it is difficult to gauge the real extent of his knowledge, but his treatment of the concrete generally enables us to tell with a fair approximation to exactness his grasp of the subject. It may be taken as axiomatic that the majority of practical questions do not involve the higher mathematics; hence there is no reason why the practical man should not be able to deal with the ordinary concrete problems. Of late years this idea has been steadily gaining ground, and lecturers and schoolmasters have extensively "used numerical problems as a means of emphasising statements made in lectures." Books on the various branches of physics now generally contain numerical examples, and so looseness of thought is made to give way to exactness.

Mr. Lupton states in his preface that it is with "some diffidence" that "an introduction has been prefixed to the examples," and gives two reasons for that introduction. We think the book would have been not altogether valueless without the introduction, but at any rate of far less value than it is with the introduction. This portion of the work extends to about one hundred pages, and consists of brief explanations of the rules and formulæ used with specimen solutions. Now although a schoolboy may be expected to have these rules and processes at his fingers' ends, the practical man forgets much of the formulæ he is seldom called upon to use; and while we should expect the student to remember the formula, say, for interpolation, in twenty years he may be rusty and glad to see it in print with an example of its use. The once familiar process is easily grasped, and the work in hand proceeds with rapidity and certainty. We do not ever remember to have seen an introduction of more real value than this of Mr. Lupton's. The next portion of the book consists of chemical problems. These are arranged in chapters, and range over a wide field. A number of tables and a sheet of four-figure logarithms completed the work.

We have scores of books on arithmetic, algebra, geometry, &c., which we would gladly see consigned to the flames as useless redundancies, whilst we have far too few books similar to the one we have thus briefly considered. We hope that the work which Mr. Lupton has so ably conceived and carried out will lead to similar books in other branches of physics—such as heat, light, and electricity.

A Dictionary of Electricity; or, the Electrician's Hand-book. By G. H. GREER, College of Electrical Engineering, New York. 1883.

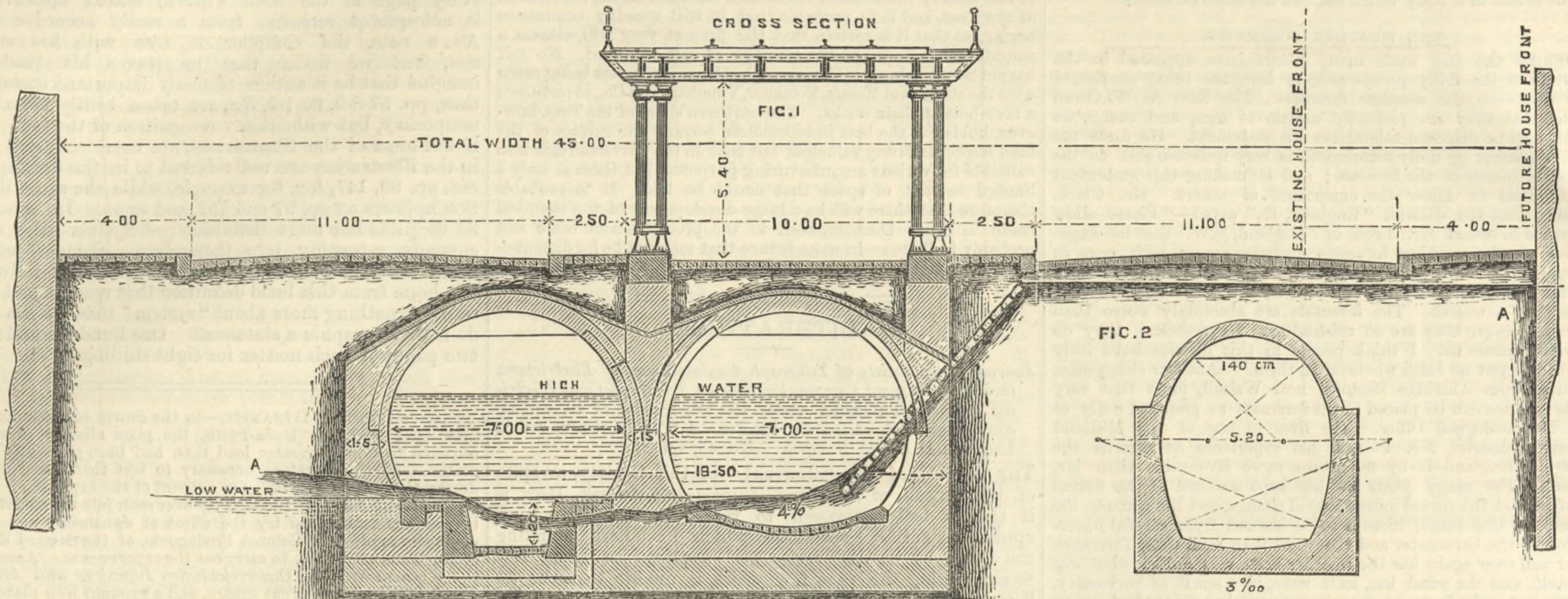
TWO DOLLARS, or eight shillings, seems a large sum for a small book, which is made up principally by the use of paste and scissors, and which presents absolutely no feature of originality. Surely Pope when he wrote the lines, "Where ignorance is bliss 'tis folly to be wise," must have had in view those hangers-on of science whose sole peculiarity is an intense conceit, which prevents them from understanding the depth of their own ignorance. The first line of the work reads as follows:—"Accumulator: an instrument that accumulates electricity, &c." Now, if there is one thing which an accumulator does not do it is to accumulate electricity. This is a fair sample of the knowledge of the subject exhibited in almost every page of the book wherein matter appears that is not quoted *verbatim* from a really accurate source. As a rule, the compiler is free with his authorities, but we notice that he leaves his readers to imagine that he is author of many important statements; thus, pp. 57-8-9, 60-1-2, &c., are taken bodily from a contemporary, but without any recognition of the fact. Many, if not most of the illustrations, are borrowed, and letters in the illustration are not referred to in the description—*vide* pp. 99, 147, &c., for example, while the same illustration appears on pp. 97 and 192, and so on. In conclusion, let us quote one more definition:—"System—the electric currents returning into themselves. Some electricians claim that the solenoid effectually overcomes induction." We hope from this lucid definition that readers will understand something more about "system" than we are able to do from so graphic a statement. One hundred and ninety-two pages of such matter for eight shillings!

PILE-DRIVING BY DYNAMITE.—In the course of executing some municipal works at Buda-Pesth, the piles already driven were required to stand a greater load than had been originally contemplated. It was, therefore, necessary to test them, and drive still deeper those that yielded. On account of the expense of bringing a pile-driving machine successively over each pile for so little work, it was determined to try the effect of dynamite; and the city engineers applied to Colonel Prodanovic, of the Second Regiment of Austrian engineers, to carry out the experiments. According to the *Wochenschrift des Oesterreichischen Ingenieur und Architekten Vereins*, the piles were cut square, and a wrought iron plate 15in. in diameter and 4⅜in. thick was placed on the top of each. On its centre, and immediately over that of the pile, was placed a charge of No. 2 dynamite, in the form of a cake, 6in. in diameter and ⅜in. thick, and weighing 17½oz. avoirdupois. This was wrapped in parchment-paper, covered with clay, and fired. The effect produced was found on an average to be equal to five blows from a 14¾ cwt. monkey falling from a height of 9ft. 10in. The iron plates stood from twenty to twenty-four explosions. The system is not considered applicable to a pile standing considerably out of the ground, but saves a great expense when piles already driven have to be sunk deeper. In America, gunpowder has been used for many years, particularly in Philadelphia, for pile-driving, though employed generally to drive the monkey upward.

AN AUSTRIAN WIRE ROPE TRAMWAY.—A description has recently been given in the German technical press of a wire tramway in connection with the coal-mining industry established near the Hersteigg, the products of which it brings to the main line belonging to the Southern Railroad of Austria. In its alternating rise and fall during its distance of 3000 yards, there is a useful excess of incline of about 142 yards, which, it is said, suffices to keep the line in self-acting working, after it has been started by means of the 12-horse power engine provided for that purpose. When there is no return load to be sent to the mine, the speed of line can be regulated by a brake. Under these circumstances, the cost of working the line is estimated at about 4½ cents per ton of coal. In its general arrangement, the tramway forms a straight line, and consists of two drawing ropes and a train rope. The line which is used for conveying the coal to the station is 1·10in. thick, and is composed of 19 steel wires, each ·18 of an inch in diameter. The line on which the coal buckets are returned to the mine is only ·66 of an inch thick, the 19 steel wires of which it is composed being only ·13 of an inch thick. Both ropes consist of wires about 765 yards long, coupled to each other, and for the ropes a breaking strength of 73 tons per square inch section is guaranteed. At the ends of the ropes, weights of 5 and 3 tons are applied in the usual way for obtaining the proper tension. The distance between the seventeen supports varies from 60 to 400 yards. The train rope is ·6 of an inch thick, and consists of twelve soft steel wires of ·07 of an inch diameter, and it runs at a speed of about 1⅝ yards per second. The buckets which convey the coal follow each other at a distance of about 83 yards; thus thirty-six are always on the way to and the same number coming from the station. Each bucket contains about 10 bushels, or about a quarter of a ton of lignite, the total quantity carried per hour being about 17½ tons. The cost of the line was about 14,000 dols.

OPENING OF THE GREAT EASTERN RAILWAY QUAY AT PARKESTON.—The loop-line lately made by the Great Eastern Company in connection with its new quay at Parkeston, near Harwich, was passed for traffic last June; the station buildings were officially inspected last Tuesday, and yesterday, the 15th, the railway and quay were used regularly for the passenger service to Antwerp and Rotterdam. The new line leaves the present Harwich branch at a point about a quarter of a mile west of Dovercourt, makes a curve to the new quay—called after Mr. Parkes, the chairman of the company—and re-joins the old line at Parkeston junction, 2¼ miles from Dovercourt. The line, about 2½ miles long, is well laid with 80lb. rails and every modern appliance; there are, besides, about 6 miles of sidings for sorting wagons. All the bottom ballast consists of burnt clay, while the top ballast is shingle with a little sand. The arrangement of points and signals, by Mackenzie and Holland, of Worcester, is very complete. A siding runs on to the quay and into the two goods sheds, each 520ft. long; the acute angle causes openings 110ft. wide, requiring bowstring girders to support the roof. The quay wall, 1800ft. long, is nearly straight, and affords berths for seven steamers alongside, while screw piles afford moorings for seven more in the river Stour. The bottom is dredged to a depth of 14ft., which will ultimately be increased to 16ft.; but at present none of the company's steamers draw more than 12ft. of water. The wall was constructed by sinking screw piles, those in front being 2ft. in diameter, and those at the back 18in. Between the piles are concrete cylinders, sunk in pairs, and consisting of seven rings, each 4ft. 6in. deep. The rings are 9ft. in diameter outside and 18in. thick, and weigh about 10 tons each. They sank of themselves, on the mud inside being excavated by Bruce and Batho's grab. To keep them in place temporarily a pile was sunk between each pair, by simply weighting it with 10 tons. The spaces inside the rings and that outside them and the piles are filled in with 8 to 1 concrete, so as to form a solid wall. The central building, in the Italian style, of 350ft. frontage, serves for the station and hotel, while on the right are the customs and general offices, and on the left the bonded warehouse. The passenger gangway from the station to the quay is very substantial and 40ft. wide. All buildings, and the station platforms, which are 300 yards long, are built upon whole timber pitch-pine piles, driven to the ancient bed of the river, consisting of black flint gravel. The average depth is 43ft., and there are considerably more than a thousand. The site was selected on account of a hill, formerly an island, which has served to form the embankment. Nearly half the excavation was lost, owing to the stuff sinking in the soft mud. The excavation—close upon a million cubic yards—was effected mainly by means of Ruston, Proctor, and Co.'s steam navvies, of which about four were at work together. No arrangements have been made for gas-lighting, as the quay is illuminated by the Brush electric light, and the buildings will be fitted with Swan incandescent lamps. The works, which will cost about half a million of money, have been completed within four years; and the 600 acres acquired and reclaimed by the company permit of considerable extensions, which the rapidly growing continental traffic will, doubtless, render necessary before very long. The engineer-in-chief is Mr. Mackintire, of Messrs. Edward Wilson and Co.; and the resident engineer, Mr. J. B. Crawford.

REGULATION WORKS ON THE WIEN.



PROFILE OF DIVERSION TUNNEL.

THE VIENNA CITY RAILWAY.

After about as hard and obstinate a struggle as the spirit of modern improvement ever encountered in factious opposition and competitive hindrances, the concession for the Vienna City Railways has at last been granted to Messrs. James Clarke Bunten, of Glasgow, and Joseph Fogerty, C.E., of Westminster. The phases of uncertainty through which this project has passed have sorely tried the patience of the promoters, and the Emperor, at the audience he granted Mr. Fogerty to receive the latter's thanks for the grant of the concession, expressed his unbounded admiration at the perseverance and endurance of Englishmen in fighting so long and so persistently against apparently almost insurmountable obstacles. It was through his Majesty's personal initiative, on the grounds of its great public utility, quite as much as on the advice of his Ministers, who have, nevertheless, consistently supported it throughout, that the final decision was granted without any further delay, and the concessionaires have been assured of his warmest interest in the execution of the works.

The general features of the scheme, as originally proposed, have undergone but little alteration. It is only in detail that changes of any consequence have been introduced into the conditions of the concession, and these chiefly in deference to the wishes of the municipality. Any one who has ever visited Vienna must have a lively, if not an agreeable, recollection of the ugly rivulet, of the same name as the city, which meanders through a great part of the inner town and empties itself into the Danube Canal. On an average of about 360 days in the year it is nothing more than a foul ditch, charged with the refuse of all the neighbouring districts, but for the remaining five a roaring and dangerous torrent. During the past century several schemes have been proposed for its regulation or total diversion, and within the last ten years nearly every proprietor of a city railway—of whom there have been over thirty—has, in some way or other, tried to incorporate this idea as a part of his scheme, but invariably failed from his inability to show in what way the expenses entailed by such an outlay could be secured. The question appears now, however, to have been solved—on paper at least—in a feasible and profitable manner by Herr Berger, technical director of the municipal board, who, under instructions of the corporation, and by permission of the Ministry of Commerce, submitted to, and obtained the approval of, the town council to a project whereby the regulation of the river can be carried out simultaneously and in connection with the elevated railway of Messrs. Bunten and Fogerty in such a way that the greater portion of the expense to the town will be covered by the building sand reclaimed by the regulation and by the enhanced value of the adjoining property.

The accompanying illustration of the system proposed explains itself. The acceptance of it by the authorities involves a slight lateral deviation of the route of the line along this part, and a portion of the burden, *i.e.*, the construction of one of the arches—as shown cross-hatched on the sketch—for a considerable distance, as a foundation for the under structure of the railway, has been thrown on the concessionaires. The extra expense is, however, compensated for to a certain extent by the saving in the purchase of house property, and the stability of the structure will be insured against the accidents of floods. To make this last precaution doubly sure, the municipality propose to construct large impounding reservoirs nearer the sources of the river, and, in addition, to divert about one half of the water through a tunnel along the high ground of the western suburbs, with catchpools for flushing the sewers. Should they be able to raise the funds for the simultaneous execution of this undertaking with the erection of the railway, the ground reclaimed will be at once available for building purposes, and, as it is proposed to construct a boulevard on either side of the line, the adjacent property will increase in value from its proximity to the latter, and a good return on the outlay may be expected. In case, however, they are unable to carry it out at once, the position of the one arch under the railway has been so chosen that the actual flood area of the river is thereby considerably increased, and no danger can be apprehended from high water either to the town or to the structure of the railway itself.

Another task is imposed on the concessionaires, which, although it involves a further outlay, adds considerably to the facilities of the traffic, is the construction of four lines of rails along the Danube canal, two of which are to serve the external traffic of the existing railway to and from the central station, and the other two the local trains of the companies' lines. The construction of the railway has been divided into three sections, each of which is to be opened for public traffic as soon as completed. The details of the several sections, with their length, the numbers of lines of rails, and term for completion, are given in a tabulated form in the accompanying statement. According to the conditions of concession, the line is to be constructed to normal gauge, with rails of 90 lb. per yard, no level crossings allowed, and all main thoroughfares to be crossed at a mean headway of 17′ 8½″. The total maximum capital is fixed at £6,000,000, which, with a length of over twenty English miles, gives nearly £300,000 per mile—a very favourable comparison with other metropolitan railways. The capital is to be issued one half in shares and one half in debentures. The caution money of 1,000,000 florins, Austrian currency, was deposited in August, 1882. The seat of the company must be in Vienna, with a second board of directors in London. All the materials used in construction are to be of native product. The permanent sub-officials are, as much as possible, to be chosen from non-commissioned officers who have completed their time of service in the army and marine. The traffic manager must, however, be an Austrian subject. There are also the usual stipulations with regard to the transport of military and war materials, but this is of more consequence in this special case, as the strategical advantages of the line are only second to those it offers for local communication. The post and telegraphic service are also provided for, as well as the conveyance, at reduced fares, of Government officials, police, fire brigades, &c. &c.

Character.	No. of line on plan.	Description of route of railway.	No. of lines to be laid.	Period of completion in years.	Length in Kilos.	Length in English miles.
		Section No. I.—Donau Canal.				
Main line ...	I.	From the Brigitta Bridge along the Danube Canal to the point where the branch to the Verbindungsbahn in the direction of the Südbahn commences near the Zollamt	2 eventually 4	*	2·980	1·852
Branch line ...	I.A	From the Brigitta Bridge to the Franz Josefs Bahn	2		1·700	1·056
,, ,, ...	I.B	From the neighbourhood of the Aspern Bridge to the Verbindungsbahn in the direction of the Nordbahn	2	2½	0·764	0·475
,, ,, ...	I.C	From a point near the Zollamt on the main line to the Verbindungsbahn in the direction of the Südbahn	2		0·506	0·314
					5·950	3·697
		Sectional No. II.—Gurtel Strasse.				
Main line ...	II.	From the point at which the branch to the Südbahn at Meidling leaves the main line in the neighbourhood of the Gumpendorfer Schlachthaus, along the Gürtel Strasse, to the Brigitta Bridge ...	2		3·565	3·458
Branch line ...	II.D	From the point above mentioned in the neighbourhood of the Gumpendorfer Schlachthaus to the Südbahn in Meidling	2		2·528	1·571
,, ,, ...	II.E	From the main line in the neighbourhood of the Brigitta Bridge, across the Danube Canal, to the point at which the branch to the Nordbahn turns off	2	3¼	1·450	0·901
,, ,, ...	II.F	From the above-named branch line II.E to the Nordbahn	1		1·023	0·636
,, ,, ...	II.G	From the above-named branch line II.E to the Nordwestbahn	1		0·580	0·360
,, ,, ...	II.H	From the above-named branch line II.F to the Donau Ufer Bahn ...	1		0·650	0·404
					11·796	7·330
		Section No. III.—Wien Valley.				
Main line ...	III.	From the Gumpendorfer Schlachthaus in the direction of the regulation of the river Wien, proposed by the Stadtbauamt and sanctioned by the Gemeinderath in their resolutions of 29th December, 1882, to the point of junction with the branch to the Verbindungsbahn described in the main line No. I. near the Zollamt	2		4·720	2·933
Branch line ...	IIIJ.	From the main line in the neighbourhood of the Gumpendorfer Schlachthaus, up the river Wien, to the Gobkowitz Bridge, and thence to the k.k. Kaiserin Elisabethbahn in Penzing	2		3·635	2·259
,, ,, ...	III.K	From the Gobkowitz Bridge in the last-named branch to the Penzinger Bridge in Kistzing	2	4	1·880	1·168
Main line ... *	I.	Eventually the completion of the third and fourth line of rails from the Brigitta Bridge, along the Danube Canal, to the point where the branch to the Verbindungsbahn in the direction of the Südbahn commences near the Zollamt in combination with a central station	2		2·980	1·852
					13·215	8·212
		Grand total			30·961	19·239

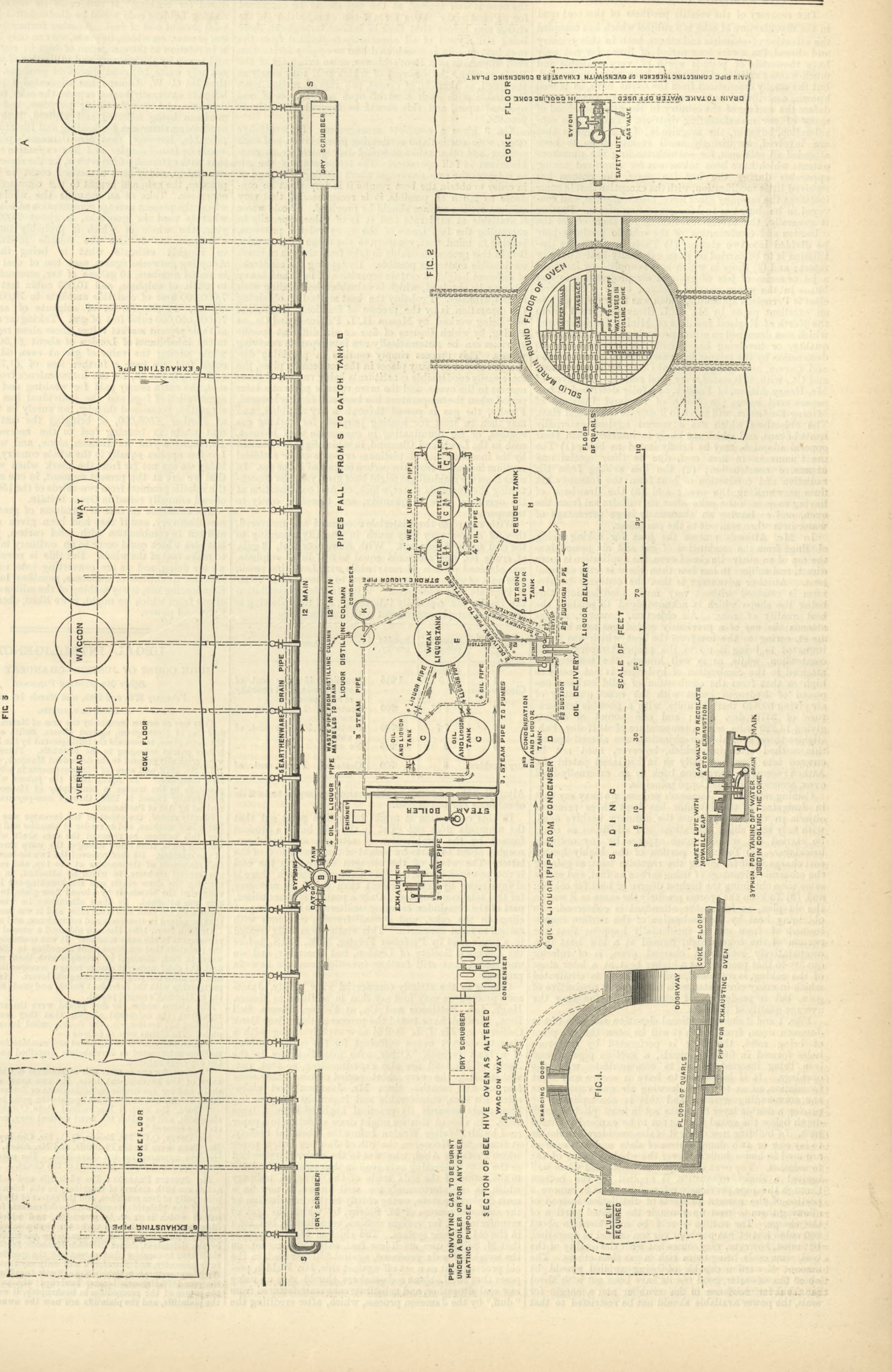
N.B.—Add eventually the short curves to the Nordwestbahn and Nordbahn in the direction of the terminal stations, indicated by dotted lines on plan, forming the double junctions with the above-named railways not yet defined nor obligatory under the Act of Concessions, which the companies concerned may fairly be called on to construct. Also the double junction with the Donau Ufer Bahn by the Danube, about 1·350 kilos., or 0·839 miles, making, without sidings, a total length of 32·311 kilos.—20·178 English miles.

The syndicate, for the purpose of completing the details of the project and floating the company has, in spite of numerous scandalous reports from disappointed competitors and opponents, been fully formed, and the actual surveys and sections are being prosecuted with the utmost vigour by a large staff of Austrian engineers, under the direction of Mr. Fogerty, M. Inst. C.E., F.R.I.B.A., and his local manager, Mr. Wm. E. Thursfield, M. Inst. C.E., and it is confidently believed that the deposition of the plans with the Government will take place in a much shorter time than has been provided for by the conditions of concession.

The sea wall at Saltburn was almost washed away to the foundations on Sunday night, and the promenade pier was damaged.

COKE OVENS ON JAMESON'S SYSTEM.

(For description see page 214.)



THE JAMESON COKING PROCESS.

THE recovery of the volatile products of the coal used in the manufacture of coke is a subject which has occupied the attention of chemists and others, both in this country and abroad, for a very long period of time; for not only have thousands of pounds worth of very valuable and much-wanted articles of commerce been annually wasted, but the smoky emanations from the ovens have, as is well known, contributed in no small degree to blacken and deface the surface of the country in the neighbourhood of many of our manufacturing districts. Taking into consideration, however, the magnitude of the interests that are involved, surprisingly small results seem to have attended all attempts, for notwithstanding the numerous patents which have been taken out for improved coking apparatus during the last ten years, the process has received little modification, with the exception that in some instances the escaping gases have been collected, and conveyed to be burnt as fuel for generating steam. Putting it generally, the inventions having for their object the collection and condensation of the volatile products may be divided into two classes: (1) Those in which the distillation is to be carried on in an externally-heated oven or retort; and (2) those in which heat is applied by means of a jet or series of jets of gas and air projected into and burnt in the upper part of a closed oven. Of the first class is Pernolet's apparatus, which was fully dealt with in an excellent paper by Mr. A. L. Steavenson, read before the North of England Institute of Mining Engineers, and which was described as either producing coke of an inferior quality, or involving heavy costs for repairs owing to destruction by the intense heat; and that of Messrs. Simon and Carves, now being worked at Crook by Messrs. Pease and Co., with, it is stated, very good results. The oven of Mr. Henry Aitken, of Falkirk, also fully described in two papers read before the North of England Institute of Mining Engineers, will serve to illustrate the second class. The objections which are advanced against externally heated ovens, and which are likely to interfere with their general adoption, may be briefly stated as being (1) The great increase in first cost, due to their special and expensive construction; (2) the loss arising from the radiation and conduction of heat from the intensely hot flues surrounding the oven; and (3) the drawback of having to quench the coke after its withdrawal from the oven, and so leaving an abnormally large percentage of water in it when sent out to the purchaser.

In Mr. Aitken's process the heat for coking being obtained from the combustion of gas and air passed into the top of an otherwise closed oven, the application is more direct, and subject to less loss than there is with external heat. Another advantage is that the ordinary beehive form is retained without very much modification, this being the shape which is acknowledged to produce the best quality of coke. An objection, however, always attends the use of a previously cooled gas as a heating agent, owing to the loss from the heat which has to be imparted to bring it up to the proper temperature for combustion, while, as is well known, the temperature attained in the combustion of hydrogen is not nearly so high as that from the combustion of solid carbon; one pound of hydrogen burnt with the exact quantity of air giving 60,840 thermal units, with a possible temperature of 3476 deg. Fah.; and one pound of carbon giving 14,220 units, with a temperature of 4347 deg. Fah. Besides these, several other objections are alleged against this method of coking, which, however, need not be entered into here, especially as in his latest patent Mr. Aitken seems to have gone back to an externally-fired oven, somewhat on the Coppé principle.

Coming now to Mr. Jameson's process, we may say that in designing it the inventor has kept three principal objects in view:—(1) To use the ordinary beehive oven, with only such slight alterations and additions as could be carried out without much expense by any ordinary bricklayer. (2) To use a portion of the highly heated coal charge itself for giving the requisite heat, so gaining the economic advantage of using carbon as fuel, and at the same time obtaining the highest degree of heat for coking; and (3) To keep the process precisely the same as it was on the old plan, as far as the attendant is concerned. In obtaining heat by the combustion of the surface carbon instead of from gas, it incidentally happens that the portion of the coke which, formed at a low heat in a comparatively cool fresh charged oven, is of inferior quality to that produced at a higher heat at a later stage of the coking, is consumed, and so a factor is eliminated which in many circumstances is not only not productive of gain, but is productive of actual loss in lowering the average quality of the coke.

Figs. 1 and 2 show a sectional elevation and plan of the Jameson oven, from which it will be seen that in place of being solid, the floor is perforated by numerous holes formed in fire-clay quarls, a suction pipe of cast iron being inserted so as to communicate with the openings. It is important to have a secure and tight foundation, so as to avoid drawing air and vapour from the surrounding ground, and this is accomplished by placing a double layer of bricks set in hard pitch at such depth below the actual floor as not to be exposed to undue heat. In building new ovens it is also considered advisable to lay one or two damp courses of slate and tar, such as are used in house building, over the whole surface of the foundation. The oven is charged as usual, and when well ignited a slight exhaustion is applied at the bottom through the pipe previously referred to, so as to remove a portion of the nascent products of distillation instead of allowing them to pass up through the ignited portion of the charge. The suction should be equivalent to about 200 cubic feet of gas per hour per ton of coal in operation, but must, however, vary somewhat with the quality of the coal, some coals being more rich in gas than others. The amount of suction capable of being applied should be about 3in. of water, good results have been got with about ½in.; but for resistance in the scrubber and a margin for seals, the power available should not be restricted to that in the first instance. The suction, beginning as soon as the oven is well ignited at the top, should be continued for at least sixty hours for a 5-ton oven, although the charge may before that time be ignited throughout, there being still a yield of oil apparently re-distilled from the oven bottom. It is considered best to employ for suction such apparatus as a Root's blower, or an exhauster of the Beale pattern, the delivery of which will vary nearly as the speed, as there is, of course, one rate of suction most favourable with each kind of oven and species of coal operated upon, and this should be secured as nearly as possible.

Fig. 3 gives a complete arrangement of twenty-five ovens, with suction and condensing pipe, blower, and such settling and other tanks as would be required in an establishment in full operation. The temperature of the gas as it leaves the ovens averages about 180 deg. Fah., and as in order to obtain the best results it is important to condense as much as possible, it is recommended that very efficient cooling surface should be provided. If cold water is available at moderate cost it is of value, especially in extracting the last traces of the more volatile products, bearing in mind that, contrary to the usage of gasworks, it is in this process desirable to take from the gas as much condensible matter as possible. By tapping the condenser at different heights a certain separation of light and heavy oils may be obtained, which is valuable when dealing with large quantities. Probably the best method of obtaining the separation is by the process of fractional distillation now being worked by Messrs. H. L. Pattinson and Co., at Felling, by which liquors of five or six different specific gravities can be automatically run into separate receiving vessels. This process simply consists in providing discharge lutes at so many places in the condensing pipes, the more easily condensible constituents being run out of those nearest to the ovens, and the more volatile parts at a later period when the temperature has been still further lowered. Finally, the gas is passed through a dry scrubber, and may then be used for heating purposes, for working gas engines, or for illuminating in connection with burners, such as the Lewis and Clamond, in which light is obtained by the incandescence of platinum or some other artificial medium instead of from the carbon contained in the gas. In some cases the residual gas might be of great value for concentrating the ammonia water, which, on first condensation at the ovens, is large in quantity, and therefore costly to transport.

With regard to the materials condensed and recovered, they, of course, vary very much in quantity according to the coal under treatment. With Shiremoor coal, 13 gals. of crude oil, and ammonia equal to 9·87 lb. of sulphate, was obtained per ton of coal; while with Longhirst small, 9·28 gals. of oil, and ammonia equal to as much as 17·78 lb. of sulphate was recovered. With fractional distillation the results are especially interesting, and the following is given as a sample experiment with one charge:—

Number of delivery pipe.	Quantity collected.	Specific gravity.	Remarks.
	Gallons.		
1 Close to oven	5	1·015	Contained 18·6 per cent. of water, and a great quantity of scale paraffine.
2	9·87	·990	Contained ·1 per cent. of water.
3	7·7	·980	Contained 10·4 per cent. of water.
4	2	·945	No water.
Dry scrubber	6	·960	Contained 1 per cent. of water.

Altogether the ammonia in this charge was equal to 12·2 lb. of sulphate per ton of coal.

In this connection it might be well to point out that the ammonia does not exist in the coal, but is a product formed by the combination of nitrogen and hydrogen, roughly about 14 parts by weight of the former to 3 of the latter. The whole of the nitrogen existing in the coal is not, however, converted into ammonia, though there is always more hydrogen present than would be necessary for this total combination. Only a portion is thus utilised, part of the remainder escaping unaltered, while some part clings to the coke, and a small fraction combines with carbon to form cyanogen. This matter was fully treated in a paper read by Professor Forster, M.A., F.C.S., before the Chemical Society of London, last December, and we understand that still further investigations are now in progress.

Coming to the strictly commercial view of Mr. Jameson's process, we may first say that in addition to Messrs. Hugh, Lee, Pattinson and Co., at Felling, Messrs. Bell Bros., Limited, have tested the process at their Page Bank Colliery, and Mr. I. L. Bell is now experimenting with a view to convert ovens sufficient for the entire working of a blast furnace. Other coke manufacturers in the North of England are also experimenting, so that, notwithstanding the very short period of time—only some four or five months—since Mr. Jameson first elaborated his idea, considerable and important progress has been made towards its practical application on a large scale. In view of this we might draw attention to a paper read by Mr. Walter Weldon before the Chemical Society, at Burlington House, on the 8th of January last, a paper which Professor Abel, who was in the chair, characterised as the most interesting ever read in that room. It related to the future of the soda trade of the Tyne, an industry which, as is unfortunately too well known, is now in a most deplorable state, owing chiefly to the introduction of the ammonia process of M. Solvay, by which the cost of manufacture is, for various reasons, considerably less than in the old Leblanc system. The chief of these reasons is that M. Solvay uses much less fuel, only 150 per cent. on the weight of soda produced, against 350 per cent. in the old process; but as a set off against this, Mr. Weldon proposes that the Leblanc soda-makers should give up using raw coal altogether, and substitute coke manufactured from "duff," by the Jameson process, which, after crediting the value of the recovered products, can practically be produced for nothing. If this could be done, the cost of making Leblanc soda would be diminished by almost the total present cost of fuel. Another feature of the Jameson process, on which, however, we can only briefly touch, is in relation to the mitigation of fogs in our large cities and towns by the recovery and utilisation of what are now, not only waste, but most obnoxious products. For a long time Dr. C. W. Siemens has advocated a plan of distillation in externally-heated retorts, the coke to be used for domestic and manufacturing purposes, and the volatile products being collected and utilised, both by partially condensing them and for heating and illuminating. It is probable, however, that Mr. Jameson's plan of coking would be found simpler and less expensive to work than that with externally-fired retorts, for the reasons previously referred to, and if such a method could be brought into practice, the gain and benefit to the community would be enormous. Take as an example the whole of London, where the present average consumption of coal, apart from what is used in gasworks, is about 7,000,000 tons a year, the whole of which is probably burnt in such a manner as to lose the volatile products, and let us roughly estimate what is being thrown away. Adopting gasworks figures, each ton of coal will produce, in round numbers, 10 gallons of tar, ammonia equivalent to 20 lb. of sulphate, and 10,000 cubic feet of gas. On 7,000,000 tons of coal this amounts to 70,000,000 gallons of tar, 140,000,000 lb. of sulphate of ammonia, and 70,000,000,000 cubic feet of gas. Taking tar and ammonia at their present market values, these alone represent a loss to the inhabitants of London of about £1,500,000 a year, while adding the value of gas, at even 6d. a thousand cubic feet, we have a further loss of £1,750,000. But even this is not all, for the inconvenience from smoke and soot, the extra money paid for washing and cleaning, the aggravation of fogs, and the individual loss and business stagnation occasioned thereby, can surely be taken at least at another £500,000, so bringing the cost of our present waste in burning fuel to the enormous total of £3,750,000 a year for London alone, and what is true of London applies equally to the whole country, so that probably we are not far from the mark when we state that that we are at the present moment, in one sense, wasting the volatile products from two-thirds of the 150,000,000 tons of coal annually raised in Great Britain.

The existence in coal of products of great value is no new discovery, and if they had been given us separately, and not in combination with solid carbon, probably the last idea which could occur to an ordinary mind would be to make fuel of the whole. But this is nevertheless what we are doing, and we are converting into smoke and fog immense quantities of ammonia, paraffine, lubricating and illuminating oils, to say nothing of the millions of cubic feet of gas from which we might, if we liked, obtain both heat, light, and power.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Before MR. JUSTICE PEARSON.

February 27th and 28th, and March 1st and 5th.

CROPPER *v.* SMITH.

THIS was an action brought by the firm of Messrs. H. S. Cropper and Co., of Nottingham, against Messrs. Smith and Hancock, of the same place, to restrain the infringement by the latter of certain letters patent belonging to the plaintiffs. These letters patent were originally granted to the defendant Hancock, on 11th August, 1873, No. 2672, and were for "improvements in bobbin net or twist lace machines." In April, 1877, the patent was sold to the plaintiffs by the trustee in bankruptcy of Hancock, and having accidentally lapsed in 1880, through non-payment of duty, was revived by Act of Parliament.

Shortly stated, the object of the inventor was to simplify the Lever lace machine, and to render it steadier and more accessible. For this purpose he removed the cam shaft which drove the working parts, from below amongst the warp threads, to the top of the machine. He then removed the two tie-bars connecting the end standards of the machine at the top, and replaced them by one central tie-beam, to which he attached, in pairs, brackets carrying the draw shafts and the knocking-out levers. He also connected the standards by a broad floor-plate, to which the back stay was attached. By these alterations he was enabled to dispense with the back and front rails, and it was proved at the trial that he gained in steadiness and convenience, and also in light.

On 26th Nov., 1880, Hancock obtained a second patent for improvements in the same machine. It was contended on behalf of the plaintiffs that machines made according to the second patent were, in fact, identical in principle with those made under the first, the chief apparent change being a transposition of the shafts and the axles carrying the knocking-out levers. Hancock went into partnership with the defendant Smith, and made machines according to Hancock's second patent.

The claims under the first patent were the subject of much argument, the defendant alleging that they were excessive as including old matter, viz., the double-ended lever and the floor plate. The claims were as follows:—

"First, the general arrangement and combination of a twist lace machine constructed as hereinbefore described and illustrated in the drawings annexed.

"Second, for one or more pair of brackets E which support the axles of the knocking-out lever, the two draw shafts, the cam shaft, and for the double-ended brackets or levers N carrying the arms, blocks, and trucks which operate the point bars.

"Third, the central longitudinal plate C connecting the end standards, and to which the front vertical stay, cradles, and back stay are secured."

Mr. Davey, Q.C., Mr. Barber, Q.C., Mr. Chadwyck Healey, and Mr. Cann were for the Plaintiffs, and Mr. Aston, Q.C., and Mr. Goodeve appeared for the defendants. The nature of the arguments appears from the judgment of the Court.

MR. JUSTICE PEARSON: The plaintiffs and defendants in this action are both makers of machinery in the town of Nottingham, principally of lace machines, and the object of the action is, on the part of the plaintiffs, to restrain the defendants from infringing a patent which is in their possession, and which they say the defendants have infringed under the circumstances I am about to state. The patent, which belongs to the plaintiffs, was taken out by the defendant, James Robinson Hancock, in the year 1873. I shall have to consider that patent and the specification very carefully presently, and therefore I will only say that it was a patent for "Improvements in Bobbin Net or Twist Lace Machines.' About the year 1876 Hancock became bankrupt; the patent was sold in the course of the proceedings in bankruptcy, it was purchased by the plaintiffs, and the plaintiffs are now the owners of it. Subsequently to his bankruptcy, Hancock went into partnership with the other defendant, Smith; and in the year 1880 Hancock took out a second patent for improvements in bobbin net or twist lace machinery, and the complaint is that the machine made in accordance with the patent so taken out in 1880 is an infringement of the patent taken out in 1873. It seems at first sight rather a strange thing that Hancock should be found himself taking out a patent in 1873, and endeavouring to infringe the patent in 1880; and at first I thought that some difficulty might arise from the manner in which the defence has been conducted in this case, but in the view I take of it no difficulty will arise. I shall treat Hancock and Smith as if they were one person, and not allude any further to the position in which they are considering the consequence of Hancock having taken out the first patent of 1873. Now, there appear to be, and I may consider that there are for the purposes of this judgment, two different kinds of machines employed in lace-making at Nottingham; the one I shall call the lace machine—by which I mean the machine which is more complex in its parts, and is capable of producing more complicated fabrics—and the other the "go-through" machine, which has no landing bars and their connections, and is only used for simpler kinds of fabrics. I need not give any full or accurate description of these machines. There are models of them in Court, and during the time that this action lasted there was a great deal of description given of them. What I am going to say will be sufficient for the purposes of judgment. The lace machines were constructed to a certain extent in this manner: There were two end stays and a middle stay. The machinery itself was hung, in the older machines, rather low down. The warp beams on which the thread was wound, and upon which the thread was worked, occupied the bottom part between the two end stays, and according to the old machines the machinery found its way—at least certain parts of it did—between the threads on the warp beams; the consequence of which was that they were chafed, and apt to be more or less broken. I may say that from the year 1860, down to the present time, the great object of every person who endeavoured to improve these machines was to improve them in these respects: in getting more light, in getting accessibility for the workman both to the machinery and to the warp beams, in removing the machinery from the warp beams, and in so placing the machinery that the machinery might be accessible and might be easily lubricated without the oil falling on the lace. Several attempts were made before 1873 to effect these improvements, and they more or less probably shadowed beforehand the instrument which Mr. Hancock produced in 1873. They attempted to do those things which I have already stated as being the desiderata of lace machines, but they never succeeded entirely. No one instrument was a success. When they first began to carry the machinery overhead, they carried with it so many rails that they darkened the machine. When they did not carry the machinery overhead, they left the cam shaft down below, and the goose necks came in amongst the warp threads. But in 1873 Mr. Hancock took out his patent, a patent, be it said, not for the making or invention of a new machine, but for the improvement of an old machine; and he improved it in this way:—He took a variety of things which were in themselves old, and he combined and rearranged them so as to make them work more easily and better for the objects desired. One tie beam had been used before; he took one tie beam. Brackets were very well known, and he took brackets. He embodied the machinery to a great extent in the brackets, but he did this with regard to the brackets which had not been done before—he wedded the brackets in pairs by means of axles, which he put through the brackets, and which not only kept the brackets together, but which supported the knocking-out levers. The brackets were therefore double brackets, and his whole system, so far as it was a system, and so far as there was anything new in it, was a system in which the brackets were arranged in pairs, and not singly, as they had been before. He carried the cam shaft through the brackets in such a position that it was directly under the centre of the beam, and then, in order to provide more room for the workman and more room for the warp beams, he took off the front and back rail which had existed before, and instead of them he placed a floor-plate between the two end stays running the whole length of the machine, so as to get rigidity in the floor of the machine instead of getting the rigidity, as it had before, by means of rails running outside the framework and along it. There is no doubt whatever those were very considerable improvements; for they increased the light, increased the accessibility, increased the space that the workmen had to work in; and I cannot help saying that I think, although none of the parts were what you could call new inventions, nor do I find them so claimed in the patent, there was sufficient novelty in the combination and rearrangement to entitle Hancock to a good patent, and that if his patent had stood alone on the first claim, "The general arrangement and combination of a twist lace machine, constructed as hereinbefore described, and illustrated in the drawings annexed," nobody could have been heard to say there was anything invalid in it. I shall not trouble myself much with Hancock's machine of 1880; because I am very clearly of opinion, and I think everybody was of opinion, that you have only to look at it in order to see that it is substantially the same machine with only one or two immaterial transpositions of the machinery.

But the main defence that was raised here was a defence founded on the specification of Hancock's patent of 1873, and it is alleged that for various reasons that patent is void, the specification being bad. The first objection that is taken to the specification—reading the specification from the beginning to the end—is to the description of the second modification, which is to be found on page 4. Beginning at line twenty-four, it runs in this way:—"A second modification consists of a machine constructed as above described, but without the landing bars and their connections, and the draw shafts carry levers, the ends of which form bearings for shafts to which arms are secured, which arms carry the axles of the catch bars. The end arms are hinged to levers which rock on the joint pins, and the draw shafts have independent levers at each end carrying connecting-rods moved by oscillating discs operated by connecting-rods at the front of the machine." It is said that the specification is bad because it would not instruct any workman how to construct a machine of that kind; that everything is vague; you are told that there are to be levers which rock on joint pins; you have to have draw shafts which have independent levers at each end carrying connecting-rods moved by oscillating discs operated by connecting-rods at the front of the machine; but, as one of the witnesses expressed it, the dimensions and proportions are not given, and it would require an intelligent mechanician to design something himself in order to construct such a machine. If I thought that was really so I should be compelled to say that the specification was bad; but I very early in the course of the argument came to a very contrary conclusion, and I see no reason to alter that. Hancock by his patent does not profess to invent a new machine. He takes out a patent simply for an improvement in an existing machine, and, as I have said before, the machinery that he uses, and which he puts together, is old machinery, which was very well known. Now, when you come to the second modification, he begins with taking a lace machine complete in all its parts, and he tells you what you are to do. You are to take away the landing bars and their connections, and then you are to transform it into a go-through machine. And this is so plain that when the specification was put into the hands of one of the defendant's witnesses—Mr. Swift—who had never seen it before, a very short glance at these lines told him at once what it was he had to do. He said at once, this is manifestly to be a go-through machine; and when he was asked whether he would have any difficulty in transforming a lace machine into a go-through machine, he said, certainly not. I hold, therefore, that this specification, being a specification not for the construction of a new machine which nobody knew at the time, but simply for changing one well-known machine into another well-known machine, is perfectly sufficient. But there was a more serious argument raised upon the second and third claims, and I must honestly say it is very much to be regretted that these second and third claims have been drawn as they are, because no one can say, reading them over, that they are at all accurate—as far, at least, as the English is concerned. Whether they are substantially bad or not is another question altogether, and that will depend upon what is really, having regard to the whole of the patent, the proper construction of them.

Now I will take the third first, because the third is the simplest. He claims first, "The general arrangement and combination of a twist lace machine, constructed as hereinbefore described and illustrated in the drawings annexed;" and then the third claim is: "The central longitudinal plate C connecting the end standards, and to which the front vertical stay, cradle, and back stay are secured." That is the floor plate of which I have already spoken—a floor plate which runs along with a standard at one end and a standard at the other end, occupying the space between them, and so welded into them as to hold them perfectly rigid. It was said with great force by the counsel for the defendants, and perfectly truly, that it was impossible to suppose that that was a new invention; that a floor plate was nothing but changing a vertical bar into a horizontal bar, and that that was a thing perfectly well known to engineers. The most ordinary mechanic is acquainted with it, and the idea of claiming a patent for that is perfectly absurd. I entirely agree with what counsel say, that to claim a patent for that in the largest possible sense, namely, to say that this person had invented the floor plate and that you could not use a floor plate either in a lace machine or any other machine that might be invented because of this patent, would be to make the claim perfectly ridiculous. But then the moment you have arrived at that you have arrived at this rule of law which prevents you giving this construction to that third claim, because the rule, as I understand it, is as plain as can be, that no man is to be considered to have claimed something which is perfectly absurd and which it would be foolish to suppose he had claimed in order to make the patent a bad patent. In the case of Harwar *v.* Hardcastle, reported in the first volume of Webster's Patent Cases, page 484, there was an objection of the same kind taken to a patent, and it was said that the patentee claimed a patent for the rails or staves over which the calicoes or other cloths were to be hung, and the Chief Justice Tindal says this:—"The use of rails and staves for this purpose was proved to have been so general before the granting of this patent that it would be almost impossible *a priori* to suppose that the patentee intended to claim what he could not but know would have avoided his patent, and the express statement that he makes—and then he quotes the passage—shows clearly that he is speaking of those rails or staves, which are things then known and in common use.

So I have here the case in which the idea of claiming the invention of this floor plate would be ridiculous, because everybody knew beforehand that a floor plate of that kind would effect the object for which it is used here. I think, therefore, I am not only not bound to assume that the patentee intended to claim it in that general manner; but I think, according to the rule of this Court, I am bound to assume he did not intend to claim it in that way. Let us see, therefore, what it is he has done. He has described, to begin with, his patent as a patent simply for an improvement. He then states the manner in which it is done. He then claims by his first claim for a new invention, the general arrangement and combination as there described, and then, I think, in the second and third he merely states the different parts of the machine which he has so arranged and combined, in order to state more definitely and specifically the arrangement and combination which he claims to have patented. It will be found that the very parts he takes are the very parts he has arranged and combined, for in the second one he takes, "one or more pair of brackets E which support the axles of the knocking-out levers, the two draw shafts and the cam shaft." That is exactly true. He has a pair of brackets supporting all these different parts of the instrument; and for the double-ended brackets or levers N carrying the arms, blocks, and trucks which operate the point bars. Those are also differently arranged from what they were in the old lever machine. Then he concludes with the floor plate, pointing to all the different matters which he claims by the second and third claim by letters referring to his plan. I think, therefore, I should say that what he really and truly is doing in this case is simply enumerating all the different parts which he has combined and arranged together for the purpose of the patent. It is a very clumsy mode of saying, I mean by my general arrangement and combination, my general arrangement and combination of the following parts of the lace machine, but I do not think it goes to more. I do not think he claims a patent for anything beyond what he has claimed in his first claim, and if that be so, although it may be entirely superfluous it does not make the patent void. I am glad to find that there is most distinct authority to enable me to put such a construction on this patent. It seems to me that this case comes entirely within what the judges said in Plimpton *v.* Spiller. That was the skate case, and there was a claim first of all for the skate altogether, and there was a subsidiary claim for the mode of securing runners and making them reversible as above described, and in giving judgment in that case the Lord Justice James says this:—"It appears to me that in doing that he is claiming not a distinct and substantive invention, but he is claiming it as one of the merits and advantages of the entire construction which he has before given, and he is not in any way pretending or claiming to enlarge his monopoly; because of course it was a novelty as far as Plimpton's skates are concerned, for Plimpton's skates were novel, and he is only applying an old thing to an entirely new thing. When the new thing ceases to be patented, that old thing will cease to be patented too; so that there is no pretence, really, for saying that he is endeavouring to claim under the colour of that second claim something other and beyond that which the invention itself purports to be; that is to say, an invention for making a rocking skate in the manner which he has described in the first part. That being so, it seems to me to be wholly immaterial what the exact construction of those words is, because, after all, that second claim really comes to nothing more than is included in the description of the invention itself. I mean that part of the invention which describes the runners, and the words 'the mode of securing the runners and making them reversible.' It seems to me to be perfectly idle and superfluous to the claim in the first part. They neither add to nor diminish from the patent, nor the monopoly which the patentee is seeking to obtain against the public." I really think I might use pretty nearly every word of this passage with regard to this patent. There is nothing new claimed by the second and third. It is a repetition, practically, in detail, of what is in the first. Then Lord Justice Brett says pretty much the same thing, and at page 434 he says:—"Under these circumstances, confining this claim to the runner of the patented skate, it is obvious that the claim, whatever it be for, with regard to this runner, does not in any way increase the monopoly of the good patent; and if you can say that the subsidiary claim in the patent cannot, under any circumstances, increase the monopoly of the patent itself, which is well claimed in the patent, it seems to me that the subsidiary claim is unimportant, is futile, has no effect, and therefore does not raise any objection to the patent." Now that being so, I think it unnecessary to discuss very much what is the proper reading of that second clause, which undoubtedly is very ungrammatical and very inaccurate, because, whether you strike out the "for," and say the second "for" is a mistake altogether, or whether you leave the two in, and take them in as two independent sentences, the result is just the same. There is nothing to my mind to lead to the second and third claim claiming more than in fact the first claim, and that being so, I hold the patent to be good. Those, I think, are all the objections taken to the patent. The question of infringement was not really seriously argued. There being, therefore, admitted an infringement of the patent if good, as I hold the patent is good, I must give the plaintiffs the relief which they seek.

Solicitors: For the plaintiffs, Mr. F. Needham, agent for Mr. Cann, of Nottingham; for the defendants, Mr. R. W. Marsland.

THE INSTITUTION OF CIVIL ENGINEERS.

ON TELEPHONES.

THE second of the series of six lectures on the applications of electricity was delivered on Thursday evening, the 1st of March, by Sir Frederick Bramwell, F.R.S., V.P. Inst. C.E., the subject being "Telephones." The following is an abstract of the lecture:—

Prior to the invention of the telephone, by making and breaking circuit at the transmitting station, sounds had been produced at the receiving station—such as the striking of bells, or the vibration of a Morse sounder—but these were independent of sound at the transmitting station, and they varied according to the implement used at the receiving station, and were and are used for purposes of audible telegraphy. Also, prior to the invention of the telephone, it was possible to reproduce at the receiving station, say by a tuning-fork, the vibrations of which break and make contact, the same note produced by a similar tuning-fork at the transmitting station; and in this case there was a reproduction at the receiving station of the sound at the transmitting station. But the only thing that was ensured was the repetition of the same note—there was no reproduction of the same sound. For example, the note might have been uttered by a violin-string, by a tuning-fork, or by a clarionet at the transmitting station; at the receiving station, however, nothing would be given forth but the note of the particular tuning-fork, or other vibrating implement, which was in accord with the number of the vibrations transmitted in a given time. All these modes were due to the variations of the current caused by break and make in the circuit, and were therefore abrupt. The best result obtained with such an agency was in the machine of Reiss, who, in 1862, reproduced tones, and it is said some words were heard. That machine received no development, and telephony lay dormant for fourteen years, until the invention of Professor Graham Bell, patented in this country in December, 1876. In 1874 Mr. William Henry Barlow, F.R.S., Past-President Inst. C.E., turned his attention to the recording of the vibrations produced by speech. He effected this by means of an instrument called a logograph. This was communicated to the Royal Society, and exhibited in operation there. By its agency there was depicted on a travelling band of paper the motions derived from the vibration of a membrane under the influence of speech; but had the results been known, they would probably have deterred an inventor seeking to produce a telephone, as it appeared the vibrations were not always the same for the same syllable, but varied with the speaker and from the circumstances. Professor Graham Bell graphically represented the variations in the electric current, either direct or reversed, caused by break and make, and showed that these were too abrupt for his purpose, namely, the reproduction of articulate speech. He proposed to attain the object sought by having the circuit always closed, and by causing rises and falls, or reversals, as the case might be, of electricity, which should be made gradually, instead of abruptly, as before. The simplest mode in which he attained this end was in one of the original forms of the Bell transmitter or receiver—for the instrument was capable of fulfilling either function—by placing an iron or a steel plate in the neighbourhood of a permanent magnet surrounded by a coil of insulated wire, so that on the plate being set into vibration by the voice it should induce, in the coil, reversed currents of electricity which could travel along the wire in prolongation of the coil to the coil of the similar instrument at the receiving station, thereby varying the power of the magnet at that station and setting up vibrations in the corresponding iron disc. This disc, acting upon the air, gave to it vibrations similar to those which had put the first disc into motion, and in that way a reproduction of the original sound—as Professor Bell said a *fac simile*—was obtained. Other modes were employed by him, such as the use of a battery in the line wire, and best of all, the use of two local batteries to send the current to a primary coil round a core, the line wire being connected with secondary coils acting by induced electricity. As transmitters these instruments were necessarily somewhat feeble, since the whole of the electricity in the first of the three cases mentioned, and what might be called the operative electricity in the other two cases, had to be derived from the microscopic movements of the disc, under the influence of the sound waves produced by the speaker. Mr. Edison's phonograph was exhibited in order to show that a disc, when caused to vibrate under speech, could by a central needle impress those vibrations on tin foil, and that on the tin foil being caused to traverse under the needle, the reproduction on the disc of those vibrations caused it to repeat the speech which had originally set the disc into motion. This was appealed to as a convincing proof that a disc, when mechanically vibrated in a manner corresponding to the vibrations which had been imparted to it by speech was sufficient, wholly irrespective of any electrical agency, to impress upon the air the needful vibrations to reproduce speech. Edison then devised a transmitter wherein the disc need not be metallic, but might be mica, and its vibrations were caused to operate upon a small block of carbon, which carbon was introduced in the circuit of a battery. It was thus found that the almost inappreciable variation in pressure due to the vibration of the disc was sufficient, for some not very well understood reason, to alter the conducting power of the carbon, and to cause varying currents to be transmitted along the line wire to the Bell receiver at the opposite end. At the present day the universal transmitting instrument for commercial purposes is the carbon transmitter of Edison or some modification thereof. Professor Hughes' microphone was next alluded to, and it was stated how by its means the most minute sounds were rendered audible, and how, from the delicacy of the instrument, it was applicable to many scientific purposes. Edison's chalk receiver was subsequently explained. Prior to Edison's time, it had been known that the friction of certain surfaces varied with the electric current passing through them, notably under such circumstances, the friction of the human tissue. Among other appropriate substances prepared chalk was one, and it was shown how Edison availed himself of this. By attaching a stem to the centre of the disc, and pressing this stem by means of an adjustable pressure upon the periphery of a chalk cylinder, a current of electricity passed from the centre of the cylinder through the stem. Upon the cylinder being turned by hand the friction on the stem caused it to move the centre of the disc—its edge being fixed—to a definite position depending on the friction and on the rigidity of the disc; but, on a variation in the current, the change produced thereby in the friction caused the stem either to be drawn in further or to yield to the elasticity of the disc and to allow it to be moved backwards, In this manner vibrations were set up in the disc corresponding with the vibrations of the transmitter that had sent the varying electrical currents. As in the case of this receiver the power was derived, not from the electricity, but from the hand of the operator turning the chalk cylinder, very considerable loudness was obtained, so that the utterances of the receiver were audible in a large room. Mr. Shelford Bidwell having been good enough to lend a photophone, that beautiful invention of Professor Graham Bell was explained. Mr. Bidwell showed how by speaking to a disc, the front being a mirror, on which a powerful light was directed, that light could be reflected on to a selenium cell, and as the disc vibrated under the influence of the voice the light playing on the selenium cell varied. Selenium was a material the conductivity of which changed with the amount of light upon it. It was therefore possible in this manner to cause a Bell receiver to speak, and reproduce the speech which had been uttered to the mirror disc. It was pointed out that in this manner there was no need of a wire connection between the transmitter and the receiver, the passage of a beam of light being all that was required. Reference was then made to the various purposes to which the telephone might be put, and to the exchange system and the necessary apparatus for receiving the calls and making the connections between the different subscribers to the Exchange. Amongst special uses a very interesting one was shown, that of the application of telephony to the diver's helmet. Thanks to the kindness of the captain of H.M.S. Vernon and of Mr. Gorman, a helmet with the whole of the apparatus was exhibited. It was shown how the application of the telephone in no way introduced any complication, as the single wire needed was in the middle of the old call-rope, the return being made by the water itself. Thus, if the telephone went wrong, the diver was left without additional apparatus of any kind to encumber him, and yet with all the resources that he would have had in the absence of the telephone.

It was stated that the development of the telephone had been far more rapid in America than in England. As an instance it was mentioned that in the city of Washington, with a population of about 120,000 white persons, as many as 800 telephones were used. Then a return, circulated that very day by the United Telephone Company, was read, showing that on the 28th of February, in the year 1881, there were, independent of private lines, 845 subscribers to the London Exchange; that on the same day in 1882 the number had increased to 1505, or an addition of 660; and on the 28th of February this year, the number was 2541, or an addition of 1036; and that contemporaneously with these increases, the use of the telephone by each subscriber had augmented, until it now reached more than 7½ calls per day for each subscriber, which, at a cost of £20 a year, represented only twopence a call; or, bearing in mind that each call involved a return message, it only amounted to one penny for the message sent each way.

The lecturer was fortunate in having the assistance of Mr. E. H. Johnson, who had been so much associated with Mr. Edison in carrying out many of his inventions, and who was kind enough to put into work both the phonograph and the chalk receiver.

ON THE PRODUCTIVE POWER AND EFFICIENCY OF MACHINE TOOLS, AND OF OTHER LABOUR-SAVING APPLIANCES, WORKED BY HYDRAULIC PRESSURE.

AT the meeting of the 6th of March, Mr. Brunlees, president, in the chair, the first paper read was "On the Productive Power and Efficiency of Machine Tools, and of other Labour-saving Appliances, worked by Hydraulic Pressure," by Mr. Ralph Hart Tweddell, M. Inst. C.E.

The author stated that some years ago he had occasion to design a machine, which was required to exert a great pressure in a confined space at a considerable distance from any shafting. The machine had to be portable, and to be capable of doing a large amount of work efficiently without the intervention of skilled labour. Such conditions were of common occurrence, and in this instance all were successfully fulfilled by the employment of hydraulic pressure. The paper was an amplification of the subject of the application of this power to actuating machine tools, and other labour-saving appliances in engineering works, and was divided under three heads—namely, the introduction and development of hydraulic pressure machine tools; the productive power and efficiency of machine tools generally, and the modes of increasing them; and the increased productive power and efficiency obtainable by the employment of hydraulic pressure for working machine tools and other labour-saving appliances. Reference was made to the unpublished experience existing on these questions.

Under the first head an illustration was afforded by a small portable hydraulic apparatus for fixing the ends of boiler tubes in tube plates, the pressure of water employed varying from 1 to 1½ ton per square inch. Owing to the introduction of high steam pressures, the scantlings of marine boilers had to be considerably increased, but the mechanical rivetting machines formerly in use were mostly inadequate to make steam-tight joints. In 1865 the author designed a hydraulic rivetting plant to overcome the difficulty. It consisted of pumps, an accumulator, and a rivetting machine, and in operation was seven times more economical than hand work; moreover, its surplus power was available for hydraulic presses for "setting," or joggling, angle and tee-irons. In action it was found that the material was much less strained, and that the wear and tear of the moulds and dies was greatly reduced, besides which the machines were movable. Previous attempts to perform similar work by portable machines driven by steam had not been very successful. This, it was believed, was the first hydraulic pressure rivetting machine which could readily be applied at different points and over considerable areas, and at the same time maintain an uninterrupted connection with the accumulator pressure in the mains. The system had been extended to machinery of sufficient gap to span the deepest girders, the same hydraulic power which actuated the heavier machines being utilised for lifting them. The water driving these machines and their lifting apparatus was supplied under a pressure of 1500 lb. per square inch. Amongst the first to employ them was the firm of Sir William Armstrong and Co. Several instances were then given of their application—for rivetting *in situ* the lattice girder bridge which carried Primrose-street over the Great Eastern Railway at Bishopsgate-street station; for rivetting locomotive boilers; for fastening rivets in gun-carriages and in agricultural machinery; for railway wagon work, and for rivetting ships. The substitution of hydraulic machinery for punching and shearing metals had been more gradual, but it had proved economical, and had been employed for shearing the links of chain cables, 3in. in diameter, both sides at one time. To obtain the full advantages due to the application of hydraulic pressure to machine tools, the system should be applied throughout the works. This had been first carried out completely at the French naval dockyard at Toulon for building iron and steel war-ships. A similar plant had since been erected at the shipyard of the Forges et Chantiers de la Loire, at Penhouet, near St. Nazaire, illustrations of which were given, as also of another machine at Brest, which was now being constructed from the author's designs. Other applications of hydraulic pressure were then referred to, such as for forging and stamping. The author held that the successful carrying out of hydraulic forging would depend greatly on the skill brought to bear in making the dies and moulds. As to the productive power and efficiency of machine-tools generally, and the mode of increasing them, the author observed that the cost of manufacturing depended upon the productive power of the tools employed, and upon the possession of facilities for transporting the material to and from them. Ample lifting and transporting arrangements should be provided in all cases. At present a large amount of lifting was done by manual labour, in which there was room for great improvement. Owing to the necessity hitherto of using belting or gearing for working them, power cranes had only been applied to machine-tools to a limited extent as a means for increasing their output. The author pointed out that by the adoption of portable hydraulic machine-tools a great saving in floor space might be effected. The introduction of hydraulic capstans had practically annihilated space in docks and railway yards, and as the haulage of a given weight on a good road required less power than lifting it, an extented application of such machinery to engine works was to be anticipated. The suitability of this system to increasing the output of large engineering shops and ship yards was evident, and safety in lifting was ensured in hydraulic cranes by the impossibility of workmen putting on them a greater load than they were calculated to bear. On the third head, namely, the increased productive power and efficiency obtainable by the employment of hydraulic pressure for working machine tools, the author observed, that so far as the prime mover was concerned, the power necessary in a hydraulic system to pump water into the accumulator was nearly always obtained from a steam engine; but even at this early stage the hydraulic system, by the use of the accumulator, allowed of a considerable reduction in the size of the motor. A comparatively small prime mover running continually stored up sufficient energy to meet any sudden demand from even the largest of the machines worked from it; while, on the other hand, the prime mover would have to be equal to this. This defect was to a small extent met by the use of fly-wheels, which were, however, objectionable from their liability to accidents, and from the strains to which the shafting was subjected. From 200 to 300 blows per minute had been obtained in hydraulic machines, and in machine-tools and cranes the accumulator acted as a perfect safety-valve. Then, for the transmission of power to points distant from the prime mover, hydraulic pressure was the most economical. By the use of hydraulic mains laid underground, all overhead shafting was dispensed with. Under the present system the lines of shafting, to a great extent, regulated the position of the machines. In a recent case 48,000 square feet were required with shafting, while 32,000 square feet only were necessary when arranged for hydraulic transmission. In this case the cost of all the roofing and flooring of a building 300ft. long, 53ft. wide, and 25ft. high, was saved. A pipe of 1in. bore could transmit nearly 6·5-horse power at a very moderate velocity of water, and a 2in. pipe about 25-horse power. All danger from the use of belts and pulleys was avoided, and when once laid in the ground it needed no further attention.

The next question was as to the suitability of hydraulic pressure to actuating the tools. It had already been employed for slotting and planing machines, and its application to rotary machines might even become as economical as any other. The simplicity and fewness of parts in all hydraulic machine tools was a source of great economy. In respect to the economical application of force through each individual machine when performing such an operation as punching, the machine was moving at its lowest speed, and friction was at a minimum when most work was being done. Again, hydraulic machines consumed no power except when actually doing work, while it was not unusual in a machine shop to see all the shafting running in order to drive a small tool at its extremity. With hydraulic machines it was immaterial whether the machine was 2ft. or 2000ft. from the accumulator, only the exact quantity of water necessary to perform the operation was consumed. In conclusion, the author stated that apart from questions of economy, attention might be directed to several of the advantages arising from the application of hydraulic power to special cases. In rivetting machinery it rendered it possible in one and the same machine to close the plates with a steady pressure, to fill the rivet hole without forcing the metal of the rivets in between the plates, and to give the metal a sharp blow; not only could the heaviest machine be lifted, but the machines could be attached to their work. In punching and shearing machinery much greater accuracy was ensured from the perfect control of the moving punch or knife, whose descent could be arrested even after it had touched the plate. Steel plates were less injured when punched by heavy hydraulic pressure. Hydraulic punching and shearing machines required no foundations, and could be readily taken on board ship, thus saving much carrying to and fro of plates. It was often desirable to follow up the effects of a sharp blow by maintaining a continued steady pressure. This was illustrated by the author, who described an "impact" accumulator, and pointed out the difference of effect of a number of light blows as compared with one heavy one in the case of hydraulic rivetting. Similar conditions applied to forging. The indirect advantages due to the uniformity of all the work applied also to the flanging machinery, and, in fact, to everything passing through dies and blocks. He thought that even small firms might find it advantageous to combine in the erection of a common pumping-station, and so to obtain many of the economical benefits due to carrying out operations on a large scale.

STAMPING AND WELDING UNDER THE STEAM HAMMER.

The second paper read was on "Stamping and Welding under the Steam Hammer," by Mr. Alexander McDonnell, M. Inst. C.E.

It was observed that the making of iron forgings under the steam hammer in moulds or dies of simple form had long been practised. They had commonly been of scrap or fagotted iron, were often roughly finished, and much heavier than necessary, requiring too much to be taken off by planing or shaping to finish them. Very few forgings had been produced of a complicated shape, or built up of several pieces, under the hammer when common bar iron was used. The steam hammer had always been employed for welding in completing the rings of wagon wheels, and in stamping wheels according to the system of Mr. Arbel. So far as the author was aware, little had been done to make smaller forgings, welding together several pieces. He thought sufficient care had not been taken in the drawing-office to design forgings so that they could be stamped, and that proper precautions had not been observed by the manager of the works or the foreman smith to arrange the material so that the welds should be made in the right way, the metal flowing in the right direction to fill the mould, and the grain of the iron placed so as to get the greatest strength. Stamping in moulds gave a uniformity and accuracy which afforded great advantages where large numbers of similar objects were made. The author had carried out the system of stamping and welding carriage and wagon ironwork for some years at the Inchicore Works of the Great Southern and Western Railway of Ireland. He contrasted the cost of stamped forgings as compared with forgings by hand, showing that for the more complicated forms the former process was the cheaper. Although for some purposes the steam hammer was necessary, he believed many forgings would be better made by hydraulic forging presses. Finally, he explained the method of making stamped forgings, by giving a detailed account of the manner of forging a number of different articles, which had been selected as fair samples of forgings of carriage and wagon ironwork.

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

(*From our own Correspondent.*)

THE improvement noted last week was this week fully maintained, especially for pigs. Prices of grey forge pigs were stronger consequent upon a shortness of supply. This shortness arises from the great difficulty which makers are experiencing in turning out iron of this quality consequent upon the ironstone and lime having been soaked by the rains. Derbyshire and Wiltshire pigs were to-day—Thursday—in Birmingham, 48s. 6d. to 50s. per ton. Northampton pigs were 46s. 3d. to 47s. 6d. Hematites were in pretty steady sale at 65s. to 62s. 6d. The current out-turn of native pigs is going into regular consumption, but there is no increase of make. All-mine hot blast pigs remain at 65s., and cold blast at 85s. Cinder pigs are 42s. 6d. to 40s. Marked bars were quieter than of late, and the works where such iron is rolled are lsss active. At the best they are only irregularly employed. The quotations of Messrs. Noah Hingley and Sons, the head of whose firm is chairman of the Ironmasters' Association, were given as: Netherton crown best bars, £7 10s. per ton at works; best horse-shoe bars also £7 10s.; best rivet iron, £8; double best bars, £8 10s.; double best plating bars, £9; and treble best bars, £9 10s. These quotations applied to rounds and squares, ½in. to 3in., not exceeding 27ft. long; and flat bars, 1in. to 6in. wide, not exceeding 25ft. long. Angle iron up to 8 united inches, and not exceeding 25ft., was quoted £8 per ton; and T-iron £8 10s.

The new British Iron Company quoted its Lion bars at £7 10s.; Lion hoops, £8; and plates, £9 per ton at works, subject to usual extras and approval of quantities and specifications.

Enquiries for hoops are rather more numerous on United States account. Australia, Italy, Spain, and other export markets are, too, taking hoops freely; £6 15s. to £7 is quoted at works.

Best thin sheets to actual consumers were quoted by Messrs. E. P. and W. Baldwin as: Severn singles at works, £12; Baldwin Wilden B., £13; B.B., £14; B.B.B., £15; charcoal, £17 10s.; best charcoal, £20 10s.; and extra best charcoal, £22 10s.

Galvanised corrugated sheet makers reported no revival, and one or two firms have had to put their works to a stand. Prices are very varied. 24 w.g. delivered at outports may be given as about £14 per ton, with some makers quoting £14 10s.

Under the new United States tariff it is hoped that increased business in galvanised sheets will be done with that country. Messrs. Morewood and Co., of the Lion Galvanising Works, Birmingham, point out that taking the new duty on such goods to be 2½c. per lb. all round, it means a drop as here: 26 to 29 w.g., £2 6s. 8d. per ton; 21 to 25 w.g., £3 14s. 8d.; and 20 w.g. and thicker, £4 4s.

At an ironworkers' meeting at Great Bridge, near Walsall, on Monday, it was resolved that in the case of all works now subscribing to the Mill and Forge Wages' Board, every man's contribution should be raised from 3d. to 6d. per quarter. It was shown that the working of the board last year cost £460, but that under the new sliding scale arrangement the expenditure would be heavier.

A new gasworks started by the local authorities of Tipton have yielded a profit of £2600 for the first half-year's working, on an outlay of £5000. The local authorities of Smethwick have secured a net profit of £5200 on a year's working of their gas-making plant.

A committee of advice, appointed to make recommendations for the more profitable and economical working of the North Staffordshire Tramways Company, has recommended that the Wilkinson type of engine should be employed on the lines instead of the ones now in use, by which change they consider that the cost of working would be much reduced. The line runs through the Potteries. This report has been adopted by the shareholders, and the directors have been requested to carry it out.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—During the past week there has been a good deal of business doing in the pig iron market, but there has not been much actual improvement so far as prices are concerned, except to demonstrate the general conclusion to which I have referred in previous reports, that values have touched their lowest point. Consumers in some cases have been buying heavily, and there have been fairly large offers in the market on the basis of late rates, Makers, however, are now unwilling to sell, except at an advance, but it is found impracticable to realise more than about 6d. per ton above the lowest figure at which orders have recently been taken. So far as finished iron is concerned, the improvement as yet is very slight; orders are still far from plentiful, and with regard to prices, the most that can be said is that they show a tendency towards more steadiness.

There was a full attendance at Tuesday's Manchester Iron Exchange, but following the recent large buying, which in many cases has pretty well filled up consumers' present requirements, inquiries were scarcely so numerous as last week. Lancashire makers of pig iron have been booking pretty largely during the week on the basis of about 46s. 6d., less 2½ for forge and foundry qualities delivered equal to Manchester, and they are now indifferent about accepting further orders at the above figure. Nominally, 46s. 6d., less 2½, is still the quoted rate for Lancashire pig iron delivered at Manchester, but makers do not offer iron at this figure. In district brands large orders have also recently been given out chiefly for Lincolnshire forge, and this has induced makers to ask an advance of 1s. per ton. This, however, they have been unable to get, but they are firm at 6d. per ton above their lowest prices, and for delivery equal to Manchester orders cannot now be placed at under 45s. 6d. to 45s. 10d. for forge, and 46s. 10d. for foundry, less 2½. For Derbyshire and North Country iron more money is also being asked, but except for small special orders these brands are practically out of the market.

Some of the finished iron makers report that they are rather better off for orders, but as a rule they have very little work in advance. Both local and North Staffordshire bars can still be bought, delivered into the Manchester district, at £6 5s. per ton; there is, however, less anxiety to seek orders at this figure, and makers in most cases are chary about selling largely at so low a rate, whilst for forward contracts more money in all cases is required. During the week there has been some buying in hoops for shipment to America, and the prices obtained have averaged £6 15s. to £7 per ton f.o.b. at Liverpool.

The engineering branches of trade appear to be recovering from the falling off in activity which followed the close of last year. Although there are still complaints of slackness in some departments, the leading firms in nearly all the important branches throughout the district are well employed, and generally the condition of trade shows an improvement. This conclusion is borne out both by the reports I receive from the employers themselves and by the returns of the leading Trades' Union societies connected with the engineering branches of industry. The usual monthly returns just issued by the various Lancashire branches of the Amalgamated Society of Engineers show a considerable reduction in the number of men out of employment, and in the Manchester and Salford district there are now less than 2 per cent. of the members in receipt of out-of-work support. The general activity in the shipbuilding yards, not only on the Mersey, but throughout the country, which seems to be on the increase, is absorbing any surplus labour from the engineering trades in the inland districts, and good workmen are becoming difficult to obtain. Locomotive builders are not only kept busy on old contracts, but new orders are coming in freely. Tool makers have plenty of work; stationary engine builders have good orders on hand; millwrights are busy, and there is sufficient demand for men in the boiler-making trade to enable the Boiler Makers' Society to practically refuse out-of-work donation to its members. The machine-making trade appears to be the only important exception to the general state of activity, and even in this branch the principal firms are for the present fairly well off for orders, but these are being worked off more rapidly than new ones are coming in. The reports for the month just closed received from the various branches of the Steam Engine-makers' Society fully corroborate the improvement shown in the returns of the Amalgamated Society of Engineers, and, in fact, are the most satisfactory that have been received for a considerable time past. During the month there has been a decided decrease in the number of men out of employment, and throughout the whole of the branches of the society, which numbers 4600 members, there are less than forty, or under 1 per cent., in receipt of out-of-work donation. With regard to trade, it is returned good in every Lancashire district with the exception of Bury, St. Helens, and Haslingden, and throughout the country generally an equally satisfactory condition of trade is reported.

At the quarterly meeting of the Manchester Association of Employers, Foremen, and Draughtsmen held on Saturday, Mr. Thos. Ashbury, the president, in the chair, nineteen new members were proposed and admitted.

The coal trade of this district is being kept generally steady, both as regards prices and demand, by the continued cold weather, and the present output of the pits is being readily disposed of, with stocks in many cases being reduced. At the pit mouth prices remain about as under:—Best coal, 9s. 6d. to 10s; seconds, 7s. 6d. to 8s.; common house fire coals, 6s. 6d. to 7s.; steam and forge coals, 5s. 9d. to 6s. 3d.; burgy, 4s. 9d. to 5s.; ordinary slack, 3s. 6d. to 3s. 9d., and best sorts 4s. to 4s. 6d. per ton.

There is a very fair demand for shipment, but a scarcity of vessels still operates against any large business being done, and comparatively low prices are taken, steam coal delivered at the high level, Liverpool and Garston docks ranging from 7s. 9d. to 8s. per ton.

For a considerable time past there has been a good deal of complaint amongst Lancashire shippers, that the somewhat anomalous conditions under which coal is shipped at Liverpool and Garston, and under which the captains of vessels decline to specify as to weight in their bill of lading, places the Lancashire coalowner at a serious disadvantage on the foreign exchanges, where these cargoes are offered in competition against those from other parts which are sent out with a clean bill of lading. The want of a clean bill of lading also gives rise to endless disputes and reclaims from customers at the home ports. A strong effort is now being made to secure adequate facilities for weighing the wagons at Garston and Liverpool as they are discharged into the vessels, so that the shippers may insist upon the weight being specified in the bill of lading, instead of the present objectionable clause, "weight unknown," with which cargoes, under existing arrangements, have to be sent out.

Barrow.—Hematite pig iron of all descriptions is in but quiet demand, though the inquiry is stronger than of late, and I am informed that users are more than ever disposed to increase orders. It is expected by those likely to be judges that the recent heavy consignments of steel, with the large orders now on hand, will lead to a much better trade in the future in hematite pig iron than is now the case. The furnaces maintain a steady output, and despite the fact of large and increasing stocks, makers expect the production will have to be kept up, so that deliveries arranged for may be completed, as well as anticipated arrangements to be shortly made. There is no material change in values, although I have been told that to clear out stocks, sales have been been made at 51s. per ton. 52s., however, is being asked for mixed qualities of Bessemer, and 53s. for No. 1, net at works, immediate delivery. There is a good all-round output of steel, the request of railway material being particularly good; and foreign orders are plentiful. Although not particularly busy, shipbuilders tell me that inquiries are numerous, and better trade may shortly be expected. A steady demand prevails for iron ore at from 10s. to 12s. 6d. per ton at mines. Stocks are large. The coal and coke trades are steady, full prices being maintained. The shipping trade is quiet.

Messrs. Cammell and Co., of the Cyclops Iron and Steel Works, Workington, Cumberland, have purchased the royalty of the Elliscales Iron Ore Mines, Dalton-in-Furness. It will be remembered that the Messrs. Cammell are erecting very large steel works at Workington.

THE SHEFFIELD DISTRICT

(*From Our Own Correspondent.*)

THE "cold snap," which commenced a fortnight ago, promptly told upon the house coal trade. London merchants, anticipating a continuance of fine weather, had allowed their stocks to fall very low, and with the first snowstorm there came a sudden demand from householders, who had also been holding off buying with a view to laying in supplies at summer prices. House coal accumulations at the pits were soon cleared off, and in South and West Yorkshire an advance of 6d. to 1s. per ton has been secured. Of course this rise will only be temporary, as summer is too close at hand to afford any hope of its permanence.

In steam coal prices continue firm, and manufacturing fuel is also in good request. With the opening of the Baltic ports next month, the demand for these classes of coal will increase, and it is possible that prices may go up. Gas coal has recently been sold at a fair advance in rates.

An order for 16,500 tons of steel rails has just been taken by the Dowlais Company in Wales. It is for the South Australian Government. A recent order for New South Wales was taken at £5 6s. per ton, and the Dowlais quotation will not be far off that figure. The actual price to be paid to Messrs. Charles Cammell and Co., Limited, Cyclops Works, Sheffield, for their 72,000 tons of steel rails for the New South Wales Government is, I hear, £5 8s. per ton, delivered at London. The order was intended for the new works at Workington; but it is probable that operations there will not be fully commenced till August, and part of the rails may be required before then, in which case the profit will be reduced by the cost of carriage, a large item on rails at £5 8s. a ton.

It is stated that Messrs. Cammell and Co. have leased the Hematite Iron Ore Mines at Eskett, belonging to Messrs. Lindon, and the Ellescales Hematite Ore Mines at Dalton-in-Furness, belonging to Messrs. Ashbourner.

There is more movement in the iron trades, though I cannot hear of any great increase in actual business done. Local ironmasters, however, are generally well employed, except in several instances where work is carried on at a disadvantage. A large local firm—the Butterley Company—have issued a circular intimating their intention of giving up the retail iron and steel trade.

In steel the most significant item of the week is the dividend by Messrs. William Jessop and Sons, Limited, which is announced at the rate of 10 per cent. per annum, as against £9 3s. 4d. for last year. The best classes of Sheffield steel—crucible—have been in very brisk demand for months, though I hear that recently there has been considerably less pressure. Bessemer billets for cutlery purposes and for wire are very largely called for, the wire departments being exceptionally animated.

"Engineer," in a letter to the *Sheffield Daily Telegraph* this week, states that for the past thirty-five years he has been in the midst of, and intimately connected with, "the rearing up of the works of which Sheffield had only a few years ago practically a monopoly—namely, steel and iron—and to which it owed its abnormal increase of population for the period of years from 1856 to 1873. This monopoly—he adds—no longer exists, and we have a dark future before us, as the heavy trades, although dying hard, are all doomed, except for high-priced 'specialities.'" "Engineer" says that if proof of this were needed, "we need only take our largest engineering establishment, which is almost exclusively engaged, and has been these several years, in the manufacture of machinery for steel or iron works. The concern is almost pulled out of the place with orders, not one of which is for Sheffield, and every one of which will take trade from us of one kind or other." This letter is written in view of a proposed scheme of drainage for Sheffield, elaborated by Mr. Gott, C.E., Bradford, and Mr. Davidson, C.E., borough surveyor of Sheffield, and which is to cost £150,000.

The Sheffield file cutters are stubbornly resisting the proposed reduction in wages to the extent of ten per cent. The trade, which is the most powerful in Sheffield, has four unions, the largest of which—the File Cutters' Society—has 2000 adult members and 800 women and boys. They have passed a resolution that in any establishment where the reduction is enforced the men are to leave work—*i.e.*, strike.

The advices from Australia, per mail on Tuesday, were very gratifying.

The new American tariff will have the effect of "steadying things;" but the reductions are too infinitesimal to operate in any way towards an increase of Sheffield trade with the States.

The Barrow Hematite Steel Company has established a branch at Sheffield for the sale of Bessemer billets, and has appointed Mr. Wm. Griffith, who is well-known in steel circles, as their agent.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

BUSINESS was somewhat quieter at the Cleveland iron market, held at Middlesbrough on Tuesday last, but this can scarcely be a matter of surprise, when it is considered that a great number of heavy sales were made last week after a smart rise in prices. Makers are now in a much better position than they were two or three weeks ago, and are not so anxious to part with their iron. Some of them asked as much as 41s. 6d. per ton for No. 3 g.m.b., whilst others would not take less than 41s.; but 40s. 6d. per ton is the most that can be really obtained from buyers at present, and the sales made on Tuesday were at that figure.

At a meeting of ironmasters, held on Tuesday, it was decided to continue the restriction of the output of pig iron till the end of June. This will help to keep the stocks from accumulating, and will doubtless tend to stiffen prices now that there is an improved demand.

Warrants are not to be had for less than 40s. 6d. per ton f.o.b., and the business taking place in them is very limited.

The stock of Cleveland iron in Messrs. Connal's Middlesbrough stores on Monday night was 84,336 tons, being a reduction of 110 tons for the week.

The shipments have been greatly impeded by the heavy snow storms which have for several days prevailed throughout the north-eastern district, nevertheless the total for the month promises to be satisfactory. The quantity of pig iron shipped this month, up to Monday night, was 24,928 tons. In the corresponding period of last month the quantity was only 18,514 tons.

A considerable amount of business has been done in the finished iron trade since last report at prices decidedly more favourable to makers than they have lately been. Ship-plates are now £6 5s. to £6 7s. 6d. per ton; angles, £5 10s. to £5 15s.; and common bars, £5 15s. to £5 17s. 6d., all f.o.t. at works less 2½ per cent. Puddled bars are still £3 15s. per ton net at works.

The ironfounders are much busier than they were, and inquiry is brisk. It is expected that better prices will soon be obtainable now that the pig iron trade has taken a turn for the better. Some large orders for chairs have been placed lately. Mr. Charles Wood, of the Tees Ironworks, Middlesbrough, has received an order for 10,000 of his patent steel sleepers, and the necessary rails for a railway in the colonies.

The value of the exports of all goods shipped from Middlesbrough in February, other than coal and coke, but including iron, was £152,732, an increase of £11,747 compared with February, 1882.

At a meeting of ironmasters and manufacturers held at Middlesbrough on Monday last, it was resolved to invite the Iron and Steel Institute to hold their next autumn meeting at Middlesbrough. The Institute was originated at Middlesbrough in 1869.

The general committee formed to promote the establishment of a school of science for Cleveland held a meeting in the Royal Exchange, Middlesbrough, on Monday last. Mr. Isaac Lowthian Bell presided, and the report prepared by the sub-committee was read. The committee had visited the technical school at Oldham and Owen's College at Manchester, and as the result of their visits, suggested that the accommodation for the proposed school for Cleveland should include a chemical and a metallurgical laboratory and three class rooms, which could be used as lecture rooms. The building should be so designed that there could be added several more class-rooms, a physical laboratory, and a lecture hall. The committee were of opinion that the school could be erected for £6000, and maintained with an annual contribution of £800 to £1000. The committee were requested to make inquiries as to the most suitable location for the school.

The dispute between the miners and colliery owners of Northumberland has now been settled amicably by a joint committee of masters and delegates. The surface-men and underground men are to have an immediate advance of 2 and 2½ per cent. respectively, with a new sliding scale upon an improved basis. It has not yet been made known what the new basis will be.

The company which is being formed at Middlesbrough to purchase Dr. Sadler's chemical works will have a capital of £200,000, and it is said that £150,000 of this has already been subscribed. Dr. Sadler will retain a large interest in the concern and will occupy the position of managing director to the company. The company will take over the whole of Dr. Sadler's works at Middlesbrough, Barrow, Carlton, and elsewhere. The Middlesbrough works are to be enlarged, and arrangements will be made to manufacture aniline dyes, chiefly Turkey red.

Messrs. Bell Brothers, of Port Clarence, are proceeding as fast as possible with the second bore-hole at their salt works. They have also commenced to put in the foundations for their new chemical works at a short distance from the first pans which were erected. These works are for the manufacture of soda. Messrs. Bell Brothers intend to utilise waste heat from their blast furnaces for the purpose of evaporation. Two salt-pans are already being heated in this manner, and nine by hand-fired furnaces.

A meeting of delegates connected with the Ironworkers' Association was held at Darlington on Saturday last, when a resolution was passed to the effect that, on and after April 9th, the number of shifts worked at all works connected with the Board of Arbitration should not exceed ten per fortnight. Under the present arrangement eleven shifts per fortnight are worked. A second resolution was passed, declaring that the basis of price of Mr. Dale's sliding scale of 1880 was too low, and saying that, if a new scale was adopted, it should be at an advance of 7½ per cent. on Mr. Dale's scale, with a minimum rate of 7s. 9d. per ton for puddling. These two questions were discussed at a meeting of the Board of Arbitration held at Darlington on Monday, and it was ultimately decided that the question as to a new sliding scale should be referred to an arbitrator, to be chosen at an adjourned meeting, to be held at Durham on Monday next. The restriction question was temporarily withdrawn, but will, no doubt, be brought up again for further discussion shortly.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

LAST week's improvement in the warrant market has not been maintained, the prices having gradually receded to nearly the point from which they started when the advance set in. There is still, however, a fair business being done. The foreign demand for Scotch pigs is not opening out so well as could be desired, and consequently the shipments are considerably smaller than they were in March last year. The United States has been taking less pig iron, but, on the other hand, there is an improvement in the demands from Italy and some other continental nations. At home the consumption is large and steady, and there is a marked increase in the trade doing in Cleveland, as well as Scotch iron, by consumers. Since last report an additional furnace has been put in blast at the Monkland Ironworks, so there are now 113 in operation as compared with 108 at the same date last year. From this fact, together with the smaller exports, it seems evident that some of the ironmasters must be storing iron in considerable quantities, particularly as the stock in Messrs. Connal and Co.'s warrant stores continues to decrease. The reduction for the past week is over 1700 tons.

Business was done in the warrant market on Friday morning at from 47s. 8d. to 47s. 7d. cash and 47s. 10½d. to 47s. 9½d. one month, the afternoon quotations being 47s. 8½d. to 47s. 7½d. cash and 47s. 10½d. to 47s. 9½d. one month. Monday's market was a shade firmer in the forenoon, with transactions from 47s. 8d. to 47s. 9d. cash and 47s. 10½d. to 47s. 11d. one month. In the afternoon the business was at 47s. 8½d. to 47s. 9d. cash and 47s. 11d. one month. On Tuesday the quotations were from 47s. 8½d. to 47s. 7d. in the forenoon and 47s. 9d. back to 47s. 8d. in the afternoon. The market was flat on Wednesday at 47s. 7½d. to 47s. 6d. cash, and 47s. 9d. one month. To-day—Thursday—the tone was again weak, with transactions down to 47s. 5½d. cash.

The prices of makers' iron have been firmer, as follows:—Gartsherrie, f.o.b., at Glasgow, per ton, No. 1, 63s.; No. 3, 55s.; Coltness, 65s. and 55s.; Langloan, 65s. and 55s. 6d.; Summerlee, 62s. and 52s.; Chapelhall, 62s. and 54s.; Calder, 62s. 6d. and 52s.; Carnbroe, 56s. and 50s. 6d.; Clyde, 52s. and 50s.; Monkland, 49s. 6d. and 47s. 6d.; Quarter, 49s. and 47s.; Govan, at Broomielaw, 49s. 6d. and 47s. 6d.; Shotts, at Leith, 65s. and 56s.; Carron, at Grangemouth, 53s. (specially selected, 57s. 6d.) and 52s.; Kinneil, at Bo'ness, 49s. and 48s.; Glengarnock, at Ardrossan, 55s. 6d. and 49s. 6d.; Eglinton, 50s. and 47s. 6d.; and Dalmellington, 50s. 6d. and 49s. 6d.

The Bilbao Iron Company's report for the past year shows a net profit, after payments on debentures and interest, of £26,489, making, with the sum brought forward from 1881, and including amount from suspense account, a balance of £42,181. Dividends of 4 per cent. to the ordinary shareholders are recommended, while £15,000 will be carried to the reserve fund, and £1049 to next account.

Since last report there have been a number of large orders intimated as placed in the manufactured iron trade, and prices are spoken of as a shade firmer, this branch of the trade being maintained in a satisfactory condition. Iron angles are quoted at £6 to £6 2s. 6d.; ship's plates, £7 to £7 5s.; boiler plates, £7 15s.; steel angles, £8 10s.; steel ship plates, £10; and steel boiler plates, £11.

The shipments of iron manufactures from the Clyde in the past week included £6100 machinery, £4601 sewing machines, £4929 steel manufactures, and £13,500 iron manufactures, exclusive of pig iron; and there have been fresh inquiries for sugar-making machinery for Brazil and China, and there is a continuance of activity in the different departments of the engineering trade.

A very good export business is being done in coals from Glasgow and other ports on the west coast, and although an impression prevails that coals will soon be had on easier terms, the quotations as yet do not show much alteration. There is a capital inquiry for furnace coal and dross, and in some districts the cold weather has quickened the demand for household qualities. There is likewise a fair demand for steam coal for shipment. On the east coast the coal trade still lacks animation, and the mine-owners of the Mid and East Lothian have followed that of Fife in reducing the wages of their workmen. The reduction is 10 per cent., and the miners are much dissatisfied with it. Upwards of a thousand men held a meeting at Dalkeith on Saturday, at which, after a long discussion, it was resolved that the men at every colliery restrict their labour to five days of eight hours per week, starting on Monday last.

The Clyde shipbuilders have voluntarily conceded an advance of ¼d. per hour to the joiners in their employment.

At Ayr the harbour trustees have adopted plans for the construction of the requisite buildings in connection with the new ship dock recently completed.

The Greenock Harbour Trust has resolved to construct a swing bridge over the entrance to the West Harbour.

It is proposed to carry out a supplementary water scheme for the burgh of Falkirk, which will yield an additional supply of 388,000 gallons per day at a cost of about £18,000, the plans for the purpose having been prepared by Mr. Copeland, C.E., Glasgow.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

AN easier bank rate, and a reduction of the American tariff, give promise of a good spring trade in iron, and I am glad to note that things are improving; the downward movement in pig, bars, and rails has been arrested, and the market is firm again.

Several good cargoes left Welsh ports last week, including 1820 tons for India, and minor ores to Oporto and Santa Manta. The stiff competition which took place amongst iron buyers at Penydarran sale may be taken as a testimony of respect to the old ironmasters of Wales. The plant was made when shoddy had not put in an appearance in iron manufacture, and the consequence is that plates, roofing, pillars—all were made of splendid iron. In the process of breaking up I have been able to examine a good deal of the iron, and the closeness of grain is excellent. The cast iron is more like steel of the present day than any I know.

The Welsh ironmasters are busy, and there are satisfactory signs ahead that another good year is before them.

In the coal trade all is thorough activity. A full average export trade has been done at each port, and docks and railway companies have literally their hands full, and as much as they can do—sometimes more.

The agitation in favour of the Barry railway and dock has extended now to the population of the Rhondda Valley, who are moving in support under the belief that with two lines instead of one they would be able to get necessaries at cheaper rates. It seems to be overlooked that in a short time they will have three lines—Taff, Swansea, and Newport. These lines will relieve the strain also on Taff Vale and Bute Docks.

The new line, Cardiff and Monmouthshire Valleys, has passed in committee. The engineering business had been too well done to afford any but a few technical objections, and though a stubborn opposition will be given by the Tredegar estate, the Bill will go forward hopefully. I regard it as second only in hopefulness to that of the Taff Vale. Whether in respect of easy gradients and cheap working, the ironworks which will be supplied with Bilbao ore, or the rich and virgin area of coal it will touch—all seem in its favour, and the mile of sidings it will have at the Bute Docks will be another great advantage.

The Newport, Caerphilly, and Pontypridd line has been hanging fire lately on account of the difficulties in the way of finding a foundation in the Taff River. Still I must retain my opinion, the bridge, the most important part of the contract, should have been commenced in the summer. The lesson here experienced should be valuable to the builders of the still greater viaduct which the Great Western Railway Company will begin shortly over the Taff at Quakers' Yard.

The coalowners in the Forest of Dean have made overtures to their men which are likely to be taken. They offer to accept a 5 per cent. reduction, and to allow the other 5 to remain in the bank and be subject to arbitrators' decision. The question will be decided on Monday next.

The tin-plate trade may possibly look up now that iron is improving; at present it is depressed, and another serious failure is announced as forthcoming. Some of the minor ones are obliged to live on the "hand-to-mouth business," by sale of a few hundred boxes of tin-plates get a cargo of pig, work that up, and so on, *ad infinitum.*

The coal trade is very brisk at Swansea, and the time a favourable one for dispersing the coal properties now in the market. This week the plant of Dwrllas colliery and of Llanmorlais will be dispersed; horizontal winding engines included. Amongst new companies are the Brynglas Steamship Company, Alaska, and Bilbao, the first Monmouthshire, the others Cardiff promotions.

At a meeting of Rhondda colliers held this week it was decided to support the Forest of Dean men in resisting a reduction.

The Powell Duffryn Company have decided to sink a new pit between New Tredegar and Cwmsyfiog, and have intrusted it to the sinker of the Harris Deep Navigation Colliery and the Pochin Pits, Mr. Beith.

A GREAT MILL ENGINE.—Messrs. Hick, Hargreaves, and Co., Bolton, are now engaged on the construction of the most powerful cotton mill engines ever made. They are intended to work the machinery at one of the Manockjee Petit Mills, at Bombay, owned by a wealthy Parsee gentleman, named Dinshaw, and are of the horizontal type, of 4000-horse power, with high and low-pressure cylinders, and a pressure of 100 lb. per square inch, the piston speed being 720ft. per minute. The cylinders are 50in. and 84in. diameter respectively, the stroke being 8ft. The fly-wheel is of the enormous weight of 140 tons, 30ft. in diameter, and about 15ft. wide on the face, which has sixty grooves for ropes. The shaft, which is of forged steel, is hollow, its dimensions being 25in. in diameter and 25ft. in length. The low-pressure cylinder weighs 32 tons, some of the other castings weighing upwards of 25 tons each. All the latest improvements have been introduced into these engines, including Messrs. Hicks, Hargreaves, and Co.'s new patent Corliss valve gear, which is applied to both the high and low-pressure cylinders. Some portions of these engines have already reached their destination—having been shipped from Liverpool and despatched through the Suez Canal—and the remaining sections are undergoing the process of packing at the works. Some idea of their massiveness may be formed when we state that the largest cotton factory engines in Bolton do not much exceed 1000-horse power.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

6th March, 1883.

1185. Centre Boards for Sailing Vessels, W. Blakely, Bournmouth.
1186. Governors, W. Mellor, Oldham.
1187. Feed Motion of Sawing Machines, T. N. Robinson, Rochdale.
1188. Chloride of Lime, F. C. Glaser.—(*J. Fehres, Buckau, Germany.*)
1189. Runners of Umbrellas, &c., J. Imray.—(*J. B. Wilson, Philadelphia, U.S.*)
1190. Secondary Batteries, T. Rowan, London.
1191. Bricks, W. G. Hudson, Manchester.
1192. Underground Conduits for Electric Wires, A. J. Boult.—(*W. Plankinton, Milwaukee, U.S.*)
1193. Wood Polishing Machines, A. J. Boult.—(*J. L. Perry and C. A. Mather, Berlin.*)
1194. Cop Retaining Spindles, A. J. Boult.—(*W. T. Coggleshall and J. E. Rice, Lowell, U.S.*)
1195. Steam Smoothing Iron, J. McLean, Belfast.
1196. Driving Mechanism, J. Carpenter, Southampton.
1197. Secondary Piles, E. G. Brewer.—(*E. Pfeifer, Antwerp.*)
1198. Dynamo-electric Machines, C. Lever, Bowdon.
1199. Vacuum Boxes, H. Schofield, Sheffield.
1200. Lamps for Velocipedes, H. Markham and T. Brettell, Birmingham.
1201. Rope Traction Tramways, C. Findlay, London.
1202. Electric Lamps, E. and A. E. Jones, London.
1203. Files, Taps, Dies, &c., H. H. Lake.—(*M. A. Howell, jun., Chicago, U.S.*)
1204. Tongs, W. R. Lake.—(*A. S. Adams, Boston, U.S.*)
1205. Brewing, W. Lawrence, London.
1206. Pumps for Drawing Beer, &c., T. Woollerton, Leicester.
1207. Filtration, W. R. Lake.—(*J. W. Hyatt, U.S.*)
1208. Galvanic Batteries, T. Slater, London.
1209. Pumps, T. D. Kyle, London.
1210. Distilling Coal, J. Woodhead, Wakefield.
1211. Targets, F. Clarke, Canterbury.
1212. Rings for Spinning Frames, A. M. Clark.—(*G. Jaquith, Maysville, U.S.*)

7th March, 1883.

1213. Fittings for Baths, T. Bradford, Manchester.
1214. Clipping Machines, J. Range, Nottingham.
1215. Breech-loading Fire-arms, G. Macaulay-Cruikshank, Glasgow.—(*M. V. Kacer and W. J. Kriz, U.S.*)
1216. Walls, &c., G. Napier, Manchester.
1217. Production of Gas, J. F. Schnell, A. Heywood, jun., and W. Darbyshire, Manchester.
1218. Electro-magnetic Signal Apparatus, W. Morgan-Brown.—(*J. D. Gould and B. M. Plumb, New York, and G. W. Daniels, Somerville, U.S.*)
1219. Lawn Tennis Bats, R. C. Powell and F. Thompson, London.
1220. Ingot Moulds, S. Rideal, Manchester.
1221. Torpedoes, A. J. Boult.—(*A. Weeks, U.S.*)
1222. Imparting Heat to Water, J. Jameson, Newcastle-on-Tyne.
1223. Dyeing Loose Cotton Black, G. W. von Nawrocki.—(*G. Jagenburg, Rydboholm, Sweden.*)
1224. Truss for Rupture, E. M. Bourjeaurd, London.
1225. Straightening, &c., Bars, W. Gilmer, Gosforth.
1226. Anchors, C. Mace, Sunderland.
1227. Steam Generators, R. G. Rodham, London.
1228. Screw Gill Boxes, G. W. Douglas, Bradford.
1229. Producing Permanent Coloured Photographic Card Pictures, A. H. Dawes, Windermere.
1230. Setting the Teeth of Circular Saws, W. R. G. Roebuck, London.
1231. Automatic Musical Instrument, M. A. Wier, London.
1232. Tramways, E. F. Roberts, London.
1233. Barbed Fencing Wire, W. R. Lake.—(*O. P. Briggs, Chicago, U.S.*)
1234. Treating Plaster of Paris, J. M. Boekbinder, London.
1235. Lathes, W. Allan, Sunderland.
1236. Coupling for Fencing, C. J. Holroyde, Warley.
1237. Locomotive Steam Engines, J. H. Johnson.—(*T. Ricour, Paris.*)
1238. Telephonic Apparatus, S. Thompson, Bristol.
1239. Fresh Air Injector, S. Low, London.
1240. Electrical Induction Apparatus, E. Edwards.—(*M. Babillot, Montoir de Bretagne, France.*)
1241. Multitubular Steam Boilers, E. Edwards.—(*J. J. Godot, Paris.*)
1242. Preventing the Deposit of Sand, &c., in Rivers, W. R. Lake.—(*H. E. Hargreaves, Brazil.*)
1243. Hurdles, A. E. Maudslay, Littlebourne.

8th March, 1883.

1244. Consolidating Carded Asbestos Fibres, A. Hollings, Salford.
1245. Governors, W. Murdoch, Glasgow.
1246. Darning Fabrics, F. C. Glaser.—(*Mrs. E. Weiss, Breslau, Germany.*)
1247. Sharpening Pencils, J. Darling, Glasgow.
1248. Working Vehicles with Compressed Air, C. R. Stevens, Lewisham.
1249. Operating the Valves of Engines, H. J. Haddan.—(*J. P. Northey, Toronto, Canada.*)
1250. Automatic Couplings, S. Gilbert, jun., Wansford.
1251. Tricycles, &c., J. Hall, Wigton.
1252. Bale Ties, &c., E. Hale, Liverpool.
1253. Heated Rollers, J. Horrocks, Worsley.
1254. Steam Generators, H. Gerner, New York.
1255. Electric Lamps, J. G. Statter, Snapethorpe.
1256. Letter Sheet and Envelope, B. J. B. Mills.—(*R. W. Stevens and G. R. Moore, U.S.*)
1257. Shuttle-box Mechanism for Looms, J. Brownlee, Glasgow.
1258. Electrical Signalling Apparatus, W. J. Brewer, London.
1259. Velvet, &c., J. Imray.—(*A. Duquesne, Paris.*)
1260. Extracting Soluble Matters, C. D. Abel.—(*H. L. J. Parenty, Paris.*)
1261. Steel Open Socket Shovels, T. Sidaway, Brierley Hill.
1262. Adjusting Roller Axles in their Bearings, J. A. A. Buchholz, Twickenham.

9th March, 1883.

1263. Umbrellas, &c., H. Hughes.—(*R. Williams, New York, U.S.*)
1264. Automatic Gas Regulator, J. and E. Tuckett, Exeter.
1265. Hot-water Apparatus, T. C. Olney, Manchester.
1266. Supporting the Body in Case of Injury to the Spine, J. W. Guilmette, Manchester.
1267. Mechanical Telegraphs, W. Chadburn, Liverpool.
1268. Adjustable Window Flower Stands, R. Körner, Dresden, Saxony.
1269. Rocking Chairs, J. T. Simpson, Halifax.
1270. Life-saving Apparatus, R. E. Pinhey, Oxton.
1271. Sanitary Closets, C. K. Lawton, Manchester.
1272. Wheels, J. Burbridge & T. Oakley, Tottenham.
1273. Fastenings for Tiles, E. Hewitt, London.
1274. Sleepers and Rail Connections, A. J. Boult.—(*P. Dietrich, Berlin.*)
1275. Electric Lamps, J. Kelsoe, jun., Stamford, U.S.

10th March, 1883.

1276. Lamps, H. J. Haddan.—(*E. S. Piper, Canada.*)
1277. Atmospheric Air Motor, H. J. Haddan.—(*B. J. Forster, Toronto, Canada.*)
1278. Raising Mud into Carts, E. Burton, London.
1279. Cooking Utensil, J. Darling, Glasgow.
1280. Applying Hoops to Casks, T. Hooman, London.
1281. Looms, G. H. Hodgson, Bradford.
1282. Ventilating House Drains, G. E. Mineard and T. Crapper, London.
1283. Adjustable Spanners, C. Neil, Sheffield.
1284. Bricks, L. Blackburn and J. Elliott, London.
1285. Mitre-dovetailing Machines, A. J. Boult.—(*United States Box Machine Company, New York, U.S.*)
1286. Books for Advertising, R. Ripley, Liverpool.
1287. Kaleidoscopic Tops, A. A. King, London.
1288. Gun Carriages, W. R. Lake.—(*H. Gruson, Buckau-Magdeburg, Germany.*)
1289. Stirrups, W. R. Lake.—(*J. Persson, Sweden.*)
1290. Telephonic Apparatus, G. H. Bassano, A. E. Slater, and F. T. Hollins, Derby.
1291. Receptacles for Matches, G. W. von Nawrocki.—(*T. Remus, Dresden.*)
1292. Fasteners for Gloves, &c., W. R. Lake.—(*E. J. Kraetzer, Boston, U.S.*)
1293. Traction Engines, A. Greig & C. Achilles, Leeds.
1294. Railway Fog Signal Apparatus, J. Coleman and I. Henson, Derby.

12th March, 1883.

1295. Electrical Apparatus, A. R. Molison, Swansea.
1296. Crushing Sugar Canes, A. S. Brindley, New Radford, and J. Worsnop, London.
1297. Braiding Machines, W. Ashton, Manchester.
1298. Carrying Electric Wires, R. Longdon and F. B. Welch, Manchester.
1299. Cigar Cases, &c., F. MacD. Robertson and J. E. Cousté, London.
1300. Hackling Machines, J. C. Mewburn.—(*J. Cardon, Lille, France.*)
1301. Forming Cast Metal Sockets, R. Clayton, Deepfields.
1302. Door Fastenings, R. Whiston, Wolverhampton.
1303. Producing Letters on Metal, W. P. Thompson.—(*E. E. Wood, jun., Northampton, U.S.*)
1304. Horseshoes, H. J. Haddan.—(*M. Marks, U.S.*)
1305. Sewing Machines, W. Churchill, London.
1306. Spinning Fibres, E. Morley, Halifax.
1307. Looms, T. Hollingworth, Blackburn.
1308. Fire-escapes, W. Brierley.—(*J. Hall and R. B. Holdsworth, Trinidad, U.S.*)
1309. Steam Boilers, G. W. von Nawrocki.—(*E. Völcker, Bernburg, Germany.*)
1310. Bicycles, F. M. Wright, Haileybury.
1311. Steam and Air Engines, H. H. Lake.—(*F. McMellon, Boston, U.S.*)
1312. Twisting, &c., Yarns, J. Farrar, Halifax.
1313. Dynamo-electric Machines, H. H. Lake.—(*G. W. Fuller, Norwich, U.S.*)
1314. Dynamo, &c., Machines, C. W. Vincent, London.
1315. Lawn Tennis Balls, F. O. Heinrich, Wimbledon.
1316. Cutting Beans, &c., G. Clayforth, St. John's.

Inventions Protected for Six Months on Deposit of Complete Specifications.

1149. Multiple Copies of Writings, A. Paget, Loughborough.—*3rd March*, 1883.
1167. Boiler Furnaces, H. J. Haddan, Kensington, London.—A communication from E. W. van Duzen, Cincinnati, U.S.—*5th March*, 1883.
1192. Underground Conduits for Electric Wires, A. J. Boult, High Holborn, London.—A communication from W. Plankinton, Milwaukee, U.S.—*6th March*, 1883.
1193. Wood-polishing Machines, A. J. Boult, High Holborn, London.—A communication from J. L. Perry and C. A. Mather, Berlin, U.S.—*6th March*, 1883.
1204. Tongs, W. R. Lake, Southampton-buildings, London.—A communication from A. S. Adams, Boston, U.S.—*6th March*, 1883.
1207. Filtration, W. R. Lake, Southampton-buildings, London.—A communication from J. W. Hyatt, Newark, U.S.—*6th March*, 1883.
1218. Electro-magnetic Signal Apparatus, W. Morgan-Brown, Southampton-buildings, London.—A communication from J. D. Gould and B. M. Plumb, New York, and G. W. Daniels, Somerville, U.S.—*7th March*, 1883.

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

1053. Regulating the Supply of Air to Furnaces, T. S. Prideaux, Brockley.—*11th March*, 1880.
856. Securing Laths to Metal Bands, C. C. Sherry, London.—*29th February*, 1880.
981. Rivetting Machines, R. H. Tweddell, London, and J. Platt and J. Fielding, Gloucester.—*6th March*, 1880.
986. Reworking the Shearings of Iron and Steel, J. H. Rogers, Llanelly.—*6th March*, 1880.
989. Knitting Machines, W. Cotton, Loughborough.—*6th March*, 1880.
1001. Bicycle Stands, C. Wicksteed, Kettering.—*8th March*, 1880.
1207. Working Railway Points, &c., P. Black, jun., London.—*20th March*, 1880.
984. Fire-arms, J. S. Heath, Birmingham.—*6th March*, 1880.
1014. Parabolical Apparatus, F. Wirth, Frankfort-on-the-Maine.—*9th March*, 1880.
1082. Drawing, &c., Rods, G. Little, Oldham.—*12th March*, 1880.
993. Treatment of Phosphates, W. J. Williams, Chester.—*8th March*, 1880.
1027. Weaving Loongees, C. Cross, Manchester.—*9th March*, 1880.
1048. Tables, H. Halstead, Leeds.—*10th March*, 1880.
1060. Working Expansion Valves, J. Ramsbottom, Alderley Edge.—*11th March*, 1880.
990. School Desks, J. Glendenning, Thorpe.—*8th March*, 1880.
1021. Carriage Fitting, C. Woolnough, London.—*9th March*, 1880.
1051. Treating Ores, F. M. Lyte, London.—*10th March*, 1880.
1055. Regulating the Supply of Gas, J. McLennan and R. Owen, London.—*11th March*, 1880.
1056. Propelling Vessels, J. McLennan and R. Owen, London.—*11th March*, 1880.
1062. Printing Cotton Fabrics, J. King, Glasgow.—*11th March*, 1880.
1186. Cooking Ranges, D. Dow, Falkirk.—*19th March*, 1880.
1078. Recovering Soda Ash, A. Chapman, Liverpool.—*12th March*, 1880.
1098. Crucibles, &c., W. R. Lake, London.—*13th March*, 1880.
1111. Rolling Plastic Compositions, C. F. Leake, Staines.—*15th March*, 1880.
1133. Detonating Signals, T. Barrow, Liverpool.—*16th March*, 1880.
1198. Governors, H. H. Lake, London.—*19th March*, 1880.
1517. Feeding Bottles, G. Wells, London.—*13th April*, 1880.
1042. Looped Fabrics, S. Thacker, Nottingham.—*10th March*, 1880.
1122. Elevators, &c., J. Stanhope, Liverpool.—*16th March*, 1880.
1152. Spinning, J. and J. A. Marsh, Ashton-under-Lyne.—*17th March*, 1880.
1216. Microscopic Photographs, W. R. Lake, London.—*20th March*, 1880.
1217. Examining Microscopic Photographs, W. R. Lake, London.—*20th March*, 1880.

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

1111. Steam Boilers, F. G. Bone, London.—*15th March*, 1876.
970. Gas Burners, W. T. Sugg, London.—*6th March*, 1876.
1028. Armour Plates, &c., J. Yates, Rotherham.—*9th March*, 1876.
1425. Making Cakes, A. M. Clark, London.—*3rd April*, 1876.
1117. Raising, &c., Liquids, E. Körting, Hanover.—*15th March*, 1876.
1200. Washing, &c., Coal, C. Sheppard, Bridgend.—*21st March*, 1876.

Notices of Intention to Proceed wtih Applications.

(*Last day for filing opposition, 30th March*, 1883.)

5059. Electric Rotary Air Brushes, N. J. Holmes, London.—*24th October*, 1882.
5250. Valve for Baths, W. D. Scott-Moncrieff and W. Dodds, London.—*3rd November*, 1882.
5272. Coupling for Leather Hose, E. Nunan, London.—*4th November*, 1882.
5283. Transclucent Plates, W. Kennedy, Glasgow.—*6th November*, 1882.
5286. Bobbins, J. Clayton, Bradford.—*6th November*, 1882.
5289. Tightening Bolts, &c., H. Scott, Liverpool.—*6th November*, 1882.
5290. Consuming Smoke in Furnaces, F. Cheesbrough, Liverpool.—A communication from C. and H. Zacharias.—*6th November*, 1882.
5291. Spinning Wool, W. Turner, Bradford.—*6th November*, 1882.
5292. Centrifugal Separating Machines, F. H. F. Engel, London.—A communication from H. Petersen.—*6th November*, 1882.
5294. Finings for Spirit, &c., J. Blum, London.—*6th November*, 1882.
5296. Tapping Casks, G. W. von Nawrocki, Germany. Com. from A. J. Schaefer.—*6th November*, 1882.
5299. Finishing Hollow-ware, J. V. Hope, Wednesbury.—*6th November*, 1882.
5303. Purifying Sewage, F. Petri, Germany.—*6th November*, 1882.
5308. Cleaning Grain, W. R. Lake, London.—A communication from L. Gathmann.—*7th November*, 1882
5310. Cooking Ranges, J. G. Whyte, Bo'ness.—*7th November*, 1882.
5312. Gas Stoves, J. Bartlett, London.—*7th November*, 1882.
5318. Bolting Mills, W. R. Lake, London.—A communication from J. Mills, U.S.—*7th November*, 1882.
5322. Compound Plates, S. and S. R. Chatwood, Bolton.—*7th November*, 1882.
5324. Ornamenting Glass, A. J. Nash, Wordsley.—*8th November*, 1882.
5326. Opening Carriage Doors, W. H. St. Aubin, Bloxwich.—*8th November*, 1882.
5342. Wire for Securing Corks in Bottles, H. H. Lake, London.—A communication from O. R. Chaplin.—*8th November*, 1882.
5349. Miners' Safety Lamps, T. Thomas, Ynishir.—*9th November*, 1882.
5373. Electric Lamps, J. M. Bouldon, I. Probert, and A. W. Soward, London.—*10th November*, 1882.
5383. Water Supply of Baths, &c., J. J. Tylor, London.—*11th November*, 1882.
5387. Regulating Electrical Currents, P. R. Allen, London.—*11th November*, 1882.
5414. Controlling Electrical Currents, P. R. Allen, London.—*13th November*, 1882.
5437. Preserving Milk, M. E. and O. E. Pohl, Liverpool.—*15th November*, 1882.
5480. Facilitating Tipping of Coal, P. G. B. Westmacott, Newcastle-upon-Tyne.—*17th November*, 1882.
5498. Treating Duff Coal, &c., J. Jameson, Newcastle-upon-Tyne.—*18th November*, 1882.
5525. Manufacture of Sugar, H. H. Lake, London.—A communication from La Société Lebaudy Frères.—*21st November*, 1882.
5541. Rotary Engines, A. M. Clark, London.—A com. from G. Wade and J. Wardell.—*21st November*, 1882.
5682. Screens for Corn, &c., R. Boby and T. Stevens, Bury St. Edmunds.—*29th November*, 1882.
5711. Conductors for Electric Currents, W. Lake, London.—Com. from F. Fitch.—*30th November*, 1882.
5744. Automatically Regulating Electric Currents, J. T. King, Liverpool.—A communication from J. R. Finney.—*2nd December*, 1882.
5792. Digging Machines, J. Parker, Stevenage.—*5th December*, 1882.
5836. Diaphragms for Gas Governors, G. Porter, London.—*8th December*, 1882.
5873. Zinc for Preventing Corrosion in Boilers, J. B. Hannay, Glasgow.—*9th December*, 1882.
5942. Mouthpieces of Cigars, &., O. W. T. Barnsdale, Nottingham.—*13th December*, 1882.
6170. Bar-rolling Mills, J. Imray, London.—A communication from U. Haskin.—*27th December*, 1882.
630. Self-protecting Portable Saw, N. W. Wallace, Clifton.—*5th February*, 1883.
657. Lamps, R. Ogden, Manchester, and R. J. Anderson, Liverpool.—*6th February*, 1883.
675. Oven Furnaces, J. D. Kemp, London.—*7th February*, 1883.
680. Multiple Cylinder Compound Engines, R. Matthews, Hyde.—*7th February*, 1883.
686. Ploughs, &c., T. Walker, Whitstable.—*7th February*, 1883.
739. Treating Alkali Waste, J. Simpson, Liverpool.—*10th February*, 1883.
747. Treating Iron Ores, A. Adair and W. Thomlinson, Seaton Carew.—*10th February*, 1883.
761. Making of Lace, G. Bentley, Nottingham.—*12th February*, 1883.
764. Carbon Filaments, G. Bowron and W. Hibbert, London.—*12th February*, 1883.
784. Governing Steam Engines, W. Knowles, Bolton.—*13th February*, 1883.
806. Knitted Loop Fabrics, H. Kiddier, Nottingham.—*14th February*, 1883.
811. Nickel, &c., F. Lotter, Prussia.—*14th February*, 1883.
1149. Multiple Copies of Writings, A. Paget, Loughborough.—*3rd March*, 1883.

(*Last day for filing opposition, 3rd April*, 1883.)

5304. Dynamo Electricity, H. Mayhew, London.—*7th November*, 1882.
5333. Bottle Stoppers, J. J. Varley, Brixton.—*8th November*, 1882.
5338. Warming Carriages, T. Perkins, Hitchin.—*8th November*, 1882.
5339. Distributing Seed, &c., J. H. Wood, London.—A communication from Messrs. McLean Bros. and Rigg.—*8th November*, 1882.
5346. Incandescent Electric Lamps, J. Jameson, Newcastle upon-Tyne.—*9th November*, 1882.
5353. Carbons, H. C. B. Shalders, London.—*9th November*, 1882.
5354. Stretching Textile Fabrics, J. Littlewood, Newsome.—*9th November*, 1882.
5358. Transportable Baking Oven, E. A. Brydges, London.—A communication from D. Grove.—*9th November*, 1882.
5362. Lamps, &c., J. Ungar, London.—*10th November*, 1882.
5370. Packing Fresh Meat, W. Thompson, London.—A com. from M. Closset.—*10th November*, 1883.
5375. Folding Pocket Scissors, A. J. Boult, London.—A communication from Böntgeu and Sabi.—*11th November*, 1882.
5376. Guards for Saws, J. Wetter, New Wandsworth.—A communication from Gretschel and Heinemann.—*11th November*, 1882.
5377. Balls, J. Wetter, New Wandsworth.—A communication from Gretschel and Heinemann.—*11th November*, 1882.
5386. Shearing Metal Plates, A. J. Leeman, West Hartlepool.—*11th November*, 1882.
5399. Metallic Alloys, A. K. Huntington, London.—*13th November*, 1882.
5402. Steam Winches, W. Allan, Sunderland.—*13th November*, 1882.
5438. Conduction of Electric Currents, R. E. B. Crompton, London.—*15th November*, 1882.
5474. Printing Machines, W. W. Taylor, Ripon.—*17th November*, 1882.
5563. Propelling Boats, W. J. Sage, London.—*22nd November*, 1882.
5592. Cricket Bat Handles, H. J. Haddan, London.—A com. from J. C. Brodie.—*24th November*, 1882.
5599. Tricycles, H. J. Hissett, Plymouth.—*24th November*, 1882.
5615. Paper Bags, J. H. Johnson, London.—A com. from F. E. Bilon.—*25th November*, 1882.
5643. Mashing, J. and W. Biden, Gosport.—A communication from N. Pigeon.—*28th November*, 1882.
5664. Sugar-cane Shredders, J. H. Johnson, London.—A com. from J. Parker.—*28th November*, 1882.
5760. Bricks, &c., J. H. Johnson, London.—A communication from J. Darrigan.—*2nd December*, 1882.
5770. Shrapnel Shells, M. Delmard, Plumstead.—*4th December*, 1882.
6113. Armour Plates, J. H. Johnson, London.—A com. Messrs. Marrel Bros.—*21st December*, 1882.
6123. Folding Cot Carriages, T. Trotman, London.—*22nd December*, 1882.
94. Drilling Machines, W. Cooke, Dundee.—*8th January*, 1883.
382. Vehicles Propelled by the Riders, J. Watson and G. Whalley, Keighley, and T. Weatherall, Leeds.—*24th January*, 1883.
425. Valve Gear for Engines, J. Johnson, London.—A com. from G. W. Storer.—*25th January*, 1883.
510. Cutting up Plastic Substances, J. H. Johnson, London.—A communication from J. G. Baker.—*30th January*, 1883.
547. Water Gauges, J. Dewrance, London.—*1st February*, 1883.
549. Electric Brushes, M. McMullin, London.—*1st February*, 1883
556. Variable Expansion Gear, T. English, Hawley.—*1st February*, 1883.
559. Dynamo-electric Machines, W. P. Thompson, Liverpool.—A communication from J. A. I. Craig.—*1st February*, 1883.
581. Slotting Machines, H. J. Haddan, London.—A com. from L. J. Knowles.—*2nd February*, 1883
629. Voltaic Batteries, R. Larchin, London.—A communication from L. Hartmann.—*5th February*, 1883.
671. Lubricators, H. J. Haddan, London.—A communication from A. W. Swift.—*7th February*, 1883.
677. Boiler Furnaces, A. Pinkerton, Glasgow.—*7th February*, 1883.
701. File Cutting, P. Ewens, Cheltenham.—*8th February*, 1883.
713. Hose Reels, J. T. Foot, London.—*9th February*, 1883.
795. Fastenings for Purses, F., H., and F. Dowler, Aston.—*13th February*, 1883.
817. Brass Bobbin Winding Engines, J. Mosley, New Basford.—*14th February*, 1883.
818. Spoked Wheels, E. Dearden, Darnall.—*14th February*, 1883.
823. Fire-arms, F. Beesley, London.—*14th February*, 1883.
832. Raising Weights, &c., W. R. Lake, London.—A communication from A. S. de la Pena and L. Drumen.—*15th February*, 1883.
847. Treating Steel Ingots, J. Gjers, Middlesbrough-on-Tees.—*15th February*, 1883.
1066. Metallic Strip-blanks, T. V. Allis, New York, U.S.—*27th February*, 1883.
1120. Telephones, W. R. Lake, London.—A communication from E. Holmes and E. T. Greenfield, U.S.—*1st March*, 1883.
1135. Electrical Accumulators, W. Lake, London.—A com. from N. S. Keith.—*2nd March*, 1883.
1192. Underground Conduits, A. J. Boult, London.—A com. from W. Plankinton.—*6th March*, 1883.
1193. Wood Polishing, A. J. Boult, London.—Com. from J. Perry & C. Mather.—*6th March*, 1883.
1204. Tongs, W. R. Lake, London.—A communication from A. S. Adams.—*6th March*, 1883.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 9th March*, 1883.)

4315. Boilers, &c., M. J. O'Riordan, Cork.—*11th September*, 1882.
4323. Vegetable Parchment, H. Hymans, London.—*12th September*, 1882.
4329. Starting, &c., Engines, W. H. Allen, R. Wright, and W. L. Williams, London.—*12th September*, 1882.
4334. Boiler Furnaces, J. R. Russell, Glasgow.—*12th September*, 1882.
4335. Hulling, &c., Rice, J. R. Russell, Glasgow.—*12th September*, 1882.
4337. Thread-winding, J. W. Shepherd and W. Ayrton, Longsight, and S. Hallam, Manchester.—*12th September*, 1882.
4347. Stoppering Bottles, A. J. T. Wild, London.—*12th September*, 1882.
4352. Electrodes, W. Sinnock, New Cross-road.—*13th September*, 1882.
4353. Opening, &c., Fanlights, H. Pearce, London.—*13th September*, 1882.
4354. Endless Platforms of Grain Straw Binding, &c., Machines, P. Robinson, Saxby.—*13th September*, 1882.
4360. Wool Combing, T. H. Wharton and R. Smith, Bradford.—*13th September*, 1882.
4361. Self-acting Mules, J. Dransfield and J. Issett, Dewsbury.—*13th September*, 1882.
4365. Feed Motions for Turning Lathes, T. Shanks, jun., Johnstone.—*14th September*, 1882.
4371. Dyeing Hanks, J. Conlong, Blackburn.—*14th September*, 1882.
4384. Preparing, &c., Cotton, T. Berry, Rochdale.—*14th September*, 1882.
4391. Plates for Secondary Batteries, N. C. Cookson, Newcastle-upon-Tyne.—*15th September*, 1882.
4404. Electric Lamps, H. H. Lake, London.—*15th September*, 1882.
4409. Coupling Railway Carriages, T. A. Brocklebank, London.—*16th September*, 1882.
4450. Porcelain, &c., Insulators, W. E. Langdon, Derby, and J. C. and G. Fuller, Bow.—*19th September*, 1882.
4457. Connecting Lamps to Bicycles, J. Lucas, Birmingham.—*19th September*, 1882.
4516. Fire-arms, W. W. Greener, Birmingham.—*21st September*, 1882.
4527. Electro-magnetic Engraving Machines, B. J. Carter, London.—*22nd September*, 1882.
4535. Dynamo-electric Machines, F. C. Glaser, Berlin.—*23rd September*, 1882.
4621. Slide-valve Expansion, &c., W. R. Lake, London.—*28th September*, 1882.
4697. Making Gas, A. Wilson, Handsworth.—*3rd October*, 1882.
4752. Fluorescent Electric Lighting, R. Kennedy, Glasgow.—*6th October*, 1882.
4779. Synchronous Movements, F. Wolff, Denmark.—*7th October*, 1882.
4790. Velocipedes, G. W. Quatremaine, Stratford-on-Avon.—*7th October*, 1882.
5151. Iron and Steel, E. F. Göransson, Stockholm.—*30th October*, 1882.
5492. Electric Light Switches, C. Maynard, London.—*18th November*, 1882.
5685. Walls, &c., F. Smith, London.—*29th November*, 1882.
5772. Fireproof Ceilings, R. W. Hitchins, London.—*4th December*, 1882.
5778. Window Sash Fastenings, J. D. Sprague, Upper Norwood.—*5th December*, 1882.
5835. Utilising Slags, C. Pieper, Berlin.—*7th December*, 1882.
6129. Inserting Type in Stereotype Plates, J. E. Taylor, P. Allen, W. Evans, and C. P. Scott, Manchester.—*22nd December*, 1882.
127. Looms, &c., W. E. Gedge, London.—*9th January*, 1883.
267. Knitting Machines, J. Adams, Philadelphia.—*17th January*, 1883.

(List of Letters Patent which passed the Great Seal on the 13th March, 1883.)

3853. Electric Lamps, G. Drayton and S. Gedge, London.—*28th July*, 1882.
4138. Deodorising, &c., G. Nobes, London.—*30th August*, 1882.
4367. Electric Lighting, W. Morgan-Brown, London. —*14th September*, 1882.
4370. Grinding, &c., H. Slack, Sheffield.—*14th September*, 1882.
4389. Stoppering Bottles, &c., J. J. Rawley, London. —*15th September*, 1882.
4396. Making of Alloys, A. Guye, London.—*15th September*, 1882.
4398. Pickers for Weaving, I. Sowden, Bradford.— *15th September*, 1882.
4406. Making Moulds, J. V. Hope, Wednesbury.—*15th September*, 1882.
4412. Locking Signals, &c., S. Brear and A. Hudson, Bradford.—*16th September*, 1882.
4417. Friction Clutches, W. A. Barlow, London.— —*16th September*, 1882.
4419. Electric Arc Lamps, J. Brockie, Brixton.—*16th September*, 1882.
4420. Gaseliers, &c., M. Merichenski, London.—*16th September*, 1882.
4423. Preserving Wood, W. R. Lake, London.—*16th September*, 1882.
4426. Pumps, T. Willoughby, London.—*18th September*, 1882.
4427. Valves, W. Lloyd, Newport.—*18th September*, 1882.
4478. Self-acting Tackle Hooks, J. T. Roe, Wandsworth.—*20th September*, 1882.
4490. Secondary Batteries, A. Khotinsky, London. —*20th September*, 1882.
4500. Doubling, J. and J. Horrocks, Manchester.— *21st September*, 1882.
4529. Paper Pulp, W. R. Lake, London.—*22nd September*, 1882.
4530. Coupling Apparatus, A. W. L. Reddie, London. —*22nd September*, 1882.
4532. Regulating Currents, W. E. Ayrton and J. Perry, London.—*23rd September*, 1882.
4589. Corset Busks, C. A. Snow, Washington, U.S.— *23rd September*, 1882.
4606. Compound Vacuum Pumps, J. H. Johnson, London.—*28th September*, 1882.
4624. Rolling Mills, W. R. Lake, London.—*28th September*, 1882.
4660. Operating on Atmosphere in Ice Chambers, W. W. Nightingale, Southport.—*30th September*, 1882.
4680. Dynamo-electric Machines, J. S. Beeman, W. Taylor, and F. King, London.—*2nd October*, 1882.
4692. Bi-carbonate of Soda, A. W. L. Reddie, London.—*3rd October*, 1882.
4701. Appliance for Swimming, J. Imray, London. —*3rd October*, 1882.
4720. Spinning Cotton, T. Coulthard, Preston.—*4th October*, 1882.
4912. Perambulators, T. F. Simmons, Ardencote.— *16th October*, 1882.
5275. Millstone, W. R. Lake, London.—*4th November*, 1882.
5466. Soap, &c., W. P. Thompson, London.—*16th November*, 1882.
5549. Saucepan Handles, E. Baldwin, Stourport.— *22nd November*, 1882.
5697. Moulds for Pipes, J. and F. Chambers, near Nottingham.—*30th November*, 1882.
5764. Furnaces, J. C. Brentnall, Timperley.—*4th December*, 1882.
5809. Treating Hydrochloric Acid, J. Hargreaves, Widnes.—*6th December*, 1882.
5837. Bending Metallic Plates, C. Scriven, Leeds.— *7th December*, 1882.
5848. Indurating Artificial Stone, J. W. Butler, Blackheath.—*7th December*, 1882.
6208. Substitutes for Barm, A. Esilman, Manchester, and H. Esilman, Glasgow.—*29th December*, 1882.
6232. Treating India-rubber, H. Gerner, London.— —*30th December*, 1882.
34. Electric Lamps, W. R. Lake, London.—*2nd January*, 1883.
46. Incandescent Electric Lamps, J. Williamson and E. Böhm, London.—*3rd January*, 1883.
307. Alarm Guns, W. Burgess, Malvern Wells.—*18th January*, 1883.

List of Specifications published during the week ending March 10th, 1883.

5024*, 4d.; 2485, 2d.; 3123, 2d.; 3307, 8d.; 3347, 6d.; 3359, 6d.; 3375, 6d.; 3380, 8d.; 3393, 6d.; 3394, 2d.; 3408, 10d.; 3414, 6d.; 3417, 6d.; 3420, 6d.; 3421, 8d.; 3124, 6d.; 3432, 6d.; 3434, 6d.; 3440, 6d.; 3441, 10d.; 3450, 2d.; 3451, 6d.; 3454, 4d.; 3455, 6d.; 3456, 6d.; 3461, 6d.; 3465, 6d.; 3371, 6d.; 3477, 6d ; 3478, 10d.; 3484, 6d.; 3486, 6d.; 3492, 6d.; 3495, 8d.; 3498, 4d.; 3499, 6d.; 3502, 8d.; 3505, 6d.; 3507, 6d.; 3508, 6d.; 3509, 6d.; 3510, 2d.; 3521, 6d.; 3513, 2d.; 3517, 1s. 4d.; 3523, 2d.; 3526, 6d.; 3532, 6d.; 3533, 6d.; 3533, 6d.; 3537, 6d.; 3538, 6d.; 3542, 6d.; 3546, 2d.; 3547, 6d.; 3549, 2d.; 3552, 6d.; 3554, 2d.; 3559, 8d.; 3563, 8d.; 3566, 8d.; 3567, 6d.; 3568, 6d.; 3569, 4d.; 3571, 6d.; 3572, 6d.; 3573, 2d.; 3578, 8d ; 3579, 8d.; 3580, 2d.; 3582, 2d.; 3584, 2d.; 3585, 4d.; 3586, 6d.; 3588, 6d.; 3592, 10d ; 3594, 2d ; 3596, 10d.; 3597, 6d.; 3599, 6d.; 3600, 6d.; 3602, 2d.; 3604, 2d.; 3605, 2d.; 3607, 2d.; 3608, 4d.; 3609, 6d.; 3611, 4d.; 3617, 6d.; 3626, 2d.; 3627, 6d ; 3630, 8d.; 3636, 2d ; 3640, 6d.; 3641, 2d.; 3660, 6d.; 3670, 2d.; 3702, 4d.; 3731, 4d.; 4258, 8d.; 4590, 4d.; 4679, 6d.; 5136, 4d.; 5564, 6d.; 5673, 8d ; 5695, 6d.; 5723, 6d.; 5850, 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.*

2485. Dust-collecting or Air Filtering Apparatus, *L. Fiechter, Minneapolis.—25th May*, 1882. —*(A communication from Kirk and Fender, Minneapolis.)—(Not proceeded with.)* 2*d.*

This consists, First, in a series of extremely steep ridges of filtering cloth projecting upward from a chamber below, into which they open. Secondly, the chamber or box below for receiving the air to be filtered. Thirdly, a screw with a single endless thread going the full length of the chamber, and provided with a nut or carriage riding on the screw, so that by the constant turning of the screw in one direction, the carriage may be slowly carried backwards and forwards the length of the chamber. Other improvements are described.

3123. Syphon for Drawing Off Liquids, *F. Sara, Plymouth.—1st June*, 1882.—*(Void.)* 2*d.*

This consists in the combination of means for charging the syphon with liquid, and thereby displacing the air contained in order to establish its action, instead of exhausting the air.

3307. Rotary Steam Engines and Pumps, *P. Goldschmidt, G. Hahlo, and A. Heussy, Manchester.— 12th July*, 1882. 8*d.*

This relates to a means for balancing the pressure exerted on the faces of the working revolvers.

3359. Apparatus for the Manufacture of Artificial Cream, *J. Van den Bergh, London.—15th July*, 1882. 6*d.*

This consists of a cylinder having a number of points or projections on the exterior surface thereof, which cylinder is so arranged within a close-fitting shell or case, as to be capable of being rapidly revolved therein.

3347. Making, Finishing, and Drying Fire-clay or Stoneware Sanitary Socketted Tubes or Pipes, *P. L. Noel, Cardiff.—14th July*, 1882. 6*d.*

This relates to improvements in process of making, &c.

3375. Apparatus for Obtaining Motive Power for Propelling Vessels, Pumping, &c., *H. Robinson, Manchester.—15th July*, 1882. 6*d.*

This relates to improvements in the general construction of the machine.

3394. Coverings for Pipes, Boilers, &c., *E. K. Leadbetter, Upton Park.—17th July*, 1882. 2*d.*

This relates to the employment of a mixture of plaster of Paris with mineral or vegetable fibre, reduced to a semi-fluid condition by water, which mixture is poured into moulds.

3408. Looms for Weaving, *R. L. Hattersley and J. Hill, Keighley.—18th July*, 1882. 10*d.*

This relates, First, to an arrangement of mechanism for operating rising or oscillating shuttle-boxes; Secondly, to mechanism for operating the picking apparatus; Thirdly, to mechanism for indicating the change of the shuttle-boxes and picking of shuttles in looms; Fourthly, to apparatus for operating the ordinary square barrel employed in jacquard apparatus for carrying chains of perforated cards.

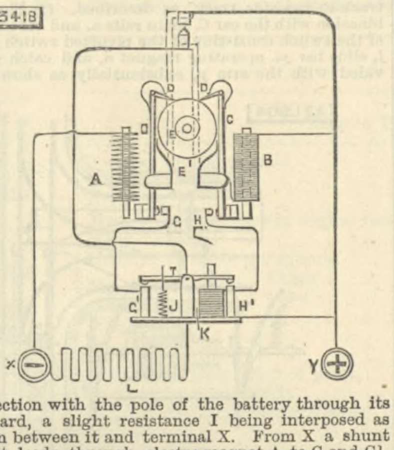
3417. Mineral Water Bottles and Stoppers, &c., *J. C. Cook, Bermondsey.—18th July*, 1882. 6*d.*

This relates to improvements in the form of the neck and shoulder or upper part of a mineral water bottle; also in the stopper, and in the application of metal caps thereto for stoppering or closing the same.

3418. Electric Arc Lamps, *S. Z. de Ferranti, Shepherd's Bush, and A. Thompson, Russell-square. —18th July*, 1882. 6*d.*

This relates to the regulation of arc lamps and also electric currents generally. The figure gives a diagram of the working of the apparatus. Electro-magnets A and B attract their armatures and so actuate pawls D by means of levers C. The pawls move ratchet wheels, one only of which is shown, which actuate the carbons. When the armatures are not attracted they make contact at G and H, which are connected to G^1 and H^1, these latter being in proximity to rocking lever I. This lever is always in

3418



connection with the pole of the battery through its standard, a slight resistance I being interposed as shown between it and terminal X. From X a shunt circuit leads through electro-magnet A to G and G^1. When the spring J overcomes magnet K, the lever makes contact with G^1, the shunt circuit through A is completed and its armature made to vibrate, whereby E is turned and the carbons separated. A part of the current, however, is always passing through K to V, so that when the arc gets too long, K is more and more energised, overcomes spring J, tilts the lever I, and completes the circuit through electro-magnet B, causing the carbons to approach by means of the armature, lever, pawl, and axis E^1, not shown in the figure.

3421. Railway Carriages, *W. P. Thompson, Liverpool.—18th July*, 1882.—*(A communication from the Rev. A. H. Munro, Montreal.)* 8*d.*

This relates to the arrangement of the compartments and seats.

3424. Mallets for Corking Bottles, &c., *A. S. Kershaw, Rochdale.—19th July*, 1882. 6*d.*

This relates to the combination with a mallet of metal or wood, or of metal and wood, of india-rubber or other flexible or elastic substance.

3432. Screw Propellers, *E. G. Brewer, London.— 19th July*, 1882.—*(A communication from G. Hoper, Iserlohn, Germany.)* 6*d.*

The blades are cast singly and with prolonged ends. The latter are placed into the mould—by preference chill mould—of the boss, the metal of which is then cast around such ends.

3440. Apparatus for Drying Coffee, *F. H. F. Engel, Hamburg.—19th July*, 1882.—*(A communication from F. Klée, Hamburg.)* 6*d.*

This relates to the combination in a coffee-drying apparatus of a double drum with a heating arrangement and regulating cover, for closing or opening the end of the free space between the two drums.

3450. Instrument for Recording the Direction of the Wind, *O. Ber, Russia.—20th July*, 1882.— *(Not proceeded with.)* 2*d.*

This relates to the construction of an instrument whereby the direction of the wind is constantly and permanently recorded or marked on dials.

3451. Life-saving and Swimming Apparatus, *A. I. Rath, Manchester.—20th July*, 1882. 6*d.*

This consists of a waterproof belt with air chamber.

3454. Arrangement of Covers and Backs of Account Books, *J. H. Linsey, London.—20th July*, 1882. 4*d.*

The object is to so arrange the covers and backs of account books that the leaves or sections of the book when opened shall be perfectly flat on both sides, at whatever part the book may be opened.

3456. Apparatus for Closing the Mouths of Bottles, &c., *C. E. H. Cheswright, London.—20th July*, 1882. 6*d.*

This relates to the employment of screw stoppers.

3461. Valvular Details of Domestic Apparatus for Supply, &c., of Water, *J. Shanks, Barrhead. —21st July*, 1882. 6*d.*

This relates to improvements in the construction of valves for supplying hot and cold water.

3471. Knives and Forks, *H. Fielding, Birmingham. —21st July*, 1882. 6*d.*

This consists in making concave depressions in the opposite broader sides of the handles.

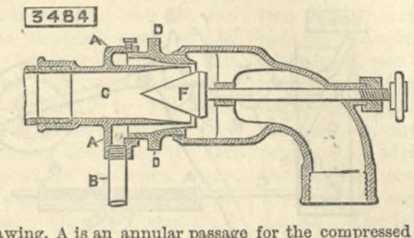
3477. Treating and Preparing Clay, &c., *J. Gillespie, Garnkirk, N.B.—21st July*, 1882. 6*d.*

This comprises, First, a method of expelling air from clay; Secondly, the admixture of moss or peat earth with the clay; Thirdly, means or appliances for supporting clay ware when in its condition in course of manufacture; Fourthly, the shaping or forming of certain articles of clay ware; Fifthly, the making or rendering air-tight or water-tight, and imparting extra strength to pipes or tanks or other articles of clay ware intended for holding or conveying liquids.

3484. Ejector Nozzles for Air, &c., *J. L. Norton, Piccadilly, and J. Sturgeon, Victoria-street.—21st July*, 1882. 6*d.*

The object is to produce currents of air by means of jets so applied as to create a partial vacuum or draft, tending to draw forward the air within its influence, and it consists, First, in forming the jet nozzle so as to produce a thin jet of compressed air of unbroken annular form, so as to present a larger circumference to act upon the outer air than in ordinary jets, and to enable both the outer and inner circumference of the jet to act on the surrounding air; and Secondly, in improved modes of controlling and regulating the velocity and force of the air forming the jet. In the

3484



drawing, A is an annular passage for the compressed air, which is fed through pipe B; C is a tube for the free air, and D is an adjustable portion of the nozzle, which can be fixed in position by a set screw. The adjustable cone F for contracting the free air orifice is actuated by a hand wheel and screw.

3486. Ventilating Appliances, *J. Leather, Liverpool. —22nd July*, 1882. 6*d.*

This relates to ventilating appliances consisting of a rectangular or equivalent box or enclosure provided with air ways and doors or their equivalents.

3492. Mechanism for Signalling, *H. J. Haddan. Kensington.—22nd July*, 1882.—*(A communication from A. and E. F. Webster, Waltham, U.S.)* 6*d.*

This relates to mechanism for the production of sound signals to indicate the course of a vessel.

3495. Connecting Links for Chains and Cables, *J. H. Shoebotham and J. F. C. James, Birmingham. —22nd July*, 1882. 8*d.*

This relates to links which are provided with projecting horns.

3498. Metallising Cloth, &c., *A. J. Boult, London. —22nd July*, 1882.—*(A communication from J. Hautrive, Lille, France.)* 4*d.*

After having received a coat of mordant mixed with white lead, the cloth, &c., to be metallised is powdered with particles of lead, and when the layer is dry the lead is rolled upon the cloth so as to obtain a homogeneous layer. Other metals may be employed.

3499. Elevators for Elevating Grain, &c., *J. McAuley, Bootle.—22nd July*, 1882. 6*d.*

This relates to elevators consisting of a hollow trunk or casing erected in position where the grain is afterwards stored around it, and provided with internal chain of buckets and with sliding gates or sluices or their equivalent at the bottom to admit the grain.

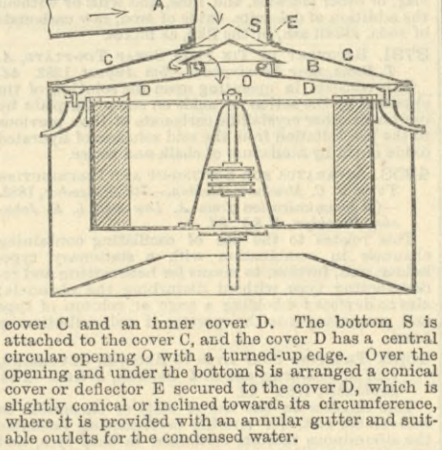
3502. Fuel Economisers, *J. G. Perkin and J. Scott, Wakefield.—22nd July*, 1882. 8*d.*

This relates partly to means for cleansing and scraping the tubes.

3505. Centrifugal Machines or Apparatus for the Manufacture or Treatment of Sugar, *J. H. Johnson, London.—24th July*, 1882.—*(A communication from M. Weinrich, Vienna.)* 6*d.*

This relates to a centrifugal machine in which steam is used for liquoring or whitening sugar, and it consists in providing means for separating watery particles from the steam, so that only dry steam comes in contact with the sugar. The steam is conducted by pipe A to dome H, the bottom of which is fitted with a conical sieve S, through the perforations of which the steam passes to a space B between the external

3505



cover C and an inner cover D. The bottom S is attached to the cover C, and the cover D has a central circular opening O with a turned-up edge. Over the opening and under the bottom S is arranged a conical cover or deflector E secured to the cover D, which is slightly conical or inclined towards its circumference, where it is provided with an annular gutter and suitable outlets for the condensed water.

3507. Railway Chairs, *J. Revell, Dukinfield.—24th July*, 1882. 6*d.*

This consists, First, in the formation of diagonal spike holes in the chair through which the spikes are driven in a diagonal direction into the sleeper; Secondly, the use and adaptation of a wedge-shaped coupling plate with lugs to clip the lower part of the chair and provided with one or more studs; Thirdly, the use of a wedging key of wood or metal or both combined, and provided with an iron locking bar.

3509. Drawing Rollers for Spinning Machines, *A. J. Boult, London.—24th July*, 1882.—*(A communication from C. Jenatzy-Leleux, Schaerbeeck-les-Bruxelles.)* 6*d.*

The drawing roller is made in two halves so as to be divisible at its periphery. One of these halves has a male screw thread, the other a female one, so that they may be firmly connected.

3511. Flush Cisterns, &c., *W. Wright, Plymouth.— 24th July*, 1882. 2*d.*

This relates to an arrangement of a float and levers which control the valves.

3517. Burglar-proof Safes, *W. Corliss, Providence, U.S.—25th July*, 1882. 1*s.* 4*d.*

This relates to improvements in the general construction of safes.

3523. Regenerative Gas Burners for Heating Purposes, *D. and W. H. Thompson and W. J. Booer, Leeds.—25th July*, 1882.—*(Void.)* 2*d.*

This relates to a pipe which is open to the atmosphere at its lower end, and at which end the nozzle of the gaspipe is inserted in the usual manner.

3526. Direct-acting Rotary Engine and Pump, *E. G. Brewer, London.—25th July*, 1882.—*(A communication from S. Marcus, Vienna.)* 6*d.*

This consists in a uniformly toothed spur wheel, gearing with an internally uniformly toothed ring which is enclosed in a box or cylinder, and adapted to turn freely round its geometrical axis close against the inner periphery of the cylinder, so that when the spur wheel is set in motion by a crank or otherwise, the ring also is turned in combination with a block piece which divides the free space between ring and wheel in two separate chambers, one of which works as a suction chamber, and the other as a delivery chamber, the admission and discharge taking place at the bottom of the pumps, and the circumference of the same being entirely closed.

3533. Taps, *W. Hunt, Scarborough.—25th July*, 1882. 6*d.*

This relates to the employment of a double purpose valve which closes the passage through the tap and opens the relief passage when screwed one way, and closes the relief passage and opens the passage through the tap when screwed the other way.

3537. Machines for Cutting and Punching Metal Washers, &c., *W. P. Thompson, Liverpool.—25th July*, 1882.—*(A communication from E. Salomon and E. Armant, Montreal.)* 6*d.*

The object is to perform the work of cutting and punching in one operation and flatten out all ragged edges, and to turn out an article finished in every respect and ready for the use to which it is to be applied.

3538. Permanent Way of Railways, &c., *A. M. Clark, London.—25th July*, 1882.—*(A communication from J. Elmer, Biloxi, U.S.)* 6*d.*

This relates to the construction of railway rails and in the means of jointing them together, and of securing them to the sleepers. It also relates to the wheels to run on the rails.

3542. Machines for Washing and Rinsing Fabrics, *B. Davies, Adlington, and J. Eckersley, Blackrod.— 26th July*, 1882. 6*d.*

This consists principally in placing beneath the bottom squeezing roller an additional box or auxiliary cistern fitted with two small rollers at or near the bottom, and a guide above having several openings or eyes made of or lined with glazed earthenware or brass.

3546. Apparatus for Demonstrating the Motion of the Earth, &c., *H. J. Haddan, Kensington.— 26th July*, 1882.—*(A communication from G. Rudholzner, Germany.)—(Not proceeded with.)* 2*d.*

This consists in apparatus for illustrating a new theory on the motion of the earth and other planets.

3549. Apparatus for Discharging or Throwing Projectiles, *W. A. Barlow, London.—26th July*, 1882.—*(A communication from A. J. Krebs, Vienna.) —(Not proceeded with.)* 2*d.*

This relates to a device for throwing or propelling projectiles having the form of an archimedean screw, which projectiles are intended to be used in place of the grass balls and similar devices for shooting practice.

3552. Apparatus for Separating Grain, &c., *W. R. Lake, London.—26th July*, 1882.—*(A communication from C. E. McNeal, Silver Creek, New York.)* 6*d.*

This relates to improvements in the general arrangements of the parts.

3554. Ventilators, *J. L. Thomasson, Worcester.— 26th July*, 1882.—*(Not proceeded with.)* 2*d.*

This relates to the employment of a corbel fitted internally with a number of square or oblong air passages having an upward inclination, and radiating from the interior to the exterior thereof.

3559. Locking Devices for Carriage Doors, &c., *H. J. Haddan, Kensington.—27th July*, 1882.—*(A communication from J. B. Fondu-Bloemendal, Vilvorde, Belgium.)* 8*d.*

This consists partly in providing and applying a falling-latch which acts automatically when the door is closed, and an indicator in the interior of the carriage for enabling the passengers to see at a glance whether the safety bolt is opened or closed; a lever is placed inside the carriage to enable the passengers to close the safety bolt without inconvenience.

3563. Regenerative Furnaces, *A. Beard, Swansea. —27th July*, 1882. 8*d.*

This consists, First, in supporting or building the regenerator and parts connected with it above the furnace proper; Secondly, in combination with regenerative furnaces of a steam boiler, preferably vertical, and devices connected with the boiler, whereby the waste heat from the regenerative furnaces may be conveyed to and utilised for heating the boiler, and when required the waste heat supplemented by gaseous fuel.

3566. Looms for Weaving, *T. Singleton, Darwen.— 27th July*, 1882. 8*d.*

This relates to several improvements in the construction of the loom.

3567. Pocket Cases for Cigars, &c., *P. Everitt, London.—27th July*, 1882. 6*d.*

This relates to a case for cigars, &c., which is provided with a shifting tablet or calendar.

3568. Hoes for Hoeing Turnips, &c., *J. P. Goss and F. Savage, King's Lynn.—27th July*, 1882. 6*d.*

This consists in providing auxiliary hoes with raised points and outwardly inclined edges, to work close up to the rows on their first appearance above the ground.

3569. Finishing Textile Fabrics, *W. W. Blackett, Leeds.—27th July*, 1882. 4*d.*

This consists in the use and employment of chloride of calcium, chloride of iron, and white arsenic, separately or in combination.

3571. Machinery for Breaking or Crushing Stone, &c., *G. Dalton, Leeds.—27th July*, 1882. 6*d.*

This consists, First, in the employment of toggle levers set at different angles for operating the movable jaw or jaws; Secondly, the combination with crushing or disintegrating machinery of a rotating screen or sieve, provided with means for imparting a vibratory or shaking motion in addition to the rotary motion.

3572. Clocks, &c., *W. R. Lake, London.—27th July*, 1882.—*(A communication from R. W. Willson, New Haven.)* 6*d.*

This consists partly in the combination with a clock movement, of mechanism for causing the time wheel to be engaged with or disengaged from the time movement, the said mechanism being arranged in an electric or other impulse-transmitting circuit, and mechanism for turning the time wheel independently of the time movement, when the said time wheel is disengaged therefrom.

3573. Ornamental Windows and other Translucent Objects, &c., *A. L. Liberty, London.—27th July*, 1882.—*(Not proceeded with.)* 2*d.*

This relates to the construction of ornamental windows, &c., requiring or not requiring translucency, and in the mode of fixing glass or other reflecting substance therein.

3578. Impregnating Wood, *W. P. Thompson, Liverpool.—27th July*, 1882.—*(A communication from L. Libert de Paradis, Vienna.)* 8*d.*

This relates to improvements in the methods of, and means for impregnating or "pickling" wood, so as to remove from the same those substances that are liable to cause decomposition therein, to extract all moisture, and, moreover, to saturate the cellular tissues with a powerful antiseptic, leaving ultimately a resinous covering or coating on said tissues. The wood treated will become durable, and capable of bearing greater strains.

3579. Locomotive Engines, *J. B. Fell, near Ulverston.—28th July*, 1882. 8*d.*

This relates partly to the combination of two separate but connected railway carriages, upon one of which the boiler and connected parts are placed, and upon the other the engine or steam cylinders, water tank, coal bunkers, and connected parts are placed.

3580. Spinning Machinery, *J. Holmes, Allerton.— 28th July*, 1882.—*(Not proceeded with.)* 2*d.*

The object is the production of softer roving and yarn having fewer turns to the inch, and with less breakages than is obtained by machines as ordinarily constructed.

3584. Pianofortes, *W. A. Waddington, York—28th July*, 1882.—*(Not proceeded with.)* 2*d.*

A metal bar is fastened to the pianoforte frame, and made to push or pull at the bottom part of the pianoforte sound-board to assist in supporting the pressure of the strings upon the bridge that is fixed to the sound-board.

3585. Facilitating Reference to Dictionaries, &c., *A. Gerken, London.—28th July*, 1882. 4*d.*

This relates to the employment of a box provided with spiral or other springs arranged to press upon a

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

6th March, 1883.

1185. Centre Boards for Sailing Vessels, W. Blakely, Bournmouth.

1186. Governors, W. Mellor, Oldham.

1187. Feed Motion of Sawing Machines, T. N. Robinson, Rochdale.

1188. Chloride of Lime, F. C. Glaser.—(*J. Fehres, Buckau, Germany.*)

1189. Runners of Umbrellas, &c., J. Imray.—(*J. B. Wilson, Philadelphia, U.S.*)

1190. Secondary Batteries, T. Rowan, London.

1191. Bricks, W. G. Hudson, Manchester.

1192. Underground Conduits for Electric Wires, A. J. Boult.—(*W. Plankinton, Milwaukee, U.S.*)

1193. Wood Polishing Machines, A. J. Boult.—(*J. L. Perry and C. A. Mather, Berlin.*)

1194. Cop Retaining Spindles, A. J. Boult.—(*W. T. Coggleshall and J. E. Rice, Lowell, U.S.*)

1195. Steam Smoothing Iron, J. McLean, Belfast.

1196. Driving Mechanism, J. Carpenter, Southampton.

1197. Secondary Piles, E. G. Brewer.—(*E. Pfeifer, Antwerp.*)

1198. Dynamo-electric Machines, C. Lever, Bowdon.

1199. Vacuum Boxes, H. Schofield, Sheffield.

1200. Lamps for Velocipedes, H. Markham and T. Brettell, Birmingham.

1201. Rope Traction Tramways, C. Findlay, London.

1202. Electric Lamps, E. and A. E. Jones, London.

1203. Files, Taps, Dies, &c., H. H. Lake.—(*M. A. Howell, jun., Chicago, U.S.*)

1204. Tongs, W. R. Lake.—(*A. S. Adams, Boston, U.S.*)

1205. Brewing, W. Lawrence, London.

1206. Pumps for Drawing Beer, &c., T. Woollerton, Leicester.

1207. Filtration, W. R. Lake.—(*J. W. Hyatt, U.S.*)

1208. Galvanic Batteries, T. Slater, London.

1209. Pumps, T. D. Kyle, London.

1210. Distilling Coal, J. Woodhead, Wakefield.

1211. Targets, F. Clarke, Canterbury.

1212. Rings for Spinning Frames, A. M. Clark.—(*G. Jaquith, Maysville, U.S.*)

7th March, 1883.

1213. Fittings for Baths, T. Bradford, Manchester.

1214. Clipping Machines, J. Range, Nottingham.

1215. Breech-loading Fire-arms, G. Macaulay-Cruikshank, Glasgow.—(*M. V. Kacer and W. J. Kriz, U.S.*)

1216. Walls, &c., G. Napier, Manchester.

1217. Production of Gas, J. F. Schnell, A. Heywood, jun., and W. Darbyshire, Manchester.

1218. Electro-magnetic Signal Apparatus, W. Morgan-Brown.—(*J. D. Gould and B. M. Plumb, New York, and G. W. Daniels, Somerville, U.S.*)

1219. Lawn Tennis Bats, R. C. Powell and F. Thompson, London.

1220. Ingot Moulds, S. Rideal, Manchester.

1221. Torpedoes, A. J. Boult.—(*A. Weeks, U.S.*)

1222. Imparting Heat to Water, J. Jameson, Newcastle-on-Tyne.

1223. Dyeing Loose Cotton Black, G. W. von Nawrocki.—(*G. Jagenburg, Rydboholm, Sweden.*)

1224. Truss for Rupture, E. M. Bourjeaurd, London.

1225. Straightening, &c., Bars, W. Gilmer, Gosforth.

1226. Anchors, C. Mace, Sunderland.

1227. Steam Generators, R. G. Rodham, London.

1228. Screw Gill Boxes, G. W. Douglas, Bradford.

1229. Producing Permanent Coloured Photographic Card Pictures, A. H. Dawes, Windermere.

1230. Setting the Teeth of Circular Saws, W. R. G. Roebuck, London.

1231. Automatic Musical Instrument, M. A. Wier, London.

1232. Tramways, E. F. Roberts, London.

1233. Barbed Fencing Wire, W. R. Lake.—(*O. P. Briggs, Chicago, U.S.*)

1234. Treating Plaster of Paris, J. M. Boekbinder, London.

1235. Lathes, W. Allan, Sunderland.

1236. Coupling for Fencing, C. J. Holroyde, Warley.

1237. Locomotive Steam Engines, J. H. Johnson.—(*T. Ricour, Paris.*)

1238. Telephonic Apparatus, S. Thompson, Bristol.

1239. Fresh Air Injector, S. Low, London.

1240. Electrical Induction Apparatus, E. Edwards.—(*M. Babillot, Montoir de Bretagne, France.*)

1241. Multitubular Steam Boilers, E. Edwards.—(*J. J. Godot, Paris.*)

1242. Preventing the Deposit of Sand, &c., in Rivers, W. R. Lake.—(*H. E. Hargreaves, Brazil.*)

1243. Hurdles, A. E. Maudslay, Littlebourne.

8th March, 1883.

1244. Consolidating Carded Asbestos Fibres, A. Hollings, Salford.

1245. Governors, W. Murdoch, Glasgow.

1246. Darning Fabrics, F. C. Glaser.—(*Mrs. E. Weiss, Breslau, Germany.*)

1247. Sharpening Pencils, J. Darling, Glasgow.

1248. Working Vehicles with Compressed Air, C. R. Stevens, Lewisham.

1249. Operating the Valves of Engines, H. J. Haddan.—(*J. P. Northey, Toronto, Canada.*)

1250. Automatic Couplings, S. Gilbert, jun., Wansford.

1251. Tricycles, &c., J. Hall, Wigton.

1252. Bale Ties, &c., E. Hale, Liverpool.

1253. Heated Rollers, J. Horrocks, Worsley.

1254. Steam Generators, H. Gerner, New York.

1255. Electric Lamps, J. G. Statter, Snapethorpe.

1256. Letter Sheet and Envelope, B. J. B. Mills.—(*R. W. Stevens and G. R. Moore, U.S.*)

1257. Shuttle-box Mechanism for Looms, J. Brownlee, Glasgow.

1258. Electrical Signalling Apparatus, W. J. Brewer, London.

1259. Velvet, &c., J. Imray.—(*A. Duquesne, Paris.*)

1260. Extracting Soluble Matters, C. D. Abel.—(*H. L. J. Parenty, Paris.*)

1261. Steel Open Socket Shovels, T. Sidaway, Brierley Hill.

1262. Adjusting Roller Axles in their Bearings, J. A. A. Buchholz, Twickenham.

9th March, 1883.

1263. Umbrellas, &c., H. Hughes.—(*R. Williams, New York, U.S.*)

1264. Automatic Gas Regulator, J. and E. Tuckett, Exeter.

1265. Hot-water Apparatus, T. C. Olney, Manchester.

1266. Supporting the Body in Case of Injury to the Spine, J. W. Guilmette, Manchester.

1267. Mechanical Telegraphs, W. Chadburn, Liverpool.

1268. Adjustable Window Flower Stands, R. Körner, Dresden, Saxony.

1269. Rocking Chairs, J. T. Simpson, Halifax.

1270. Life-saving Apparatus, R. E. Pinhey, Oxton.

1271. Sanitary Closets, C. K. Lawton, Manchester.

1272. Wheels, J. Burbridge & T. Oakley, Tottenham.

1273. Fastenings for Tils, E. Hewitt, London.

1274. Sleepers and Rail Connections, A. J. Boult.—(*P. Dietrich, Berlin.*)

1275. Electric Lamps, J. Kelsoe, jun., Stamford, U.S.

10th March, 1883.

1276. Lamps, H. J. Haddan.—(*E. S. Piper, Canada.*)

1277. Atmospheric Air Motor, H. J. Haddan.—(*B. J. Forster, Toronto, Canada.*)

1278. Raising Mud into Carts, E. Burton, London.

1279. Cooking Utensil, J. Darling, Glasgow.

1280. Applying Hoops to Casks, T. Hooman, London.

1281. Looms, G. H. Hodgson, Bradford.

1282. Ventilating House Drains, G. E. Mineard and T. Crapper, London.

1283. Adjustable Spanners, C. Neil, Sheffield.

1284. Bricks, L. Blackburn and J. Elliott, London.

1285. Mitre-dovetailing Machines, A. J. Boult.—(*United States Box Machine Company, New York, U.S.*)

1286. Books for Advertising, R. Ripley, Liverpool.

1287. Kaleidoscopic Tops, A. A. King, London.

1288. Gun Carriages, W. R. Lake.—(*H. Gruson, Buckau-Magdeburg, Germany.*)

1289. Stirrups, W. R. Lake.—(*J. Persson, Sweden.*)

1290. Telephonic Apparatus, G. H. Bassano, A. E. Slater, and F. T. Hollins, Derby.

1291. Receptacles for Matches, G. W. von Nawrocki.—(*T. Remus, Dresden.*)

1292. Fasteners for Gloves, &c., W. R. Lake.—(*E. J. Kraetzer, Boston, U.S.*)

1293. Traction Engines, A. Greig & C. Achilles, Leeds.

1294. Railway Fog Signal Apparatus, J. Coleman and I. Henson, Derby.

12th March, 1883.

1295. Electrical Apparatus, A. R. Molison, Swansea.

1296. Crushing Sugar Canes, A. S. Brindley, New Radford, and J. Worsnop, London.

1297. Braiding Machines, W. Ashton, Manchester.

1298. Carrying Electric Wires, R. Longdon and F. B. Welch, Manchester.

1299. Cigar Cases, &c., F. MacD. Robertson and J. E. Cousté, London.

1300. Hackling Machines, J. C. Mewburn.—(*J. Cardon, Lille, France.*)

1301. Forming Cast Metal Sockets, R. Clayton, Deepfields.

1302. Door Fastenings, R. Whiston, Wolverhampton.

1303. Producing Letters on Metal, W. P. Thompson.—(*E. E. Wood, jun., Northampton, U.S.*)

1304. Horseshoes, H. J. Haddan.—(*M. Marks, U.S.*)

1305. Sewing Machines, W. Churchill, London.

1306. Spinning Fibres, E. Morley, Halifax.

1307. Looms, T. Hollingworth, Blackburn.

1308. Fire-escapes, W. Brierley.—(*J. Hall and R. B. Holdsworth, Trinidad, U.S.*)

1309. Steam Boilers, G. W. von Nawrocki.—(*E. Völcker, Bernburg, Germany.*)

1310. Bicycles, F. M. Wright, Haileybury.

1311. Steam and Air Engines, H. H. Lake.—(*F. McMellon, Boston, U.S.*)

1312. Twisting, &c., Yarns, J. Farrar, Halifax.

1313. Dynamo-electric Machines, H. H. Lake.—(*G. W. Fuller, Norwich, U.S.*)

1314. Dynamo, &c., Machines, C. W. Vincent, London.

1315. Lawn Tennis Balls, F. O. Heinrich, Wimbledon.

1316. Cutting Beans, &c., G. Clayforth, St. John's.

Inventions Protected for Six Months on Deposit of Complete Specifications.

1149. Multiple Copies of Writings, A. Paget, Loughborough.—*3rd March*, 1883.

1167. Boiler Furnaces, H. J. Haddan, Kensington, London.—A communication from E. W. van Duzen, Cincinnati, U.S.—*5th March*, 1883.

1192. Underground Conduits for Electric Wires, A. J. Boult, High Holborn, London.—A communication from W. Plankinton, Milwaukee, U.S.—*6th March*, 1883.

1193. Wood-polishing Machines, A. J. Boult, High Holborn, London.—A communication from J. L. Perry and C. A. Mather, Berlin, U.S.—*6th March*, 1883.

1204. Tongs, W. R. Lake, Southampton-buildings, London.—A communication from A. S. Adams, Boston, U.S.—*6th March*, 1883.

1207. Filtration, W. R. Lake, Southampton-buildings, London.—A communication from J. W. Hyatt, Newark, U.S.—*6th March*, 1883.

1218. Electro-magnetic Signal Apparatus, W. Morgan-Brown, Southampton-buildings, London.—A communication from J. D. Gould and B. M. Plumb, New York, and G. W. Daniels, Somerville, U.S.—*7th March*, 1883.

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

1053. Regulating the Supply of Air to Furnaces, T. S. Prideaux, Brockley.—*11th March*, 1880.

856. Securing Laths to Metal Bands, C. C. Sherry, London.—*29th February*, 1880.

981. Rivetting Machines, R. H. Tweddell, London, and J. Platt and J. Fielding, Gloucester.—*6th March*, 1880.

986. Reworking the Shearings of Iron and Steel, J. H. Rogers, Llanelly.—*6th March*, 1880.

989. Knitting Machines, W. Cotton, Loughborough.—*6th March*, 1880.

1001. Bicycle Stands, C. Wicksteed, Kettering.—*8th March*, 1880.

1207. Working Railway Points, &c., P. Black, jun., London.—*20th March*, 1880.

984. Fire-arms, J. S. Heath, Birmingham.—*6th March*, 1880.

1014. Parabolical Apparatus, F. Wirth, Frankfort-on-the-Maine.—*9th March*, 1880.

1082. Drawing, &c., Rods, G. Little, Oldham.—*12th March*, 1880.

993. Treatment of Phosphates, W. J. Williams, Chester.—*8th March*, 1880.

1027. Weaving Loongees, C. Cross, Manchester.—*9th March*, 1880.

1048. Tables, H. Halstead, Leeds.—*10th March*, 1880.

1060. Working Expansion Valves, J. Ramsbottom, Alderley Edge.—*11th March*, 1880.

990. School Desks, J. Glendenning, Thorpe.—*8th March*, 1880.

1021. Carriage Fitting, C. Woolnough, London.—*9th March*, 1880.

1051. Treating Ores, F. M. Lyte, London.—*10th March*, 1880.

1055. Regulating the Supply of Gas, J. McLennan and R. Owen, London.—*11th March*, 1880.

1056. Propelling Vessels, J. McLennan and R. Owen, London.—*11th March*, 1880.

1062. Printing Cotton Fabrics, J. King, Glasgow.—*11th March*, 1880.

1186. Cooking Ranges, D. Dow, Falkirk.—*19th March*, 1880.

1078. Recovering Soda Ash, A. Chapman, Liverpool.—*12th March*, 1880.

1098. Crucibles, &c., W. R. Lake, London.—*13th March*, 1880.

1111. Rolling Plastic Compositions, C. F. Leake, Staines.—*15th March*, 1880.

1133. Detonating Signals, T. Barrow, Liverpool.—*16th March*, 1880.

1198. Governors, H. H. Lake, London.—*19th March*, 1880.

1517. Feeding Bottles, G. Wells, London.—*13th April*, 1880.

1042. Looped Fabrics, S. Thacker, Nottingham.—*10th March*, 1880.

1122. Elevators, &c., J. Stanhope, Liverpool.—*16th March*, 1880.

1152. Spinning, J. and J. A. Marsh, Ashton-under-Lyne.—*17th March*, 1880.

1216. Microscopic Photographs, W. R. Lake, London.—*20th March*, 1880.

1217. Examining Microscopic Photographs, W. R. Lake, London.—*20th March*, 1880.

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

1111. Steam Boilers, F. G. Bone, London.—*15th March*, 1876.

970. Gas Burners, W. T. Sugg, London.—*6th March*, 1876.

1028. Armour Plates, &c., J. Yates, Rotherham.—*9th March*, 1876.

1425. Making Cakes, A. M. Clark, London.—*3rd April*, 1876.

1117. Raising, &c., Liquids, E. Körting, Hanover.—*15th March*, 1876.

1200. Washing, &c., Coal, C. Sheppard, Bridgend.—*21st March*, 1876.

Notices of Intention to Proceed wtih Applications.

(*Last day for filing opposition*, *30th March*, 1883.)

5059. Electric Rotary Air Brushes, N. J. Holmes, London.—*24th October*, 1882.

5250. Valve for Baths, W. D. Scott-Moncrieff and W. Dodds, London.—*3rd November*, 1882.

5272. Coupling for Leather Hose, E. Nunan, London.—*4th November*, 1882.

5283. Transclucent Plates, W. Kennedy, Glasgow.—*6th November*, 1882.

5286. Bobbins, J. Clayton, Bradford.—*6th November*, 1882.

5289. Tightening Bolts, &c., H. Scott, Liverpool.—*6th November*, 1882.

5290. Consuming Smoke in Furnaces, F. Cheesbrough, Liverpool.—A communication from C. and H. Zacharias.—*6th November*, 1882.

5291. Spinning Wool, W. Turner, Bradford.—*6th November*, 1882.

5292. Centrifugal Separating Machines, F. H. F. Engel, London.—A communication from H. Petersen.—*6th November*, 1882.

5294. Finings for Spirit, &c., J. Blum, London.—*6th November*, 1882.

5296. Tapping Casks, G. W. von Nawrocki, Germany. Com. from A. J. Schaefer.—*6th November*, 1882.

5299. Finishing Hollow-ware, J. V. Hope, Wednesbury.—*6th November*, 1882.

5303. Purifying Sewage, F. Petri, Germany.—*6th November*, 1882.

5308. Cleaning Grain, W. R. Lake, London.—A communication from L. Gathmann.—*7th November*, 1882

5310. Cooking Ranges, J. G. Whyte, Bo'ness.—*7th November*, 1882.

5312. Gas Stoves, J. Bartlett, London.—*7th November*, 1882.

5318. Bolting Mills, W. R. Lake, London.—A communication from J. Mills, U.S.—*7th November*, 1882.

5322. Compound Plates, S. and S. R. Chatwood, Bolton.—*7th November*, 1882.

5324. Ornamenting Glass, A. J. Nash, Wordsley.—*8th November*, 1882.

5326. Opening Carriage Doors, W. H. St. Aubin, Bloxwich.—*8th November*, 1882.

5342. Wire for Securing Corks in Bottles, H. H. Lake, London.—A communication from O. R. Chaplin.—*8th November*, 1882.

5349. Miners' Safety Lamps, T. Thomas, Ynishir.—*9th November*, 1882.

5373. Electric Lamps, J. M. Bouldon, I. Probert, and A. W. Soward, London.—*10th November*, 1882.

5383. Water Supply of Baths, &c., J. J. Tylor, London.—*11th November*, 1882.

5387. Regulating Electrical Currents, P. R. Allen, London.—*11th November*, 1882.

5414. Controlling Electrical Currents, P. R. Allen, London.—*13th November*, 1882.

5437. Preserving Milk, M. E. and O. E. Pohl, Liverpool.—*15th November*, 1882.

5480. Facilitating Tipping of Coal, P. G. B. Westmacott, Newcastle-upon-Tyne.—*17th November*, 1882.

5498. Treating Duff Coal, &c., J. Jameson, Newcastle-upon-Tyne.—*18th November*, 1882.

5525. Manufacture of Sugar, H. H. Lake, London.—A communication from La Société Lebaudy Frères.—*21st November*, 1882.

5541. Rotary Engines, A. M. Clark, London.—A com. from G. Wade and J. Wardell.—*21st November*, 1882.

5682. Screens for Corn, &c., R. Boby and T. Stevens, Bury St. Edmunds.—*29th November*, 1882.

5711. Conductors for Electric Currents, W. Lake, London.—Com. from F. Fitch.—*30th November*, 1882.

5744. Automatically Regulating Electric Currents, J. T. King, Liverpool.—A communication from J. R. Finney.—*2nd December*, 1882.

5792. Digging Machines, J. Parker, Stevenage.—*5th December*, 1882.

5856. Diaphragms for Gas Governors, G. Porter, London.—*8th December*, 1882.

5873. Zinc for Preventing Corrosion in Boilers, J. B. Hannay, Glasgow.—*9th December*, 1882.

5942. Mouthpieces of Cigars, &c., O. W. T. Barnsdale, Nottingham.—*13th December*, 1882.

6170. Bar-rolling Mills, J. Imray, London.—A communication from U. Haskin.—*27th December*, 1882.

630. Self-protecting Portable Saw, N. W. Wallace, Clifton.—*5th February*, 1883.

657. Lamps, R. Ogden, Manchester, and R. J. Anderson, Liverpool.—*6th February*, 1883.

675. Oven Furnaces, J. D. Kemp, London.—*7th February*, 1883.

680. Multiple Cylinder Compound Engines, R. Matthews, Hyde.—*7th February*, 1883.

686. Ploughs, &c., T. Walker, Whitstable.—*7th February*, 1883.

739. Treating Alkali Waste, J. Simpson, Liverpool.—*10th February*, 1883.

747. Treating Iron Ores, A. Adair and W. Thomlinson, Seaton Carew.—*10th February*, 1883.

761. Making of Lace, G. Bentley, Nottingham.—*12th February*, 1883.

764. Carbon Filaments, G. Bowron and W. Hibbert, London.—*12th February*, 1883.

784. Governing Steam Engines, W. Knowles, Bolton.—*13th February*, 1883.

806. Knitted Loop Fabrics, H. Kiddier, Nottingham.—*14th February*, 1883.

811. Nickel, &c., F. Lotter, Prussia.—*14th February*, 1883.

1149. Multiple Copies of Writings, A. Paget, Loughborough.—*3rd March*, 1883.

(*Last day for filing opposition*, *3rd April*, 1883.)

5304. Dynamo Electricity, H. Mayhew, London.—*7th November*, 1882.

5333. Bottle Stoppers, J. J. Varley, Brixton.—*8th November*, 1882.

5338. Warming Carriages, T. Perkins, Hitchin.—*8th November*, 1882.

5339. Distributing Seed, &c., J. H. Wood, London.—A communication from Messrs. McLean Bros. and Rigg.—*8th November*, 1882.

5346. Incandescent Electric Lamps, J. Jameson, Newcastle upon-Tyne.—*9th November*, 1882.

5353. Carbons, H. C. B. Shalders, London.—*9th November*, 1882.

5354. Stretching Textile Fabrics, J. Littlewood, Newsome.—*9th November*, 1882.

5358. Transportable Baking Oven, E. A. Brydges, London.—A communication from D. Grove.—*9th November*, 1882.

5362. Lamps, &c., J. Ungar, London.—*10th November*, 1882.

5370. Packing Fresh Meat, W. Thompson, London.—A com. from M. Closset.—*10th November*, 1883.

5375. Folding Pocket Scissors, A. J. Boult, London.—A communication from Böntgeu and Sabi.—*11th November*, 1882.

5376. Guards for Saws, J. Wetter, New Wandsworth.—A communication from Gretschel and Heinemann.—*11th November*, 1882.

5377. Balls, J. Wetter, New Wandsworth.—A communication from Gretschel and Heinemann.—*11th November*, 1882.

5386. Shearing Metal Plates, A. J. Leeman, West Hartlepool.—*11th November*, 1882.

5399. Metallic Alloys, A. K. Huntington, London.—*13th November*, 1882.

5402. Steam Winches, W. Allan, Sunderland.—*13th November*, 1882.

5438. Conduction of Electric Currents, R. E. B. Crompton, London.—*15th November*, 1882.

5474. Printing Machines, W. W. Taylor, Ripon.—*17th November*, 1882.

5563. Propelling Boats, W. J. Sage, London.—*22nd November*, 1882.

5592. Cricket Bat Handles, H. J. Haddan, London.—A com. from J. C. Brodie.—*24th November*, 1882.

5599. Tricycles, H. J. Hissett, Plymouth.—*24th November*, 1882.

5615. Paper Bags, J. H. Johnson, London.—A com. from F. E. Bilon.—*25th November*, 1882.

5643. Mashing, J. and W. Biden, Gosport.—A communication from N. Pigeon.—*28th November*, 1882.

5664. Sugar-cane Shredders, J. H. Johnson, London.—A com. from J. Parker.—*28th November*, 1882.

5760. Bricks, &c., J. H. Johnson, London.—A communication from J. Darrigan.—*2nd December*, 1882.

5770. Shrapnel Shells, M. Delmard, Plumstead.—*4th December*, 1882.

6113. Armour Plates, J. H. Johnson, London.—A com. Messrs. Marrel Bros.—*21st December*, 1882.

6123. Folding Cot Carriages, T. Trotman, London.—*22nd December*, 1882.

94. Drilling Machines, W. Cooke, Dundee.—*8th January*, 1883.

382. Vehicles Propelled by the Riders, J. Watson and G. Whalley, Keighley, and T. Weatherall, Leeds.—*24th January*, 1883.

425. Valve Gear for Engines, J. Johnson, London.—A com. from G. W. Storer.—*25th January*, 1883.

510. Cutting up Plastic Substances, J. H. Johnson, London.—A communication from J. G. Baker.—*30th January*, 1883.

547. Water Gauges, J. Dewrance, London.—*1st February*, 1883.

549. Electric Brushes, M. McMullin, London.—*1st February*, 1883

556. Variable Expansion Gear, T. English, Hawley.—*1st February*, 1883.

559. Dynamo-electric Machines, W. P. Thompson, Liverpool.—A communication from J. A. I. Craig.—*1st February*, 1883.

581. Slotting Machines, H. J. Haddan, London.—A com. from L. J. Knowles.—*2nd February*, 1883

629. Voltaic Batteries, R. Larchin, London.—A communication from L. Hartmann.—*5th February*, 1883.

671. Lubricators, H. J. Haddan, London.—A communication from A. W. Swift.—*7th February*, 1883.

677. Boiler Furnaces, A. Pinkerton, Glasgow.—*7th February*, 1883.

701. File Cutting, P. Ewens, Cheltenham.—*8th February*, 1883.

713. Hose Reels, J. T. Foot, London.—*9th February*, 1883.

795. Fastenings for Purses, F., H., and F. Dowler, Aston.—*13th February*, 1883.

817. Brass Bobbin Winding Engines, J. Mosley, New Basford.—*14th February*, 1883.

818. Spoked Wheels, E. Dearden, Darnall.—*14th February*, 1883.

823. Fire-arms, F. Beesley, London.—*14th February*, 1883.

832. Raising Weights, &c., W. R. Lake, London.—A communication from A. S. de la Pena and L. Drumen.—*15th February*, 1883.

847. Treating Steel Ingots, J. Gjers, Middlesbrough-on-Tees.—*15th February*, 1883.

1066. Metallic Strip-blanks, T. V. Allis, New York, U.S.—*27th February*, 1883.

1120. Telephones, W. R. Lake, London.—A communication from E. Holmes and E. T. Greenfield, U.S.—*1st March*, 1883.

1135. Electrical Accumulators, W. Lake, London.—A com. from N. S. Keith.—*2nd March*, 1883.

1192. Underground Conduits, A. J. Boult, London.—A com. from W. Plankinton.—*6th March*, 1883.

1193. Wood Polishing, A. J. Boult, London.—Com. from J. Perry & C. Mather.—*6th March*, 1883.

1204. Tongs, W. R. Lake, London.—A communication from A. S. Adams.—*6th March*, 1883.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 9th March*, 1883.)

4315. Boilers, &c., M. J. O'Riordan, Cork.—*11th September*, 1882.

4323. Vegetable Parchment, H. Hymans, London.—*12th September*, 1882.

4329. Starting, &c., Engines, W. H. Allen, R. Wright, and W. L. Williams, London.—*12th September*, 1882.

4334. Boiler Furnaces, J. R. Russell, Glasgow.—*12th September*, 1882.

4335. Hulling, &c., Rice, J. R. Russell, Glasgow.—*12th September*, 1882.

4337. Thread-winding, J. W. Shepherd and W. Ayrton, Longsight, and S. Hallam, Manchester.—*12th September*, 1882.

4347. Stoppering Bottles, A. J. T. Wild, London.—*12th September*, 1882.

4352. Electrodes, W. Sinnock, New Cross-road.—*13th September*, 1882.

4353. Opening, &c., Fanlights, H. Pearce, London.—*13th September*, 1882.

4354. Endless Platforms of Grain Straw Binding, &c., Machines, P. Robinson, Saxby.—*13th September*, 1882.

4360. Wool Combing, T. H. Wharton and R. Smith, Bradford.—*13th September*, 1882.

4361. Self-acting Mules, J. Dransfield and J. Issett, Dewsbury.—*13th September*, 1882.

4365. Feed Motions for Turning Lathes, T. Shanks, jun., Johnstone.—*14th September*, 1882.

4371. Dyeing Hanks, J. Conlong, Blackburn.—*14th September*, 1882.

4384. Preparing, &c., Cotton, T. Berry, Rochdale.—*14th September*, 1882.

4391. Plates for Secondary Batteries, N. C. Cookson, Newcastle-upon-Tyne.—*15th September*, 1882.

4404. Electric Lamps, H. H. Lake, London.—*15th September*, 1882.

4409. Coupling Railway Carriages, T. A. Brocklebank, London.—*16th September*, 1882.

4450. Porcelain, &c., Insulators, W. E. Langdon, Derby, and J. C. and G. Fuller, Bow.—*19th September*, 1882.

4457. Connecting Lamps to Bicycles, J. Lucas, Birmingham.—*19th September*, 1882.

4516. Fire-arms, W. W. Greener, Birmingham.—*21st September*, 1882.

4527. Electro-magnetic Engraving Machines, B. J. Carter, London.—*22nd September*, 1882.

4535. Dynamo-electric Machines, F. C. Glaser, Berlin.—*23rd September*, 1882.

4621. Slide-valve Expansion, &c., W. R. Lake, London.—*28th September*, 1882.

4697. Making Gas, A. Wilson, Handsworth.—*3rd October*, 1882.

4752. Fluorescent Electric Lighting, R. Kennedy, Glasgow.—*6th October*, 1882.

4779. Synchronous Movements, F. Wolff, Denmark.—*7th October*, 1882.

4790. Velocipedes, G. W. Quatremaine, Stratford-on-Avon.—*7th October*, 1882.

5151. Iron and Steel, E. F. Göransson, Stockholm.—*30th October*, 1882.

5492. Electric Light Switches, C. Maynard, London.—*18th November*, 1882.

5685. Walls, &c., F. Smith, London.—*29th November*, 1882.

5772. Fireproof Ceilings, R. W. Hitchins, London.—*4th December*, 1882.

5778. Window Sash Fastenings, J. D. Sprague, Upper Norwood.—*5th December*, 1882.

5835. Utilising Slags, C. Pieper, Berlin.—*7th December*, 1882.

6129. Inserting Type in Stereotype Plates, J. E. Taylor, P. Allen, W. Evans, and C. P. Scott, Manchester.—*22nd December*, 1882.

127. Looms, &c., W. E. Gedge, London.—*9th January*, 1883.

267. Knitting Machines, J. Adams, Philadelphia.—*17th January*, 1883.

(*List of Letters Patent which passed the Great Seal on the 13th March, 1883.*)

3853. ELECTRIC LAMPS, G. Drayton and S. Gedge, London.—*28th July*, 1882.
4138. DEODORISING, &c., G. Nobes, London.—*30th August*, 1882.
4367. ELECTRIC LIGHTING, W. Morgan-Brown, London. —*14th September*, 1882.
4370. GRINDING, &c., H. Slack, Sheffield.—*14th September*, 1882.
4389. STOPPERING BOTTLES, &c., J. J. Rawley, London. —*15th September*, 1882.
4396. MAKING of ALLOYS, A. Guye, London.—*15th September*, 1882.
4398. PICKERS for WEAVING, I. Sowden, Bradford.— *15th September*, 1882.
4406. MAKING MOULDS, J. V. Hope, Wednesbury.—*15th September*, 1882.
4412. LOCKING SIGNALS, &c., S. Brear and A. Hudson, Bradford.—*16th September*, 1882.
4417. FRICTION CLUTCHES, W. A. Barlow, London.— *16th September*, 1882.
4419. ELECTRIC ARC LAMPS, J. Brockie, Brixton.—*16th September*, 1882.
4420. GASELIERS, &c., M. Merichenski, London.—*16th September*, 1882.
4423. PRESERVING WOOD, W. R. Lake, London.—*16th September*, 1882.
4426. PUMPS, T. Willoughby, London.—*18th September*, 1882.
4427. VALVES, W. Lloyd, Newport.—*18th September*, 1882.
4478. SELF-ACTING TACKLE HOOKS, J. T. Roe, Wandsworth.—*20th September*, 1882.
4490. SECONDARY BATTERIES, A. Khotinsky, London. —*20th September*, 1882.
4500. DOUBLING, J. and J. Horrocks, Manchester.— *21st September*, 1882.
4529. PAPER PULP, W. R. Lake, London.—*22nd September*, 1882.
4530. COUPLING APPARATUS, A. W. L. Reddie, London. —*22nd September*, 1882.
4532. REGULATING CURRENTS, W. E. Ayrton and J. Perry, London.—*23rd September*, 1882.
4589. CORSET BUSKS, C. A. Snow, Washington, U.S.— *23rd September*, 1882.
4606. COMPOUND VACUUM PUMPS, J. H. Johnson, London.—*28th September*, 1882.
4624. ROLLING MILLS, W. R. Lake, London.—*28th September*, 1882.
4660. OPERATING ON ATMOSPHERE in ICE CHAMBERS, W. W. Nightingale, Southport.—*30th September*, 1882.
4680. DYNAMO-ELECTRIC MACHINES, J. S. Beeman, W. Taylor, and F. King, London.—*2nd October*, 1882.
4692. BI-CARBONATE of SODA, A. W. L. Reddie, London.—*3rd October*, 1882.
4701. APPLIANCE for SWIMMING, J. Imray, London. —*3rd October*, 1882.
4720. SPINNING COTTON, T. Coulthard, Preston.—*4th October*, 1882.
4912. PERAMBULATORS, T. F. Simmons, Ardencote.— *16th October*, 1882.
5275. MILLSTONE, W. R. Lake, London.—*4th November*, 1882.
5466. SOAP, &c., W. P. Thompson, London.—*16th November*, 1882.
5549. SAUCEPAN HANDLES, E. Baldwin, Stourport.— *22nd November*, 1882.
5697. MOULDS for PIPES, J. and F. Chambers, near Nottingham.—*30th November*, 1882.
5764. FURNACES, J. C. Brentnall, Timperley.—*4th December*, 1882.
5809. TREATING HYDROCHLORIC ACID, J. Hargreaves, Widnes.—*6th December*, 1882.
5837. BENDING METALLIC PLATES, C. Scriven, Leeds.— *7th December*, 1882.
5848. INDURATING ARTIFICIAL STONE, J. W. Butler, Blackheath.—*7th December*, 1882.
6208. SUBSTITUTES for BARM, A. Esilman, Manchester, and H. Esilman, Glasgow.—*29th December*, 1882.
6232. TREATING INDIA-RUBBER, H. Gerner, London.— —*30th December*, 1882.
34. ELECTRIC LAMPS, W. R. Lake, London.—*2nd January*, 1883.
46. INCANDESCENT ELECTRIC LAMPS, J. Williamson and E. Böhm, London.—*3rd January*, 1883.
307. ALARM GUNS, W. Burgess, Malvern Wells.—*18th January*, 1883.

List of Specifications published during the week ending March 10th, 1883.

5024*, 4d.; 2485, 2d.; 3123, 2d.; 3307, 8d.; 3347, 6d.; 3359, 6d.; 3375, 6d.; 3380, 8d.; 3393, 6d.; 3394, 2d.; 3408, 10d.; 3414, 6d.; 3417, 6d.; 3420, 6d.; 3421, 8d.; 3424, 6d.; 3432, 6d.; 3434, 6d.; 3440, 6d.; 3441, 10d.; 3450, 2d.; 3451, 6d.; 3454, 4d.; 3455, 6d.; 3456, 6d.; 3461, 6d.; 3465, 6d.; 3471, 6d.; 3477, 6d.; 3478, 10d.; 3484, 6d.; 3486, 6d.; 3492, 6d.; 3495, 8d.; 3498, 4d.; 3499, 6d.; 3502, 8d.; 3505, 6d.; 3507, 6d.; 3508, 6d.; 3509, 6d.; 3510, 2d.; 3521, 6d.; 3513, 2d.; 3517, 1s. 4d.; 3523, 2d.; 3526, 6d.; 3532, 6d.; 3533, 6d.; 3533, 6d.; 3537, 6d.; 3538, 6d.; 3542, 6d.; 3546, 2d.; 3547, 6d.; 3549, 2d.; 3552, 6d.; 3554, 2d.; 3559, 8d.; 3563, 8d.; 3566, 8d.; 3567, 6d.; 3568, 6d.; 3569, 4d.; 3571, 6d.; 3572, 6d.; 3573, 2d.; 3578, 8d.; 3579, 8d.; 3580, 2d.; 3582, 2d.; 3584, 2d.; 3585, 4d.; 3586, 6d.; 3588, 6d.; 3592, 10d.; 3594, 2d.; 3596, 10d.; 3597, 6d.; 3599, 6d.; 3600, 6d.; 3602, 2d.; 3604, 2d.; 3605, 2d.; 3607, 2d.; 3608, 4d.; 3609, 6d.; 3611, 4d.; 3617, 6d.; 3626, 2d.; 3627, 6d.; 3630, 6d.; 3636, 2d.; 3640, 6d.; 3641, 6d.; 3660, 6d.; 3670, 2d.; 3702, 4d.; 3731, 4d.; 4258, 8d.; 4590, 4d.; 4679, 6d.; 5136, 4d.; 5564, 6d.; 5673, 8d.; 5695, 6d.; 5723, 6d.; 5850, 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.*

2485. DUST-COLLECTING OR AIR FILTERING APPARATUS, *L. Fiechter, Minneapolis.—25th May, 1882.—(A communication from Kirk and Fender, Minneapolis.)—(Not proceeded with.)* 2d.

This consists, First, in a series of extremely steep ridges of filtering cloth projecting upward from a chamber below, into which they open. Secondly, the chamber or box below for receiving the air to be filtered. Thirdly, a screw with a single endless thread going the full length of the chamber, and provided with a nut or carriage riding on the screw, so that by the constant turning of the screw in one direction, the carriage may be slowly carried backwards and forwards the length of the chamber. Other improvements are described.

3123. SYPHON FOR DRAWING OFF LIQUIDS, *F. Sara, Plymouth.—1st June, 1882.—(Void.)* 2d.

This consists in the combination of means for charging the syphon with liquid, and thereby displacing the air contained in order to establish its action, instead of exhausting the air.

3307. ROTARY STEAM ENGINES AND PUMPS, *P. Goldschmidt, G. Hahlo, and A. Heussy, Manchester.—12th July, 1882.* 8d.

This relates to a means for balancing the pressure exerted on the faces of the working revolvers.

3359. APPARATUS FOR THE MANUFACTURE OF ARTIFICIAL CREAM, *J. Van den Bergh, London.—15th July, 1882.* 6d.

This consists of a cylinder having a number of points or projections on the exterior surface thereof, which cylinder is so arranged within a close-fitting shell or case, as to be capable of being rapidly revolved therein.

3347. MAKING, FINISHING, AND DRYING FIRE-CLAY OR STONEWARE SANITARY SOCKETTED TUBES OR PIPES, *P. L. Noel, Cardiff.—14th July, 1882.* 6d.

This relates to improvements in process of making, &c.

3375. APPARATUS FOR OBTAINING MOTIVE POWER FOR PROPELLING VESSELS, PUMPING, &c., *H. Robinson, Manchester.—15th July, 1882.* 6d.

This relates to improvements in the general construction of the machine.

3394. COVERINGS FOR PIPES, BOILERS, &c., *E. K. Leadbetter, Upton Park.—17th July, 1882.* 2d.

This relates to the employment of a mixture of plaster of Paris with mineral or vegetable fibre, reduced to a semi-fluid condition by water, which mixture is poured into moulds.

3408. LOOMS FOR WEAVING, *R. L. Hattersley and J. Hill, Keighley.—18th July, 1882.* 10d.

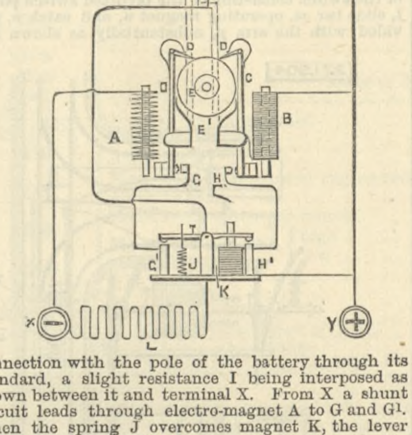
This relates, First, to an arrangement of mechanism for operating rising or oscillating shuttle-boxes; Secondly, to mechanism for operating the picking apparatus; Thirdly, to mechanism for indicating the change of the shuttle-boxes and picking of shuttles in looms; Fourthly, to apparatus for operating the ordinary square barrel employed in jacquard apparatus for carrying chains of perforated cards.

3417. MINERAL WATER BOTTLES AND STOPPERS, &c., *J. C. Cook, Bermondsey.—18th July, 1882.* 6d.

This relates to improvements in the form of the neck and shoulder or upper part of a mineral water bottle; also in the stopper, and in the application of metal caps thereto for stoppering or closing the same.

3418. ELECTRIC ARC LAMPS, *S. Z. de Ferranti, Shepherd's Bush, and A. Thompson, Russell-square.—18th July, 1882.* 6d.

This relates to the regulation of arc lamps and also electric currents generally. The figure gives a diagram of the working of the apparatus. Electromagnets A and B attract their armatures and so actuate pawls D by means of levers C. The pawls move ratchet wheels, one only of which is shown, which actuate the carbons. When the armatures are not attracted they make contact at G and H, which are connected to G1 and H1, these latter being in proximity to rocking lever I. This lever is always in



connection with the pole of the battery through its standard, a slight resistance I being interposed as shown between it and terminal X. From X a shunt circuit leads through electro-magnet A to G and G1. When the spring J overcomes magnet K, the lever makes contact with G1, the shunt circuit through A is completed and its armature made to vibrate, whereby E is turned and the carbons separated. A part of the current, however, is always passing through K to Y, so that when the arc gets too long, K is more and more energised, overcomes spring J, tilts the lever I, and completes the circuit through electro-magnet B, causing the carbons to approach by means of the armature, lever, pawl, and axis E1, not shown in the figure.

3421. RAILWAY CARRIAGES, *W. P. Thompson, Liverpool.—18th July, 1882.—(A communication from the Rev. A. H. Munro, Montreal.)* 8d.

This relates to the arrangement of the compartments and seats.

3424. MALLETS FOR CORKING BOTTLES, &c., *A. S. Kershaw, Rochdale.—19th July, 1882.* 6d.

This relates to the combination with a mallet of metal or wood, or of metal and wood, of india-rubber or other flexible or elastic substance.

3432. SCREW PROPELLERS, *E. G. Brewer, London.—19th July, 1882.—(A communication from G. Hoper, Iserlohn, Germany.)* 6d.

The blades are cast singly and with prolonged ends. The latter are placed into the mould—by preference chill mould—of the boss, the metal of which is then cast around such ends.

3440. APPARATUS FOR DRYING COFFEE, *F. H. F. Engel, Hamburg.—19th July, 1882.—(A communication from F. Klée, Hamburg.)* 6d.

This relates to the combination in a coffee-drying apparatus of a double drum with a heating arrangement and regulating cover, for closing or opening the end of the free space between the two drums.

3450. INSTRUMENT FOR RECORDING THE DIRECTION OF THE WIND, *O. Ber, Russia.—20th July, 1882.—(Not proceeded with.)* 2d.

This relates to the construction of an instrument whereby the direction of the wind is constantly and permanently recorded or marked on dials.

3451. LIFE-SAVING AND SWIMMING APPARATUS, *A. I. Rath, Manchester.—20th July, 1882.* 6d.

This consists of a waterproof belt with air chamber.

3454. ARRANGEMENT OF COVERS AND BACKS OF ACCOUNT BOOKS, *J. H. Linsey, London.—20th July, 1882.* 4d.

The object is to so arrange the covers and backs of account books that the leaves or sections of the book when opened shall be perfectly flat on both sides, at whatever part the book may be opened.

3456. APPARATUS FOR CLOSING THE MOUTHS OF BOTTLES, &c., *C. E. H. Chesweright, London.—20th July, 1882.* 6d.

This relates to the employment of screw stoppers.

3461. VALVULAR DETAILS OF DOMESTIC APPARATUS FOR SUPPLY, &c., OF WATER, *J. Shanks, Barrhead.—21st July, 1882.* 6d.

This relates to improvements in the construction of valves for supplying hot and cold water.

3471. KNIVES AND FORKS, *B. Fielding, Birmingham.—21st July, 1882.* 6d.

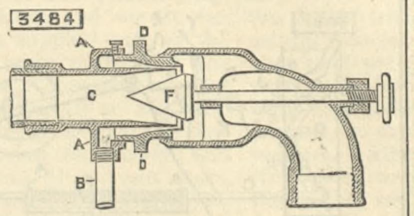
This consists in making concave depressions in the opposite broader sides of the handles.

3477. TREATING AND PREPARING CLAY, &c., *J. Gillespie, Garnkirk, N.B.—21st July, 1882.* 6d.

This comprises, First, a method of expelling air from clay; Secondly, the admixture of moss or peat earth with the clay; Thirdly, means or appliances for supporting clay ware while in its condition in course of manufacture; Fourthly, the shaping or forming of certain articles of clay ware; Fifthly, the making or rendering air-tight or water-tight, and imparting extra strength to pipes or tanks or other articles of clay ware intended for holding or conveying liquids.

3484. EJECTOR NOZZLES FOR AIR, &c., *J. L. Norton, Piccadilly, and J. Sturgeon, Victoria-street.—21st July, 1882.* 6d.

The object is to produce currents of air by means of jets so applied as to create a partial vacuum or draft, tending to draw forward the air within its influence, and it consists, First, in forming the jet nozzle so as to produce a thin jet of compressed air of unbroken annular form, so as to present a larger circumference to act upon the outer air than in ordinary jets, and to enable both the outer and inner circumference of the jet to act on the surrounding air; and Secondly, in improved modes of controlling and regulating the velocity and force of the air forming the jet. In the



drawing, A is an annular passage for the compressed air, which is fed through pipe B; C is a tube for the free air, and D is an adjustable portion of the nozzle, which can be fixed in position by a set screw. The adjustable cone F for contracting the free air orifice is actuated by a hand wheel and screw.

3486. VENTILATING APPLIANCES, *J. Leather, Liverpool.—22nd July, 1882.* 6d.

This relates to ventilating appliances consisting of a rectangular or equivalent box or enclosure provided with air ways and doors or their equivalents.

3492. MECHANISM FOR SIGNALLING, *H. J. Haddan, Kensington.—22nd July, 1882.—(A communication from A. and E. F. Webster, Waltham, U.S.)* 6d.

This relates to mechanism for the production of sound signals to indicate the course of a vessel.

3495. CONNECTING LINKS FOR CHAINS AND CABLES, *J. H. Shoebotham and J. F. C. James, Birmingham.—22nd July, 1882.* 8d.

This relates to links which are provided with projecting horns.

3498. METALLISING CLOTH, &c., *A. J. Boult, London.—22nd July, 1882.—(A communication from J. Hautrive, Lille, France.)* 4d.

After having received a coat of mordant mixed with white lead, the cloth, &c., to be metallised is powdered with particles of lead, and when the layer is dry the lead is rolled upon the cloth so as to obtain a homogeneous layer. Other metals may be employed.

3499. ELEVATORS FOR ELEVATING GRAIN, &c., *J. McAuley, Bootle.—22nd July, 1882.* 6d.

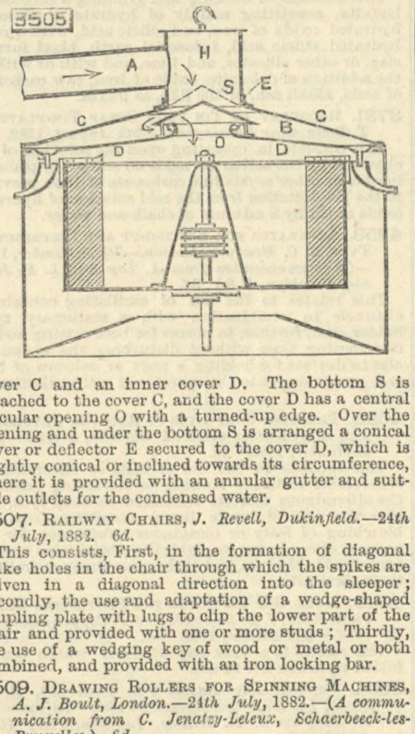
This relates to elevators consisting of a hollow trunk or casing erected in position where the grain is afterwards stored around it, and provided with internal chain of buckets and with sliding gates or sluices or their equivalent at the bottom to admit the grain.

3502. FUEL ECONOMISERS, *J. G. Perkin and J. Scott, Wakefield.—22nd July, 1882.* 8d.

This relates partly to means for cleansing and scraping the tubes.

3505. CENTRIFUGAL MACHINES OR APPARATUS FOR THE MANUFACTURE OR TREATMENT OF SUGAR, *J. H. Johnson, London.—24th July, 1882.—(A communication from M. Weinrich, Vienna.)* 6d.

This relates to a centrifugal machine in which steam is used for liquoring or whitening sugar, and it consists in providing means for separating watery particles from the steam, so that only dry steam comes in contact with the sugar. The steam is conducted by pipe A to dome H, the bottom of which is fitted with a conical sieve S, through the perforations of which the steam passes to a space B between the external



cover C and an inner cover D. The bottom S is attached to the cover C, and the cover D has a central circular opening O with a turned-up edge. Over the opening and under the bottom S is arranged a conical cover or deflector E secured to the cover D, which is slightly conical or inclined towards its circumference, where it is provided with an annular gutter and suitable outlets for the condensed water.

3507. RAILWAY CHAIRS, *J. Revell, Dukinfield.—24th July, 1882.* 6d.

This consists, First, in the formation of diagonal spike holes in the chair through which the spikes are driven in a diagonal direction into the sleeper; Secondly, the use and adaptation of a wedge-shaped coupling plate with lugs to clip the lower part of the chair and provided with one or more studs; Thirdly, the use of a wedging key of wood or metal or both combined, and provided with an iron locking bar.

3509. DRAWING ROLLERS FOR SPINNING MACHINES, *A. J. Boult, London.—24th July, 1882.—(A communication from C. Jenatzy-Leleux, Schaerbeeck-les-Bruxelles.)* 6d.

The drawing roller is made in two halves so as to be divisible at its periphery. One of these halves has a male screw thread, the other a female one, so that they may be firmly connected.

3511. FLUSH CISTERNS, &c., *W. Wright, Plymouth.—24th July, 1882.* 2d.

This relates to an arrangement of a float and levers which control the valves.

3517. BURGLAR-PROOF SAFES, *W. Corliss, Providence, U.S.—25th July, 1882.* 1s. 4d.

This relates to improvements in the general construction of safes.

3523. REGENERATIVE GAS BURNERS FOR HEATING PURPOSES, *D. and W. H. Thompson and W. J. Booer, Leeds.—25th July, 1882.—(Void.)* 2d.

This relates to a pipe which is open to the atmosphere at its lower end, and at which end the nozzle of the gaspipe is inserted in the usual manner.

3526. DIRECT-ACTING ROTARY ENGINE AND PUMP, *E. G. Brewer, London.—25th July, 1882.—(A communication from S. Marcus, Vienna.)* 6d.

This consists in a uniformly toothed spur wheel, gearing with an internally uniformly toothed ring which is enclosed in a box or cylinder, and adapted to turn freely round its geometrical axis close against the inner periphery of the cylinder, so that when the spur wheel is set in motion by a crank or otherwise, the ring also is turned in combination with a block piece which divides the free space between ring and wheel in two separate chambers, one of which works as a suction chamber, and the other as a delivery chamber, the admission and discharge taking place at the bottom of the pumps, and the circumference of the same being entirely closed.

3533. TAPS, *W. Hunt, Scarborough.—25th July, 1882.* 6d.

This relates to the employment of a double purpose valve which closes the passage through the tap and opens the relief passage when screwed one way, and closes the relief passage and opens the passage through the tap when screwed the other way.

3537. MACHINES FOR CUTTING AND PUNCHING METAL WASHERS, &c., *W. P. Thompson, Liverpool.—25th July, 1882.—(A communication from E. Salomon and E. Armant, Montreal.)* 6d.

The object is to perform the work of cutting and punching in one operation and flatten out all ragged edges, and to turn out an article finished in every respect and ready for the use to which it is to be applied.

3538. PERMANENT WAY OF RAILWAYS, &c., *A. M. Clark, London.—25th July, 1882.—(A communication from J. Elmer, Biloxi, U.S.)* 6d.

This relates to the construction of railway rails and in the means of jointing them together, and of securing them to the sleepers. It also relates to the wheels to run on the rails.

3542. MACHINES FOR WASHING AND RINSING FABRICS, *B. Davies, Adlington, and J. Eckersley, Blackrod.—26th July, 1882.* 6d.

This consists principally in placing beneath the bottom squeezing roller an additional box or auxiliary cistern fitted with two small rollers at or near the bottom, and a guide above having several openings or eyes made of or lined with glazed earthenware or brass.

3546. APPARATUS FOR DEMONSTRATING THE MOTION OF THE EARTH, &c., *H. J. Haddan, Kensington.—26th July, 1882.—(A communication from G. Rudholzner, Germany.)—(Not proceeded with.)* 2d.

This consists in apparatus for illustrating a new theory on the motion of the earth and other planets.

3549. APPARATUS FOR DISCHARGING OR THROWING PROJECTILES, *W. A. Barlow, London.—26th July, 1882.—(A communication from A. J. Krebs, Vienna.)—(Not proceeded with.)* 2d.

This relates to a device for throwing or propelling projectiles having the form of an archimedean screw, which projectiles are intended to be used in place of the grass balls and similar devices for shooting practice.

3552. APPARATUS FOR SEPARATING GRAIN, &c., *W. R. Lake, London.—26th July, 1882.—(A communication from C. E. McNeal, Silver Creek, New York.)* 6d.

This relates to improvements in the general arrangements of the parts.

3554. VENTILATORS, *J. L. Thomasson, Worcester.—26th July, 1882.—(Not proceeded with.)* 2d.

This relates to the employment of a corbel fitted internally with a number of square or oblong air passages having an upward inclination, and radiating from the interior to the exterior thereof.

3559. LOCKING DEVICES FOR CARRIAGE DOORS, &c., *H. J. Haddan, Kensington.—27th July, 1882.—(A communication from J. B. Fondu-Bloemendal, Vilvorde, Belgium.)* 8d.

This consists partly in providing and applying a falling-latch which acts automatically when the door is closed, and an indicator in the interior of the carriage for enabling the passengers to see at a glance whether the safety bolt is opened or closed; a lever is placed inside the carriage to enable the passengers to close the safety bolt without inconvenience.

3563. REGENERATIVE FURNACES, *A. Beard, Swansea.—27th July, 1882.* 8d.

This consists, First, in supporting or building the regenerator and parts connected with it above the furnace proper; Secondly, in combination with regenerative furnaces of a steam boiler, preferably vertical, and devices connected with the boiler, whereby the waste heat from the regenerative furnaces may be conveyed to and utilised for heating the boiler, and when required the waste heat supplemented by gaseous fuel.

3566. LOOMS FOR WEAVING, *T. Singleton, Darwen.—27th July, 1882.* 8d.

This relates to several improvements in the construction of the loom.

3567. POCKET CASES FOR CIGARS, &c., *P. Everitt, London.—27th July, 1882.* 6d.

This relates to a case for cigars, &c., which is provided with a shifting tablet or calendar.

3568. HOES FOR HOEING TURNIPS, &c., *J. P. Goss and F. Savage, King's Lynn.—27th July, 1882.* 6d.

This consists in providing auxiliary hoes with raised points and outwardly inclined edges, to work close up to the rows on their first appearance above the ground.

3569. FINISHING TEXTILE FABRICS, *W. W. Blackett, Leeds.—27th July, 1882.* 4d.

This consists in the use and employment of chloride of calcium, chloride of iron, and white arsenic, separately or in combination.

3571. MACHINERY FOR BREAKING OR CRUSHING STONE, &c., *G. Dalton, Leeds.—27th July, 1882.* 6d.

This consists, First, in the employment of toggle levers set at different angles for operating the movable jaw or jaws; Secondly, the combination with crushing or disintegrating machinery of a rotating screen or sieve, provided with means for imparting a vibratory or shaking motion in addition to the rotary motion.

3572. CLOCKS, &c., *W. R. Lake, London.—27th July, 1882.—(A communication from R. W. Willson, New Haven.)* 6d.

This consists partly in the combination with a clock movement, of mechanism for causing the time wheel to be engaged with or disengaged from the time movement, the said mechanism being arranged in an electric or other impulse-transmitting circuit, and mechanism for turning the time wheel independently of the time movement, when the said time wheel is disengaged therefrom.

3573. ORNAMENTAL WINDOWS AND OTHER TRANSLUCENT OBJECTS, &c., *A. L. Liberty, London.—27th July, 1882.—(Not proceeded with.)* 2d.

This relates to the construction of ornamental windows, &c., requiring or not requiring translucency, and in the mode of fixing glass or other reflecting substance therein.

3578. IMPREGNATING WOOD, *W. P. Thompson, Liverpool.—27th July, 1882.—(A communication from L. Libert de Paradis, Vienna.)* 8d.

This relates to improvements in the methods of, and means for impregnating or "pickling" wood, so as to remove from the same those substances that are liable to cause decomposition therein, to extract all moisture, and, moreover, to saturate the cellular tissues with a powerful antiseptic, leaving ultimately a resinous covering or coating on said tissues. The wood treated will become durable, and capable of bearing greater strains.

3579. LOCOMOTIVE ENGINES, *J. B. Fell, near Ulverston.—28th July, 1882.* 8d.

This relates partly to the combination of two separate but connected railway carriages, upon one of which the boiler and connected parts are placed, and upon the other the engine or steam cylinders, water tank, coal bunkers, and connected parts are placed.

3580. SPINNING MACHINERY, *J. Holmes, Allerton.—28th July, 1882.—(Not proceeded with.)* 2d.

The object is the production of softer roving and yarn having fewer turns to the inch, and with less breakages than is obtained by machines as ordinarily constructed.

3584. PIANOFORTES, *W. A. Waddington, York.—28th July, 1882.—(Not proceeded with.)* 2d.

A metal bar is fastened to the pianoforte frame, and made to push or pull at the bottom part of the pianoforte sound-board to assist in supporting the pressure of the strings upon the bridge that is fixed to the sound-board.

3585. FACILITATING REFERENCE TO DICTIONARIES, &c., *A. Gerken, London.—28th July, 1882.* 4d.

This relates to the employment of a box provided with spiral or other springs arranged to press upon a supply of clips or pieces therein, and having an opening at one end through which the said pieces project in such a manner that they may be readily applied to the leaves of the book, and a sponge for damping the said leaves.

3586. TOY SAVINGS BANKS, *W. R. Lake, London.—28th July*, 1882.—(*A communication from J. H. Bowen, Philadelphia.*) 6*d*.

This consists mainly of a toy saving bank, composed of a receptacle for money, having an aperture or opening for money to be passed through it into the receptacle; a stand or support in front of said opening on which to place the money, and a device connected to and forming part of the toy and constructed and arranged to strike and project the money placed on said stand through said opening into said receptacle.

3588. SAFETY OR MINERS' LAMPS, *W. L. Wise, London.—28th July*, 1882.—(*A communication from La Cie Houillère de Bessèges, Nimes, France.*) 6*d*.

This relates particularly to improvements on the Mueseler lamps.

3594. MANUFACTURE OF GLASS, *W. S. Sutherland, Birmingham.—29th July*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the construction and arrangement of a small plant adapted to work continuously and economically.

3596. MACHINERY FOR THE MANUFACTURE OF HATS, *R. Wallwork, Manchester.—29th July*, 1882. 10*d*.

This refers, First, to mechanism to be used for "shaving" the bodies of felt hats when they are in the soft cone form; Secondly, to machines for pressing and for curling hats by hydraulic pressure; Thirdly, to the construction of moulds used for pressing hats, and consists in making them in two or more parts instead of all in one as hitherto.

3597. AWNINGS FOR HAMMOCKS, COTS, &c., *O. Seydel, Birmingham.—29th July*, 1882. 6*d*.

This relates principally to the employment of curtains and flaps.

3605. DRIVING CHAINS, *W. Hartcliffe, Salford.—29th July*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the construction of the links or brackets.

3599. SEWING MACHINE NEEDLES, &c., *J. Darling, Glasgow.—29th July*, 1882. 6*d*.

This relates to the construction of sewing machine needles to facilitate the threading of the same.

3600. TRICYCLES, &c., *J. P. Dalby, Leeds.—29th July*, 1882. 6*d*.

This consists in an arrangement to actuate tricycles either by hand and foot combined or separately, thus making the ascent of hills more easy.

3601. APPARATUS FOR RINSING, WASHING, AND SEPARATING STRONTIUM SACCHARATE, &c., *G. W. von Nawrocki, Berlin.—29th July*, 1882.—(*A communication from the "Zeitzer Eisengieserei and Maschinenbau-Aktien-Gesellschaft," Germany.*)—(*Not proceeded with.*) 2*d*.

The apparatus is composed of a number of sieve boxes, which are arranged in a circle around a central shaft, and dip in special washing tanks, which are connected by pipes.

3604. ROUNDABOUTS, &c., *A. Waddington and J. C. Rowbotham, Bradford.—29th July*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in constructing the roundabouts by preference with boats, which are suspended from strong rafters, and which receive by a peculiarly constructed apparatus a slow and easy up-and-down motion, something like a boat riding on the waves of the sea.

3607. PRODUCTION OF LIGHT AND HEAT, *S. R. Smyth, Westminster.—29th July*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the production of light and heat, and in the apparatus therefor.

3608. OBTAINING SULPHUR FROM SULPHIDE OF HYDROGEN, *C. F. Claus, London.—29th July*, 1882 4*d*.

This invention claims, First, the use of heated anhydrous oxide of iron for the absorption of sulphide of hydrogen; Secondly, the admixture of cold or heated air in regulated quantities, with the sulphide of hydrogen, before it is passed through the anhydrous oxide of iron, for the purpose of obtaining free sulphur in a continuous stream; Thirdly, the maintenance of the necessary temperature for causing the anhydrous oxide of iron to absorb the sulphide of hydrogen by the admixture of air with the gases, and the consequent carrying forward of the sulphur.

3609. OBTAINING CARBONATE OF STRONTIA FROM THE RESIDUES IN THE MANUFACTURE OF SUGAR, *D. Sidersky and H. Probst, Rositz, Germany.—29th July*, 1882. 6*d*.

This relates to an improved process for obtaining carbonate of strontia from the residues in the manufacture of sugar by means of strontianite, which process consists in boiling the slimy compound with hydrochloric acid, filtering the strongly acid solution, treating the same with moderately diluted sulphuric acid, whereby the strontia is precipitated as sulphate of strontia, removing the solution therefrom, washing the precipitate with water, which is afterwards drawn off, and finally treating the sulphate of strontia with a solution of soda or potash, or with residuary liquors from distilleries.

3611. AUTOMATIC APPARATUS FOR REGULATING SUPPLY OF GAS, &c., *A. Haley and A. C. Savage, London.—31st July*, 1882. 4*d*

The inventor claims, First, the mode or method of introducing the gas to actuate the regulating medium separately and independently of the supply of the burners; Secondly, the admission of the regulated gas from the outlet side of the apparatus to the diaphragm chamber, thus dispensing with air holes in the cover, and avoiding the risk of escape of gas should there be leakage through a defective diaphragm, bag, or container.

3617. FLOUR-DRESSING MACHINES, *W. B. Dell, London.—31st July*, 1882.—(*A communication from G. T. Smith, Jackson, U.S.*) 6*d*.

The inventor claims the use in dressing machines of sliding drawers or slides at the bottom of the shoot delivering the material into the conveyers, such drawers being so arranged with lateral openings that, according as they are placed in one position or the other, they can be made to deliver the material into the one or the other of two conveyers.

3626. TREATING DYED TEXTILE FIBRES WITH ANILINE, *W. J. S. Grawitz, Fontenay-sous-Bois, France.—31st July*, 1882. 2*d*.

The inventor claims the treatment of textile materials, dyed aniline black or grey or shades approaching black or grey, by means of non-alkaline reducing agents.

3630. IMPROVED MOTOR, *H. J. Haddan, Kensington. 31st July*, 1882.—(*A communication from G. Rupalley, Paris.*) 8*d*.

The object is to utilise the buoyancy of objects immersed in fluids for obtaining motive power.

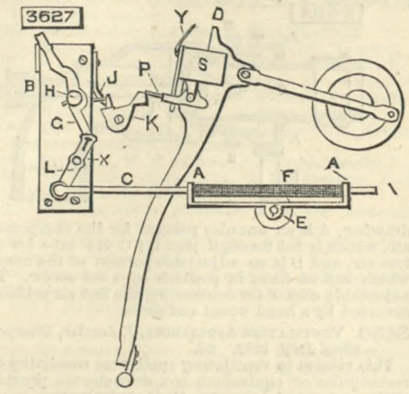
3636 SEPARATING METALLIC ORES FROM THEIR GANGUE, *T. S. G. Kirkpatrick, London.—31st July*, 1382.—(*Not proceeded with.*) 2*d*.

This consists in the method of winnowing the ore for the purpose of separating particles of different densities.

3627. WEFT STOP MOTIONS FOR LOOMS, *H. J. Haddan, Kensington.—31st July*, 1882.—(*A communication from L. J. Knowles, Massachusetts, U.S.*) 6*d*.

This consists in the combination, in a weft stop motion, of a dagger and fingers, so connected that the movements of one depend upon the movements of the other, with a rocking shoe operating to guide the dagger or receive and communicate its thrust to the belt shifting mechanism. B is the breast beam; C the shipper rod passing through holes in projections A upon a supporting plate rocking on a pivot in the end of an arm E projecting from the loom frame. A spring F surrounds the shipper rod. The shipper lever G is secured to a rock shaft H, and is connected by lever I to the shipper rod C, the lever I turning on a centre X and having a locking slot at its upper end to receive a pin projecting from a shipper lever G, the motion of which is limited by a stop. A finger J

3627



extends from shaft H, and is acted upon by an arm on the shoe K, so as to depress the finger and operate the belt-shifting mechanism. The dagger P acts on a stop of the shoe K, when the feelers Y fall into a slot in the lay S, by reason of the weft thread not having been properly thrown.

3640. DISTILLATION OF TAR, &c., *W. Maxwell, Gartsherrie.—1st August*, 1882. 6*d*.

The inventor claims the placing of vertical pipes within a still, with or without the use of a compressed air tube, and for the purpose of facilitating the disengaging or separation of the water, oil, or other liquids from bars while undergoing distillation, thereby considerably shortening the time occupied in the process of distilling tars, oils, and other liquids.

3641. SHIRTS, *G. W. von Nawrocki, Berlin.—1st August*, 1882.—(*A communication from S. Stern and Sohn, Germany.*)—(*Not proceeded with.*) 2*d*.

This relates to shirts made with side openings, and consists in closing the same by means of a stiff flap fitting into a pocket, instead of employing buttons or studs.

3660. MECHANICAL MUSICAL INSTRUMENTS, *P. Ehrlich, near Leipsic.—2nd August*, 1882. 6*d*.

This relates to instruments operated by the passage of a perforated sheet across levers operating the valves or reeds, and it consists, First, in the employment of a perforated disc, instead of an endless band; and Secondly, to the arrangement of reeds and valves, and to the combination of the bellows with an auxiliary bellows in the interior of the instrument.

3670. STOPPERING BOTTLES, &c., *T. and J. Brooke, Sheffield.—2nd August*, 1882.—(*Not proceeded with.*) 2*d*.

The stopper is fitted with an elastic ring, and has two projections, which enter grooves inside the neck of the bottle, so that when the stopper is forced downwards the bottle is closed, and by turning the stopper the projections pass into annular grooves, and secure the stopper in position.

3702. CEMENT, *L. Roth, Germany.—3rd August*, 1882. 4*d*.

This consists in burning and grinding a mixture of bauxite, consisting mainly of hydrate of alumina, hydrated oxide of iron, and silicic acid, with quartz, hydrated silicic acid, infusorial earth, blast furnace slag, or other silicates, and lime, and with or without the addition of dolomite, oxide of iron, raw carbonate of soda, alkali ash, or the like, as fluxes.

3731. RECOVERY OF TIN FROM SCRAP TIN-PLATE, *A. T. Becks, near Birmingham.—5th August*, 1882. 4*d*.

This consists in operating upon the solution of tin obtained by the action of acids on scrap tin-plate by marble or other crystalline carbonate of lime previous to the precipitation from the said solution of hydrated oxide of tin by a mixture of chalk and water.

4258. APPARATUS FOR SETTING-UP AND DISTRIBUTING TYPE, *J. C. Mewburn, London.—7th September*, 1882.—(*A communication from A. Low and L. K. Johnson, Brooklyn, U.S.*) 8*d*.

This relates to the use of oscillating containing channels in combination with a stationary type-holder, and, further, to means for both setting and redistributing type without disturbing the channels; also to devices for holding a page or column of type and presenting it to the operator of redistribution by hand.

4590. TREATING SOAP LYES TO RECOVER GLYCERINE, &c., *A. J. Lawson and H. L. Sulman, Bristol.—27th September*, 1882. 4*d*.

This consists in the use of salts of chromium as recoverable salts for tanning or rendering insoluble the albuminous matters contained in soap lyes, and also the use of waste liquor resulting from the bleaching of fatty or oleaginous substances for the purpose of rendering insoluble the albuminous matters contained in the lyes, and at the same time neutralising their alkalinity.

4679. HACK CAP OR COVER FOR PROTECTING BRICKS FROM RAIN, *J. D. Lampard and F. Coppen, Hackney-road.—2nd October*, 1882. 6*d*.

This relates to a hack cap or cover which can be folded up when not in use.

5564. WHEELS AND AXLES FOR VEHICLES, *A. M. Clark, London.—2nd November*, 1882.—(*A communication from B. N. Shelley, Indiana, U.S.*)—(*Complete*) 6*d*.

This relates to the construction and combination of a vehicle wheel and self-lubricating axle, the latter consisting of a tube filled with oil and fitted with sleeves at each end, on which the axle-box rotates.

5723. ATTRITION MILLS, *T. L. Sturtevant, Framingham, U.S.—1st December*, 1882.—(*Complete.*) 6*d*.

This relates to attrition mills for grinding phosphates, ores, grain, and other materials, in which the material furnishes its own self-grinding surfaces, and the objects are, First, to enable the circular edge of the rotary head to be renewed as it wears, by employing a movable lining to each head; Secondly, to rapidly remove the powder as it forms by the use of a case with cells to receive the powder, and which by revolving raises the same above the unground material, when it is removed by a fan or other means.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

271,902. GAS ENGINE, *Lewis H. Nash, Brooklyn.—Filed May 19th*, 1882.

Claim.—(1) The method of operating an explosive gas engine, which consists in admitting to the working cylinder a charge of gas from a reservoir or other source of supply, and a charge of air from a separate chamber, igniting the same by successive jets, and finally discharging the waste gases through the same port or chamber by which the charge of air is admitted, substantially as herein set forth. (2) A gas engine, in which a charge of gas is admitted to the working cylinder from a reservoir controlled by a suitable valve, and a charge of air from a chamber formed between the pistons of the controlling valve, and ignited by means of a jet supplied with gas from the reservoir, conducted through the main valve and introduced into the working cylinder at the point where the explosion is desired to take place, substantially as herein set forth. (3) The combination, with the reservoir R and the chamber L, of the jets J and n and the cylinder W, arranged and operating substantially as described, and for the purpose set forth. (4) The combination of the reservoir R, chamber V, lighter space L, port E, jet n, and the cylinder W, substantially as shown and described. (5) The valve composed of the section K, K^1, K^2, forming chambers L and V, and provided with the passages d and n, substantially as described. (6)

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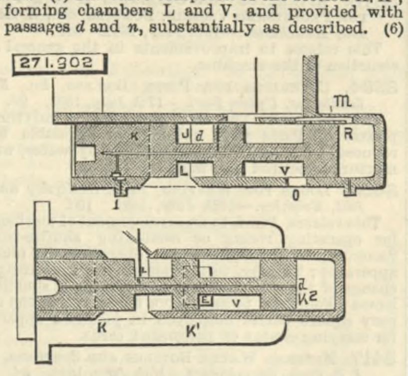

The combination of the cylinder W, port m, reservoir R, chamber V, and jets J and n, substantially as set forth. (7) The combination of the cylinder W, reservoir R, port m, chamber V, ports o and E, and means, substantially as described, for igniting the explosive mixture in the cylinder. (8) The combination of the cylinder W, reservoir R, chambers V and L, ports m, O, E, H, and jets T, J, and n, substantially as described for the purpose specified.

271,904. ELECTRIC MAIL CONVEYER, *Eberhardt Nicolasien, New York, N.Y.—Filed May 24th*, 1882.

Claim.—(1) The combination with a car having an electric motor, of a main and side tracks whose rails form an electric circuit, including the motor on the car, the railway switch l l^1, arm q, anvil t^1, slide r, and magnet n, with circuit connections from the main track to the magnet and arm q and anvil t^1, whereby the cars may be automatically shifted from the main track to the side track, as described. (2) The combination with the car C, main rails a, and side rails b, of the switch consisting of the pivotted switch points l, slide bar m, operating magnet n, and catch o, provided with the arm p, substantially as shown and

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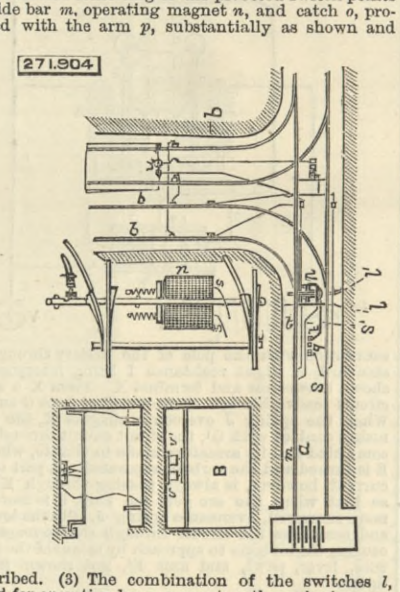

described. (3) The combination of the switches l, fitted for operation by a magnet n, the swinging contact arm q, connected by wires s s^1 to the switch magnet and the adjustable slide piece r upon the car, substantially as described, for operation to move the switch automatically, as set forth. (4) The combination of the sliding stop bar t, swinging bar v^1, magnet u, means for operating the swing bar, and the circuit connections to the electrical switch and track, substantially as described and for the purpose set forth. (5) The combination of the sliding catch o and lever v with the switch bar m and magnet n, substantially as described.

271,928. DYNAMO AND MAGNETO ELECTRIC MACHINE, *Chas. A. Seeley, New York, N.Y.—Filed November 1st*, 1882.

Claim.—(1) An armature wheel having coils wound sectorally, in combination with radial braces between the coils, a shaft, clamping rings at the hub, and clamping rings around the circumferential portions of the coils substantially as set forth. (2) An armature wheel having coils wound sectorally, in combination

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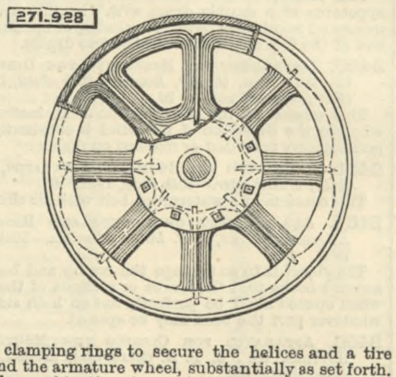

with clamping rings to secure the helices and a tire around the armature wheel, substantially as set forth. (3) The combination, in an armature wheel having no iron cores, of coils wound sectorally and placed near each other, with the adjacent portions of the coils parallel, or nearly so, substantially as set forth.

271,972. DYNAMO-ELECTRIC MACHINE, *William Baxter, Jun., Jersey City, N.J.—Filed April 6th*, 1882.

Claim.—(1) The combination of the armature H, with flattened annular magnets arranged at each side thereof, as described, the magnets being provided with lugs E and l, and the wires g^1 being wrapped upon the magnet in parallel coils, forming triangular air spaces or channels n, substantially as shown and described. (2) The combination of the flattened annular armature H, constructed of thin plates and enveloped in the circuit wires, as described, with the discs d d, flanges J J^1, hub I, and shaft C, the whole arranged and operating to rotate the armature with the shaft, substantially as shown and described. (3) The combination, with the two annular magnets formed with lugs E at the polar points, of the adjusting blocks G, and means, as bolts b b, for securing the magnets together with the blocks between them, substantially as and for the purpose set forth. (4) The combination, with the cylindrical commutator K, having circumferential sections disposed parallel to its axis, of the brush holders L, pivotted in the bracket M by shanks parallel with the shaft of the commutator, and extending from the bracket parallel with the sections thereon, and formed with slots k at an angle with the joints between the sections, substantially as shown and described. (5) The combination, with flattened annular armature, wound, as described, so as to be thicker toward the centre, of the flattened annular magnets, dished or concaved, as described, to secure a uniform distance between the opposed faces, substantially as shown and described. (6) The com-

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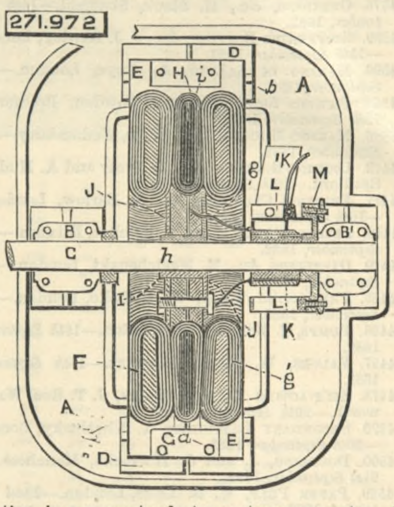

bination, in a magneto-electro motor or generator, of a series of alternate flattened annular armatures and magnets, the arrangement containing two or more armatures having magnets arranged upon both sides thereof, substantially as and for the purpose set forth.

272,086. UNIVERSAL ROLLING MILL, *Jacob Reese, Pittsburg, Pa.—Filed September 30th*, 1882.

Claim.—(1) In a universal rolling mill the combination, with two pairs or series of horizontal rolls, of a pair of intermediate vertical idler-rolls provided with means for horizontal adjustment, substantially as set forth, whereby the ingot operated upon is caused to rotate the vertical idler-rolls, and whereby said idler-rolls may be brought into close proximity for the purposes described. (2) In a universal rolling mill the combination, with the idler-rolls F of the frames G, the housings B, provided with openings of

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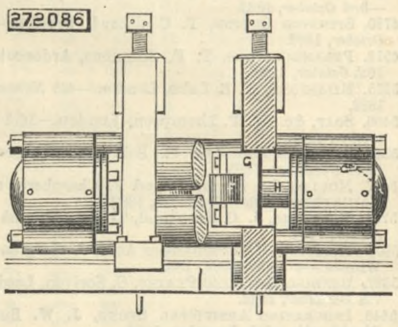

like cross-sectional area with that of said frame G, and means for withdrawing the said frame, as set forth, whereby the vertical idler-rolls may be drawn within the housings, and the whole surface of the horizontal rolls be utilised for the purposes described. (3) The combination, with the vertical rolls and the housings provided with openings, of the bifurcated frames G, the piston H, the ram C, all arranged as described, whereby horizontal movement is imparted to the vertical rolls in the manner and for the purposes set forth.

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