

conjointly with the theory. It was not, however, encouraging, for I was told I would do better to turn a workman, and that the beautiful part of the thing was merely the mathematical theory of the whole, the remainder, or practical part, being very paltry in comparison—only worth occupying the attention of draughtsmen. For me, however—and I am sure to have many people on my side—the beautiful part is the able and thoroughly rendered practical realisation of some projected monument of engineering, especially when it is to be of public utility.

I have not written these lines out of spite, or to deery either the actually existing schools or their scholars. I have merely done the little I could to draw public attention to a state of things which involves the future renown of a profession which has distinguished England for more than a century.

In passing I may name a fact often noticed, and which may not be out of season here. Last week saw the celebration of the first centenary of the Father of Railways, G. Stephenson, one of the greatest benefactors of mankind. Everybody knows how practical the great engineer was. To practical observation he owed part of his greatness. The same may be said of James Watt, and many others who contributed to the fame of this land. All were "practical men." Their works are wonderful; their inventions are their best titles to the remembrance and admiration of posterity.

I have already pointed out what I thought most expedient to form an engineer. Perhaps the great evil of theoretical training is that the professors, in the love of the thing, do not know where to stop. It is certain that a little theory will open the mind of the student. It is easy to lay down what branches of science will be useful to him in his career, and how far he must study them; for instance, notions of infinitesimal calculus are sufficient, but the theory of elliptical functions is needless! Let it be understood once more that this is not meant to discourage the student of the above schools. He may become a first-rate engineer on leaving the school if he will forget for a while his studies, and cautiously learn practice. Theory and practice lend each other assistance, so that he can become if he likes a very good engineer. The examinations ought never to be such as to eliminate practical minds, though they may not be much inclined towards the science of abstractions.

Let us hope that a salutary reaction may take place, and England will keep the foremost rank it occupies still in the art of engineering. I will not judge here whether the Government do right or wrong to reserve themselves the appointment of engineers in some cases and places, but it is certain they might have had more sense. They may act indirectly, and leave to private enterprise the care of undertaking works which often are more beneficial for the public than the Government. I hope there will rise some interesting and sound discussion on this subject as the result of your leading article. ED. GOBERT, B.Sc. Nottingham, June 18th.

ENGINE-ROOM ARTIFICERS IN THE NAVY.

SIR,—In your issue of June 17th there appears a letter signed "R. N." commenting on the position of one very important branch of the Royal Navy, namely, the engine-room artificers; and taking into consideration the trenchant articles which have lately appeared in your columns on reforms in the engineering branch of the Navy, the appearance of "R. N.'s" letter is not ill-timed, considering the fact that the articles in your paper pointed to the introduction of thorough practical mechanics to take charge and superintend the engines in her Majesty's ships of war. Well, Sir, it is patent to me, as it is to others in her Majesty's service who come in contact with engineers and engine-room artificers, that the service is to a very great extent in possession of the practical man, by which I mean an engine-room artificer—without for one moment wishing to disparage the mechanical skill of the engineers collectively, as some of them are gentlemen of the highest abilities, both practical and theoretical. But can this be said for them all? Alas! I am afraid not; for in 1868, to supply this very deficiency, the Admiralty issued a circular for the entering of mechanics as engine-room artificers, for supplying the practical knowledge which the majority of engineers lacked. And how has this experiment worked—and with what result? Take for example H.M.S. Inflexible, which will perhaps be in commission before this reaches you. She will, I believe, take a complement of seven or eight engineers and sixteen engine-room artificers. Compare this with H.M.S. Devastation, for when she went into commission eight years ago she carried fourteen engineers and four engine-room artificers. And as regards the horse-power, why there is no analogy between the two vessels. Then why this reduction of engineers? For if the Devastation required fourteen engineers to work her engines efficiently, why surely the Inflexible must, of a necessity, require twenty-eight engineers, as she is double the horse-power of the Devastation. Then I ask again, how has this revolution taken place in the engineering element? It is, Sir, because their lordships have discovered that they can get the same amount of intelligence in the engine-room for a far less outlay than formerly by giving an engine-room artificer work to do that had been done—prior to the introduction of this class—by the practical engineer. I have only given you this instance as a proof that the entry of engine-room artificers in the Royal Navy has been quite a success. I could quote you numerous cases, were further proof for my assertion required, where engine-room artificers have been told off to do engineers' duty. So that I can quite confirm "R. N.'s" statement about engine-room artificers relieving engineers when on watch. In fact, cases have frequently come under my own observation where an engine-room artificer has had full charge of the engines. "R. N." I am afraid only speaks too truly when he says that obstacles have been thrown in the way of the engine-room artificers doing any responsible work. But I must take exception to the rule, for I have often heard engineers speak in laudatory terms of the artificers under their charge. Well, Sir, getting back to the point, this reduction of the engineers in her Majesty's navy has been, and must be one of the most economising points on the part of the Admiralty, besides ensuring the better working of the engines in her Majesty's service of war; and now it is only fear of trespassing upon your valuable space which forbids me mentioning a few of the glaring anomalies under which this very useful class of labour on board ship, such as bad pay, bad pensions, washing and messing accommodation, acting time for confirmation, ranking with but below a ship's policeman, a boatswain's, carpenter's, and gunner's mate, &c. &c.; and, now, to be brief, there is, to my mind, only one solution to this much vexed question of engineering reform in the Royal Navy—that is, looked at financially, and for the best interests of the country at large, and for the true interests in every respect to her Majesty's service. Improve the position of the good and qualified engineers, and give the engine-room artificers warrant rank, or something analogous to it, with better pay, and then you will get even a still better and more competent class of mechanics to join as engineer artificers or engine-room artificers, if you like, and by doing so justice will be done to a very numerous and deserving class. If the present arrangements, such as you find in "regulations," "addendas," and "circulars," are allowed to last, it will only be to the continued disarrangement of the engineering staff in her Majesty's Navy. June 22nd. E. X.

THE MILLING EXHIBITION.

SIR,—Your correspondents, "French Burr" and "Quern," in last week's number, seem to be rather upset about the success achieved by the "high grinding" or gradual reduction process by means of roller mills during the last Milling Exhibition in Islington, and although I do not doubt that they are right that the millstones will not be dispensed with in a hurry, they will nevertheless make the experience that roller mills will supersede millstones slowly but surely, in the same way as they have done in Austria and Germany.

Roller mills are superior to millstones in the work of reducing wheat to flour, &c., because they are able to treat the wheat in

such a manner as to enable the rejection of such impurities—such as the dust out of the crease, very small particles of bran, and last, not least, the germs to be effected. These millstones partly produce themselves—rubbing off very small particles of bran, speckles—and partly are obliged to leave in the flour.

"French Burr" admits himself that flour made by rollers is superior to that made by stones, and if any proof was needed for this assertion, it is the fact that the consumers pay a higher price for roller-made flour than for stone-made flour.

Besides, flour made by rollers is imported largely into England, and the import increases every year. In 1874 it amounted to 228,105 cwt., and in 1877 to 1,016,300 cwt. How much the import was last year I cannot say, because statistics of this kind generally are published some years late. In Budapest existed in 1860 five large high grinding mills, producing 7 grades of flour; today there are twelve mills, which produced a total quantity of 9 million cwt. of flour in 12 grades, of which the four finest numbers are sold to England. If such flour can bear the cost of manufacture by rollers, the profit of the Austrian miller, the cost of transport, and the profit of the agents in England, perhaps "French Burr" will believe that English millers can earn a good profit if, by the use of roller mills, they are enabled to make from English wheat a flour equalling the finest Austrian.

"French Burr" will no doubt know that millers are not able, by any brushing or smutting of the wheat, to remove the dust out of the crease or longitudinal fold of the wheat berry, and also that he cannot prevent the stones rubbing off a large amount of such small particles from the outer husk—bran—of the wheat that they will pass through the silk of the dressing machine into the flour, thereby discolouring the same and injuring its quality. Nor are stone millers able to reject the germs. Every grain of wheat has a germ consisting of a very bitter-tasting oily substance, and it is the elimination of these three impurities which form the main principles of roller milling, and ensure the higher quality of roller-made flour. Further, by advancing step by step, and always selecting the fittest and best parts of the wheat, and grinding them separately, we obtain in roller milling, flours which pay well for the trouble taken in their production.

If "French Burr" says he can cite instances where roller mills did not succeed, I can only conclude that they were neither properly constructed nor managed. I can cite numerous instances where roller mills did succeed, one of the most striking being Messrs. MacDougal Bros., millers in London and Manchester, who began a trial with one roller mill in the year 1877, and have at present about seventy roller mills. Besides, I can cite one instance where a stone mill had been badly constructed, and in consequence several millers either were doomed in this unlucky place or sold it to another unfortunate. This very mill is now in the possession of a miller who uses only part of it for a roller mill plant, and turns out a larger quantity of flour than the stones would be able to do. This miller succeeded, although he lets his stones stand idle. Also, if worse flour has been manufactured by the use of rollers as in the same mill by stones, it is the same as if a man cannot travel faster with a steamer than with a sailing vessel, or if he cannot write quicker by shorthand than by ordinary writing. If "French Burr" wants to convince himself about the quality of roller-made flour in puddings, he will find plenty of places where he can procure roller-made flour, either Austrian or English, and if he is happy enough to possess a perfect cook, I am sure he will prefer the roller-flour pudding to the stone-flour pudding.

Your correspondent "Quern" may rest assured that the millers of England not only can pay the cost of manufacturing flour by rollers, but also that by means of using roller mills, and by this means only, they will be able to overcome American competition in patent flour. If he will take the trouble, he will be able to obtain, also, statistics about the import of American patent flour into England, which would not be saleable if English millers could make a better flour on the spot, and thus save the cost of transport of the finished product.

With regard to cost of making flour by means of roller-mills, I may refer "Quern" to Professor F. Hick's well-known book about "the manufacture of flour," where he states on page 219 that on the average rollers are able to turn out about 30 to 60 per cent. more flour with the same power that they used in the stone mill—or, in other words, a roller mill grinds from 4 to 5 cwt. of wheat per twenty-four hours per indicated horse-power, whereas stones only ground 3'15 cwt. wheat per twenty-four hours per horse-power indicated. This alone involves a saving of about 50 per cent. in working expenses. Besides, by making more high-class flour, which is sold at a higher price than best stone flour, the miller derives an extra profit of about 3s. to 5s. on every ton of wheat ground, according to the market where the flour is sold. As an explanation of this extra profit, I give you below an estimate of percentages and prices of roller-made flour, as made by several roller mills in England and Ireland, which are working for a period of more than twelve months.

100 cwt. of clean Wheat produce with Stones.

Table with 2 columns: Description of flour and its price per cwt. Total value is £69 13 5.

100 cwt. of clean Wheat produce with Rollers.

Table with 2 columns: Description of flour and its price per cwt. Total value is £74 4 9.

Extra advantage of rollers over stones for every 100 cwt. of wheat ground . . . . . 4 11 4

7, St. Peter's-square, Manchester. THEODORE VOSS. June 14th.

LAW AND CLARK'S CIVIL ENGINEERING.

SIR,—This is the last time that I will trespass upon your goodness, as your space and my time are of too much value to waste in discussion with Mr. Clark. The tone of his reply is what I should expect from a person capable of mutilating the work of a living author—as he has mutilated mine—without having consulted that author's wishes.

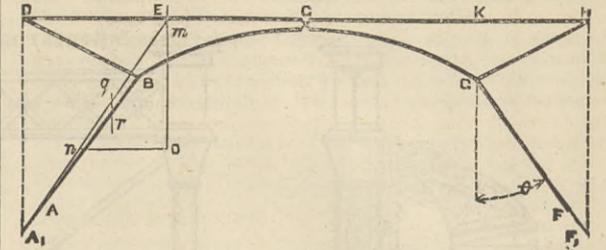
He has thought proper to bring against me the charge of having taken portions of my work from other sources without acknowledgment. I emphatically deny that a single line of my work was copied without acknowledgment, and I call upon Mr. Clark to substantiate his charge, or to remain with the odium that attaches to those who make such charges falsely. If any person will read the remarks in my former letter relative to concrete, Portland cement, and steel, and will then look up Mr. Clark's references, he will be able to form a very accurate opinion of the merits both of Mr. Clark and of his work.

But, Sir, is it not a matter for just wonderment that a person with Mr. Clark's own marvellous cerebral development and extensive practical knowledge of civil engineering, should have condescended to waste so much of his time in improving the "sad jumble" which a man with "paste brains" had stolen without acknowledgment from other sources, when, of course, he could have written such a much better work himself? 5, Queen Anne's-gate, June 20th. HENRY LAW.

THE PROPOSED BRIDGE OVER THE DOURO.

SIR,—In THE ENGINEER of June 10th you published a letter from Mr. Reilly, but as I think the stress diagrams have been

drawn out under a misapprehension as to the way in which the loads would act, perhaps I may make the meaning of my letter clearer by taking out the strains on some of the members, using Mr. Reilly's figures and weights so far as they apply.



(a) Stresses due to fixed load.—The centre of gravity of D B C is 10ft. to the right of B, therefore the weight at D necessary to bring the centre of gravity over B = (750 tons × 10ft.) / 135ft. = 55 tons.

(Mr. Reilly makes an excess of weight of 112 tons.) (b) The thrust on the strut A B at B adding 50 tons for its weight = w × sec. θ = (750 tons + 55 tons + 50 tons) × sec. 36° 30' = 1060 tons. (Mr. Reilly makes this strain = 830 tons.)

(c) The thrust at C = the horizontal strain at B = w × tan. θ = (750 tons + 55 tons + 50 tons) × tan. 36° 30' = 632 tons. (Mr. Reilly makes this strain = 512 tons.)

(d) Live load on E C.—The weight at D necessary to counter-balance this load = (192 tons × 80ft.) / 135ft. = 113 tons. (Mr. Reilly makes this strain = 25 tons.)

(e) The strain at E or B due to the counterbalance weights (a) and (d) = (W × D E) / E B = ((112 tons + 113 tons) × 135ft.) / 48ft. = 632 tons

tension at E or compression at B. (Mr. Reilly makes these strains = 337 tons compression at E and 360 tons tension at B.)

In reply to the first question in my previous letter, viz., "Why the lines D E C and C K H should not form the letter V." Mr. Reilly states, "Inspection of the diagram is sufficient to show that such movement, implying sinking of the point C, would require rotation of D B C and C G H about the points D H. There was always a certain amount of downward pressure at D and H, and provision against upward movement at these points was not required."

I think I have clearly shown above (a) that provision to the extent of 55 tons would be required, otherwise the lines D B C and C K H would form the letter V. In regard to the second question in my previous letter, if the strain on m A can be transferred, as Mr. Reilly shows, to A B without producing a bending moment at B, then the strain on A B = W × sec. θ, and on M A = W × sec. α, therefore, if θ = 20 deg., α = 15 deg., and W = 10 tons, then the strain on A B = 10 tons × 1'064 = 10'64 tons, and the strain on m A = 10 tons × 1'035 = 10'35 tons, whereas Mr. Reilly makes the strain on A B less than on m A. In reply to the third question, Mr. Reilly states, "It is evident again that q r, the vertical component of the oblique resultant at A1, is transmitted along the line A1 D to D, and is the upward reaction at that point." Would Mr. Reilly be kind enough to explain how the strain can be transmitted along the imaginary line A1 D to D? If Mr. Reilly is correct in regarding the structure as consisting primarily of two great cantilevers A1 D C and F1 H C, what is the object of articulating the points B and G? As there are such very great differences between the primary strains calculated by Mr. Reilly and myself—for instance, in (c) the difference amounts to 992 tons—I think it is unnecessary to pursue the criticism any further. I wish, however, to state that in thus criticising some of the strains, I do not intend to say anything against the general design of the bridge, or the Clerk-Maxwell method of calculating strains by reciprocal figures, but I do not think it right to allow what I consider to be a wrong application of this method to pass unchallenged. A COMMON FIVE-EIGHT. June 21st.

SAFETY VALVES.

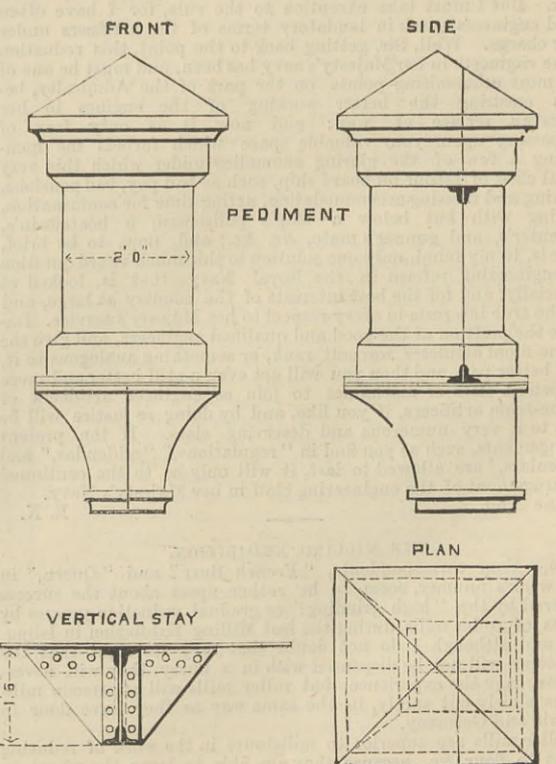
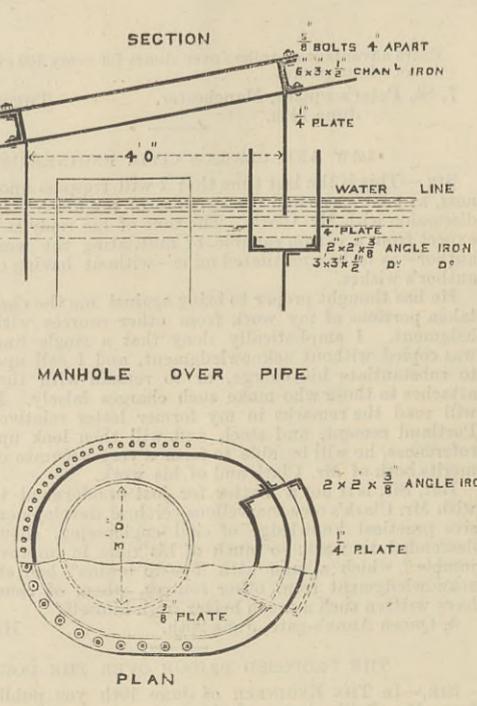
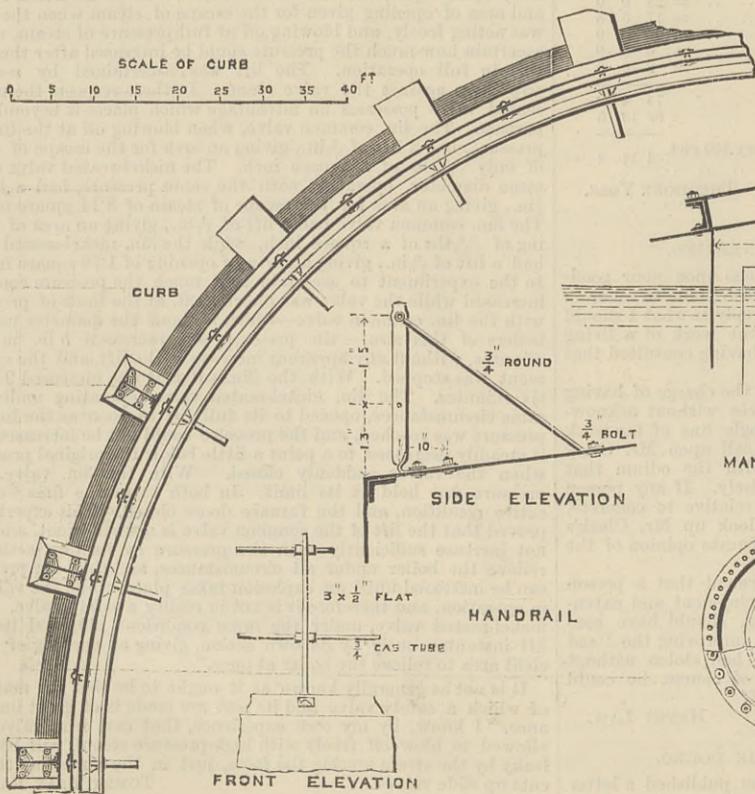
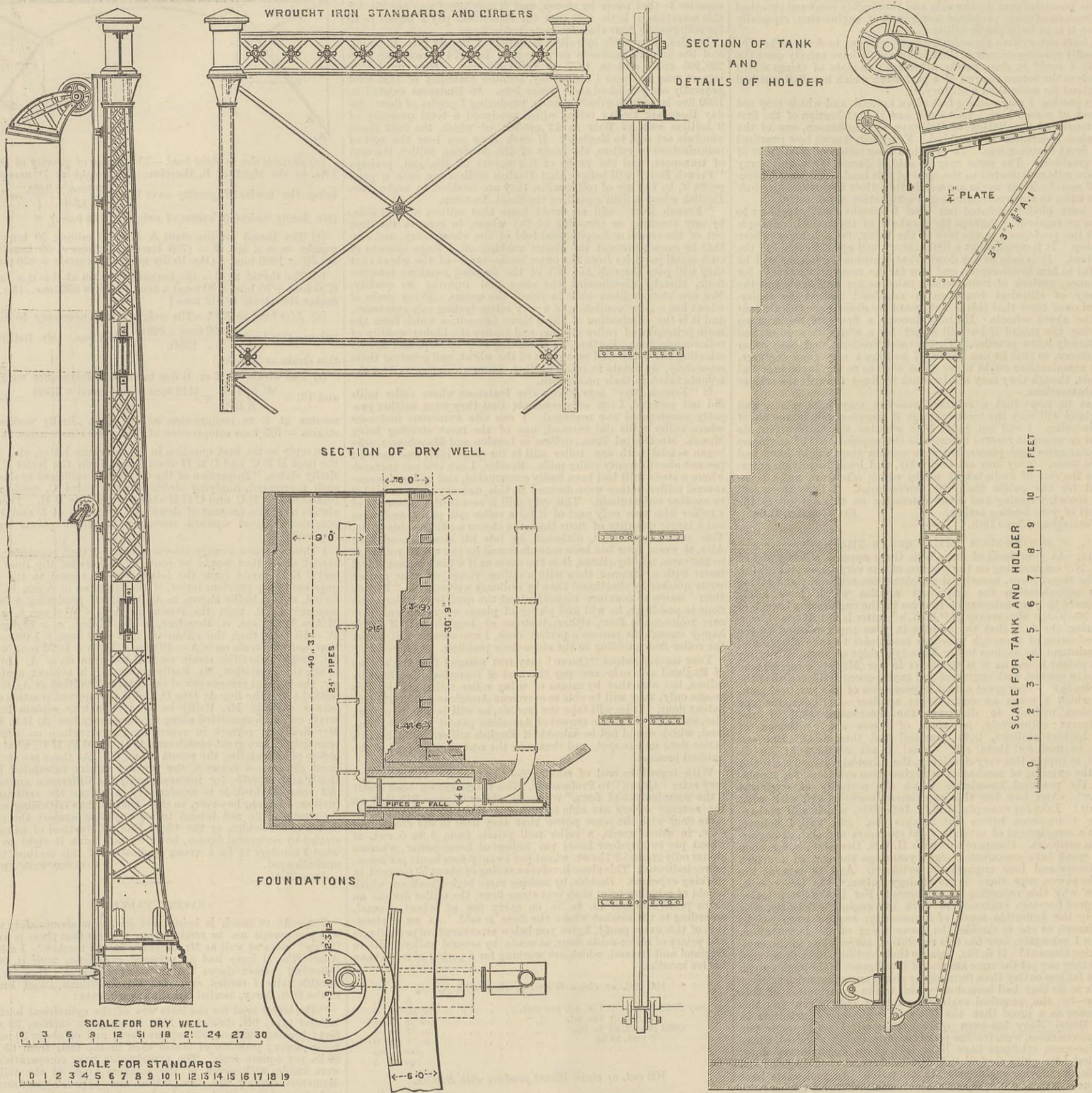
SIR,—As so much is being said just now about safety valves, will you permit me to remind your readers that there is another "Pop" valve as well as Mr. Adams's in the market? I allude to Ashcroft's. I have had no personal experience with it, but the following extract shows that it is a good valve. How far it is a durable valve I cannot say. Mr. Edwin Fithian, Chief Engineer in the U.S. Navy, carried out the experiments:—

"The boiler used for the tests was of the cylindrical horizontal tubular type, 6ft. diameter, 20ft. long; grate surface, 22 square feet; heating surface, 928 square feet; and of about 30 nominal horse-power; pressure of steam used in the test, from 65 lb. to 80 lb. per square inch. The experiments were comparative, and were made with seven of the common kind, of the following diameters, namely, 4in., 3in., 2 1/2 in., 2in., 1 3/4 in., 1 1/2 in., and 1in., and seven of the nickel-seated valves, of diameters 4in., 3in., 2 1/2 in., 2in., 1 3/4 in., 1 1/2 in., and 1in. The object was to ascertain the lift and area of opening given for the escape of steam when the valve was acting freely, and blowing off at full pressure of steam, and to ascertain how much the pressure could be increased after the valve was in full operation. The lift was ascertained by securing scratchers against the valve stems. In these respects the nickel-seated valve possesses an advantage which places it beyond comparison. The 4in. common valve, when blowing off at the limit of pressure, had a lift of 1/2 in., giving an area for the escape of steam of only 1/16ths of a square inch. The nickel-seated valve of the same diameter, operating with the same pressure, had a lift of 1 1/2 in., giving an area for the escape of steam of 3'14 square inches. The 3in. common valve had a lift of 1/4 in., giving an area of opening of 1/16ths of a square inch, while the 3in. nickel-seated valve had a lift of 1 1/8 in., giving an area of opening of 1'76 square inches. In the experiment to ascertain how much the pressure could be increased while the valve was blowing off, at the limit of pressure, with the 4in. common valve—which is about the diameter used on boilers of this size—the pressure was increased 5 lb. in four minutes, without any apparent increase in the lift, and the experiment was stopped. With the 3in. valve it was increased 9 lb. in six minutes. The 4in. nickel-seated valve, operating under the same circumstances, opened to its full lift as soon as the limit of pressure was reached, and the pressure could not be increased, but it steadily decreased to a point a little below the original pressure, when the valves suddenly closed. With the 3in. valve, the pressure was held at its limit. In both cases the fires were in active condition, and the furnace doors closed. This experiment proved that the lift of the common valve is not sufficient, and will not increase sufficiently with the pressure by its own action to relieve the boiler under all circumstances, and that the pressure can be increased until an explosion takes place, while the valve is in operation, and therefore it is not in reality a safety valve. The nickel-seated valve, under the same conditions, obtained its full lift instantaneously by its own action, giving an opening of sufficient area to relieve the boiler at once."

It is not as generally known as it ought to be that the material of which a safety valve and its seat are made is of great importance. I know, by my own experience, that cast iron valves, if allowed to blow off freely with high-pressure steam, will become leaky by the steam scoring the faces, just in the same way that it cuts up slide valves. TOMMY PLAY FAIR, Southampton, June 14th.

CONTRACTS OPEN.—TELESCOPE GASHOLDER FOR HALIFAX.

(For description see page 462.)



RAILWAY MATTERS.

A PARIS telegram says:—A sub-committee has reported the rival routes from Paris to Milan to be as follows: St. Gothard 1121 kilometres, Mount Blanc 1109, Sinplon 1037, Mount Cenis 1207.

ON Sunday night a goods train belonging to the Dublin, Wicklow, and Wexford Railway Company ran over an embankment, and twelve wagons tumbled into Kingstown Harbour. No one was injured, although several persons had remarkably narrow escapes.

THE rim of the homogeneous car wheel, as it is called, is cast from melted scrap of wrought iron and steel. As soon as it has cooled sufficiently to set it is taken from the mould and placed in another and the centre piece is cast of best wheel iron. The two metals are thus firmly welded together.

GENERAL BEAUREGARD claims to have originated the cable system for street railroads. He brought a suit against the San Francisco Company, and it was compromised by the agreement of defendants not to extend their use of it away from the Pacific coast. It is stated that the Chicago companies will pay him a royalty for the use of the system in that city.

THE North Staffordshire Railway Company has issued a revised scale of charges for the carriage of iron and minerals. By the new tariff they propose to charge their freightage on the short-weight ton—2240 lb.—against the long-weight ton—2400 lb.—as formerly. This change means a net increase of 2d. per ton. The new rate on pottery-mine is 3s. 8d. per ton carried in owners' trucks, and 4s. 6d. carried in the company's trucks for delivery in South Staffordshire. These alterations are giving rise to loud complaints.

In the United States markets steel rails are lower, and quotations are £11 4s. to £12 per ton at the mill. It is almost impossible to place any order for delivery before September. Some sales of English steel rails are reported at £12 6s. to £12 15s. at southern ports. For iron rails there is still much inquiry, and the mills are all full of work. Prices range from £9 6s. to £10 per ton at mill according to section. For old iron rails the market is dull. Sales are reported at £5 4s. to £5 6s. per ton in Philadelphia.

THE stream of water that burst into the heading on the Gloucester side and flooded the works of the Severn Tunnel has been stopped. It was traced to the bed of the huge salmon pool in the middle of the Severn. This pool, which was many acres in extent, has been drained in some parts, and where the water percolated through the bed bags of clay have been used and any further influx has been stopped. Nearly all the water has been pumped out of the heading, and the consequences of the mishap will be recovered in a few weeks, and the works on both sides of the Severn will once more be in fair progress.

THE destruction of a great length of railroad by natural causes seems to have occurred for the first time in the United States, when the flood and ice gorges of the Missouri swept away or buried nearly the whole of what was formerly the Dakota Southern Railroad—now the Sioux City and Dakota Division of the Chicago, Milwaukee, and St. Paul—from Yankton to Sioux City, sixty miles. A correspondent of the New York *Tribune*, writing from Yankton, June 1st, says: "Down the valley winds the wrecked or buried track of a once prosperous railway, and its cars are crushed and its offices closed for sixty miles, and not a whistle of a locomotive has been heard in Yankton since March 28th."

A DEPUTATION of the more influential gentlemen of the town and district of Bishop Auckland and the Local Board of that place, waited last week upon the directors of the North-Eastern Railway Company, in their board-room at York, and asked them to consider the idea of constructing a railway between Bishop Auckland and Spennymoor. The aim of the proposed line is to open up a populous district which is difficult of access from Bishop Auckland, that direct communication may be obtained with the mid-eastern portion of the country and with the main line. The representations of the deputation were listened to attentively, and a promise was made by the directors that the subject should receive careful consideration.

"CONSIDERABLE excitement," says the *Port Jervis Gazette* of June 6th, "was caused just before one o'clock to-day by a loud report which many supposed was that of a locomotive exploding. A rush was made for the railroad yard, when it was ascertained that the gas in the fire-box of engine 272, Chauncy Anderson engineer, had blown open the door of the fire-box. The fireman, George Brown, was at work on the running-board, oiling the engine, and thus escaped the injury that would very likely have resulted had he been in the cab. The engine was not damaged. The fire had been banked in the engine since Saturday, and when the locomotive was run out on the track near the water tank and the fire stirred, the explosion followed. This is the second time a similar explosion has taken place in this engine."

WE learn that the Fife coalowners and others are at present endeavouring to induce the Caledonian Railway Company to construct a new line for passenger and goods traffic between Alloa and Kirkcaldy. Plans of the scheme have been prepared to be laid before the railway company. The route of the proposed new line would be from the new bridge at Alloa, touching at Kennetpans, Kincairdine, Culross, Cairney-hill, Crossford, Dunfermline, Crossgates, and Auchtertool. This would be less circuitous than the present North British route, and would lessen the distance from Dunfermline to Kirkcaldy by twelve miles. In connection with this scheme it is also proposed to construct a tidal harbour at Kirkcaldy of seventeen acres area, and ultimately to extend the railway to Leven in event of the undertaking proving successful.

THE following are the items of cost of an American goods box car, 30ft. long and 8ft. 8in. wide, as furnished to the *National Car Builder* by a superintendent of the car department of a prominent road in one of the middle States:—Items of cost: Castings, 1106½ lb., at 3 cents per lb., 31 dols. 87 cents; wrought iron, 1437 lb., 38 dols. 89 cents; brake chain, 3½ lb., 22 cents; bolts, 175½ lb., at 4 cents, 7 dols. 2 cents; nuts, 58¼ lb., at 4 cents, 2 dols. 35 cents; Atwood nuts, 7½ lb., at 5½ cents, 40 cents; washers, 41½ lb., at 4 cents, 19 cents; sag screws, 66 lb., 1 dol. 20 cents; royalty on draw-bars, 2 lb., at 20 cents, 40 cents; paint stock, 5 dols. 30 cents; tin, 163 sheets, at 2 cents, 13 dols. 4 cents; solder, 8 lb., at 11 cents, 88 cents; tin nails, 1 lb., 10 cents; cleat nails, 1 lb., 10 cents; 40-penny nails, 30 lb., at 3 cents, 90 cents; steel nails, 50 lb., at 4 cents, 2 dols.; two Hubbard draw-bar springs, 60 lb., at 6½ cents, 4 dols. 8 cents; iron for door, 86 lb., 2 dols. 15 cents; 40 iron bolts, 19 lb., at 4 cents, 76 cents; 16 carriage bolts, at 1½ cents, 24 cents; 44 screws, 11 cents; 20 ditto, 9 cents; 10 round iron staples, 2 cents; 4 carriage bolts, 7 cents; 52 wrought washers, 2½ lb., 14 cents; 42 clipped ditto, 4 lb., 20 cents; 8 staples, 1½ lb., 7 cents; 2 hasps, 1½ lb., 6 cents; 2 eye bolts, 8 cents; 2 door pins and chains, 10 cents; 10 sag screws, 3in. by 4in., 5 cents; six 6-penny steel nails, 30 cents; pine, 770ft., at 28 dols., 21 dols. 56 cents; spruce, 662ft., at 10½ dols., 6 dols. 75 cents; hard pine, 1156ft., at 20 dols., 23 dols. 12 cents; oak, 810ft., at 25 dols., 20 dols. 25 cents; Pratt's door-hanger, 5 dols. 92 cents; 4 axles, 1488 lb., at 3 cents, 44 dols. 64 cents; 8 wheels, at 11 dols., 88 dols.; castings, 1945 lb., at 3 cents, 58 dols. 25 cents; journal-box covers, &c., 1 dol. 14 cents; 8 brasses, 78 lb., at 20 cents, 15 dols. 60 cents; 8 wheel springs, 20 dols. 40 cents; oak, 138ft., at 2½ cents, 3 dols. 45 cents; 4 dust guards in journal boxes, 6 cents; truck frames, &c., 1205 lb., at 2½ cents, 27 dols. 72 cents; wrought iron, 446 lb., 11 dols. 20 cents; 4 brake springs, 14½ lb., at 5½ cents, 80 cents; 4 safety chains, 6 lb., at 5 cents, 30 cents; bolts, 103½ lb., at 4 cents, 4 dols. 16 cents; nuts, 57½ lb., at 4 cents, 2 dols. 30 cents; Atwood nuts, 7½ lb., at 5½ cents, 41 cents; washers, 5½ lb., 13 cents; 8 carriage bolts, 20 cents; labour, 41 dols. 70 cents. Total cost of car, 511 dols. 64 cents. Recapitulation: Material in body, 190 dols. 98 cents; labour in body, 32 dols. 64 cents—cost of body, 223 dols. 62 cents. Material in truck, 278 dols. 86 cents; labour in truck, 9 dols. 16 cents—cost of truck, 288 dols. 2 cents. Total cost of car, 511 dols. 64 cents.

NOTES AND MEMORANDA.

As a substitute for oil upon oil stones, which often thicken and makes the stones dirty, a mixture of glycerine and alcohol can be used with good results.

THE limiting pressure of 50 lb. on the square foot on the pressure plate of Osler's Anemometer at the Greenwich Observatory was twice exceeded during the snow-storm of January 18th, 1881.

THE loss of life in the mining district of Yorkshire during the year 1880 shows only a very slight reduction on that of 1879; and was in excess of the average from 1874 to 1880. The total loss of life during the past year was 106. The number of accidents was 95, or 18 in excess of 1879; and 60 per cent. of the fatal accidents were due to falls of the roofs and the sides of the workings. The explosion of gas was attended by only 11 deaths in the Yorkshire pits in 1880.

THE fifth annual report of the Inspectors of Explosives has been issued. They have visited every factory and magazine on their books, and report with satisfaction that not a single death has been caused by accident in manufacture in the United Kingdom during the past year. In 306 licensed magazines two accidents have occurred, causing three deaths, while miscellaneous accidents with explosives have caused twenty-nine deaths. There are for the sale of explosives over 15,000 registered premises, the condition of which is reported as generally satisfactory.

IN Forbes' "Tourists" the capacity of the larger European churches and cathedrals is given as below:—St. Peter's Church, Rome, holds 54,000 people; St. Paul's, London, 35,000; St. Sophia's, Constantinople, 33,000; the Florence Cathedral, 24,300; St. Petronius, Bologna, 24,000; St. Paul's, Rome, 32,000; St. John Lateran, 22,900; Notre Dame, Paris, 20,000; the Pisa Cathedral, 13,000; St. Stephen's Vienna, 12,400; St. Domenico's, Bologna, 12,000; St. Peter's, Bologna, 11,500; the Cathedral of Venice, 11,000; St. Mark, Venice, 7000; the Milan Cathedral, 7000. These figures, it will be remembered, do not refer to seating capacity.

CAPTAIN ABNEY recently exhibited at the Physical Society of London a number of photographic negatives taken by himself and Colonel Festin by radiation through thin sheets of ebonite. The light from the positive pole of an electric lamp was sent through a sheet of ebonite ¼ in. thick, and photographs taken showed the radiation to have a low wave length from 8000 to 14,000. The carbon points of the lamp could be photographed through the sheet, and Colonel Festin observed the sun's disc through it. The ebonite showed a grained structure, and different samples of ebonite gave different results, but all gave some result, in course of time at least; old ebonite, like that used in some of Mr. Preece's experiments, scattering the light more than new ebonite.

AT a recent meeting of the Paris Academy of Science, a memoir on the temperature of the air at the surface of the ground and down to 36 m. depth, also the temperature of two pieces of ground, the one bare, the other covered with grass, during 1880, and on the penetration of frost into these, was read by MM. Becquerel. Amongst other things the propagation of frost is shown to be slower in grassy grounds than in bare ground. In the latter the rate increases very slightly with the depth, the propagation being very regular. In grassy ground the increase is very notable, and with increasing depth, the rate tends to come near that in bare ground. Each layer of ground is subject to two calorific effects: one due to variations of external temperature; the other to the action of deep layers which tend to give a constant temperature.

THE influence of pressure on the electric conductivity of metal wires has been studied anew by M. Chwolson, and described in the bulletin of the Imperial Academy of St. Petersburg for March. M. Chwolson used a piezometer, giving pressures up to 60 atmospheres, the wire being wound round a glass tube, then passed through it, and the tube inserted in another, which was connected with the piezometer. The two wire ends were brought out through binding screws. Among other results, at 3·8 C. the copper wire showed a relative diminution of resistance of about 0·0000013 by one atmosphere of pressure; a hard brass wire about 0·0000011; and a lead wire (at 7 deg. C.) about 0·000011, or ten times more than the brass. Pressing at 17 deg. C. the calorific action preponderates over the direct action of pressure for copper and brass, while the reverse occurs with lead. Moreover, the author proves, in the case of the brass wire, that the pressure causes change of the specific resistance besides change of the resistance through change of the length and thickness. Every relative change of volume involves a relative change of the specific resistance about 3·6 times as great.

THE following table relating to machinery belts is taken from a paper by Mr. Nagle, an American engineer, and read before the American Society of Mechanical Engineers:—

Horse-power.	Velocity in feet per minute.	Diameter of small pulley.	Full of belt per inch of width—pounds.	Width of belt in use.	Width by Webber's rule.	Width by Nagle's rule.	Thickness.
375	5600	5 0	98	24	22	34	Double
250	3080	7 0	58	45	50	28	4 ply
220	2451	3 6	185	22	98	31	Single
175	3179	6 0	93	19½	15½	25	Double
175	3029	9 7½	55	29	15	22	"
130	2117	5 10	113	18	18	22	"
125	3490	7 0	82	14½	8	17	"
90	2800	5 0	87	12	10	15	"
77	2268	5 0	77	14½	12	12	"
45	2000	4 0	37	20	21	15	Single
49	2111	6 0	24	18	14	18	"
43	1800	5 0	44	18	20	14	"
40	2000	6 0	37	18	14	13	"
41	1809	5 0	42	17½	12	16	"
18	850	0 22	116	6	19	8	Double
8	942	2 6	40	7	12	8	Single

A NEW invention for coating iron and steel with iridescent copper, says the *Revue Polytech.*, is the work of Dr. Weil, of Paris. First, thirty-five parts of crystallised sulphate, or an equivalent amount of any other salt of copper, are precipitated as hydrated oxide by means of caustic soda or some other suitable alkaline base; this oxide of copper is to be added to a solution of 150 parts of Rochelle salts, and dissolved in 1000 parts of water; to this 60 parts of best caustic soda, containing about 70 per cent. NaO, is to be added, when a clear solution of copper will be formed. The object to be coppered is to be cleaned with a scratch-brush in an alkalino-organic bath, attached as a cathode, immersed in the coppering bath, and treated with the usual precautions, when it will become rapidly coated with an adherent film of metallic copper. As the bath gradually loses its copper, oxide of copper, as above prepared, should be added, to maintain it in a condition of activity, but the quantity of copper introduced should not ordinarily exceed that above prescribed as compared with the quantity of tartaric acid the bath may contain. If the quantity of copper notably exceeds this proportion, certain metallic irisations are produced on the surface of the object. These effects may be employed for ornamental and artistic purposes. According to the time of the immersion, the strength of the current, and the proportion of copper to the tartaric acid, the iridescences may be produced of different shades and tints, which may be varied or intermingled by shielding certain parts of the object by an impermeable coating of paraffine or varnish, while the iridescent effect is being produced on the parts left exposed. All colours, from that of brass to bronze, scarlet, blue, and green may thus be produced at will.

MISCELLANEA.

MR. W. MATHIEU WILLIAMS, F.R.A.S., F.C.S., author of "The fuel of the Sun," "Through Norway with a Knapsack," &c., has been appointed to the management of the Royal Polytechnic Institution, and commences his duties forthwith.

THE Patent Nut and Bolt Company has removed its offices from the premises No. 24, Budge-row, Cannon-street, to more convenient offices, No. 7, Laurence Pountney-hill, Cannon-street, for many years in the occupation of the Ebbw Vale Steel, Iron and Coal Company.

It is proposed to make a trial of the electric light in Edinburgh. The quarter of the town to be experimentally lighted will be Princes-street, the Waverley Bridge, and the North Bridge as far as the iron church. The cost of the experiment for three months is estimated at about £400.

THE new waterworks at Tamworth, which have been constructed under the direction of Mr. H. J. Marten, engineer, of Wolverhampton, will be complete in about a week, as soon as the connection between the pumps and the mains leading through the town to the reservoir at Glascoate is effected. All the machinery is substantial, durable, and well put together.

THE Earl of Crawford and Balcarres, F.R.S., has been appointed British Commissioner to watch over British interests at the forthcoming electrical exhibition at Paris. The appointment of his lordship, who is better known as Lord Lindsay, has been received with great approval. It is proposed to hold a meeting of exhibitors on Tuesday next to consider final arrangements. Lord Crawford will preside. The exhibition will open on August 1st without fail.

NOT long since, in an arbitration case, an engineer was thus examined as to his professional experience and capacity, so called: "How long have you been in the profession?" "Twelve years." "Are you thoroughly acquainted with your work, theoretically and practically?" "Yes." "Do you feel competent to undertake large constructions?" "Yes, most certainly." "In what engineering works have you been engaged during the last twelve years?" "The manufacture of iron bedsteads."

SAWDUST seems to be a valuable commodity in New York. According to the *North-Western Lumberman* there are about 500 vendors of the article in that city, having a capital of 200,000 dols. invested, and doing a business amounting to more than 2,000,000 dols. annually. Forty years ago the mills were glad to have sawdust carted away; twenty-five years ago it could be bought for 50 cents a load, but the price is increased, and now it brings 3 dols. 50 cents a load at the mills.

AN International Congress of Contractors is to be held at Liège, Belgium, from the 24th to the 26th of July next. At the same place, and lasting from July 24th to August 31st, there will be held, in connection with this Congress, an exhibition of new machines, and of improved engines and materials, all under the patronage of the Liège Chamber of Contractors for Public Works. Objects intended for this exhibition will be admitted free of duty, and can be transported in cars directly upon the exhibition grounds at the Longdex station, at specially low rates—free one way—for railroad transportation. Applications for space should be made to the Chamber's committee for organising the exhibition, of which E. Hargot is president and Em. Voituron, secretary.

HERR J. JAROLIMEK, of Hainburg, Austria, has brought out a novel kind of wire belting. The wire is wound on spindles, the diameter of which is as small as practicable, and is obtained, therefore, in the form of a long spring. *Der Techniker* states that the main point to be observed in using these wire coils is to give them dimensions proportioned to the power to be transmitted, so that while flexible they do not suffer undue elongation when in use. Practical trials have proved that the proper proportion between tenacity and elasticity of these coiled wire strings is obtained when the spindle, around which it had been wound, has a diameter equal to that of the wire. The two ends of a string are hooked together, and each string, the number varying according to the power transmitted, is laid in a groove on the pulleys. This method of transmission is reported to be cheap and effective.

A NEW iron hopper dredger of 1800 tons, built and engined by Messrs. W. Simons and Co., was launched last week from their works at Renfrew. It is the property of the Otago Harbour Commissioners, and has been constructed under the direction of Messrs. Kinipple and Morris, their engineers. This vessel will dredge from 3ft. to 35ft. depth, and carry 1400 tons of its own dredgings; it is fitted with twin screws, two sets of compound engines, collectively of 700 indicated horse-power, centrifugal pumps and steam appliances for mooring, lifting, dredging, and manoeuvring. This vessel is over 200ft. in length, and is the tenth and largest hopper dredger this firm have constructed, they being the inventors and originators of the system, and we notice they have another new dredger in progress for the Lancashire and Yorkshire Railway Company for the port of Fleetwood.

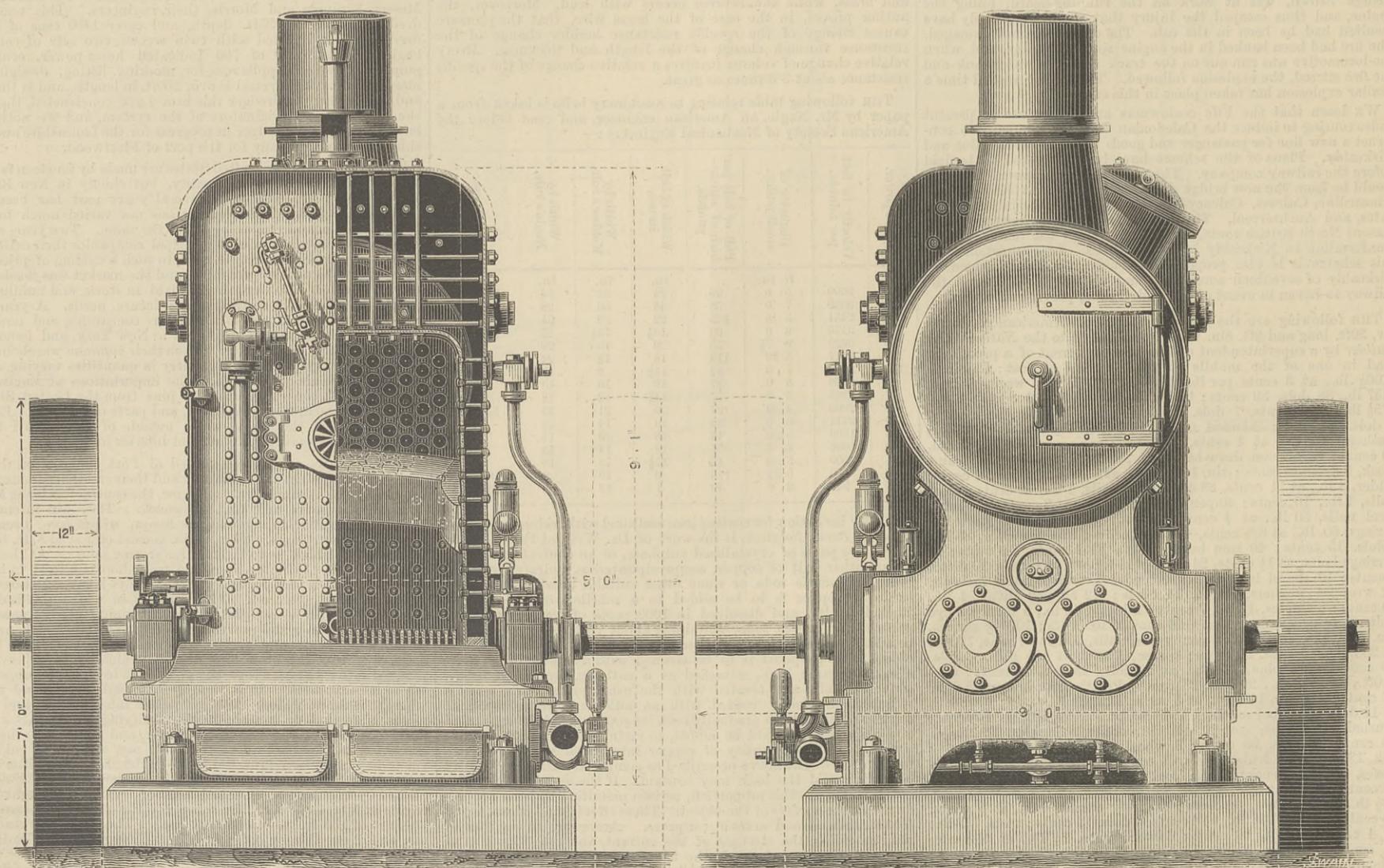
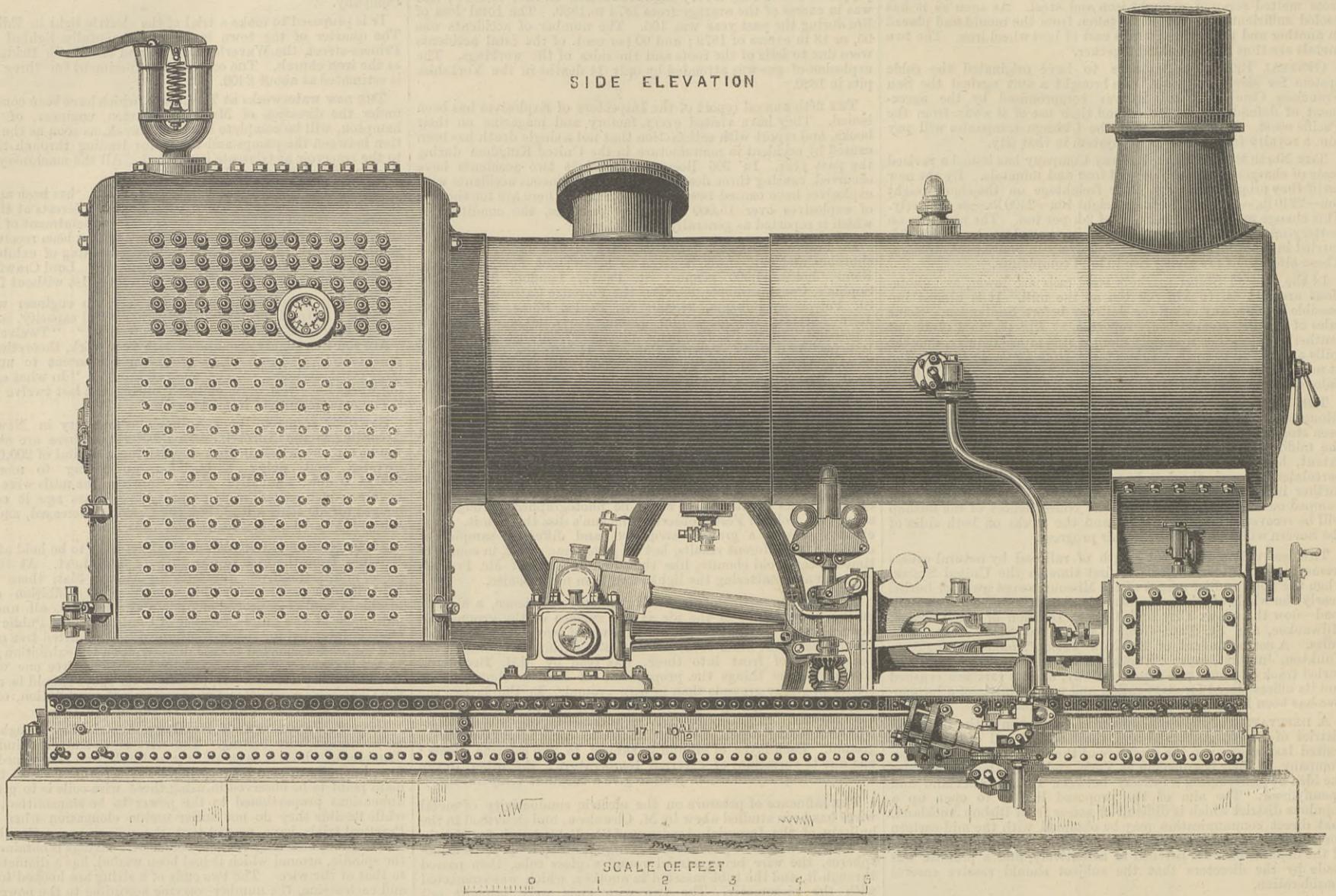
THE pins used in the United States are made by fourteen factories, somewhat scattered as to locality, but chiefly in New England. Their annual production for several years past has been about 7,000,000,000 pins. This number has not varied much for some years, the demand remaining about the same. Two years ago the competition among the nine principal companies then existing for the manufacture of toilet pins led to such a cutting of prices that the business became unprofitable, and the market was flooded with goods. Dealers who were shrewd laid in stock, and families even bought in wholesale quantities for future needs. A year ago a combination was formed of three wire companies, and now all of the pins made by them are shipped to New York, and handled by the head agency in that city. From their common warehouse they are sent to every part of the country in quantities varying according to the female population. The importations of English pins are small, and the exportation of pins from the United States is confined to Cuba, South America, and parts of Canada. England supplies almost the whole world outside of the United States, although the American pins are not inferior in quality.

A NEW oil gas works was opened at Port Glasgow on the 16th inst. The buildings were designed and their erection superintended by Mr. W. M. Alston, C.E., Glasgow, the contractors being Messrs. T. Neill, Chalmers, and Co., Greenock. They are intended to supply gas to Pintsch's patent gas buoys, which have been fully described in our pages. The works consist of a shed 87ft. long by 30ft. broad, which is to be used for storing buoys. At the south end of this shed is built a store and workshop one story in height. The gas which is used for charging the buoys is manufactured from petroleum and shale oil. The building in which this is done is divided into three compartments, containing the furnaces and retorts, the washer and purifier, condenser and gas meter, and the compression pump and engine. The retorts are arranged in two rows, one above the other, and the oil, which has been previously pumped into a cistern above the retorts, is led into the upper one, where it evaporates. It is then led through the second retort, where it is again heated. It then passes into a tar pit, and afterwards is carried by a main to the purifying room. After being purified, the gas passes through a meter, and thence into the gasometer. The manufacture of the gas is now completed, but it has yet to be compressed into the store-holder, a wrought iron cylindrical tank 20ft. long by 4ft. 2in. in diameter. This is accomplished by means of a compression pump, which is wrought by an engine of 5-horse power. By this pump the gas is compressed to a pressure of 150 lb. to the square inch. The gas is now ready for use, and from this cylinder it is sent through a main, leading to the quay, where it is easily transferred to the cylinders by which the buoys are supplied. The apparatus and machinery were put down and placed in order, under the superintendence of Mr. Reinhold, of Pintsch's Patent Lighting Company, London; while the general erection of the works was superintended by Mr. Harsie, the Lighthouses Trust's officer for the lower reaches of the Clyde

DOUBLE CYLINDER SEMI-PORTABLE ENGINE FOR THE INDIAN STATE RAILWAYS.

MESSRS. MARSHALL, SONS AND CO., GAINSBOROUGH, ENGINEERS.

*For description see page 467.)*



HALF END ELEVATION AND SECTION FROM FIRE-BOX END

END ELEVATION FROM SMOKE-BOX END

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame BOYVEAU, Rue de la Banque.
BERLIN.—ASHER and Co., 5, Unter den Linden.
VIENNA.—Messrs. GEROLD and Co., Booksellers.
LEIPSIK.—A. TWIETMEYER, Bookseller.
NEW YORK.—THE WILMER and ROGERS NEWS COMPANY, 31, Beekman-Street.

THE ENGINEER.

JUNE 24, 1881.

THE CHANNEL TUNNEL SCHEME.

It is not easy to believe that Sir E. Watkin meant his speech on the Channel Tunnel, delivered last Friday at a meeting of the shareholders of the South-Eastern Railway, to be taken quite seriously. The statement that it may be possible to drive a tunnel 7ft. in diameter and 22 miles long under the sea in the space of five years, makes a demand on our powers of belief to which they are not equal. But the shareholders seem to have believed it all. One of the immediate effects of the speech on which Sir Edward Watkin did not count was to frighten a daily contemporary half out of its wits. The tunnel would leave England at once open to invasion; a hostile force might land near Dover, take possession of the English end of the tunnel, and then it would be all up with us. Threatened men, we can assure our contemporary, live long, and if England is not to be invaded until the Channel Tunnel is made, we shall have immunity for many years. It is, we think, much to be regretted that a man of Sir E. Watkin's influence should have made the assertions he is reported to have made. If Sir Edward had consulted any competent engineer before he spoke, he would have ascertained that the rate of progress made during a single week on shore close to the mouth of a tunnel is no evidence whatever of the average rate at which it can be advanced. No thought seems to have been given to the ever-increasing difficulty of removing debris and maintaining ventilation—difficulties so great that we have no hesitation in saying that to drive a drift way only 7ft. in diameter through the chalk between England and France is absolutely impossible. If a tunnel is ever made it must be made of practicable dimensions at once, for reasons which we shall deal with in a moment.

The greatest possible reticence has been observed concerning the tunnel and its work. We recently visited the Shakespeare Cliff working. The enclosure was locked up, the sheds were shut, and no one was to be seen but a watchman who was admirably silent. Sir Edward Watkin gave the first information concerning the tunnel that has been heard for a long time to the world. The South-Eastern shareholders, he said, had permitted the directors to carry out certain experiments, to try if the making of a tunnel in a reasonable time was practicable. They had sunk two shafts—one at the Abbot's Cliff Tunnel, and the other on this side of the Shakespeare Cliff Tunnel. From the first shaft they had driven a gallery of 800 or 900 yards, of a diameter of 7ft., which had all been excavated by machinery. The machinery was not perfect, but last week they excavated sixty-seven yards of lineal distance in the extension of that gallery. If that were the maximum rate of speed, it meant about two miles of progress in a year, and as they were working from both ends, and as it was only twenty miles, practically speaking, it meant five years to complete a gallery 7ft. in diameter as an experiment, under the whole width of the Channel. With regard to the second shaft, at the Shakespeare Cliff, they had sunk that down to a depth of 155ft. They had also bored from the bottom of that shaft to a further depth of 106ft. They had gone right through the old grey chalk and right to the gault clay, and he was happy to say that they had found no trace whatever of water. Practically these are all the engineering statements which Sir Edward had to put before his hearers. With his proposals for finding money to carry on the work we do not concern ourselves. There never was a smaller basis on which to build up a superstructure. The question keenly discussed by geologists, namely, whether the chalk beneath the Channel is or is not identical with that through which the present headings are being driven, is settled in his own favour by Sir Edward without the least hesitation. It is well understood by engineers that one of the great risks to be incurred in driving a tunnel beneath the Straits of Dover lies in the extreme probability that a fault will be encountered. In other words, a crack or fissure would, within a few hours after it was tapped, have completely flooded the tunnel, drowned the workmen, and brought an end to the enterprise. We are not aware that any one ever expected that much water would be found in the chalk itself at the shallow depth of the lowest point in the tunnel. The circumstance that no water has been found on shore or near the shore has really nothing to do with the matter. Land springs in the chalk can be dealt with, and would have to be very powerful indeed to prevent the work from being carried through; but the case is entirely different as regards the sea, and it is the knowledge that one false step, one blow of a pick, might, when the work was almost complete, bring it to an end for ever, that makes engineers cautious and doubtful. Whether water was or was not found in the tiny holes already tunnelled in the chalk is of no more importance to the true issue than the presence or absence of the handle of Aldgate pump.

The more carefully we consider Sir Edward Watkin's speech, the more startling do its assumptions appear to be. We are told that 67 yards had been excavated in one week. We believe that the work of excavation is being done by Beaumont's rotary cutting machine, which gets on very well in soft chalk. The total quantity thus cut was, say, 282 cubic yards in the solid. In bulk this would measure about 350 yards. All this had to be run out to spoil through a driftway 900 yards long and 7ft. in diameter; and this without interfering with the working of the boring machine at the inner face of the heading. We find it very difficult to believe that any such feat was really accomplished. We do not dispute that the boring machine really did bore 67 yards forward; but was the debris removed clear out of the tunnel at the same time? If so, the feat deserves to be placed on record. But when we have admitted all that we can be expected to concede in this direction, we are no nearer than before to accepting

Sir Edward Watkin's five-years' estimate. It is clear that in a 7ft. heading there is not much room to work; and when the stuff has to be run, say, seven or eight miles from the face of the heading, it is evident that a great deal more time will be required than is now consumed in removing debris. In long tunnels, where the material is worked with moderate ease, the rate of progress is fixed, not by the power of the boring or tunnelling machines, but by the rate at which the debris can be got rid of. Our readers may rest assured that nothing has yet been accomplished at either this side or the French side of the Channel to prove that a driftway can be driven in five years, or even in ten years, under the Channel. It is because room is absolutely required for a double line of rails for the spoil wagons, and for the ventilating pipes, which must be of large diameter, that we assert that it is impossible to drive a 7ft. drift way under the channel. The full-sized tunnel will be small enough to comply with the conditions.

Concerning the ventilation of the workings Sir Edward was silent. We do not think we shall err if we assert that the difficulty of producing adequate ventilation in the Channel Tunnel will increase as the cube of the distance from the mouth of the tunnel. We have nothing at all in the way of experience to act as a guide in this matter. If we take the longest tunnels in existence, those of St. Gothard and the Mont Cenis, we find that the maximum distance from the mouth to the face of the working in no case exceeded four miles. These tunnels are on the tops of hills, and so arranged that as far as possible nature aided in the work of driving currents of air into them. Yet we know that enormous, all but insurmountable, difficulties were met with in supplying air enough to the workmen to keep them alive. It is true that in the Channel Tunnel explosives will not be used, but it remains to be seen how fresh air is to be driven in a distance of ten miles, and foul air extracted. The horsepower needed to accomplish this duty must be enormous. The machinery will be very heavy and expensive. The problem to be solved is exceedingly difficult, but Sir Edward Watkin passes all this over in silence. We hold that a Channel tunnel can never be worth what it will cost, and we have formerly explained that it would be absolutely impossible to work enough trains through one to make it pay, unless enormous rates for both passengers and goods were charged. The expenditure of a comparatively small sum in providing proper harbour accommodation at Calais would be followed by the advent of splendid fast steamers, which would render a tunnel less necessary than ever. The more carefully the tunnel scheme in its present form is considered, the more prominently does it appear as a chimera, a fancy, a freak of the imagination. No consistent scheme for making it, ventilating it, or working it if made, is before the public. The highest engineering authorities of the day, in so far as they have considered it at all, are adverse to it. The more carefully the whole scheme—if scheme there can be said to be—before the public is considered, the more is it to be regretted that any body of men should be found ready to waste money in boring holes which prove nothing, and advance the prospects of the Channel tunnel not one inch.

We are very far from asserting that a tunnel cannot be made under the Channel. He would be a rash man who set a limit on the powers of engineers, but we do assert that no consistent scheme for making such a tunnel, and working it if made, is before the public; and that the cost must be so great that the work can only be carried out by the aid of national funds contributed by the Governments of France and England. On these facts Sir Edward Watkin is quite silent. The fact that a large sum is to be spent in dredging Dover harbour, that the accommodation at Calais is to be improved, and the London, Chatham, and Dover Company is about to put on three new boats, larger and faster than any yet used in crossing the Channel, will not promote the success of the tunnel scheme.

THE EASTERN SHIPPING TRADE.

AFTER a period of great stagnation, which has lasted fully three years, there appears to be every chance of a revival of trade with our Eastern possessions and China. It is scarcely possible to over-estimate the effect such revival has upon the general prosperity of this country. Even the stimulus which has been imparted to our manufacturing industries by the improvement which is being experienced in Canada exercises an influence by no means equal to that arising from the demand now springing up in India and China. It is curious to consider how it has arisen that a trade which so mainly consists of the supply of articles of daily want, such as cotton, cloth, and tea, should be so variable as it has of late proved to be. As regards India, however, it must be borne in mind that at the time the great famine commenced the markets of that country had become glutted by shipments from England made during a period of exceptional commercial prosperity at home; and the purchasing power of its people was of course almost paralysed by the distress into which they were suddenly plunged by the failure of their crops. It has taken years to recover from the consequent impecuniosity; and the native who perhaps annually purchased a new waist cloth, was constrained by poverty to content himself with an old one as long as it would hang in shreds upon his person. What such a course means in India, none but those conversant with its people can estimate. Distress must be great indeed before they will deny themselves the decency of new cloths. As the result, the large stocks we have above alluded to have only just begun to be absorbed, and the normal demand for the produce of our Manchester looms restored. The failure of that demand has, of course, reacted on the workpeople employed to meet it, and the consumption of tea has been largely and correspondingly restricted. With the restoration of activity in our exports has increased the spending power of our operative population, and the few pinches of tea which during the period of long-continued short work and wages have been made to satisfy its wants, can now be increased to a more liberal use. These, in

TO CORRESPONDENTS.

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

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

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

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

J. E. (Leeds).—There is no treatise on turning chilled rolls, or making them. They can be turned with tools made of any good steel. The speed of the surface must be very slow—not more than 2ft. to 3ft. per minute—and the tools are blocks of steel about 3in. long and 1 1/4in. square, wedged up parallel with and against the roll, the corners of the long sides of the blocks forming the cutting edges. Much skill is required in the workman.

A. S.—We do not know what power a gas engine of the size named will indicate. A gas engine will not be suitable for your purpose for the reason you have stated. A steam engine with a 14in. cylinder, 2ft. stroke, making 75 revolutions per minute, will readily indicate 25 or 30-horse power, with a very moderate pressure of steam, say 40 lb., in the boiler. We fancy you will require more power than 25-horse power indicated, but an engine of the size we have named ought to do the work you want done.

SUBSCRIBER.—The term "surfacing lathe" is vague, and does not always mean the same thing. Properly it applies to lathes which will take a face plate on which large surfaces, such as cylinder covers, can be got up. But it is often employed to denote lathes which are adapted for doing fine work only bringing small strains on the parts. Such lathes are often of inferior construction. The argument used to meet the complaints of the incautious buyer is that the tool was only intended to produce finished surfaces.

ARGUZOID.

(To the Editor of The Engineer.)

SIR,—Can any reader name the ingredients used in the above alloy, or where it can be obtained? ENQUIRER. Edinburgh, June 22nd.

SOLDERING ALUMINIUM.

(To the Editor of The Engineer.)

SIR,—Can any correspondent tell me by what method I could solder very thin sheet aluminium? J. W. B. Birmingham, June 20th.

COLLAPSIBLE TUBE-MAKING MACHINES.

(To the Editor of The Engineer.)

SIR,—Can any of your readers tell us the makers of machinery for making collapsible metal tubes, used for scent fountains, &c.? London, June 16th. X. AND CO.

DR. ANGUS SMITH'S SOLUTION.

(To the Editor of The Engineer.)

SIR,—Can any of your readers inform me whether Dr. Angus Smith's solution with which cast iron pipes are generally coated, will stand for, say, ten years sea-water without causing the water to be discoloured? Margate, June 22nd. PURE SEA-WATER BATH.

TEMPLETON'S "WORKSHOP COMPANION."

(To the Editor of The Engineer.)

SIR,—In the fifth edition of Templeton's "Workshop Companion," page 39, appears the following:—Any chord and versed sine of a circle being given, to find the diameter. Rule: Divide the sum of the squares of the chord and versed sine by the versed sine; the quotient is the diameter of corresponding circle. It should be, divide the sum of the squares of the semi-chord, &c. &c. And in the examples given in pages 39 and 40 of a chord of 6ft. and versed sine = 2ft., the diameter of circle should be 7.2812ft. instead of 23.125, and a chord of .72ft. and versed sine of 1 1/4ft., the radius of curve is 519.025ft. instead of 2074.225, as given. J. J. T.

BELL METAL SLIDE VALVES.

(To the Editor of The Engineer.)

SIR,—In reply to your correspondent "Engineer," I would, in the first place, advise him never again even to dream of using this metal for either slide or any kinds of valves, as it is neither necessary nor practicable. Concerning the cause or causes of cutting both the face of the valve and also that of the steam chest, it is one of those cases upon which an opinion cannot justly be ventured unless it can first be inspected. It is hardly necessary to call the attention of your correspondent to the increased friction caused by two working surfaces of the same kind of metal, inasmuch that it is a thing well-known and generally accepted. However, after looking over "Engineer's" sketch and the information accompanying it, I have not the least doubt as to the good results to be obtained by adopting the following formula, viz., copper 1lb, tin 3 1/2 oz. But of course there are certain conditions which must be observed in order to secure the desired results with this or any other alloy. By all means to entrust the work to experienced engineer's brassfounder, and not to an iron-brassfounder; or in other words, to an ironfounder who professes to be master of the two arts of founding. Unfortunately, too many, both masters and men, are possessed with the idea that to be in the possession of the most approved alloys—from books or otherwise—is all that is necessary to the securing of good castings in the hands of an ironfounder. Although common, a greater error than this can scarcely exist. Demonstrations innumerable of this fact have I seen in my time. June 20th. FOUNDRYMAN.

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fact, are the main points involved in the revival of our Eastern trade.

We have been led to the consideration of this subject in great measure by statements made by the chairman of the Peninsular and Oriental Steam Navigation Company at its eighty-first half-yearly general meeting. These statements fully indicate that, in the opinion of the directors of that company, the improvement in the Eastern trade is not of a spasmodic character only, but bears that impress of permanence which will justify, and, indeed, render imperatively necessary, the large expenditure to which the company is committing itself in the construction of new shipping. Mr. Thomas Sutherland, as chairman, stated that the directors have at the present time contracts running for the construction of 40,000 tons of new steamships, and even although we must make allowance for a considerable proportion of this tonnage being required to replace much of the company's stock that has become obsolete in character, it is certain that a great deal of it is required to meet the improved state of the freight and passenger trade. We cannot pass unnoticed in connection with these statements as to successful working by the Peninsular and Oriental Company, the great results obtained from the economic and careful course upon which its directors have wisely insisted during the past few years of commercial depression. As the chairman stated, the directors have not only had to meet difficulties arising from this, but have had, in addition, to provide for a much extended mail service, with a subsidy of £75,000 of less annual amount than they had received under their former mail contract. We congratulate the company also upon the improvement in its passenger traffic. It is useless to disguise the fact that for some years past there has existed an impression—whether justifiable or not we cannot say—that the accommodation and messing afforded to passengers by our great eastern English mail line was far inferior to that supplied by the Messageries Maritimes; and a large proportion of English passengers made their voyages to and from the East by preference in the steamers of the latter company. We are glad to find that the directors of the Peninsular and Oriental Company are overcoming that impression, for which certainly no occasion should ever have been given. Our Australian friends will be pleased to hear that the directors hope to be able to dispatch two steamers a month in the ensuing autumn with passengers and freight direct to Australia. Hitherto, total transshipments have had to be made at Point de Galle in Ceylon, and it has been naturally trying to voyagers to our important Australian colonies to submit to the delay and inconvenience consequent upon such trans-shipment.

Our reference to Australia takes us far on towards the limits of our eastern trade; but, before noticing progress being made in our shipping communication with important colonies, we will make some reference to China. The *Times* has recently published most interesting letters from a correspondent in that country which seem to justify a certain hope that at last its Government is entering on a path of progress. This has been induced solely, it would appear from those letters, by the discovery of the great assistance railways and telegraphs afford to military operations. Already, a telegraph line has been laid between Peking and Tientsin, and on the reports received in obedience to instructions from the Central Government from Mandarins in charge of provinces, it has been determined to commence some small mileage of railway. Thus the thin end of the wedge has been introduced, and it is not difficult to foresee that when the benefits of railway communication once become appreciated, it will rapidly spread in accordance with natural demand. It may be reasonably hoped that a large proportion of the material required for their construction will be obtained from England, and in that case, the iron and manufacturing trade at home will receive a stimulus which has been absent from them since the larger schemes of railway work in India have been closed. We have previously referred to the improved demand in this country for the main staple of Chinese produce—tea; and the freight for this will, if outward freights become strengthened by a market for railway material, be so reduced, as perhaps to enable this luxury of the poor to be greatly cheapened to them.

Competition in the carrying trade of Australia has always been strong, for, having the alternative route by the Cape of Good Hope, the opening of the Suez Canal did not affect freights thither to the same extent that it did those to Indian and Chinese ports. Nevertheless, the history of steam communication with Australia, *via* the Cape, has been one of persistent failure, for which all sorts of possible and impossible reasons have been given. One company after another was started, but the companies were never able to run their steamers at a cost enabling them to compete with the Peninsular and Oriental line, even when the business of the latter had to submit to the disadvantage of breaking bulk at Alexandria, the transit by rail through Egypt, and re-shipment at Suez. It was scarcely likely, therefore, that when the expense of these three operations was saved, and the company's steamers could steam through the Suez Canal, the competitive Cape lines to Australia would prove to be very remunerative. A gallant attempt has, however, been made in this direction by the Orient Company, whose fine steamers are models of what ocean-going steamers should be; but we fear, judging from the report last put before the shareholders, that as yet, at all events, the latter have not been able to receive a dividend on their investment. A formidable and fresh rival to the Orient line has, since it was started, sprung up in the Queensland line, run by the British Indian Steam Navigation Company. Perhaps no steamship company yet working has had so unchequered a course of prosperity as the last-named company has had. Its dividends have always been good, and its fleet developed annually from its small beginning until its vessels class among the most successful and efficient of those possessed by any of our great maritime companies. Starting from that small beginning in the coasting trade of India, it has developed until it is a formidable competitor with the old-established Peninsular and Oriental Company

in the outward Indian trade from England *via* the Suez Canal; and now it has received still further development by the establishment of this Queensland line of steamers, calling at the Ceylon ports, early in the present year. In one article of Australian produce which is as yet, as regards its introduction into England, in its infancy—we allude to the dead meat trade—the steamer lines *via* the Cape will possess advantages in the future over those running through the Suez Canal which may yet do much to render their financial position a satisfactory one. We learned by telegram last week that the Orient, of the Orient Line, has had 250 tons of her cargo accommodation taken up for the conveyance of frozen meat. Such shipments of this as have as yet arrived in England have sold at good prices, and had the importation been trebled in quantity it would have met with as ready a sale. There is therefore no end to the possibilities which may arise out of this trade in developing the steam route to Australia *via* the Cape of Good Hope; and the activity which is experienced in all the shipbuilding yards of this country may yet be increased for a time at all events. We have thus briefly sketched out some of the leading considerations involved in, and hopes opened out by, the improvement in our Eastern trade. After long years of commercial distress, it is indeed gratifying to be able to point to some signs of the lifting of the cloud so long hanging over all branches of trade and industry in this country.

#### THE DRAINAGE OF PORTSMOUTH.

PORTSMOUTH has to some extent outgrown its sewerage system, although it is of comparatively modern construction, and the Town Council have resolved to offer a premium of £500 to any scientific authority who shall elaborate a plan of remedying its incompleteness without entailing too large an expenditure. The Drainage and Sanitary Committee of the Corporation had recommended the voting of £200 to obtain the opinion and advice of some eminent drainage and sanitary engineer, but little argument was needed to convince the members of the civic body that a solution of the difficulty was more likely to be arrived at by the offer of a premium sufficiently large to make it worth the while of competent persons to enter the lists as scientific claimants for the prize. The sewerage system of our first naval port may be regarded as peculiar to the town, the sewage being accumulated in tanks at Eastney, which lies on the easternmost side of the borough, and pumped into the sea at stated periods, it being stipulated by an agreement entered into with the Admiralty in 1865 that the discharge should commence an hour after high tide, and should be finished half an hour before low water. As the population numbers more than 120,000, and as Portsmouth also possesses numerous barracks, which are uninterruptedly tenanted, it will be apparent that, with comparatively limited storage accommodation, great difficulties are experienced in keeping within such a restriction, and consequently it is hardly matter for surprise that the borough engineer should have to report that as it is simply impossible, even under ordinary circumstances, to discharge the whole of the sewage of the borough in so short a space of time, every advantage had to be taken of the terms of the agreement. Negotiations were pending for years for the acquisition of a piece of land from the Admiralty, which, being partly excavated, could have been transformed into good storage tanks at a reasonable outlay; but my lords having taken scientific advice, declined to come to terms, on the ground that the utilisation of the land for such a purpose would be prejudicial to the health of the Royal Marine Artillerymen quartered in the adjacent barracks. The borough engineer is prepared with two plans of his own, and though they may be complete they are considerably too expensive, one involving an outlay of nearly £100,000, and the other of over £70,000. The open reservoir system would, if adopted, necessitate a great alteration and diversion of the present system of sewers and discharge pipes at the pumping station, as the proposed site for the construction of the reservoirs is not in a direct line with the main sewer; and the borough engineer anticipated that an enormous silting in the bottom of the reservoirs would be continually going on, causing a great expense in keeping the bottoms clean, and provoking bitter complaints from residents in contiguous property and barracks. The alternative scheme is the providing of two brick culverts from the pumping station to a point 2000ft. eastward, constructed and made perfectly water-tight, the strata for that distance being hard blue clay. From that point to the outfall the borough engineer proposed laying two D-shaped cylinders, 6ft. high, and 6ft. wide. Owing to the shingle bed to be contended with from this point to the outfall, penstock chambers would have to be constructed 100ft. from the extreme end in such a manner as not to admit any sea water, and the whole of the joints must be made water-tight, so that percolation would be impossible. The line of these reservoir culverts would, it is explained, be about 30ft. north of the present sewer, which passes under the glacis, in order that the present sewer should remain intact and in working order until the time for connecting the new scheme. In the opinion of the borough engineer silting in this scheme would be impossible, on account of the great quantity of sewage which would pass through in so short a time. The Portsmouth Town Council is recognising its responsibility by taking action in so important a matter, for it is a significant fact that during "prohibited" hours the whole of the sewerage of Portsmouth, Portsea, Southsea, and a portion of Landfort is penned up in the Southsea sewers, as inhabitants at that watering place occasionally know from painful experience. If the culvert plan, recommended by the borough engineer, was adopted, both sewers would be enabled to be continuously discharging into the reservoir culverts; but perhaps the offer of the premium may result in some effective and more economical scheme being propounded. Competitors, at any rate, may do well to remember that the sewerage system of Portsmouth was inspected in 1868 by Mr. Hawkesley, who removed apprehension as to the capabilities of the discharge pipes at the outfall, but pointed out the importance of relieving the town of surface drainage, and of preventing leakage at the junction of the high level with the low level sewers. Is it not a moot question whether those warnings have been fully heeded? The test of the practicability of the selected plan, which is quite an independent question to that of cost, will be its confirmation by the Local Government Board; and no guarantee is given that the successful competitor shall have, upon commission, the superintendence of his scheme when it is being put into execution.

#### IRON SHIPBUILDING IN THE NORTH.

THE half year that is close upon its termination has been a busy and a prolific one in the iron shipbuilding trade of the North. In the first three months the prolonged winter and the severe frosts very materially restricted the amount of work done, but since then there has been far more than the average number

of vessels constructed at the whole of the shipbuilding centres, and the tendency has been towards the construction of larger vessels, so that the output of the last three months in tonnage has been very high. This remark may be said to have full application to every one of the north-eastern shipbuilding ports on the Tees, at West Hartlepool, on the Wear, on the Tyne, and at Blyth. Indeed, the briskness in this industry has been the cause of the activity in the iron trade of the north, which it has stimulated to such an extent that the production of plates and angles has been higher than in any preceding period, and double that of one of the briskest times in the iron trade when iron rails formed the staple of the production of manufactured iron in the north. One of the ports named—West Hartlepool—has, in the six months now closing, launched not less than fourteen vessels. The tonnage of these vessels may be estimated at 28,000 tons, and the horse-power at about 2000—a six months' work which, remembering the enforced idleness of the first part, may be said to be not only good, but almost unparalleled in the history of the port. It is evident from this statement of the tonnage and the numbers of the vessels that have been and are in course of building, that there will be for the year a keen contest for the place of honour as the builder of the largest tonnage; but so far as present appearances go, it would seem most probable that the Tyne will again succeed in claiming it as in the past year—that is, of the north-eastern ports, those from Whitby to Blyth. So far as the particulars have been published, it would not appear that the number of steel vessels built last year has been maintained in the present year, but those built have been more exclusively steamers. It may be said that the north-east has as yet no advantage in the building of steel vessels—indeed, owing to the distance of steel-plate mills, it is at a disadvantage in comparison with the Clyde, but its advantages as a centre for the building of iron vessels are great. It has not only the great bulk of the plate mills in the heart of the district, but it has abundant supplies of fuel, the experience of generations of shipbuilders, and a tolerably complete marine engineering plant, sufficient to equip all the steamers it builds. It is to the cheapness that results from these advantages that the north-east owes its growth in recent years as a shipbuilding centre—to these and to the enterprise that characterises its shipowners and steamship managers. One of the ports which has entered practically into the trade of steamship owning within the last two decades—Hartlepool—has now registered as owned by it nearly 180 screw steamers—a magnificent fleet, only second in tonnage amongst the north-eastern ports to Newcastle, but one to which it is adding continually. Up to the present these fleets are worked to great profit, and whilst this is the case, a further growth is to be anticipated, and a further continuance of the activity in shipbuilding yards may be relied upon.

#### THE TONNAGE RATES FOR COAL FROM YORKSHIRE AND DURHAM.

THE question of a reduction of the tonnage rates for coal, more especially from Yorkshire to London, the Eastern counties, Hull, and other places, is just now engrossing a large share of attention, coalowners generally looking forward to the Select Committee on Railway Rates and Fares for some relief. On the 13th inst. the Great Northern Railway Company agreeably surprised many of the leading local owners by issuing a revised list of rates for coal passing over its line to Great Eastern stations, which, in many instances, yielded a reduction of 4d. per ton. Although this concession was heartily welcomed, a reduction in the rate from Yorkshire to London would have been much more acceptable. Under date of June 17th, Mr. H. Oakley, the general manager, has issued another circular, addressed to the coalowners, asking them to cancel the new list of rates for the Great Eastern country stations, and to note that the through rates in force prior to that date will be charged from Monday last. What has caused the cancelling of the rates is not known, but it is stated the Midland Company did not issue a revised list of rates. The rates to Hull and London have, for a long time, pressed heavily on the South Yorkshire coal owners. During the week Mr. Massey, of Hull, a large importer of South Yorkshire coal, who has been examined before the committee in London, has pointed out some of the inequalities which exist. He showed that the rate from South Yorkshire to Hull was greater than it is from the collieries in the North of England. From Monk Bretton, about two miles from Barnsley, the rate is 3s. 1d. per ton to Hull, a distance of fifty-eight miles, whilst the rate from Radcliffe Colliery to the Tyne Dock, forty-three miles, is 1s. 6½d. per ton. The rate on Cannel coal, from Wigan to Hull, is 7s. 4d. per ton, the distance being 109 miles, and from Denaby Main Colliery to London, 161 miles, the rate was 7s. 4d. per ton. It may also be stated that the rate from most of the South Yorkshire Collieries to the metropolis is 8s. 3d. per ton by the Great Northern, including city dues, whilst sea-borne coal can be carried from the Tyne to the Thames for about 4s. per ton.

#### THE PROPOSED FRENCH TARIFF.

SHEFFIELD is making earnest and successful efforts to show how injuriously she will be affected by the new duties proposed by France. In the various public places petitions are being signed by thousands of workpeople, praying Parliament not to conclude a special commercial treaty with France, until the public has had an opportunity of considering its provisions, and that under no circumstances shall any treaty be concluded without containing a stipulation enabling Great Britain to withdraw from it after one year's notice. Some valuable information is given by Messrs. Atkinson Brothers, of the Milton Works, in a letter to the *Sheffield Daily Telegraph*. The firm are large cutlery manufacturers, who have had many opportunities of seeing the growth of the cutlery manufacture in France, and they recently wrote to a French firm for an official statement of the amount of cutlery imported into France from England during the last three years, as well as the amount exported, and to what countries during the same period. In reply the firm received a reply from the "Ministère des Finances," stating that the imports of cutlery into France from England during the last three years were 832,651f., whilst the exports of cutlery from France during the same period were 8,305,286f. France's largest customer was Spain, which took cutlery to the value of 1,339,400f. This is the unkindest cut of all. In re-arranging our excise duties, we favoured the light wines of France to the disadvantage of the heavy wines of Spain. On that account Spain refused to permit us the advantages of the favoured nation clause. In other words, Spain practically excluded Sheffield cutlery and admitted that of France. Thus, for helping France in the matter of her wines, we lose Spain as a customer, and France shows her gratitude by seeking to shut out English cutlery from her markets also. The figures quoted prove conclusively that the present *ad valorem* duty of 15 per cent. is in itself almost prohibitive, and that the slightest increase would make it completely exclusive. At present a dozen common table-knives value 2s. 6d. pay a duty of 4½d.; it is proposed to make the duty 3s. 0½d.; common table cutlery,

in sets worth 6s. 8d., are charged 1s.; it is proposed to make the charge 12s. 2d. France simply seeks to establish the most rigid kind of protection for herself, while reaping all the advantages of our most liberal Free Trade regulations.

LITERATURE.

*Ueber Compound Maschinen.* By V. CARL OERTLING. Kiel: Lipsius and Tischler. 1881.

THIS is an interesting series of calculations as to the effect upon the steam economy, and upon the variation of the crank moment, produced by altering the ratio between the cylinder volumes and by the division of the expansion between the two cylinders. Unfortunately, we do not think the data upon which the calculations are based are correct, and, therefore, the results cannot be of much value. This is a pity, because the problem is worked out from the starting point taken, in the usual German thorough style. The term "compound engine" is restricted to those with cranks at 90 deg., many Germans still adhering to the old name Woolfsche Maschine for those with the two pistons on the same piston-rod, and those with cranks at 135 deg. or 120 deg. not being considered in this memoir. There is a loss occasioned when the steam from the high-pressure cylinder is allowed to exhaust into the intermediate chamber at a lower pressure than the terminal pressure in the small cylinder. The amount of this loss is taken to be what Rankine says it is—which, although not strictly accurate, is sufficiently so to base reasoning upon as to the proper cut-off in the two cylinders. Herr Oertling next assumes that the back-pressure in the small cylinder remains constant, for the sake of simplifying the calculation of the proper ratio of cut-off. This assumption is so far from the truth that it alone would, we think, destroy the legitimacy of the conclusions based on it. Afterwards, in calculating the variation of the crank shaft moment, Herr Oertling takes into account this variation of pressure in the receiver, and shows how very large it is. His next assumption is that what he calls "the total slide valve expansion ratio," i.e., the reciprocal of the product of the high and low-pressure cylinder slide valve cut-off, is limited by other considerations than those of steam or coal efficiency; and sets himself the problem of finding in what ratio this fixed product is to be divided into its two factors—for high and low-pressure cylinders—in order to procure the greatest amount of work done per pound of steam. Of course, in considering compound engines it is necessary to distinguish between the total expansion ratio as given by the slide valves and the real ratio of total expansion; because there occurs in the low-pressure cylinder, usually, a good deal of expansion before the point of cut-off. It is this real ratio of total expansion that is actually limited by other considerations than steam efficiency. Why the author of the book before us should think that it is the other ratio which is limited in this way we do not know; but it leads him to suppose that he may lower the steam in the low-pressure cylinder to any terminal pressure his equations may dictate, without reference to practical difficulties created by a very low terminal pressure. This method results in the conclusion that much more work can be got out of a given quantity of steam at a given initial pressure if its pressure be allowed to fall suddenly in exhausting from the small cylinder into the receiver, than if it did not lose pressure suddenly at this point. Herr Oertling's mathematics are strictly accurate, but his conclusion is quite false because his premises are false.

The correct solution of the compound engine slide valve problem is to make the cut-off in the low-pressure cylinder such that the steam in the intermediate chamber will be compressed to pressure equality with the terminal pressure in the high-pressure cylinder at the moment that exhaust takes place. The steam will not then rush out violently nor lose tension suddenly, and the amount of work got from it will be the maximum, i.e., the amount that would be got if it were expanded in one cylinder to the same terminal pressure. This can be proved by strict thermo-dynamic reasoning, and it is always possible to calculate the proper cut-off of the slide valve in the low-pressure cylinder that will procure this result. The real total rate of expansion becomes then the expansion ratio of the high-pressure cylinder multiplied by the ratio of the volume of large cylinder to that of small cylinder.

In considering the possible economy obtainable from the use of high pressures, Herr Oertling points out a fact which ought to be well known to engineers, but is sometimes misunderstood. So far as consumption of coal—or of heat—is concerned, the advantage of high pressures consists solely in the possibility they introduce of using large grades of expansion. If no expansion be employed the amount of horse-power obtained from a given expenditure of heat increases so very slowly with increase of boiler pressure that the advantage falls far short of the extra expense of the boiler and engine. The calculations of the curves of pressures in the intermediate chamber, and those of the driving moment on the crank shaft, are instructive and interesting. The author has found from an examination of actual indicator diagrams what we have repeatedly pointed out, namely, that the losses caused by wire-drawing and compression are heightened rather by high speed of crank shaft revolution than by high linear speed of piston. For the sake of steam economy, therefore, he would recommend long stroke engines wherever practicable, and this would also result in less rapid wear of the crosshead and crank pin journals.

BOOKS RECEIVED.

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*Elements of Plane Analytic Geometry.* A Text-book by G. R. BRIGGS. New York: J. Wiley and Co. London: Sampson, Low, and Co. 1881.  
*Gasworks Statistics, 1881.* Edited by C. W. HASTINGS. London: C. W. Hastings.  
*The Gas Manager in the Laboratory.* By a Practical Student. London: C. W. Hastings. 1881.

*Waterworks Statistics, 1881.* Edited and published by C. W. HASTINGS.  
*The Gas and Water Company's Directory, 1881.* Fifth issue. Edited and published by C. W. HASTINGS. London, 1881.  
*Revista General de Marina.* Tomo VIII. Abril, 1881, y Mayo, 1881. Madrid: Direccion de Hidrografia.  
*Melbourne Exhibition, 1880.* Official Catalogue of Exhibits, with introductory notice of countries exhibiting. Vols. I. and II. Printed for Commissioners, by Mason-Firth and M. Cutcheon, Melbourne.  
*The Dictionary of Architecture.* Part XXI. P.-Q. London: Thos. Richards, 1881. Published for the Architectural Publication Society.  
*Die Darstellung des Eisens und der Eisenfabrikate.* Handbuch: Von Eduard Japing. Vienna: A. Hartleben. 1881.  
*Aid Book to Engineering Enterprise Abroad.* By Ewing MATHESON, M.I.C.E. Part II. London: E. and F. N. Spon. 1881.  
*Criticisms on Stationary Steam Boilers: Directed especially to matters of construction, tests of quality, and choice of boilers.* By W. MORGANS, F.G.S. London: Colliery Guardian Office. 1881.  
*Accented Four-figure Logarithms and other Tables for Arithmetical and Trigonometrical Purposes, with formulae and examples.* By Lewis D'A. JACKSON. London: W. H. Allen and Co. 1881.  
*History of Salt.* By E. M. BODY, F.R.C.S.: London: Ballière, Tindall and Cox. 1881.  
*Proceedings Institution Mechanical Engineers, No. 1, 1881, and Library Catalogue, with subject matter, index of papers in the Proceedings 1847-1880.* London: The Institution.  
*A Practical Treatise on Mechanical Engineering.* By Francis CAMPIN, C.E. Weale's Series. London: Lockwood and Co. 1881.  
*Transactions of the Chesterfield and Derbyshire Institute of Mining, Civil, and Mechanical Engineers.* Vol. IX. Part I. London: Bembrose and Son.

SEMI-PORTABLE ENGINE.

THIS engine, which we illustrate on page 464, is erected on a strong wrought iron frame, underneath a boiler of the locomotive type, the ashpan being bolted down to the frame to support the boiler at the fire-box end, while the smoke-box rests upon and is bolted to the cylinders at the front end in the usual manner.

The shell of the steam-jacketed cylinders, steam chests, stop valve chamber, and feet for bolting to the frame at the bottom and smoke-box at the top, are made in one large casting. The cylinder liners are afterwards forced into their places, thus the whole of the working barrels are in contact with the jacket steam. The cylinders, jackets, steam chests, and exhaust chamber are all efficiently drained. The engine is fitted with Hartnell's patent governor and automatic expansion valve gear, the bracket for which is bolted to a wrought bridge plate which extends across the engine. Between the cylinders and the wrought iron bridge plate, are substituted, in lieu of the slide bars cylindrical bored guides, the flange at one end of these guides forms the back cylinder cover and piston rod stuffing box, while at the motion plate end another flange is provided, making a firm bolted attachment to the motion plate. The crossheads are made of wrought iron with gun-metal slippers easily adjusted. Special provision is made for properly lubricating the guides, and the oil is collected in a trough and can be emptied away as desired.

Much care has been bestowed on the design of this engine to keep down the number of parts to the utmost limit, combining simplicity with neatness of appearance, strength of details, and ample wearing surfaces. The fire-box of the boiler is of the Belpaire type, thoroughly stayed for 100 lb. working pressure; all the mountings are bolted to wrought iron planed fixings rivetted to the boiler shell. The diameter of the cylinders is 13in.; length of stroke, 18in.; revolutions per minute, 85; diameter of fly-wheel, 7ft.; working pressure 100 lb. per square inch. The engine has been constructed to the order of the Indian Government.

THE SOCIETY OF ENGINEERS.

ON Wednesday took place the first of the summer visits of the members of the Society of Engineers to works of technical interest. Arrangements were made with the Government officials for a visit to the Mint, permission being conceded only under some very strict conditions. The visitors were admitted only by ticket, in groups of six at a time, and the number was limited to 150. The visitors were received by Mr. Nash, deputy superintendent, while valuable assistance was rendered in explaining the various processes by Mr. Joseph Newton, who was for very many years engineer to the Mint. The visitors first entered the melting shop, where they witnessed the production of ingots from bar metal and old coins. Then they proceeded to the rolling room, where the ingots are reduced to flat bars. From there they proceeded successively through the adjusting room, punching rooms where blanks are produced, and then through the pickling, and washing and cleaning rooms. Then they visited the press rooms, in which are eight screw and four lever presses, and they finally passed through the weighing room with its nineteen splendid automatic weighing machines, and the museum. There were many more applications for tickets than could be granted. In the evening nearly 50 of the members and their friends dined together at the Guildhall Tavern. Among those present were Mr. Horseley, president; Mr. Bernays, past president; Mr. Williams, hon. sec. and treasurer; Mr. Schonheyder and Mr. Nursey, members of council, and Mr. B. Reed, secretary.

TENDERS.

FOR Pile-driving, &c., required in extension of Ballast Bank, Portmadoc Harbour. Engineer, Mr. Thomas Roberts, Assoc. M. Inst. C.E.

	£	s.	d.
Davies, Waunfawr .. .. .	812	0	0
Morris, Carnarvon .. .. .	477	0	0
Pritchard, Portmadoc .. .. .	430	0	0
Owen, Portmadoc .. .. .	430	0	0
Hughes, Portmadoc .. .. .	424	0	0
Greene, Portmadoc .. .. .	423	0	0
Williams, Carnarvon .. .. .	416	0	0

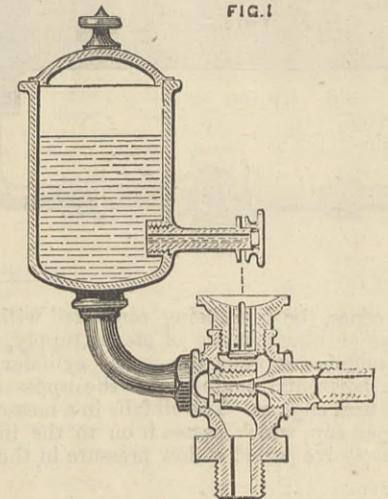
TENDERS received by the Hastings Urban Sanitary Authority for Ornamental Wrought Iron Gates and Railings to be used in connection with the Public Park.

	£	s.	d.
W. Letheren, Ironworks, Cheltenham—accepted ..	183	14	0
J. Bagshaw and Sons, Victoria Foundry, Yorkshire ..	202	0	0
Thos. Riding, Ironworks, Bury .. .. .	251	7	6
John Bros. and Co., London .. .. .	260	0	0
Geo. Fletcher, Wolverhampton .. .. .	265	14	0
Francis Morton and Co., Liverpool .. .. .	281	2	6
Thos. Ashworth, Vulcan Works, Manchester ..	295	10	0
Barnard, Bishop, and Barnards .. .. .	300	0	0
St. Pancras Ironwork Company, London .. .. .	307	0	0
A. and J. Main and Co., London .. .. .	357	10	0
Chas. Lock, St. Leonards-on-Sea .. .. .	359	2	2
Hill and Smith, Ironworks, Staffordshire .. ..	415	0	0
W. P. Wenham, Croydon .. .. .	480	0	0
Robinson and Robson, London .. .. .	510	0	0
S. Gillman and Son, Cirencester .. .. .	561	15	0

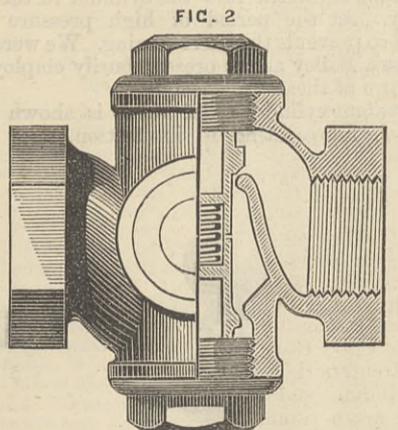
VISITS IN THE PROVINCES.

MESSRS. W. H. BAILEY AND CO.'S ALBION WORKS, SALFORD.

A VISIT to these works is interesting, not so much that there are any special tools or novelties of modern machinery in operation to attract particular attention, but rather because of the multitude of mechanical inventions which are to be seen, either completed or in process of manufacture. It is, therefore, more to a description of some of the new inventions which Messrs. Bailey are producing, than of the works themselves, that we purpose devoting our present notice. It is difficult to specify precisely the particular branch of mechanics or engineering to which Messrs. Bailey turn their special attention. In the first place, they are manufacturers of all kinds of clocks, from turrets to timepieces; but in this direction the firm are perhaps best known by their ingenious adaptations of



clockwork movements to an infinite variety of automatic recorders—from arrangements for preventing suicide on the part of inmates of lunatic asylums, to their more recent productions of clock time-keepers for works, and recording indicators of the varying state of the ventilation in coal mines. Then they are manufacturers of all kinds of fittings for boilers and engines, electric apparatus, cement, oil, and other testing machines; hydraulic engines and pumping machinery. The works consist of a range of buildings of modern construction, somewhat ornamental in their architectural features, occupying a plot of land of from five to six acres in the centre of the manufacturing district of Salford; and the firm have plans in hand for enlarging their workshops to about double their present extent. The class of business in which Messrs. Bailey are engaged necessitates their keeping on hand a heavy stock of manufactured goods; their stock, when taken at the close of last year, amounting to £25,000, and the offices, showrooms, and stores, consequently occupy a considerable portion of the building. The arrangement of the erecting, fitting, and finishing shops is, however, worthy of notice. These are all comprised within one building. The erecting shop, which is about 150ft. square, occupies the whole of the ground floor, and the remaining departments are arranged in three galleries or storeys running round the building,



with offices for the foremen, constructed of framework filled in with glass, rising one above the other in one corner from the basement to each separate floor. By this arrangement good light, ventilation, and easy supervision of every department are afforded. In the erecting shop there are several heavy radial drilling machines and a number of boring machines, in some of which special improvements have been introduced by the firm; in the other shops there is the usual class of machinery, and the only special feature to notice is that in connection with the brasswork, scarcely a file is used, everything with a flat surface being operated upon by milling and polishing machines, to which one side of the building in the top floors is devoted. This is all that need be said with regard to the works, and we will now proceed to a brief description of a few of the mechanical inventions which here and there attracted our attention.

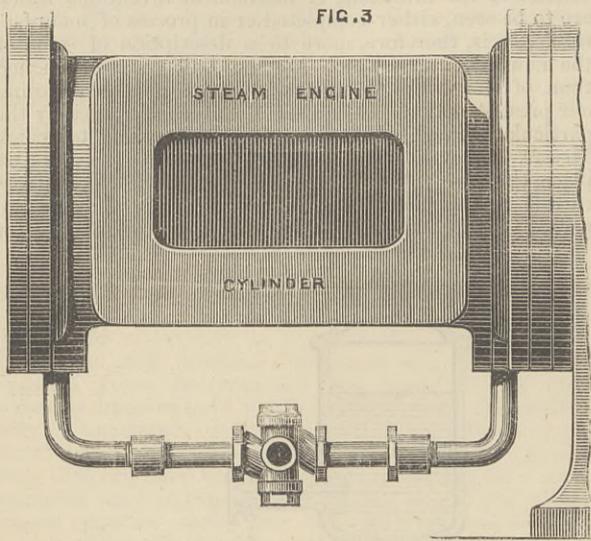
Passing through the showrooms and stores, we noticed miners' safety lamps, which were being packed up for shipment to China, water motors for New Zealand, testing machines for the East India State Railways, turnstiles for Constantinople, a turret clock for Montago Bay Town Hall, Jamaica; water gauges for Valencia, and a miscellaneous variety of fittings for boilers, furnaces, and collieries, which were being sent away to works in different parts of the United Kingdom. This will serve to illustrate the varied class of business which the firm have in hand, and we will now select a few of the specialties which, with the accompanying illustrations, may be of interest to our readers.

In our Lancashire notes reference was recently made to Royle's "Oleojector," of which Messrs. Bailey are the sole licensees. This is a new invention, illustrated by Fig. 1, for lubricating steam engine cylinders and slide valves. A small jet of steam taken from any high-pressure part of the engine is allowed to play through the apparatus, and the suction thus created is employed to carry the lubricant into the cylinder. The body, or injector portion of the apparatus, is provided

stand pipe is carried up from the blow-off cock to the low-water level, and as all the water must pass into the stand pipe at the top, no water can leak down through the top of the stand-pipe. By this arrangement scum water can be blown off through the stand-pipe down to low-water

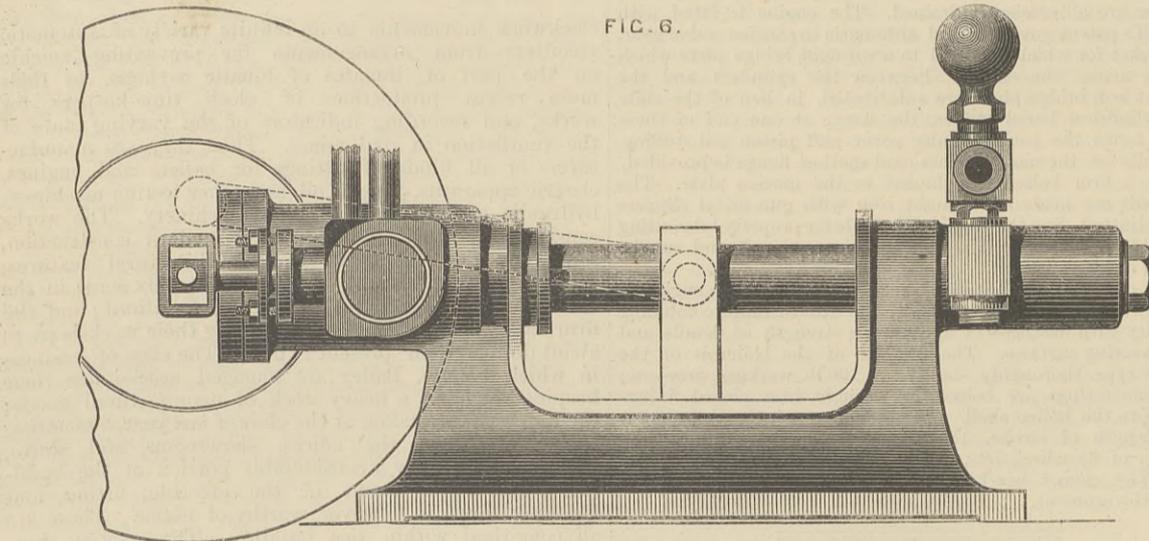
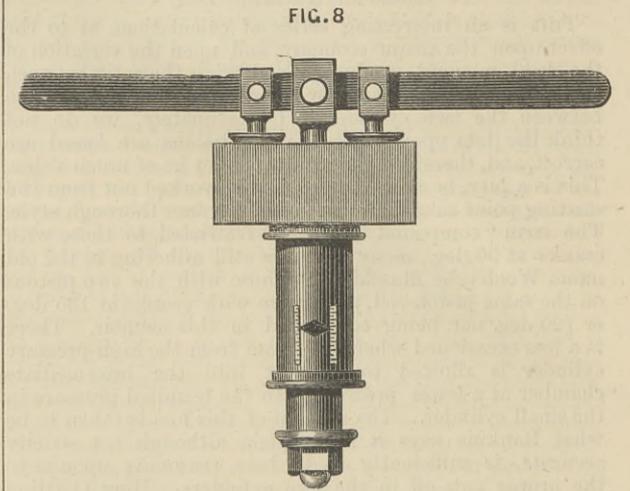
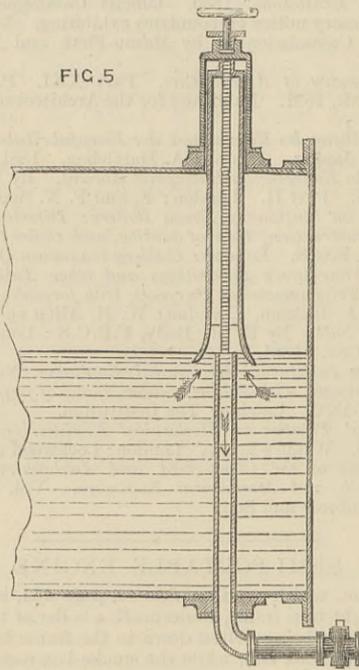
the cases of these valves, and the fittings are also made with water or steam gauges.

A short time back a suggestion was made to Mr. Bailey whether he could not apply a clock movement so as to produce an automatic time recorder for workshops, which would prevent the frequent disputes between the time-keepers and the workmen. Following up this suggestion, Mr. Bailey has just brought out a check clock, which is shown in Fig. 9. This consists of a shoot



with two cones, the inlet being connected with the main steam pipe or other source of steam supply, whilst the outlet communicates with the engine cylinder about the middle in horizontal engines, and the upper end in the case of vertical engines. The oil falls in a measured supply into an open cup, which passes it on to the injector, and at each successive period of low pressure in the cylinder a

level. When the muddy water is to be blown out from the bottom of the boiler, a plain hood pipe closed at the top is screwed down over the stand-pipe, and the water rushes up between the stand-pipe and hood pipe to the



jet of steam passes through the cones, a valve which is arranged to prevent the return of the oil is opened, and the lubricant is carried into the cylinder in the form of a fine spray. At the period of high pressure the valve closes and so prevents the oil returning. We were informed that Messrs. Bailey are at present busily employed in the manufacture of these "oleojectors."

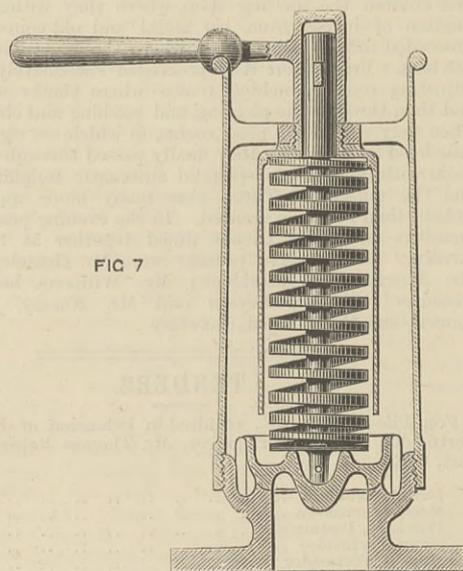
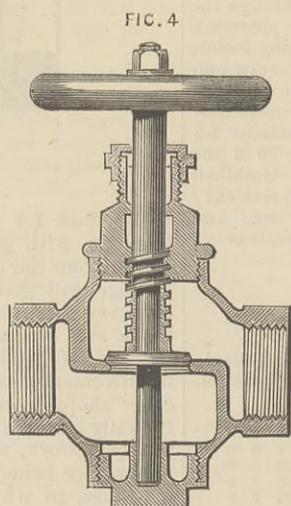
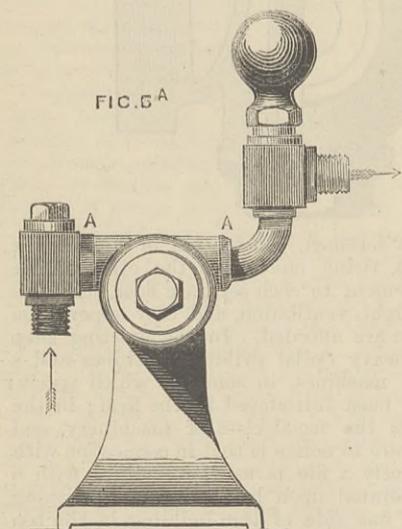
top of the stand pipe, and thence down through the stand pipe and the blow-off cock.

Bailey's patent swivel valve pump, which is represented in Figs. 6 and 6A, is an arrangement by which the valves can be worked in any position. The suction and delivery valves, which are secured in position by the lock nut A A, are so arranged that in whatever position the pump is placed the valves can always be vertical, and this enables the pump to be worked either as a wall or a hori-

which moves, within a certain period of time, which can be regulated at will, over a series of partitions. The workmen drop their checks through the shoot, and they pass into the different partitions in accordance with the time at which they were deposited in the clock. One of these clocks is now being made for the offices of the *Bolton Evening News*, and several have been ordered for other works.

Considerable difficulty has always been experienced in

Holt's patent cylinder relief valve is shown in Figs. 2 and 3, one representing it in section, and the other



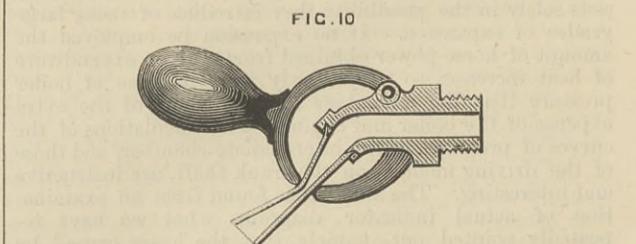
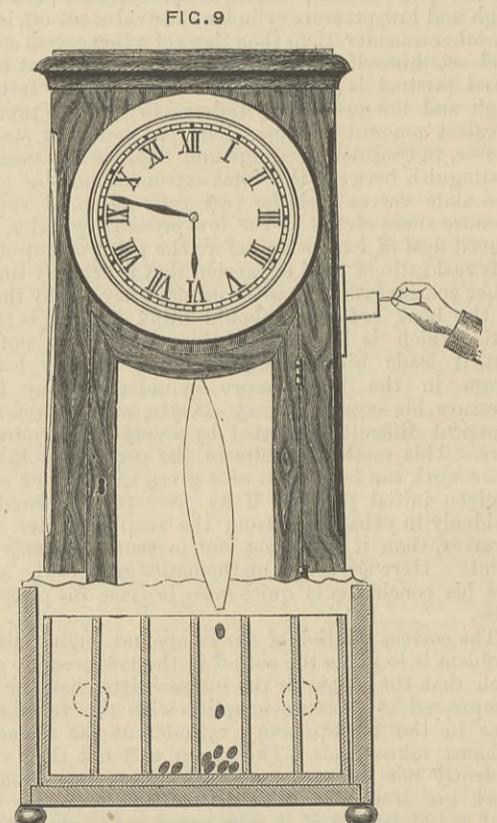
coupled to the cylinder. This is a valve which takes the place of the two valves ordinarily attached to each end of the cylinder, consists of a pair of valves fixed in a case, one valve being in connection with the pressure and the other with the exhaust. The valve opens when the engine is exhausting, allowing all condensed water to escape, and closes when the pressure comes on. Fig. 4 shows a reversible valve. The seating and valve have each two faces, and all the parts are made to fit either way. Thus when one side of the valve is worn it can be readily reversed, so that it practically becomes a new valve.

Fig. 5 illustrates an invention for clearing out surface scum as well as deposit from boilers, and is termed a boiler "scavenger"—Watkin's patent. A plain

zontal pump. Fig. 7 is a representation of Bailey's lock-up safety valve for steam launches, which, we may add, has been adopted by the Manchester Steam Users' Association. It is made throughout of gun-metal, with nickel plated spring. The valve is on Hallam's patent, and the casing is locked with a Chubb's lock, so that there can be no tampering with it after it has been once set. Another of Messrs. Bailey's patent locked safety valves is shown in Fig. 8. This is a modification of the well-known valve used on locomotives, and invented some years ago by Mr. John Ramsbottom. The principle is that of having two valves, one operating upon the other, so that in the event of one valve not acting it becomes a fulcrum for raising the other. Locks are also attached to

producing taps which would effectually withstand the action of acids. Mr. Bailey has patented an acid tap, as shown in Fig. 10, which would seem to meet the requirements in a very simple manner. The tap is constructed of white metal to resist the acid, and the cock itself consists of an india-rubber tube, in place of the ordinary block, which is closed by a weight acting on a clip. When out of order a fresh piece of tubing at once renews the cock.

The importance of an undisputable record of the state of the ventilation of a mine has been repeatedly brought into prominence during inquiries into recent colliery explo-



sions, and as we have already intimated in our Lancashire notes, Mr. Bailey, at the suggestion of Mr. Joseph Dickinson Hill, her Majesty's chief inspector of mines, has just constructed what he terms a miners' clock, with the object of meeting these requirements. This is a modification of Messrs. Bailey's well-known clock-recording apparatus, and consists of an eight day clock, which drives a drum of about 8in. diameter, to which is attached a paper divided into all the hours of one week. As the drum revolves the fluctuations of the pressure of the air passing through the mine are recorded upon it up to 6in. of water column pressure. The speed of the engine when the fluctuations occurred is also marked upon the drum by means of a pricker, which punctures a diagram once for every 5000 revolutions of the engines connected with the ventilating apparatus. Thus in a concise form are obtained the speed

of the engines and the fluctuations of the air pressure at every hour during the week's work. The first of these clocks is at present being fitted up at the Townley collieries, Burnley, but we understand that many inquiries are already being made from other quarters.

Numerous other little inventions attracted our attention, but these we have not space to notice.

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

(From our own Correspondent.)

UPON 'Change in Birmingham to-day—Thursday—as also in Wolverhampton yesterday, there was an active inquiry for sheets and hoops. Latens were fully quoted £9 15s. per ton, and doubles of a good quality were not procurable at under £8 10s.; singles of a like sort were quoted at from £7 15s. to £8; but the same gauge of iron needed by the braziers was to be had at £7 5s. to £7 10s. Both classes were in request. Hoops were hardly less in demand for cooerage than for baling purposes. Ordinary qualities of coopers' hoops were not procurable at less than £6 10s., an increase of 5s. per ton in some cases; for superior sorts up to £7 was asked. Tube strips keep in excess of average inquiry at this time of the year. Boiler plate orders were difficult to obtain, either in Birmingham or Wolverhampton, and mills can be kept going only partially; still the makers uphold their quotations, asserting that quality cannot be otherwise maintained.

Angles, tees, and channel and bedstead iron are in fairly good request, and prices are not weaker. Constructive iron generally is selling better, but not at much improvement in price. Chain and cable iron sold tolerably well to-day; and the best makers have but little room for complaint touching the extent of business they are doing.

Marked bars were in improved demand. Quotations are firmly upheld, makers insisting upon prices as per circulars issued when the crucial price was made £7. That figure, £7 10s., and £7 12s. 6d. are still demanded. Unmarked bars taper down from £6 10s. to £5 7s. 6d., and occasionally even £5 15s., according to quality. The demand shows a tendency to grow. Puddled bars were sought after, and slightly better prices would have been given to-day, but makers were not in a position to deliver with promptitude, and only few sales were reported. Most firms are doing their best to keep on their forges full time.

The pig market shows a tendency to stiffen. The prices range this week from 42s. 6d. to 45s. per ton strong. Part-mine pigs of local make are also a shade stronger in quotations, ranging from £2 12s. 6d. down to £2 5s. Common sorts graduate according to the proportion of cinder in the admixture from £2 2s. 6d. down to £1 17s. 6d. All-mine pigs, on the other hand, hold their own at from £3 up to £3 5s. Yet hematite pigs are not stronger on the week, transactions being more general at slightly within 67s. 6d. for excellent sorts. There were attempts yesterday to "bear" the market in this commodity, but without much effect, makers expressing through their agents the fullest confidence in their ability to get better prices on an early day. The number of furnaces blowing hereabouts this week is forty-two.

Coal is selling somewhat better than usual at this time of the year; yet the pits are only partially employed. The higher qualities keep their hold upon the market both as to mill and forge, and also furnace and domestic requirements. The sheet mill requirements run up the average of business at the better class forge-coal pits.

Coke is just a shade easier.

Ironmasters and colliery owners are beginning again to move with a view to the return at the pits to nine hours as a day's work; and it is believed that if the change is sought to be effected with due recognition of operatives' prejudices as to certain local customs, the movement would be now attended with success.

The Ettingshall Ironworks, situated at Barbor's Field, near Bilston, which in the early history of the South Staffordshire iron trade were run by Messrs. Banks and Son, and later by Messrs. Morewood and Co., for galvanising purposes, have just been remodelled. The works have been vacant for a few years, and have been acquired by the Barbor's Field Iron Company, by whom the alterations have been made. Amongst other items of improvement has been the erection of seven horizontal boilers, the taking out of the old, and putting in of new rolling machinery, &c. The works stand on three acres of land, and comprise fourteen puddling furnaces, three mills, and a forge; and the machinery laid down is capable of rolling any description of iron. The boilers are arranged so that the steam can be all raised by the heat from the puddling furnaces, which will allow of firing boilers being almost dispensed with. With the canal running through them and a line of railway hard by, these should be desirable works; yet they are still in the market, for the Barbor's Field Company do not intend to operate them.

On Wednesday a large boiler that was being used for working the cupola at the brass and ironfoundry of Messrs. Baugh, at Wellington, Shropshire, exploded with great force. The boiler, which was 10ft. 6in. long by 3ft., was carried a distance of thirty yards, and lodged deep in a brick wall. Fortunately no personal injuries occurred.

In North Staffordshire the finished ironworks are doing most on foreign account, for the home trade, although slightly improved, is yet very slack. Prices show no signs of improvement, and competition amongst local makers is keen. The nominal quotations are:—Crown bars, £6 5s.; best, £6 15s.; and plates, £8 5s. and £8 15s., according to quality. Pig iron is showing somewhat better prospects.

The commission sitting in London upon the French Treaty have consented to receive from the carriers and leather trade departments of Walsall a deputation to set forth their objections to the tariff. These are—that it will have the effect of completely closing their trade with France, for even at the present rate they are being considerably undersold by French manufacturers; and that the unsatisfactory classification of the goods leaves them at the mercy of the French Custom House officials. Walsall will, therefore, ask that instead of any further duties being imposed, the present ones may be lowered.

**NOTES FROM LANCASHIRE.**

(From our own Correspondent.)

Manchester.—The slight tendency towards improvement in the iron trade of this district, which I noticed last week, seems to have developed into a generally better feeling throughout the market, and at Tuesday's meeting at Manchester more inquiries were reported, whilst amongst sellers decidedly more firmness was noticeable. There has, however, not been that enlarged amount of business doing during the week to justify the conclusion that trade has actually taken a permanent change for the better; the large stocks which are known to exist in the principal iron-making centres stand in the way of buyers being very readily induced to pay higher prices, and although orders could not be placed at the exceptionally low rates which sellers in some cases were willing to accept a week or two back, where any actual advance was asked, this had a tendency to check business.

Lancashire makers of pig iron report a moderate improvement in business during the week, and they are holding firmly for their late rates of 43s. for No. 3 foundry, and 44s. for No. 4 forge, less 2½ per cent. delivered into the Manchester district, whilst in some cases business has been done at slightly better prices than these.

Sellers of outside brands in this district have generally been stiffer in their prices. In some cases Lincolnshire iron has been advanced 1s. per ton, the average quotations for delivery into the

Manchester district now ranging from 43s. 6d. up to 45s. per ton, less 2½ for forge and foundry numbers, and Derbyshire irons are being quoted at about 45s. to 46s., less 2½. For Middlesbrough 45s. 4d. to 45s. 10d. net cash has been quoted for delivery equal to Manchester.

In the finished iron trade there is still a good deal of complaining that new orders do not come in so freely as they ought, but the principal makers in this district seem at present tolerably well supplied with work, and there appears to be a fair amount of export trade stirring in the market. Prices also show a healthier tone, the minimum quotations for bars delivered into the Manchester district being now about £5 15s. to £5 17s. 6d. per ton; for hoops, £6 7s. 6d. to £6 10s.; and for ordinary sheets, £6 10s. to £6 15s. per ton.

In the engineering branches of trade the position of affairs continues unsatisfactory. Although throughout the country the last reports issued by the Amalgamated Society of Engineers show a slight decrease in the number of men out of employment, there are not half-a-dozen districts where trade is returned as actually good, whilst throughout the Lancashire districts trade is reported as either only "moderate," or "bad," and in some cases as "declining," even Birkenhead and Liverpool, where the shipbuilding trade has been very brisk for some time past, being now reported as only "moderate."

Messrs. De Bergue and Co., of Manchester, are tolerably well known in connection with railway engineering work, and the other day in passing through their establishment I had an opportunity of inspecting some samples of their bridge girders at present in course of construction. These included a couple of girders, one 108ft. and the other 94ft. long, which are going to Stalybridge. One feature was the accuracy with which both plates and flanges are planed and fitted together, nothing approaching what might be termed a gap being noticeable from end to end. As these girders are rivetted together through holes punched in the plates separately, the accuracy with which this is attained is a little surprising, and a brief description of the process with special machinery laid down by the firm may be of interest. The work is performed by means of a multiple punching machine fitted with an independent steam engine, and which is constructed to take in plates up to 20ft. long and 4ft. wide. The machine punches any number up to eight holes at each stroke, and traverses and punches the plate by self-acting movements from end to end without stoppage. Holes are punched at any pitch, either across, longitudinally, or in irregular forms over the plate, and any of the punches can be stopped or started at will, without interfering with the others or stopping the machine. By this means the row of holes is produced exactly in line, and the accuracy of the holes longitudinally is guaranteed by the traversing screw itself, which is cut to Whitworth's standard. Amongst other pieces of machinery which presented some features of novelty I noticed an improved form of punching and shearing machine which Messrs. De Bergue are just bringing out. In this machine there are fitted a pair of bar cutters, placed within the jaws of the machine behind, and at right angles with the plate shears in such a way as not to interfere with them. By this means the machine has been rendered capable of cutting flat bars up to 1in. thick, in addition to the other operations of punching, shearing, and angle iron cutting.

In the coal trade business continues extremely dull, and although numbers of the pits throughout Lancashire are not working more than three to four days a week the output is considerably in excess of requirements. Although the principal Manchester firms still maintain late rates generally, all descriptions of round coal are weak in price, very low figures being taken to move away anything like quantities. Engine classes of fuel are tolerably steady, but with the exception of the better qualities of slack there is no scarcity of supplies. The average prices at the pit mouth are about as under: Best coal, 8s. 6d. to 8s. 9d.; seconds, 6s. 3d. to 6s. 9d.; common coal, 4s. 9d. to 5s. 6d.; good burgy, 4s. 3d. to 4s. 8d.; and slack, 3s. 9d. to 4s. 3d. per ton.

Shipping is very depressed and coal is being offered at the high level, Liverpool, at extremely low prices.

Barrow.—The hematite pig iron trade shows no new features save one—the diminution in the output of the furnaces is causing a firmer tone all round, and although no change has taken place in the demand, which remains very quiet, there is a much more cheerful view taken by those most directly affected by the trade. There is one very considerable drawback, however, to an improvement in the tone of the iron trade, and that is the immense stocks of metal held throughout the district. These have not practically been reduced for some weeks, and deliveries have not been sufficiently large to admit of any reduction whatever—hence, the necessity of pulling down the production. The iron trade, generally speaking, is in anything but a satisfactory position, and the outlook is not at all cheerful. Steel makers are very busy and orders are not difficult to get, but, of course, rates are very low. The shipbuilding trade is also busy.

The Barrow Shipbuilding Company has just booked another order for two steamers to carry about 3000 tons of cargo, for Messrs. Wm. Johnston and Co., of London.

The City of Rome has been brought under the 100-ton hydraulic crane at Barrow, and during the next few days she will receive her boilers and engines. She is an object of the greatest interest, and the public are watching with much curiosity the completion of this monster ship. The inquest on the bodies of the four men who were killed in the explosion on the City of Rome resulted in a verdict that the deceased fireman, Clucas, maintained too high a pressure of steam, having before the explosion a pressure of 70 lb., instead of 40 lb., which pressure he was instructed not to exceed. Scientific evidence was given that the plate above the furnace was so thin as not to be able to withstand a pressure of 70 lb.

**THE SHEFFIELD DISTRICT.**

(From our own Correspondent.)

AFTER diligent inquiries, made in this and neighbouring districts, I am sorry I cannot confirm the statements which I see reported elsewhere, that the iron trade shows signs of improvement. I am told, however, that importation is daily looked for, that the American demand is undoubtedly overlapping the facilities of American production, and that the long continuance of depression must result, and that early, in a distinct revival. In the meantime, in expectation of this importation, quotations are more firmly sustained.

In the coal trade the owners up to this time have been able to delay any further reduction in price, preferring to diminish the output by giving lessened labour. This is, in effect, "the doctrine of idleness" from another standpoint, though it can scarcely be considered as other than justifiable to limit the supply to the actual demand. In gas coal there is a good trade doing at the advance of 9d. per ton noted some time ago; steam coal and other sorts are in very poor request. In the Derbyshire coal-fields affairs are even worse. At the pit top "bests" are fetching from 7s. 6d. to 8s.; seconds, 5s. to 6s.; cobbles, 4s. 6d. to 5s. 6d.; slacks, 3s. to 4s. 6d.; in smithern, 1s. 6d. to 3s. per ton. Best steam coal only fetches from 5s. 6d. to 6s. 6d. per ton at the pit top, exclusive of wagon hire. Nuts and slacks are fairly inquired for, a good quantity being sent into Lancashire and Cheshire.

There is some talk of a diminution of railway rates by the Great Northern and Midland Companies, with a view to enabling the South Yorkshire coal-owners to compete more successfully with the owners of the north. Sea-borne coal is carried from the Tyne to the Thames at about 4s. per ton, against 8s. 3d. by rail; so that it will be seen there is considerable room for reduction before the South Yorkshire coal-owners are on an equality with those of Durham. The suggestion of the committee of South Yorkshire coal-owners, to the effect that the Manchester, Sheffield, and Lincoln revised rates should be paid in full, has led to the company making some reductions at Grimsby, Keadby, and other places, as

well as a return of a portion of the extra charges. The rate to Hull, it is expected, will also be reduced.

The armour plate mills continue to be busy with orders for the ships already mentioned in previous letters, and there is no diminution in the demand for plates and other material for shipbuilding. In the rail mills there is an immense weight of rails being turned out both for home and foreign markets. Tires, axles, and springs are also well inquired for. In the engineering establishments some heavy orders have recently been received, and generally both the light and the heavy branches are in a satisfactory state, though several of the tool-makers report that they are not quite so actively employed as they expected to be.

Both for crucible and Bessemer steel there is a gratifying demand, the former chiefly for the States and other foreign markets, and the latter mainly for general purposes at home.

In the lighter branches I hear complaints of the smallness of recent orders for files, saws, and edge tools. Russian orders seem to fall off still more seriously. Makers of sheep shears, springs, and table knives and razors are very busy. The kinds of cutlery required for summer resorts are in demand. I hear continued complaint of German competition in scissors, and also of silver and electro-plated branches being excessively languid.

The annual report of the directors of John Brown and Co., Limited, Atlas Steel and Iron Works, was issued to the shareholders on Wednesday. The amount available for dividend, including the balance brought forward from last year, is £51,102, and the directors recommend a dividend of 5 per cent.

Appropos of the boiler explosion on board the City of Rome at Barrow, it may be interesting to mention that the explosion of steel which took place at Messrs. Vickers and Co.'s Works, Sheffield, some time ago, when several men were killed and others injured, occurred in the course of casting a propeller blade for that vessel.

**NOTES FROM SCOTLAND.**

(From our own Correspondent.)

THE iron trade is on the whole in an encouraging position. Since last week the warrant market has been comparatively strong, and better prices have ruled, although the quantity of iron which has changed hands does not appear to have been great. Of the 120 furnaces now in blast, six are making hematite pigs from Spanish ores, using a fine Scotch coal, instead of coke, as fuel. From the United States there is at present a good demand for hematite ore, but the inquiry for ordinary pig iron is slow.

Business was done in the warrant market on Friday morning at from 46s. 7½d. to 46s. 9d. cash, and 46s. 8d. to 46s. 10d. one month, the afternoon quotations being 46s. 9d. to 46s. 6½d. cash, and 46s. 10d. one month. On Monday the market was strong with business in the forenoon from 46s. 10d. to 47s. 1d. cash, and 47s. to 47s. 2½d. one month. In the afternoon, from 47s. to 47s. 1d. cash, and 47s. 2½d. one month were the quotations. The market was steady on Tuesday at 47s. 1½d. to 47s. 3½d. cash, and 47s. 3d. to 47s. 5d. one month. Business was done on Wednesday at 46s. 11d. cash to 47s. 1½d. one month. The market was firm to-day—Thursday—with a moderate business from 46s. 11d. cash and 47s. 1d. one month, to 47s. 1d. cash and 47s. 2d. one month.

Makers' prices are a shade firmer in sympathy with warrants, one or two of the principal brands being quoted 6d. per ton higher. The quotations in merchants' brands are as follow:—g.m.b. f.o.b. at Glasgow, per ton, No. 1, 47s. 6d., No. 3, 45s. 6d.; Gartsherrie, 55s. and 48s. 6d.; Coltness, 56s. and 48s. 6d.; Summerlee, 54s. and 47s.; Langloan, 56s. and 48s.; Carnbroe, 51s. 6d. and 47s.; Calder, 54s. 6d. and 47s. 6d.; Glengarnock at Ardrossan, 51s. 6d. and 47s. 6d.; Eglinton, 47s. 6d. and 45s.; Dalmellington, 47s. 6d. and 45s.; Shotts, at Leith, 55s. 6d. and 49s.; Kinneil, at Bo'ness, 47s. 6d. and 45s. 6d.; Carron, at Grangemouth, 47s. 6d. and 46s. 6d.

The strike of 1400 men at the Steel Company of Scotland's works, near Glasgow, is now at an end, after lasting for five weeks, the men having gone in with hardly any concession. The same company's Blochairn works are also now going, the 600 men who struck there having returned to work at the employers' terms.

The f.o.b. prices at Glasgow are—for steam coals, 7s. 3d. to 7s. 9d. per ton; splint, 6s. 6d. to 7s.; ell, 5s. 9d. to 6s. 3d.; and main, 5s. 6d. to 6s. In the Firth of Forth the prices free on board are 5s. 9d. to 6s., and at the pits 7s. to 7s. 6d., while in Ayrshire the quotations range from 6s. 3d. to 7s. 3d. per ton.

By a plebiscite of the members, it has been resolved to dissolve the Mid and East Lothian Miners' Association, and distribute the funds, amounting to about £1000, among the remaining members, who are about 500 in number.

**THE NORTH OF ENGLAND.**

(From our own Correspondent.)

A SOMEWHAT more cheerful feeling pervaded the Cleveland iron market, held at Middlesbrough on Tuesday. This was mainly caused by a similar change which had taken place at Glasgow. Attempts to trace back to its origin the improvement do not appear, however to get beyond the fact that the Clyde Company are likely to put out four furnaces, whilst they are also about to blow in two new ones. Inasmuch as the four to be put out are probably old and inferior ones, and the two to be blown in are naturally good and efficient ones, it is not likely that the make will be much affected by the change. In the Cleveland district two furnaces are likely to be blown out for relining—one belonging to Messrs. B. Samuelson and Co., and the other to the Tees-side Iron and Engineering Works Company. This suspension of production, so long as it lasts, will decrease the general output by about 800 tons weekly. Much has been said about the effect on the pig iron market of an increased demand for manufactured iron. It is true that there has been a better inquiry during the last few days for shipbuilding iron, principally on foreign account; but much business has not yet resulted. Indeed, the production and consumption of manufactured iron have been about equal for some months past, which accounts for the continued steadiness of prices. It is not at all unlikely—indeed, quite probable—that there will be some rise before long.

The principal shipbuilders on the Tyne and Wear have not contracted for all their requirements, and are now holding back from doing so in hopes of lower prices. Some of them are even ordering in dribbles, which is a very unusual thing for them, and clearly reveals their position as to contracts. At the moment the best customers for shipbuilding iron are the foreigners, including German, Danish, Swedish, and even French consumers. These buyers are collectively taking large quantities from the Cleveland district, and are helping materially to prevent a further lowering of prices. The price of No. 3 g.m.b. may now be put at 36s. 9d. for prompt delivery, or 37s. over next month. Forge iron is 1s. per ton less, and warrants 9d. per ton more. Shipments have somewhat improved during the present month, and it is expected they may exceed the returns for May by 5000 to 10,000 tons. In that case the accumulation of stocks will be proportionately reduced. Iron still goes into store, the increase during the week being 762 tons, making a total of 175,974 tons in Connal's store at Middlesbrough, and 564,032 at Glasgow. The price of ship-plates is still about £6 per ton, though a trifle less is accepted for extra favourable specifications. Iron rails, bars, and angles are all at about £5 7s. 6d. in trucks Middlesbrough, cash less 2½ per cent. discount.

The prices of coal are a little easier. The usual contracts for the second half of the year have been largely under negotiation during the last week or two, and, where concluded, have usually been somewhat in favour of the buyer. Scrap iron of all kinds is lower in price. Old rails may be bought at £3 7s. 6d. per ton; shipbuilders' scrap at £3 2s. 6d.; light scrap and turnings at £2 7s. 6d. delivered at Middlesbrough. Purple ore is also lower, the price at which recent contracts have been made for prime sorts being

about 17s. per ton net cash. In ironfounding, considerable slackness still prevails, and the keenest competition takes place for any orders there may be to give out. Ordinary covered sand castings may be had as low as £4 per ton; grain rolls at £6 15s., and other castings in proportion. A meeting of the Tees Conservancy Commissioners has been held to consider a proposal that their contribution towards the new bridge at Stockton should be increased from £7000 to £10,000. It was decided that no increase be made, and the only alternative now seems to be that the estimates should be cut down to suit the available funds.

Another underground fire has broken out at South Shields. This town is built upon heaps of ballast consisting in part of layers of small coal and cinders, which were regarded as refuse, and tipped and spread about in bye-gone times. If under such circumstances any part of a combustible layer lying below others should become accidentally ignited, it becomes impossible to put the fire out, except by cutting trenches down to it and so isolating the burning portion. As it burns, and occupies less room the superincumbent strata fall in, carrying with them whatever buildings may be above. This actually took place some years since under a portion of the town in question, and only when some £16,000 damage had been incurred was the fire subdued. Within the last few days the fire has again broken out at a new place, to the great consternation of the property owners in the neighbourhood, who cannot tell what loss and trouble they may not be put to before the difficulty is overcome.

The works of Messrs. Watson, Kipling, and Company, Limited, of Seaham Harbour, are about to be laid in. A meeting of shareholders was held at York recently, when a resolution was proposed to wind up the concern voluntarily. Another meeting is about to be held to confirm the same, but it is said that it will be opposed. There are now only 50 hands employed, owing to depression in trade, instead of the usual complement of 400.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

A BLUE BOOK just issued contains matter of considerable interest to the coalowners of Wales. I note from the report of Mr. Wales that the total number of persons employed in the South Wales district during the year was 50,418, 42,242 being employed underground, and 8174 on the surface. The total quantity of coal raised was over 15 million tons. It will be seen, on comparing these figures with previous reports, that there is an increase of 4 per cent. in the number of persons employed, and fully 25 per cent. in the quantity of coal raised. The total number of fatal accidents was 131, with a loss of 243 lives. This does not compare so favourably, for in the year previous, 1879, 122 accidents only occurred, with a loss of 195 lives.

Great energy is being displayed at the new Swansea Docks, and though heads are shaken when October is named, and doubts are freely expressed as to the readiness of things by that time, I do not despair but that they may be sufficiently forward for the purpose. Sir Wm. Armstrong, it is understood, will supply the various engineering appliances.

There is little to chronicle in the iron and steel trade, except that prices are firm, and business pretty good. Large cargoes have sailed during the week, the total from all Wales having been 7402 tons.

A new colliery is being opened at Cymmer Glynorwry, on the side of Nant-y-bar Mountain, by the proprietor of the Yspitty Works.

Mr. E. W. T. Lewis's vigorous action seems to have stamped out discontent and brought about a peaceful and prosperous condition. Half measures, such as are often adopted in our industries, never succeed, and coalowners and all other employers find that a fair and liberal offer, accompanied by unmistakable determination to abide by it, always carries the day.

It is expected that the tin-plate manufacturers who have remained firm by their offer will now reap the benefit, stocks having fallen very low. The demand is already setting in well, but no movement has yet taken place in price.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

- 14th June, 1881.
2569. LOOMS, R. Hall and J. Hobson, Bury.
2570. DISTRIBUTING WATER, J. Dempster, Elland.
2571. LOOMS, J. Pickering, (G. Pickering, Berlin.)
2572. ELECTRIC LAMPS, H. E. Newton, (C. A. Hussey and A. S. Dodd, New York.)
2573. SUPPORTING WIRES, H. E. Newton, (C. A. Hussey and A. S. Dodd, New York.)
2574. KNEADING DOUGH, B. J. B. Mills, (E. R. von Sooda, Bohemia.)
2575. BARTNA, W. E. Gedge, (E. J. Mauwene, France.)
2576. EXPANDING FIRE-GRATES, W. Hopkins, Worcester.
2577. FASTENING FOR BEDSTEPS, E. Edwards, (J. Dudley, Paris.)
2578. FOOT-POWER MECHANISM FOR DRIVING SAWS, A. M. Clark, (C. E. Mayo and W. L. Perry, Lowell, U.S.)
2579. MOULDS, A. Clark, (H. Atwood and W. Driscoll, U.S.)
2580. ALUMINA, J. Webster, Solihull.
2581. STAINS, C. Sombart, (G. Glojey, Nurnberg.)
2582. TRICYCLES, H. Haddan, (C. W. Oldrieve, U.S.)
2583. STEELYARDS, H. J. Haddan, (F. Subra, Algiers.)
2584. COVERINGS FOR ROLLERS, H. J. Haddan, (J. Precost, France.)
2585. HAMMERS, H. J. Haddan, (A. Beaudry, U.S.)
2586. SHIP PENS, H. J. Haddan, (S. Shaw, U.S.)
2587. REFRIGERATING, W. Lake, (G. Stockman, U.S.)
2588. LOCKS, I. J. Glerum, Christiansund, Norway.

- 2589. DESULPHURATION OF LIQUIDS, F. Lux, Bavaria.
2590. GRATE BARS, W. Lake, (W. U. Fairbairn, U.S.)
2591. VELOCIPEDS, W. Harrison, Manchester.
2592. TELEPHONIC CONDUCTORS, W. R. Lake, (H. A. Clark, Boston, U.S.)
2593. ELECTRIC CLOCKS, A. M. Clark, (J. Schweizer, Switzerland.)
15th June, 1881.
2594. BURNERS, G. Lauckner, (N. S. Wax, Germany.)
2595. LEVER HAMMER, J. Cuthbert, Landport, and G. H. King, Portsea.
2596. LAMPS, R. H. Brandon, (L. Sepulchre, Belgium.)
2597. WIRE GAUZE, R. Brandon, (Lang & Son, Germany.)
2598. FIRE-LIGHTERS, S. Rigby, Blackpool.
2599. BINDING, & C., H. Rees, London.
2600. WASHING POTATOES, J. Boardman, Rainford.
2601. LEGGINGS, I. Frankenburg, Salford.
2602. COPYING PRESSES, J. Mitchell, Sheffield.
2603. WASHING WOOL, & C., J. Clough, Keighley.
2604. COOKING EGGS, W. Beck, (P. Labarre, Paris.)
2605. SUN-LIGHTS, W. T. Sugg, Westminster.
2606. ELECTRIC ACCUMULATORS, A. Muirhead, London.
2607. ELECTRIC BELLS, W. P. Granville, London.
2608. CAPSULING BOTTLES, F. Wirth, (F. Fehr, Germany.)
2609. LACE-UP BOOTS, G. A. M. d'Haine, Paris.
2610. SECURING THE TOPS OF CYLINDRICAL METAL BOXES, W. Downie and W. F. Lotz, London.
2611. DISTRIBUTION OF FLUID, W. Wise, (C. Roue, Paris.)
2612. ELECTRIC LAMPS, W. Crookes, London.

- 16th June, 1881.
2613. VELOCIPEDS, A. L. Bricknell, London.
2614. VENTILATION OF MINES, J. Onions, London.
2615. WRENCHES, H. Lunt, (T. McLean, New York.)
2616. CHIMNEY-PIECES, G. Hodson, Loughborough.
2617. BLOCKING THE UPPER LEATHERS FOR BOOTS, F. H. Morriss, (L. Bonthoux, Grenoble, France.)
2618. GOVERNING DYNAMO-ELECTRIC MACHINES, J. Jameson, Newcastle-upon-Tyne.
2619. BALL COCKS, S. Owen, London.
2620. TOOLS, W. C. Dixon, Basingstoke.
2621. MUSICAL INSTRUMENTS, J. Pulford, London.
2622. DRYING LIMESTONE, & C., W. R. Lake, (The International Pavement Company, Incorporated, U.S.)
2623. FACILITATING TRANSPORT OF CARRIAGES, I. Bell, F. G. M. Stoney, and W. E. Rich, Westminster.
2624. GAS COOKING STOVES, W. T. Sugg, Westminster.
2625. VALVES, J. H. Slatter, Warwickshire.
2626. STRIKING MECHANISM OF CLOCKS, A. W. L. Reddie, (H. J. Davis, New York.)
2627. HOLDERS FOR MATCHES, M. Wilson, London.
2628. DRESSING STONE, & C., W. Beaumont, London, and J. Welman, Poole.
2629. FORMING BLOCKS, G. A. Wright, Portsmouth.
2630. STOPPERS FOR BOTTLES, J. Massey, Nottingham.
2631. DISTANCE INDICATORS, E. Underwood and T. A. Underwood, Birmingham.
2632. PLATING FIBROUS MATERIALS, & C., N. Fraser, Arbroath.
2633. WINDOW BLINDS, S. Hodgkinson, Manchester.
2634. READING TABLES, J. Wilson, (C. Richter, Prussia.)
2635. FLOATING APPARATUS FOR GENERATING ELECTRICITY, W. C. Johnson and S. E. Phillips, Charlton.
2636. GAS STOVES, G. J. Cox, Maidstone.
2637. CIGARETTES, H. Black, London.

- 17th June, 1881.
2638. LAMPS, F. Siemens, Dresden.
2639. BESSEMER CONVERTERS, D. Evans and A. E. Tucker, South Wales.
2640. KNIVES, H. Brands, Hamburg.
2641. SAFETY VALVES, H. Haddan, (C. Codron, Lille.)
2642. CORKSCREWS, F. A. Whelan, London.
2643. PROTECTING OPERATOR IN DISCHARGING LIQUIDS, & C., F. Cooper, Handsworth.
2644. SELF-ACTING SWITCHES, R. Kitchen, Manchester.
2645. GAS ENGINES, C. W. Pinkney, Swethwick.
2646. VEHICLES FOR STORAGE OF DAIRY PRODUCE, J. Wilson, London.
2647. LOCOMOTIVES, L. A. Groth, (C. Raulo, U.S.)
2648. WORKING TARGETS, W. B. Blaikie, Edinburgh.
2649. GYPSUM AND MAGNESIA, C. Scheibler, Berlin.
2650. BINDING BOOKS, G. Brown, Glasgow.
2651. STEEL, C. W. Siemens, London.
2652. ROWING BOATS, W. J. Sage, Walworth.
2653. STOVES, W. Barton, Boston.
2654. BOOK-CASES, W. T. Rogers, West Dulwich.
2655. RAISING PATIENTS FROM BEDS, F. Glover, Harding.
2656. GOVERNORS FOR ENGINES, J. Bourne, Bayswater.
2657. GLASS-HOLDERS OF LAMPS, J. Gordon, Birmingham.
2658. SAVING LIFE AT SEA, A. D. Roth, Blackheath.
2659. BOTTLE STOPPER, F. W. Woodman, Brixton.
2660. FEEDING FIBROUS MATERIAL TO CARDING ENGINES, A. M. Clark, (E. Gessner, Sacony.)

- 19th June, 1881.
2661. STOOL TO PREVENT SEA SICKNESS, F. Lebacqz, Paris.
2662. CEMENTS, A. M. Clark, (E. E. A. Sorcl, Paris.)
2663. ROPE COMPRESSOR, W. McElishan, Leith.
2664. COMPRESSED FOOD, W. Jambaker, Berlin.
2665. BOILERS FOR WASHING, & C., A. Cooper, London.
2666. CLIPPING SHEARS, G. Brockelbank, Anerley.
2667. HARROWS, E. Walker, Newark-upon-Trent.
2668. SAFETY PINS, L. A. Groth, (J. Levi, New York.)
2669. GAS RETORTS, G. Anderson, Westminster.
2670. MOTIVE-POWER, B. Mills, (J. Lunant, France.)
2671. RAIL JOINTS, W. Story, Linslade.
2672. TREATING TAN, W. Guest and C. Court, London.
2673. EXTRACTING SILVER FROM ORES, W. Fuller, London.
2674. TYPE COMPOSITION, & C., I. Delcambre, Brussels.
2675. MILL GEARING, N. Macbeth, Bolton.
2676. FELT HATS, W. Grimshaw, Ashton-under-Lyne.
2677. FOLDING SEAT, J. Rettie, Kirby-street, London.
2678. BICYCLES, & C., A. Lafargue, Kensington, London.
2679. FASTENINGS FOR BAGS, L. Marx, London.
2680. MONOCYCLES, L. H. Pearce, London.
2681. LAMPS, F. R. Baker, Birmingham.
2682. SOAPS, W. Green, St. Lawrence, Thanet.
2683. BRASS TUBES, W. E. Everitt, Birmingham.
2684. BREAKING STONES, & C., H. J. Ramu, Brussels.

- 20th June, 1881.
2685. ENVELOPES, S. R. English, Nottingham.
2686. PARQUET FLOORING, A. Damman and A. Cassard, Brussels.
2687. ENGINE GOVERNOR, J. M. Gorham, Lincoln.
2688. UNION HOLDERS, W. A. Hudgell, Hendon.
2689. COLOURING MATTERS, A. Sansone, Manchester.
2690. LAMPS, E. Alexander, (G. C. Desprin, France.)
2691. FILTER PRESSES, H. Haddan, (A. Collette, France.)
2692. PRINTING MACHINES, F. H. F. Engel, (F. Schlotke and L. Hesse, Hamburg.)
2693. COMBING FLAX, J. Mewburn, (J. Dequoy, France.)
2694. LAMPS, W. H. Bulpitt, Birmingham.
2695. DESTRUCTION OF RATS, W. Hagelsieb, London.
2696. BOOT AND SHOE CLOSERS, J. F. Walters, London.
2697. LOOMS FOR WEAVING, J. West & J. Fish, Blackburn.
2698. DIVING APPARATUS, G. H. Heinke, London.
2699. PRESSING WADS OF WAX, W. Lorenz, Germany.
2700. ROLLER MILLS, M. Benson, (O. Oeclt, Germany.)
2701. CANVASS STRETCHERS, M. Lazerges, Paris.
2702. ENVELOPES, J. Heu, Paris.
2703. ELECTRIC APPLIANCES FOR MOVING CARRIAGES, J. Richardson, Lincoln.
2704. SCHOOL SLATES, J. Walters & W. Pickering, London.
2705. CHAIN-MAKING MACHINES, A. J. Boulton, (L. Danziger and H. Ziel, Germany.)
2706. FIXING FOLDS OF FABRICS, W. P. Thompson, (M. F. Sallade, New York.)
2707. TREATING LIQUIDS, W. Lake, (C. Ramsay, U.S.)
2708. ESCAPEMENT FOR WATCH MOVEMENTS, A. Browne, (E. Wensch, Vienna.)

Inventions Protected for Six Months on deposit of Complete Specifications.

- 2543. SOAP, A. J. Boulton, High Holborn, London.—A com. from C. Higgins, New York.—11th June, 1881.
2566. BOOT AND SHOE SOLE EDGE SETTING MACHINES, C. H. Trask, Lynn, U.S.—13th June, 1881.
2578. DRIVING SAWS, A. M. Clark, Chancery-lane, London.—A communication from C. E. Mayo and W. L. Perrey, Lowell, U.S.—14th June, 1881.
2587. ICE-MAKING APPARATUS, W. R. Lake, Southamp-

- ton-buildings, London.—A communication from G. W. Stockman, Indianapolis, U.S.—14th June, 1881.
2590. GRATE-BARS, W. R. Lake, Southampton-buildings, London.—A communication from W. U. Fairbairn, Boston, U.S.—14th June, 1881.
2593. ELECTRIC CLOCKS, A. M. Clark, London.—Com. from J. Schweizer, Switzerland.—14th June, 1881.
2622. DRYING LIMESTONE, & C., W. R. Lake, Southampton-buildings.—A communication from The International Pavement Company, Incorporated, Hartford, U.S.—16th June, 1881.

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

- 2351. SIFTING, J. H. Johnson, London.—13th June, 1878.
2455. SEPARATING CREAM FROM MILK, E. P. Alexander, London.—20th June, 1878.
2468. INDICATING FARES, G. W. Warren, London.—20th June, 1878.
2367. FELLOES AND TIRES OF WHEELS, T. J. Bell, South Shields.—14th June, 1878.
2466. TORPEDO NETS, W. M. Bullivant, London.—20th June, 1878.
2470. SEPARATING SUBSTANCES, P. Van Gelder, Liverpool.—21st June, 1878.
2400. PYROMETER, F. A. J. Baptiste, Longwy, France.—17th June, 1878.
2404. WINDING, & C., YARN, J. Boyd, Shettleston, N.B.—17th June, 1878.
2405. WOOD-SAWING MACHINES, D. Thomson, Johnstone, N.B.—17th June, 1878.
2474. OBTAINING MOTIVE POWER, J. H. Johnson, London.—21st June, 1878.
2527. TELEPHONES, C. H. Siemens, Westminster.—25th June, 1878.
2540. SHELLS AND ROCKETTS, C. A. Faure and G. Trench, Faversham.—25th June, 1878.
2600. HYDRAULIC ARRANGEMENTS, S. Chatwood, London.—28th June, 1878.
2601. SECURING DOORS OF SAFES, & C., S. Chatwood, London.—28th June, 1878.
2880. EXTRACTING METALLIC COPPER FROM ITS ORES, H. Doetsch, London.—19th July, 1878.
2882. EXTRACTING METALLIC ORES, H. Doetsch, London.—19th July, 1878.
2429. TEMPLES FOR LOOMS, J. Hardaker, Leeds.—18th June, 1878.
2432. PACKAGES, S. C. Allibone, Blenheim-road, London.—18th June, 1878.
2451. LIGHTING, M. M. Franzini, St. John's Wood, London.—20th June, 1878.
2463. BLEACHING PAPER PULP, S. Pitt, Sutton.—20th June, 1878.
2464. WASHING FIBROUS MATERIALS, S. Pitt, Sutton.—20th June, 1878.
2467. ELECTRO-MAGNETIC CLOCKS, C. Shepherd, London.—20th June, 1878.
2471. BUTTON-HOLE ATTACHMENTS, T. B. Hirschman and J. C. Felton, London.—21st June, 1878.
2581. BUFFALO HIDE, S. Yarwood, Manchester.—27th June, 1878.

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

- 2465. FITTING OF VESSELS, J. Price, Sunderland.—14th July, 1874.
2155. FEEDING STEAM BOILERS, W. L. Wise, London.—20th June, 1874.
2111. PIPES, W. W. Pilkington, St. Helens.—17th June, 1874.
2560. FASTENING POCKETS, J. W. Davis and L. Strauss, San Francisco, U.S.—22nd July, 1874.

Notices of Intention to Proceed with Applications.

- Last day for filing opposition, 8th July, 1881.
442. EXTINGUISHING FIRES, J. C. Hudson, Wimbledon.—2nd February, 1881.
595. FOLDING EASY CHAIRS, A. Lloyd, London.—11th February, 1881.
598. SLIDE VALVES, E. Pilkington, Pendleton.—11th February, 1881.
612. HARROWS, H. G. Grant, Manchester.—Communication from C. Moulin.—12th February, 1881.
616. PISTON RINGS, A. Henshaw, Sheffield.—14th February, 1881.
617. PORTABLE DRILLING MACHINES, T. Lees and R. Lees, Manchester.—14th February, 1881.
619. GAS-HEATED SMOOTHING IRONS, R. Macaulay and J. Ballantine, Glasgow.—14th February, 1881.
621. VIOLINS, H. J. Haddan, Westminster.—Com. from E. R. Mollenhauer.—14th February, 1881.
624. RETAINING HEAT IN COOKED FOOD, E. A. Brydges, Upton.—Com. from Dr. Finne.—14th February, 1881.
625. OBTAINING AMMONIA, J. C. Mewburn, London.—Com. from T. Scholz.—14th February, 1881.
630. DRAWING OFF BEER, T. Slade, Westminster.—14th February, 1881.
633. LOOMS FOR WEAVING, E. Smith, Houley, near Huddersfield.—14th February, 1881.
648. SECURING HANDLES OF CROSS-CUT SAWS, A. J. and R. F. Drury, Sheffield.—15th February, 1881.
654. SORTING SEEDS, K. H. Sander, Leipzig, Germany.—15th February, 1881.
658. MEDICINAL BEVERAGE, G. W. Hamilton, Chancery-lane, London.—16th February, 1881.
660. SIZING MACHINES, E. Tweedale and S. Tweedale, Accrington.—16th February, 1881.
699. DIGGING POTATOES, R. A. Clark, Liverpool.—17th February, 1881.
724. BOOTS AND SHOES, L. Morton, West Kingston.—19th February, 1881.
743. STEAM ENGINES, H. H. Lake, London.—Com. from J. W. Chisholm.—21st February, 1881.
788. SEED DISTRIBUTOR, C. T. Tulley, Martley.—24th February, 1881.
807. AERIAL NAVIGATION, F. Wirth, Frankfort-on-Main, Germany.—A communication from E. Goehring.—25th February, 1881.
900. LUBRICATING AXLES, W. James, Abercarn.—2nd March, 1881.
976. SECURING PIPES, W. R. Lake, London.—Com. from J. Hubble and F. Raymond.—7th March, 1881.
1231. KILN OR OVEN, R. Ballard, Clifford's-inn, London.—21st March, 1881.
1233. WINDMILL, L. Purper, Paris.—21st March, 1881.
1418. ORNAMENTAL FABRICS, W. Strang, Glasgow.—31st March, 1881.
1503. CUPOLA FURNACES, H. A. Dufréné, Finsbury, London.—6th April, 1881.
2157. SMOOTHING PAPER, A. J. Boulton, High Holborn, London.—Com. from J. Eck & Sons.—17th May, 1881.
2281. VENTILATORS, J. E. Ellison and F. Fourness, Leeds.—24th May, 1881.
2288. WEAVING PLAIN AND ORNAMENTAL GAUZE, & C., William Strang, Glasgow.—25th May, 1881.
2308. SIGNALING, J. King, Pinxton.—26th May, 1881.
2309. ROTARY PRINTING MACHINES, J. Smale, Southwark.—26th May, 1881.
Last day for filing opposition, 12th July, 1881.
638. BICYCLES, & C., J. H. Palmer, Aston-juxta-Birmingham.—15th February, 1881.
642. CHILDREN'S COTS, G. W. Moon, Regent-street, London.—15th February, 1881.
669. ARTIFICIAL BAIT FOR FISHING, J. Richardson, Fetter-lane, London.—16th February, 1881.
672. LOOMS, E. Jackson, Bradford.—16th February, 1881.
674. SHAFT SINKING, W. R. Beith, Crumlin.—16th February, 1881.
675. SUPPORTING AUTOMATIC BRAKES, & C., W. S. Paterson, London.—16th February, 1881.
682. CUTTING PAPER FOR HATS, & C., S. Wilde, Hyde, and J. Carter, Stalybridge.—17th February, 1881.
689. PIG IRON, J. B. Thorneycroft, Hulford.—17th February, 1881.
695. STEAM AND AIR ENGINES, G. Sellers, Birstall.—17th February, 1881.
702. FLOOR CRAMPS, G. Butler, Chiswick.—18th February, 1881.
705. SUBSTITUTE FOR PUTTY, F. W. Fletcher, Great George-street, London.—18th February, 1881.

- 713. OIL CANS, L. Field, Birmingham.—18th February, 1881.
730. TREATING TEXTILE FABRICS, & C., J. Paterson, Belfast, & D. Stewart, Glasgow.—21st February, 1881.
740. HOLDING SACKS FOR FILLING, S. Wilkerson, Basingbourn.—21st February, 1881.
769. COOKING, & C., H. Lecornu, Caen, France.—23rd February, 1881.
772. RAILWAY BUFFERS, J. W. Howard, Fenchurch-street, London.—23rd February, 1881.
783. ELECTRICAL CONDUCTORS, J. Perry and W. E. Ayrton, London.—24th February, 1881.
785. COVERING WIRE, W. E. Ayrton, London.—24th February, 1881.
1302. GRATES AND STOVES, T. Parker, Coalbrookdale.—23rd March, 1881.
1322. IRON, J. H. Johnson, Lincoln's-inn-fields.—Com. from W. E. Sendey.—24th March, 1881.
1465. SPINNING COTTON, G. Bodden, Oldham.—4th April, 1881.
1482. SUBAQUEOUS BORING, T. English, Dartford.—5th April, 1881.
1511. RACKS FOR PACKING BOTTLES, J. Heaps, Manchester.—6th April, 1881.
1552. SCRAPING SHIPS' BOTTOMS, J. Westburg, London.—9th April, 1881.
1564. PURIFYING SEWAGE, R. Wild, Littleborough, and H. Ledger, Leek.—11th April, 1881.
1581. THRASHING MACHINE, R. Creed, Cloyne.—11th April, 1881.
1606. TRACTION ENGINES, A. M. Clark, London.—Com. from A. O. Frick.—12th April, 1880.
1676. GALVANIC BATTERIES, J. H. Johnson, London.—Com. from C. A. Faure.—16th April, 1881.
1785. CHURNS, H. Powell, Ruthin.—25th April, 1881.
2024. BOOTS, M. Nicholson, London.—9th May, 1881.
2030. COLOURING MATTERS, J. A. Dixon, Glasgow.—Com. from C. Rumpff.—10th May, 1881.
2136. ARTIFICIAL ALIZARINE, J. A. Dixon, Glasgow.—Com. from Dr. C. Koenig.—17th May, 1881.
2198. ELECTRIC LAMPS, C. D. Abel, London.—Com. from W. Tschikoleff and H. Kleiber.—19th May, 1881.
2251. BRECH-LOADING MECHANISM, G. Quick, Buxted, Uckfield.—24th May, 1881.
2270. DIGGING LAND, W. E. Crossby, Chelmsford, and A. Carey, Rochford.—24th May, 1881.
2345. UTILISATION OF MATERIALS FOR THE DISINFECTING OF FEGAL MATTER, W. R. Lake, London.—Communication from F. Petri.—27th May, 1881.
2578. FOOT POWER MECHANISM FOR DRIVING SAWS, & C., A. M. Clark, London.—Communication from C. E. Mayo and W. L. Perry.—14th June, 1881.

Patents Sealed

(List of Letters Patent which passed the Great Seal on the 17th June, 1881.)

- 5338. TYING BUNDLES, M. Glover, Leeds.—20th December, 1880.
5345. BRANDING WOOD, J. Richmond and W. Whiting, Kirby-street, London.—21st December, 1880.
5347. ENGINES WORKED BY STEAM, & C., S. Robinson, Westbromwich.—21st December, 1880.
5355. REFRACTORY MATERIALS FOR CONVERTER LININGS, H. Wedekind, London.—21st December, 1880.
5357. BOXES, & C., P. Lawrence, Farringdon-road, London.—21st December, 1880.
5366. COKE BREAKING MACHINES, W. F. Anderson and G. Mant, Stratford.—22nd December, 1880.
5376. PADLOCKS, A. Linley, London.—22nd December, 1880.
5388. WIRE FENCING, J. Shaw, Sheffield.—22nd December, 1880.
5403. BRECH-LOADING MECHANISM, D. Fraser, Edinburgh.—23rd December, 1880.
5406. ROTARY BLOWER & C., P. Goldschmidt, G. Hanlo, and A. Heussy, Manchester.—23rd December, 1880.
5408. KILNS FOR BURNING BRICKS, & C., E. E. Street, Clifton.—23rd December, 1880.
5410. VELOCIPEDS, W. Hillman, Coventry.—23rd December, 1880.
5425. MINERS' SAFETY LAMPS, W. Crossley, Glasgow.—24th December, 1880.
5436. FURNACES FOR STEEL, & C., A. C. Wylie and T. Lockerbie, London.—24th December, 1880.
5437. TURNING, & C., METALS, J. Evans, Wolverhampton.—24th December, 1880.
5439. ATTACHING DOOR KNOBS TO SPINDLES, H. Payton, Worcester, and W. S. Dackus, Worcester.—24th December, 1880.
5442. CARD-GRINDING, J. S. Dronsfield, Oldham.—27th December, 1880.
5490. ILLUMINATED CLOCKS, C. H. Leycester, Gwynfe, South Wales.—30th December, 1880.
5499. COMPOUNDS FOR JOINTS IN VAPOUR ENGINES, I. R. Blumenberg, Chancery-lane.—30th December, 1880.
5502. VALVES FOR PUMPS, & C., N. Foley, Jarrow-on-Tyne.—31st December, 1880.
59. RAILWAY BRAKE APPARATUS, J. Batey, Stockwell, London.—5th January, 1881.
120. WORKING RAILWAY SWITCHES, J. T. Bucknill, Long Ditton.—10th January, 1881.
126. EYELET TAPE, W. Pretty, jun., Ipswich.—11th January, 1881.
168. PISTON ROD PACKINGS, H. J. Haddan, Westminster.—13th January, 1881.
184. CARBONATE OF POTASSIUM, E. P. Alexander, London.—14th January, 1881.
320. GAS ENGINES, C. M. Sombart, Magdeburg, Germany.—25th January, 1881.
328. PIGMENTS, J. B. Orr, London.—25th January, 1881.
354. PUMPING ENGINES, M. Silvester, Brixton, London.—26th January, 1881.
434. FILTERING, E. P. Alexander, London.—3rd February, 1881.
742. COMPOUND BRAKE APPARATUS, W. J. Adams, London.—21st February, 1881.
1009. TRACTION AND LOCOMOTIVE ENGINES, J. Braby, Rudgwick.—5th March, 1881.
1422. ELECTRIC LIGHT, W. Crookes, London.—31st March, 1881.
1529. LINE, CORD, & C., A. T. Lawson, Leeds.—7th April, 1881.
1600. TANNING, C. Michel, jun., C. Kollen, and G. Hertzog, Reims, France.—12th April, 1881.
1602. PHOTOGRAPHIC OBJECTIVES, H. A. Steinheil, Munich, Germany.—12th April, 1881.

(List of Letters Patent which passed the Great Seal on the 21st June, 1881.)

- 4847. OBTAINING OIL FROM PETROLEUM, & C., W. R. Lake, London.—22nd November, 1880.
4856. LOOMS FOR WEAVING, J. Crook, Blackburn.—23rd November, 1880.
4967. DETERMINING THE QUANTITY OF WATER CARRIED BY STEAM, C. D. Abel, London.—29th November, 1880.
5380. TREATING WOOD PULP, E. C. T. Blake, London.—22nd December, 1880.
5382. SPECTACLES, G. W. von Nawrocki, Germany.—22nd December, 1880.
5390. UTILISING UNCONSUMED GASES, R. Paulson, London.—22nd December, 1880.
5398. SECURING BOTTLE STOPPERS, W. C. Eaton, Sheffield.—23rd December, 1880.
5399. ROVING, & C., FRAMES, J. Farrar, Halifax.—23rd December, 1880.
5412. ROTARY MACHINES, W. R. Lake, London.—23rd December, 1880.
5413. METALLIC FRAMES, H. H. Andrew and W. Lockwood, Sheffield.—23rd December, 1880.
5415. MACHINES FOR WEIGHING GRAIN, W. R. Lake, London.—23rd December, 1880.
5418. OBTAINING FIBROUS MATERIALS, R. M. A. Duguid, Liverpool.—24th December, 1880.
5422. PILED VELVET, J. Perkins, jun., Warwick.—24th December, 1880.
5433. ROUNDABOUTS, P. Everitt, London.—24th December, 1880.
5434. SAFETY VALVES, W. R. Lake, London.—24th December, 1880.
5466. TRANSFERS FOR FREIGHT, & C., A. E. McDonald, New York.—29th December, 1880.
5474. PREPARING SEEDS FOR CRUSHING, C. Eskrett and W. H. Searle, Hull.—29th December, 1880.

- 5500. PREVENTING THE SHIFTING OF CARGOES, J. Goudie, East Hartlepool.—31st December, 1880.
- 5515. CRUCIBLES, A. Landsberg, Stoberg, Prussia.—31st December, 1880.
- 16. SCREW STEAMSHIPS, T. F. Irwin, Liverpool.—3rd January, 1881.
- 23. COUPLING APPARATUS, H. H. Lake, London.—3rd January, 1881.
- 26. WEIGHING YARN, J. H. Johnson, London.—3rd January, 1881.
- 51. WORKING RAILWAY BRAKES, J. Inray, London.—5th January, 1881.
- 52. AXLE-BOXES, C. D. Abel, London.—5th January, 1881.
- 87. GAS REGULATORS, H. E. Newton, London.—7th January, 1881.
- 91. CAP SPINNING, R. Dawson and W. H. Dawson, Hunslet, Leeds.—8th January, 1881.
- 99. SECURING CORKS, T. Burns, Wolverhampton.—8th January, 1881.
- 143. PICKS, AXES, &c., T. Brown, Sheffield.—12th January, 1881.
- 156. FURNACES, J. H. Johnson, London.—11th January, 1881.
- 163. DUMPING BOATS, H. E. Newton, Chancery-lane.—13th January, 1881.
- 165. CARPET CLEANING, J. H. Johnson, London.—13th January, 1881.
- 221. VINEGAR, H. H. Lake, London.—18th January, 1881.
- 289. BENZALDIACETATE, J. A. Dixon, Glasgow.—22nd January, 1881.
- 312. TESTING GASES IN AIR, A. W. L. Reddie, London.—24th January, 1881.
- 579. ELECTRO-PHOTOGRAPHICAL RECEIVERS, H. Chamero, France.—10th February, 1881.
- 729. BICYCLES, &c., G. G. M. Fernum, Birmingham.—19th February, 1881.
- 826. TOBACCO POUCHES, J. Burbridge, Tottenham.—26th February, 1881.
- 891. WHEELS, T. Humber, T. R. Marriott, and F. Cooper, Beeston.—2nd March, 1881.
- 981. EARTHENWARE, T. Willett, Burslem.—8th March, 1881.
- 1099. SHADES, W. R. Lake, London.—14th March, 1881.
- 1204. BEVERAGES, R. Bull, Peckham.—18th March, 1881.
- 1212. COLOURING MATTERS, J. A. Dixon, Glasgow.—19th March, 1881.
- 1225. COLOURING MATTERS, J. A. Dixon, Glasgow.—21st March, 1881.
- 1329. VALVES, L. Berry, Rotherham.—21st March, 1881.
- 1397. FIELD ROLLERS, R. Maynard, Whittlesford.—30th March, 1881.
- 1583. SEWING MACHINES, J. H. Johnson, London.—12th April, 1881.
- 1585. GAS, J. Somerville, Denmark Park.—12th April, 1881.
- 1623. FUSIBLE COMPOUNDS, James D'Arcy, Belvedere.—18th April, 1881.
- 1670. ELECTRIC LAMPS, G. S. Grimston, Brockley-road.—16th April, 1881.
- 1697. CLEANING COTTON, &c., W. R. Lake, London.—19th April, 1881.
- 1701. RAILWAY WHEELS, W. R. Lake, London.—19th April, 1881.
- 1838. LUBRICATING OILS, H. J. Haddan, London.—28th April, 1881.

List of Specifications published during the week ending June 18th, 1881.

- 3311, 6d.; 4049, 6d.; 4063, 6d.; 4088, 6d.; 4114, 6d.; 4171, 6d.; 4235, 6d.; 4248, 6d.; 4317, 6d.; 4581, 6d.; 4592, 8d.; 4595, 6d.; 4602, 6d.; 4607, 8d.; 4608, 1s. 2d.; 4614, 6d.; 4620, 6d.; 4629, 6d.; 4631, 6d.; 4632, 6d.; 4635, 6d.; 4636, 6d.; 4637, 6d.; 4641, 6d.; 4642, 6d.; 4647, 6d.; 4648, 6d.; 4649, 6d.; 4650, 6d.; 4656, 6d.; 4658, 6d.; 4661, 6d.; 4663, 6d.; 4668, 2d.; 4669, 6d.; 4673, 8d.; 4678, 4d.; 4684, 6d.; 4699, 6d.; 4710, 2d.; 4712, 6d.; 4713, 4d.; 4716, 2d.; 4719, 2d.; 4722, 4d.; 4723, 6d.; 4724, 2d.; 4728, 6d.; 4729, 6d.; 4730, 6d.; 4734, 4d.; 4735, 4d.; 4736, 6d.; 4738, 2d.; 4739, 4d.; 4740, 6d.; 4741, 2d.; 4742, 2d.; 4743, 2d.; 4744, 2d.; 4745, 2d.; 4746, 2d.; 4751, 4d.; 4756, 4d.; 4758, 6d.; 4760, 2d.; 4764, 2d.; 4765, 2d.; 4770, 4d.; 4771, 6d.; 4772, 2d.; 4773, 2d.; 4775, 2d.; 4776, 2d.; 4778, 2d.; 4780, 2d.; 4783, 2d.; 4784, 2d.; 4785, 2d.; 4789, 2d.; 4790, 2d.; 4791, 4d.; 4793, 6d.; 4794, 6d.; 4795, 6d.; 4801, 2d.; 4802, 2d.; 4804, 2d.; 4808, 2d.; 4813, 2d.; 4814, 2d.; 4816, 2d.; 4817, 4d.; 4820, 2d.; 4821, 2d.; 4823, 2d.; 4824, 4d.; 4825, 4d.; 4827, 2d.; 4830, 4d.; 4835, 2d.; 4838, 2d.; 4840, 2d.; 4844, 4d.; 4846, 4d.; 4909, 6d.; 4913, 6d.; 4959, 4d.; 4966, 4d.; 5013, 2d.; 5232, 6d.; 5240, 6d.; 426, 4d.; 1144, 6d.; 1379, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

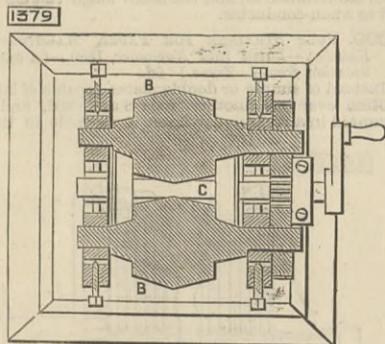
Prepared by ourselves expressly for THE ENGINEER at the office of Her Majesty's Commissioners of Patents.

1144. REFRIGERATORS, H. J. Haddan.—Dated 16th March, 1881.—(A communication from J. H. Forsyth.)—(Complete.) 6d.

The inner faces of the walls of the refrigerator are lined to render them water-tight, and within the chamber is placed a provision-box open at top, and supported so as to leave a space below and all round it for the reception of ice. A cover fits over the top of the box and has two or more chimneys or ventilators communicating with the external air. Ice may also be placed on the cover.

1379. ROLLS, H. J. Haddan.—Dated 29th March, 1881.—(A communication from T. S. Cook.)—(Complete.) 6d.

This relates to the mechanism for rolling railway car axles, and consists essentially of two rolls B geared to



run in the same direction, their surfaces conforming to the central portion of the car axle; and in connection therewith two rolls C located opposite the space between the first rolls, and adapted to roll the journals, the said rolls B and C provided with adjusting mechanism for turning them towards the bar that is being rolled.

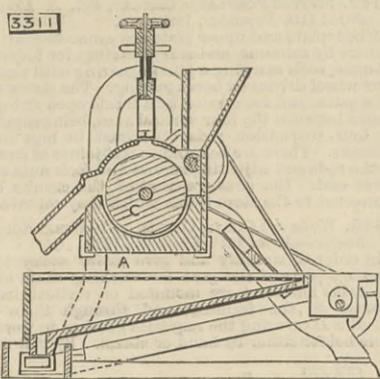
4063. UMBRELLA FURNITURE, B. E. Cox.—Dated 6th October, 1880. 6d.

This relates to means for securing the ribs in position without the use of springs. The tip cup is mounted on the runner, and by a simple locking action holds the tips of the ribs when closed and retains them firmly when extended.

3311. GRINDING MILLS, E. W. Anderson.—Dated 14th August, 1880.—(A communication from J. Jones.)—(Complete.) 6d.

This consists principally in certain combinations of

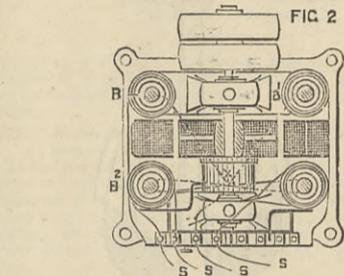
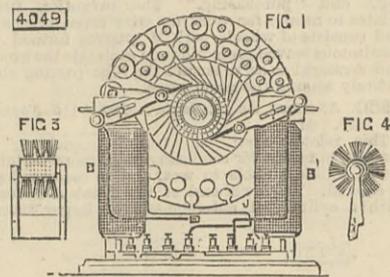
parts, whereby the smooth cylindrical running stone C may be adjusted to the concave bed stone A with



extreme nicety. The adjustment of the said bed stone to render it level is made by means of screws.

4049. IMPROVEMENTS IN DYNAMO AND MAGNETO-ELECTRIC MACHINES, A. W. L. Reddie.—Dated 5th October, 1880.—(A communication from Messrs. Biloret and Mora.) 6d.

The inventors wish to obtain two or more circuits in one machine, also more efficient armatures. The wires surrounding the field magnets are connected at one end in a group to one of the brushes of the commutator, the other ends being connected with separate



circuits, and led to the other commutator brush. The bobbins forming the armature are placed between two discs of iron, and connected thereto by their ends BB are the bobbins; J, J, the iron discs. In Fig. 2 BB<sup>1</sup> BB<sup>2</sup> BB<sup>3</sup> show the field magnets. The inner ends of the wires are grouped at X; the outer ends to the bending screws S S S S.

4088. TRICYCLES, R. H. Charley.—Dated 8th October, 1880. 6d.

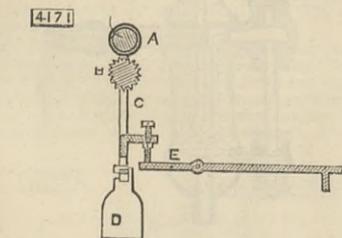
This relates to improvements on patent No. 2451, A.D. 1869, in which the driver sits above the axle, and consists in means for enabling the driver to work both with the hands and feet. The cranks are connected to levers, the upper ends of which are bent and form handles, their fulcrum being adjustable and situated near the extremities of radius rods working on fixed pivots on the frame, and their forward ends serving as treadles.

4114. CRABBING, SQUEEZING, AND FINISHING WOVEN AND KNITTED FABRICS, G. W. Hawksley and W. Lamb.—Dated 9th October, 1880. 6d.

This relates to machinery which during the operations of crabbing, squeezing, and finishing, will stretch the fabric laterally in addition to stretching it lengthwise. The machines are fitted with expanding rollers with screw adjustment, which effect the lateral stretching.

4171. DRAWING FRAMES FOR COTTON, &c., W. A. Barlow.—Dated 13th October, 1880.—(A communication from C. Pfeiffer and H. Offroy.) 6d.

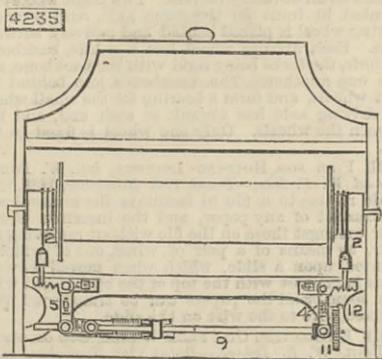
The object is to prevent the beads of the fibre from rolling round the top leather-covered cylinder A, and this is accomplished by stopping the drawing



frame; B is the fluted drawing cylinder. The throwing out of gear is effected by means of an articulated lever E, which, through its long arm, produces the stoppage of the drawing, the shorter one pressing on a tappet fixed on the rod C which supports the weight D, giving pressure to the drawing rollers.

4235. LOOMS, R. Hindle and G. Greenwood.—Dated 18th October, 1880. 6d.

This relates to improvements in mechanism for regulating the "letting off" the warp from the beam,



for adjusting and determining the degree of tension on the warp during the letting off, and for facilitating "letting back" or slacking the warp when requisite. The weight ropes 2 at each end of the beam are

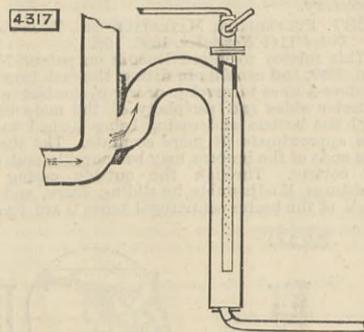
attached to one end of a L or cranked lever 4 and 5, having their fulcrums on a stud fixed in the cross rail of the loom; to the other end of each of the said L levers is attached a rod 9, giving expansion and contraction by means of springs, the other end of the said rod having screw adjustment generated by means of hand ratchet wheel 11, by means of which the amount of tension put upon the warp is regulated, there being a holding catch 12 for securing the hand wheel in its predetermined position. A modification is described.

4248. REPRODUCING COPIES OF WRITINGS, DRAWINGS, &c., O. Lelin.—Dated 18th October, 1880. 6d.

Vegetable parchment covered on both sides with a gelatinous composition forms the printing surface, which is mounted in a stretching frame, and used to reproduce writings, &c., with greasy or thick ink.

4317. FEED-WATER HEATERS, W. Chance.—Dated 22nd October, 1880. 6d.

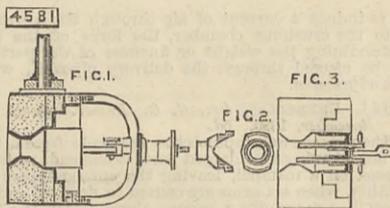
This consists of a tube of about the same diameter as the exhaust pipe and fixed on to the exhaust pipe as near as possible to the cylinder, and the other end is connected to the feed pump through which the hot water is pumped into the water, and into the perpen-



dicular leg of the apparatus is fixed a vertical pipe of smaller dimensions perforated with holes, but closed at its lower end, and having beyond its connection with such leg a stop or other cock. This pipe brings water from a cistern placed in any convenient position above its normal level.

4581. IMPROVEMENTS IN TELEGRAPH RECEIVING APPARATUS, G. J. W. Fuller.—Dated 8th November, 1880. 6d.

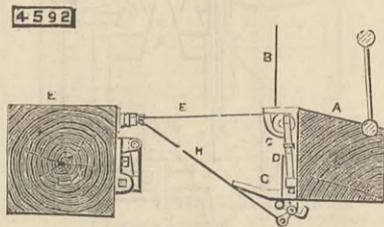
The invention is intended to obtain upon the instruments working long cables clearer definition of signals, to increase the rapidity of the signals, and so obtain a higher working speed. The bobbin on which the galvanised coils are wound is of peculiar shape—Fig. 1. The wire is wound on the bobbin in separate



coils, that the outer coils may be shunted when not required. A semi-funnel-shaped tube or cup holds the mirror, and is fitted in from the front, while at the back as a sort of core is placed either (1) a special form of magnet; (2) a "nurse armature" shaped coil; (3) a bundle of iron wire; (4) a rod of iron; (5) a rod of iron surrounded by wires. Each of these can be connected with a battery or condenser if required. Fig. 2 shows holder above mentioned; Fig. 3 a section of coils with one of the adjusting appliances. The inventor claims the special form of bobbin and the adjusting appliances.

4592. LOOMS, F. O. Tucker.—Dated 9th November, 1880. 8d.

This invention is especially applicable to looms with change shuttle boxes, and its object is to ascertain when the web is absent, and thereby stop the loom, and it consists in combining with the slay board A needles or fingers B connected at one end to a boss fixed on a horizontal shaft operated by a crank or cam C from an upright rod D, the rod being actuated by a cord or rod E attached to a spring on the breast beam F, which at each movement of the slay board causes the needles to lift up into a vertical position



through the warp. At right angles to the rod D is a horizontal finger G also connected by cord H or rod to a spring on the breast beam, and being prevented from dropping by a horizontal pin sliding in and out of a hole in the finger G. The pin is operated by a lever actuated by rod D. When the web is absent the needles B drop into a groove formed in the slay board and the pin is moved in the hole in the finger G, by which means it is held sufficiently high up to actuate the knocking-off apparatus, and thus stop the loom.

4595. RAISING AND REMOVING SUNKEN OR STRANDED VESSELS, D. H. Sisson.—Dated 9th November, 1880. 6d.

A number of closed cylinders or boxes are filled with water and placed in the sunken vessel, when, by means of a pump, the water is forced out and the cylinders charged with compressed air, which, as the vessel rises, escapes through a suitable valve.

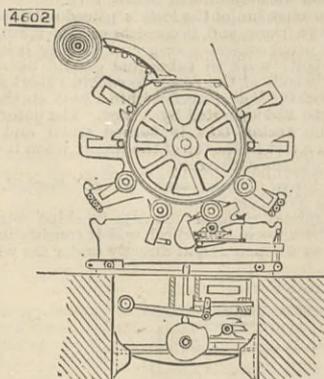
4607. PORTABLE AND TRACTION ENGINES, R. Brown.—Dated 9th November, 1880. 8d.

This relates to an engine with hoisting and winding gear and carrying a crane. The jib is placed over the hind or driving wheel axle, its feet resting over the bearings thereof, and being secured to the framing; and in conjunction with the jib sockets are provided on the frame to receive the ends of a pair of transoms which rest on the frame, and can be slipped in or out of the sockets. They serve to receive from the crane, and carry heavy articles. In addition to first motion pinions, arranged for throwing into or out of gear, the second motion pinions are also similarly arranged, so that the first motion driving gear and countershaft can be used for winding and hoisting. The crank shaft of double-cylinder engines may be made in two, and secured together by a metallic disc. The fore carriage of portable and traction engines is made elastic by a curved bar of steel, arranged on top of the axle, and in such a form that the central part slides laterally in a saddle under the turn plate when travelling on uneven ground.

4602. PRINTING FABRICS, J. Kerr and J. Haworth.—Dated 9th November, 1880. 6d.

The characteristic feature of this invention is that in the act of lifting the weighted lever has the effect of moving the printing rollers away from the fabric

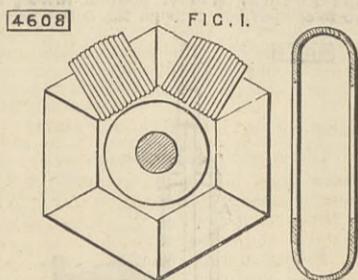
being printed and vice versa, and that the levers are locked when the printing rollers are in their position away from the fabric. With the apparatus is combined measuring apparatus, so that the distance between



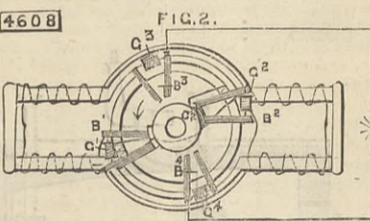
the patterns can be varied at will. All the actuating apparatus is, under the machine below the floor line, and is out of the way of the printer or his attendants.

4608. IMPROVEMENTS IN THE MEANS AND APPARATUS FOR GENERATING, SUBDIVIDING, AND TRANSMITTING ELECTRIC CURRENTS, ALSO IN ELECTRIC LAMPS, C. F. Heinrichs.—Dated 9th November, 1880. 1s. 2d.

The first part of the title of this specification relates to improvements on previous patents, first, as regards the ring armature, one modification of which is shown in Fig. 1, and secondly, in the method of dividing and transmitting the current shown in Fig. 2. A great many drawings are also given of improvements in Heinrichs's well-known lamps, which we have not space to reproduce. Fig. 1 shows an armature constructed out of six electro-magnets arranged on the shaft. The inventor has proved by experiment that



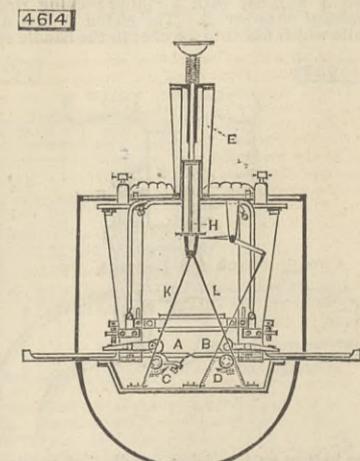
when the armature is rotated at a very high velocity (say over 10,000ft. circumferentially per minute) the iron core acquires little magnetism, he therefore modifies the above armature so as to reduce the mass of iron and expose a large length of insulated wire surrounding the core to the air, thus preventing the heating of the wire and maintaining the efficiency of the armature. In Fig. 2 two sections of insulated conducting wire are shown surrounding the ring core. Two ends of the wire are connected with each other, and the other two ends to the commutator plates C<sup>1</sup> and C<sup>2</sup>, when the armature is rotated within the inducing magnets in the direction of the arrows. The current generated in the two sections is taken by the brushes B<sup>1</sup> and B<sup>2</sup>, and passed under the brushes B<sup>3</sup> and B<sup>4</sup>, and led to the coils of the inducing magnets to excite them. When the commutator plates have left the first set of brushes



and passed under the second set, a break of the current which would take place is prevented by extra brushes, which are connected by two resistance coils G<sup>1</sup> and G<sup>2</sup>, to the brushes B<sup>1</sup> and B<sup>2</sup>, and when on continuing the motion of the armature the coils of wire leave the respective fields of the inducing magnets, an extra set of brushes (also connected with the brushes B<sup>3</sup> and B<sup>4</sup> by the two resistance coils G<sup>3</sup> and G<sup>4</sup>) will prevent the production of sparks in the brushes B<sup>3</sup> and B<sup>4</sup>. What has been described for these two sections of wire takes place in all the other sections.

4614. IMPROVEMENTS IN ELECTRIC LAMPS, C. W. Siemens.—Dated 10th November, 1880. 6d.

The object of this invention is to automatically adjust and regulate the distance between the carbons.



The operation of the lamp is as follows:—As the distance between the carbons A and B increases by their consumption, the resistance to the direct circuit of the lamp increases, and consequently a larger amount of electricity passes through the by-pass circuit of the solenoid coil E. The core H is thus attracted upwards, and by its ascent draws up the two bars K and L. These, as they retire from their rests, come to bear with their ratchet teeth against the wheels C and D, and as they still ascend cause these wheels to turn partly round in the direction of the arrows, thus turning the grooved rollers shown in drawing, and causing the carbons to approach one another. Should the carbons be too near, so that the resistance in the direct circuit of the lamp is small, then the solenoid E having little power the core H descends, and when it has descended some distance moves a tappet lever N, raising a bar, which acting on the wheel D, causes it to turn partly round

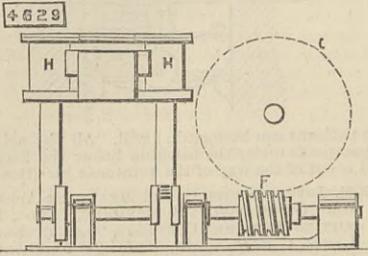
in a direction opposite to the arrow, and so retract the carbon B.

4620. LOCKS OR FASTENINGS FOR BAGS, &c., E. Pfeiffer.—Dated 10th November, 1880.—(A communication from Huppe and Bender.) 6d.

The mechanism of the lock is placed outside and on top of the frame, and it consists of two spring bolts, and the usual central spring and locking bolts. The spring bolts work in tubes and extend nearly from the outer ends of the frame to within a short distance of the locking bolt, placed within a case on the top of the frame and operated by a key. The outer end of the latch spring bolt is turned down and passes through a slot in the top of the frame, when it engages with projections thereon.

4629. SHIPS' WINDLASSES, W. H. Harfield.—Dated 10th November, 1880. 6d.

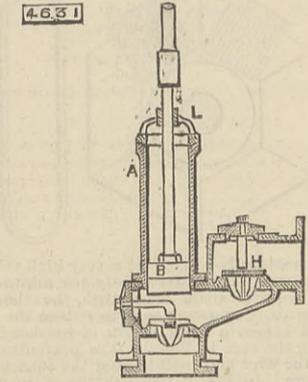
This relates to improvements in ships' windlasses driven by a worm and wheel, and it consists in fitting the worm F upon a shaft directly under the windlass,



and it gears with a worm wheel C on a barrel fast on the windlass axis. The two chain holders are mounted on the windlass axis, and are made fast with the barrel by frictional clutch gearing. To work by steam cranks are formed on the shaft carrying the worm, and are connected by rod with engines H.

4631. PUMPS, C. Chapman.—Dated 11th November, 1880. 6d.

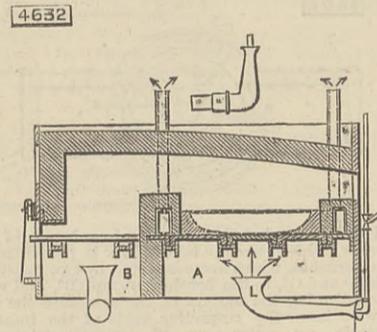
This consists in placing the bottom of the seating of the outlet valve H level or above the bottom of the plunger B when at its lowest position, thereby allowing air to escape freely through the outlet valve and



discharge pipe, and effectually prevent any accumulation in the vacuum part of the pump. The top of each pump barrel A carries a guide L for the plunger rod, and the barrel is open to the atmosphere, no stuffing-box and packing being employed.

4632. PUDDLING FURNACES, [W. S. Williamson.—Dated 11th November, 1880. 6d.

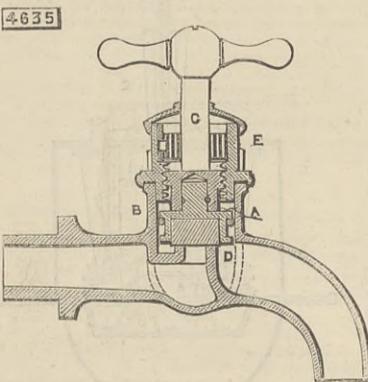
The air space A below the hearth is shut off from the space B below the grate, and the first-named space is enclosed, and air is injected into it by means of a jet



or jets of steam through the pipe L. Air passages are formed which communicate with pipes or flues through which the air and steam escape from the furnace.

4635. SELF-CLOSING COCKS OR VALVES, J. Barr.—Dated 11th November, 1880. 6d.

The valves are constructed, so that whilst they close against the pressure no injurious concussion is produced. The drawing shows one form of valve, in which the valve is a plug of rubber held in a small piston A working with a rolling packing ring in a cylindrical chamber B. The piston A has a short spindle which fits into a socket in the handle spindle

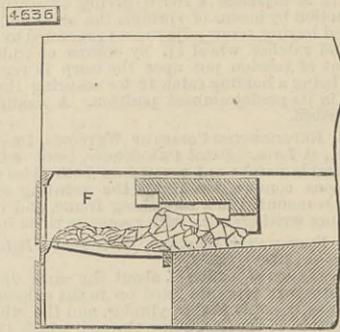


C free to turn on the piston spindle, but moving to or from the valve seat D by means of a cross pin. The spindle C is screwed near its inner end and works in a screwed cover E, so as to move the valve to or from its seat by a screw action. A volute spring is placed inside the cover E, to which one end is fixed, the other being secured to spindle C.

4636. FURNACES, W. R. Lake.—Dated 11th November, 1880.—(A communication from D. Sinton.) 6d.

The object is to prevent the emission of smoke. In the furnace at or near the rear end of the fire chamber F is constructed a tunnel, the arch of which reaches the boiler and descends in steps from front to rear. The upper portion of the arch must encircle the boiler on both sides until it reaches its horizontal diameter or closure. From the end of the grate bars the base of the tunnel is built solid, either gradually ascending or level, which its arch descends by steps from front to rear, and thus the exit of the tunnel can

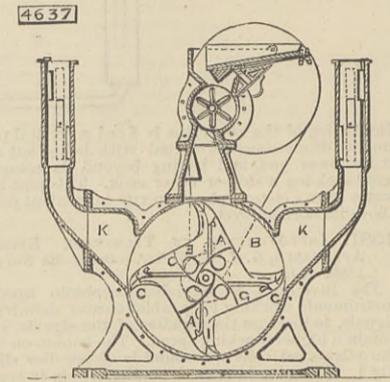
be more or less contracted. Atmospheric air is admitted in graduated or regulated quantities through the fire doors by merely opening and closing them



from time to time and to such an extent as may be necessary.

4637. PULVERISING MATERIALS, &c., T. R. Jordan.—Dated 11th November, 1880. 6d.

This relates to improvements on patent No. 4951, A.D. 1879, and consists in fitting the cast iron or steel beaters A so as to revolve nearly in contact with the interior sides and periphery of the main casing B, both the beaters and casing being turned to render the approximate fit more accurate. The shoes C on the ends of the beaters may be movable and secured by cotters. Through the outside casing B are apertures E adjustable by sliding doors, and on the back of the beater centrifugal vanes G are formed so



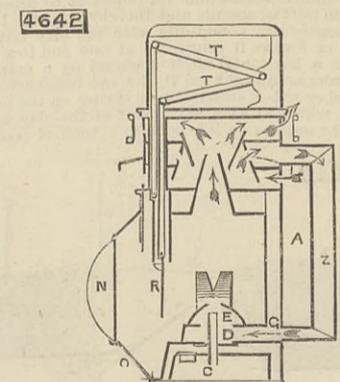
as to induce a current of air through the apertures into the crushing chamber, the force of the blast determining the weight or fineness of the particles to be ejected through the delivery pipes K, which are adjustable.

4641. UMBRELLAS, &c., G. G. Lusher.—Dated 11th November, 1880. 6d.

The runners and top notches are made from a tube of brass having an enlarged part at one end, which is placed on a mandril, leaving the enlarged part projecting, when six arms are caused to descend and act upon it so as to form a groove, above which the tube increases in diameter to the end. The conical part is then turned over and forms one flange, while the sides of the groove are forced together to form the other. To make ferules, a tube closed at one end has a taper iron tip inserted in it, and by means of dies and pressure the tube is made to taper from its open to its closed end, thus firmly securing the iron tip in position.

4642. LAMPS FOR RAILWAYS, &c., J. Thomas.—Dated 11th November, 1880. 6d.

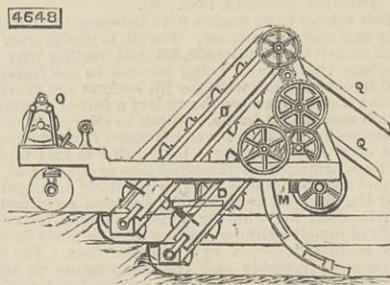
This relates, first, to lamps used for signalling; secondly, to lamps exposed sometimes to violent winds, and at other times placed in positions where the oil may become unduly warm; thirdly, to a mode of regulating the size of the flame; and fourthly, to means for improving the light without the aid of a



chimney. The bottom of lamp A is connected thereto by a hinge joint and spring catch, and on it is mounted the oil cistern C, on top of which is a platform D supported by a ring of perforated metal. On the platform stands the wick tube E, and a division plate G cut away to allow the wick tube to pass. The division plate divides the flame chamber from the oil cistern, so as to keep it cool by means of the current of air passing down through the handle Z as shown by the arrows. Under the lens N is a small window O to allow part of the light to pass downwards, and between the lens and the flame are coloured slides R worked by the levers T. To regulate the size of the flame accurately the ordinary button is corrugated on its inner face, and with it a spring engages to limit its movement.

4648. LAND DRAINING, G. Robson and E. Herdman.—Dated 11th November, 1880. 6d.

This relates to machinery for digging a continuous trench, placing the drain pipes therein, and then



covering them with earth, and it consists of one or more excavators D worked by a rope passing over a pulley, the whole mounted on a frame which by suitable gearing travels forward. The excavators are adjustable by the winch O. The buckets carry the earth upwards and deliver it at the rear of the machine into shoots Q, from whence it falls back into

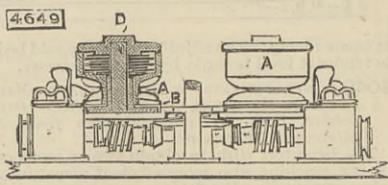
the trench, the drain pipes having been previously deposited therein by the tube M.

4647. SIFTING PORTLAND CEMENT, &c., S. Mayell.—Dated 11th November, 1880. 6d.

A bed plate and upper plate are connected at their corners by columns, and carry bearings for four vertical axes, each carrying a pinion gearing with a central spur wheel driven by bevel gearing. The sieves are of wire gauze and are carried by a frame open at top and placed between the four vertical axes, being supported by four suspension rods connected to lugs on the columns. There are ball-and-socket joints at each end of the rods and adjusting screws and lock nuts at the lower end. The axes are cranked, the cranks being connected to the sieve frame which they actuate.

4649. WORKING CHAIN CABLES AND WIRE ROPES, S. Baxter.—Dated 11th November, 1880. 6d.

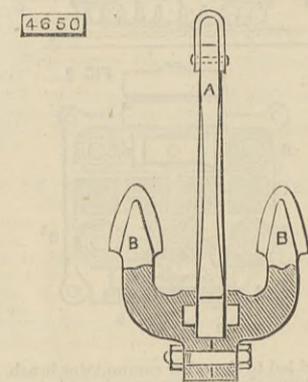
In order to simplify and give easier access to the working parts of the gear for working chain cables, the cable holders A are mounted on vertical shafts B secured to the framing, and through them pass spindles D carrying the requisite gearing to work the cable holder either by hand or steam. By this means



each cable is around a cable holder, and the necessity for dismounting it is obviated, the cable always being on its holder for "letting go anchor," "veering," "riding," and "purchasing." The invention further relates to means for working wire ropes or hawsers, and consists of wheels with V grooves formed with continuous waved projections on each side of the grooves, and arranged so as to ensure the rope passing almost entirely around the main wheel.

4650. ANCHORS, &c., S. Baxter.—Dated 11th November, 1880. 6d.

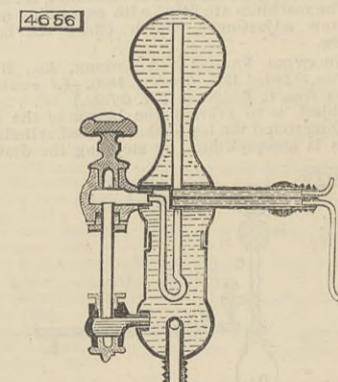
This relates, first, to "trunnion anchors," and consists in means for rendering them more certain in action, and less liable to wear and to become clogged or choked. The lower end of the shank A is formed with a cylindrical enlargement of larger diameter



than and concentric with the trunnions, and a socket is formed in the crown of the anchor to receive this enlargement. The catching points are prolonged so as to serve also as stops to limit the motion of the arms B on shank A. The invention further relates to shackles for connecting together and readily disconnecting lengths of chain and wire cables, and it consists in making it in two parts sliding transversely, and formed with projections on one part to enter recesses in the other, pins being used to secure the two parts together.

4656. LUBRICATING APPARATUS FOR STEAM ENGINES, &c., W. P. Thompson.—Dated 12th November, 1880.—(A communication from J. V. and J. J. Renchard.) 6d.

This relates to improvements in lubricators or apparatus for injecting oil into the steam pipes of engines when under pressure. It consists of two reservoirs arranged in a vertical position one above the other, a diaphragm which closes the direct communication between the reservoirs, a trunk for



attaching the reservoirs to a steam pipe and water reservoir, and another between the steam pipe and oil reservoir, a glass tube or gauge arranged in a vertical position in front of the oil reservoir, and communicating with it at both upper and lower ends, whereby the quantity of oil in the reservoir and the flow or feed are readily observed.

4658. TRICYCLES, E. Hughes.—Dated 12th November, 1880. 6d.

This relates to a tricycle capable of being driven by two people and operated by either or both in a similar manner to an ordinary bicycle. Two large wheels are mounted in front on the same axle, and a small steering wheel is placed behind and midway between them. Each driving wheel has a saddle, backbone, and fork, the forks being rigid with the backbone, and with one another. The backbones join behind the front wheels, and form a bearing for the small wheel. The driving axle has a crank at each end, and two between the wheels. Only one wheel is fixed to the axle.

4661. FILE FOR HOLDING LETTERS, &c., W. Downie and W. F. Lots.—Dated 12th November, 1880. 6d.

This relates to a file to facilitate the removal and replacement of any paper, and the insertion of any paper amongst those on the file without removing the latter, by means of a pair of wires, one of which is mounted upon a slide, which when moved forward comes in contact with the top of the other fixed wire, when some or all the papers can be transferred from the fixed wire to the wire on the slide.

4663. EXTRACTING OILS FROM WHALE, COD OR OTHER FISH, W. R. Dekeer.—Dated 12th November, 1880. 6d.

The blubber or stuff from which oil is to be extracted is placed in a jacketed pan around which steam circulates. As the stuff rises in the pan it is knocked down by a revolving beater which descends centrally within it. The oil runs off through a pipe,

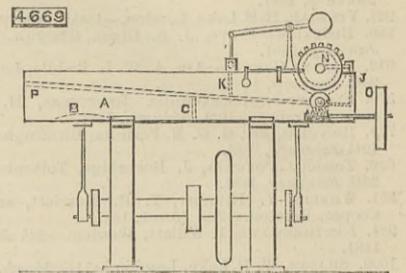
and the moisture and gases given off are drawn off by means of a fan so as to create a partial vacuum.

4668. STEAM ENGINES, &c., C. Cottame.—Dated 12th November, 1880.—(Not proceeded with.) 2d.

To a shaft is fixed a steam cylinder which revolves with it and is worked by steam or other motive power, its action being vertical. At each revolution the steam forces the piston upwards. Round the piston rod (which protrudes from both ends of the cylinder) is fixed a ring inside which are two guide rods to prevent the piston rod turning when moved by the steam. To this ring arms are attached and carry weights which run on guides.

4669. MANUFACTURE OF PAPER, W. H. Richardson and H. Glenny.—Dated 12th November, 1880. 6d.

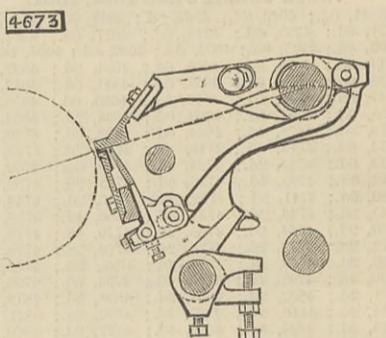
This relates to an improved knoter or strainer, to be used, first, for straining half stuff from weeds, &c., before placing it in the beating engine; secondly, for straining beater stuff from partially beaten stuff whilst passing through the beating engine; and, thirdly, for straining paper pulp before passing to the paper machine as a substitute for the jog strainer or revolving strainer. A is the vat fitted with strainer plates, and divided by a feather C into two compartments, in each of which is a diaphragm B worked by



a crank below the vat. The stuff is admitted at P, and the strainer plates in this compartment are placed in an inclined position with the cut transverse to the flow of the stuff, while those in the other compartment are finer, and may be either level or slightly inclined. The clean stuff mostly passes through the plates in the first compartment and is conducted to the paper-making machine, the other part of the stuff, including foreign matter, passing to the finer plates, where the dirt in time accumulates, when the sluice K is automatically let down and stops the flow while the sluice J is opened by cam N, and a valve opened so as to throw water on to the strainer plate and remove the dirt, which escapes at O.

4678. PREPARING AND SPINNING COTTON, &c., J. M. Hetherington.—Dated 13th November, 1880. 8d.

To prevent the weight hooks vibrating or dancing upon the roller necks, a suitable spring is interposed between the roller and the weight. A spring so applied permits the weight hook to follow the movements of the roller neck more quickly than the inertia of the weight will permit when the said weight is applied in the ordinary manner. To the ordinary



nipper which holds the cotton during the combing operation is applied a plate or bar which presses the cotton against a surface which is formed or provided upon one of the jaws of the nippers, with the object of putting an amount of pressure or tension upon the fibres whilst they are being drawn forwards and detached. The improvements in the nipping apparatus are shown in the drawing.

4678. LOOMS, J. Hindle.—Dated 13th November, 1880. 4d.

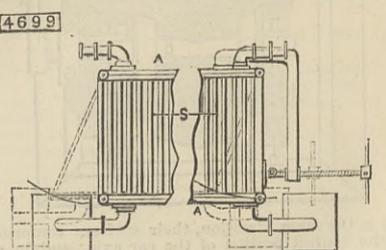
This relates to check straps of looms, and consists in attaching to the stay a bracket with a loop, through which a strap having stop pegs is passed, and connected with the strap are two other straps and loops suspended from and capable of movement along the picking spindle, whereby an adjustable and effective check is obtained.

4684. FURNACES, RANGES, &c., T. J. Constantine.—Dated 13th November, 1880. 6d.

The lower outer edge of a furnace door is formed so as to allow air to enter and pass up channels formed on the inner surface, up one side of an inner plate and through apertures or over the top edge, to descend upon the other side, and then under a second plate to openings in the top of the inside plate, the air being heated in its passage before mixing with the products of combustion. Projections are made at the side of the fire basket to form passages that separate the air and heat it before allowing it to mix with the products of combustion. The bottom plates of furnaces are channelled to form air spaces for heating the air to support combustion. The upper surfaces of fire bars are channelled, and the ashes lodge therein and act as a non-conductor.

4699. PULP STRAINER FOR PAPER MACHINES, C. Kessler.—Dated 15th November, 1880.—(A communication from L. Zeyen.) 6d.

Instead of simple or double plates capable of lateral motion over one another, rods S are used, and are mounted in a rectangular frame A movable in itself,



thus forming a trellis or lattice frame; the spaces between the rods can be made wider or narrower by the movement of the frame whilst the machine is in motion.

4706. MANUFACTURE OF CLOTH IN CIRCULAR KNITTING MACHINES, S. Thacker.—Dated 15th November, 1880. 4d.

In order to produce patterns on the cloth one or more straight threads is used in combination with ordinary looping threads, and is laid in front of some and behind other needles in any desired order. Instead of a plain presser, a tucking presser is arranged to press the same needles that are depressed and missed by the depressing wheel employed in selecting the needles for the laying in of the straight thread or

threads. The tucking presser may also be arranged to press the needles in different orders from that of those depressed by the depressing wheel.

4710. FIRE AND BURGLAR ALARMS, &c., W. T. Braham.—Dated 16th November, 1880.—(Not proceeded with.) 2d.

This consists of a hook placed in a box, and which is released when the door or window to which it is attached is opened. To the hook is secured a cord attached to the alarm, consisting preferably of a number of hollow balls placed in a box on the staircase, such box having a trap bottom, which, when removed, allows the balls to roll down the stairs.

4711. TABLETS FOR WRITING OR DRAWING, C. D. Abel.—Dated 16th November, 1880.—(A communication from E. Thieben.) 4d.

White cements and mastics, such as porcelain clay and Spanish white, cements or mastics prepared from magnesia and its compounds; also cement or plaster of gypsum, with alum and borax, zinc oxide made up with solution of zinc chloride, Spanish white, baryta, or caesium, with solutions of silicate of soda or potash, are used to form tablets, the materials being mixed with water and cast into moulds, and then pressed and polished.

4712. GLAZIERS' POINTS OR TACKS, &c., A. M. Clark.—Dated 16th November, 1880.—(A communication from G. W. Hubbard.) 6d.

The points of the tacks are of rhombic or lozenge shape, and a number of them are cemented together in sections of convenient length to be inserted into a sash or tool. The third part of the invention relates to a machine for driving the tacks.

4713. BRACES, G. W. von Navroeki.—Dated 16th November, 1880.—(A communication from C. M. Rompler.) 4d.

The ring carrying the back straps is formed with an upper curved slot closed and rounded at the ends, and through it passes the brace, to which the end straps are fastened.

4716. AUTOGRAPHIC PRINTING, E. Edwards.—Dated 16th November, 1880.—(A communication from C. Stener.) 2d.

The plate from which the impression is to be obtained is so prepared that it only receives the printing inks on the parts to which the writing has been transferred by means of a solution of acetic iron. For this purpose the printing surface consists of 15 parts gelatine moistened in water, 5 parts glycerine and 1 part water-glass, the whole prepared in a mould to form a sheet. The writing is made on paper with acetic iron, or acetate of iron, and then placed on the printing surface.

4719. WOODEN SHIPS OR VESSELS, J. H. Johnson.—Dated 16th November, 1880.—(A communication from H. H. Carter and J. B. and J. F. Wood.)—(Not proceeded with.) 2d.

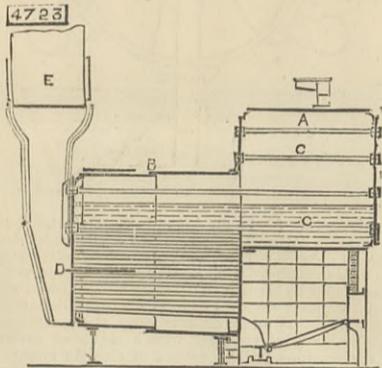
In order to seal the planks of a ship they are formed with ribs to receive wooden strips.

4722. BRICKS FOR BUILDING, F. Wirth.—Dated 10th November, 1880.—(A communication from C. Grünzweig and P. Hartmann.) 4d.

To produce a light, firm brick, cork wood is reduced to powder and mixed with cement, sand, clay, hydrate of lime, soluble glass, hair, or other fibre, and a sufficient quantity of water to form a plastic mass, which is formed in moulds and dried in the air.

4723. STEAM BOILER, J. Howden and W. B. Hill.—Dated 16th November, 1880. 6d.

The boiler consists of two cylindrical shells A and B placed horizontally and end to end, but the front one higher than the back, the two communicating where



they meet. Stays C connect the two boilers, and the part of B below A is fitted with tubes D. Under the front part A is placed the furnace, the flames from which pass through tubes D to the uptake E.

4724. OBTAINING MOTIVE POWER, S. Hill, G. E. Williams, and C. G. Hill.—Dated 16th November, 1880.—(Not proceeded with.) 2d.

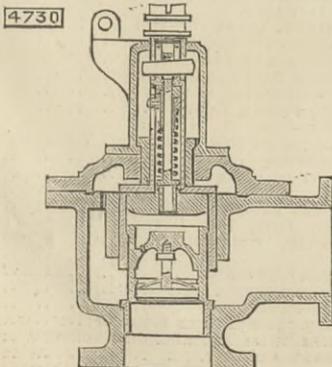
The apparatus consists of a shaft supported in a bearing at one end, the other sliding in a tube formed with an external screw engaging with a female screw capable of being turned, but which cannot move otherwise. The inner end of the tube has a conical collar through which the shaft passes freely, and on its end is a fly-wheel connected by rods to a spring.

4728. LAMPS, S. Pitt.—Dated 17th November, 1880.—(A communication from W. B. Robins.) 6d.

This relates to Argand lamps for burning mineral oils without smoke or odour and producing a smaller or larger flame as desired. The oil font is angular and affords a central passage for air and for the adjusting mechanism of the flame-regulating tube, the wick being stationary, while its tube can be moved so as to regulate the size of the flame, such tube being formed in two parts, one having a coarse thread for quick adjustment, and the other a fine thread for nice or slow adjustment.

4730. SAFETY VALVES FOR STEAM BOILERS, C. Stuart.—Dated 17th November, 1880. 6d.

The valve chest is of cast iron with a branch pipe in the usual manner, and fitted with a brass valve seat. The casing is partly closed above and bored out for the



reception of a brass bush, in which a seat is turned to receive the upper end of the main valve, while the lower end rests in the brass seat at the bottom of the valve chest. A flange above the upper seating prevents the escape of steam downwards through the upper

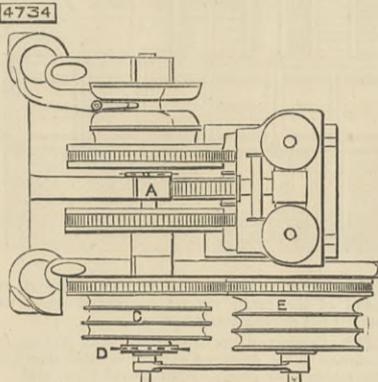
seat when the valve lifts. The bush is closed above by a screwed plug in which works a small valve kept in its seat by an adjustable spiral spring, and the valve, screw, and spring, &c., are inclosed in a brass cylinder screwed to the plug by a flange at its lower end. The cylinder is inserted in a bush screwed into the top of the cast iron valve chest, the bush being formed with an octagonal head, by which it can be turned, thus raising or lowering the valve, bush, and all attached to it, so as to accurately adjust the two seats of the main valve. An index works in a vertical slot in the brass cylinder, indicating the pressure to which the valve is loaded, and the cylinder is covered by a cast iron dome screwed to the valve chest, and a bracket is cast on the dome to support the lever which operates on the cap.

4729. LAMPS, S. Pitt.—Dated 17th November, 1880.—(A communication from W. B. Robins.) 6d.

This relates to Argand lamps with a large cylindrical passage forming the air passage, a central deflector being employed to direct the air against the flame, and also to reflect the light and produce various pleasing and useful effects. The wick is in two parts and is stationary, sheaths being adjusted to regulate the flame.

4734. HAULING AND VEERING MACHINES, W. H. Harfield.—Dated 17th November, 1880. 4d.

The apparatus consists of two multi-grooved barrels C and E connected by gearing, several turns of the rope passing partly round the grooved barrels. Inside the barrel C is a frictional brake and connector, so arranged that by working the hand wheel D the spindle A of the windlass may be connected or disconnected as desired, or the barrel may be allowed to revolve at a greater or less resistance. The barrels are provided with flanges, which roll the ore on the other.

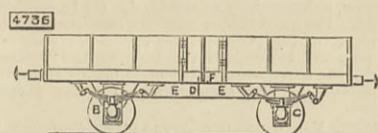


4735. SYPHONS AND TRAPS FOR SINKS, DRAINS, &c., D. Brown.—Dated 17th November, 1880. 4d.

In the induct pipe of a syphon is formed a globular space containing a ball of cork or wood of larger diameter than the induct and educt pipe, so that when there is liquid in the syphon the ball is held against the induct pipe, and when there is no water therein the ball rests on the mouth of the educt pipe.

4736. WEIGHING DEVICES FOR RAILROAD FREIGHT CARS, B. J. B. Mills.—Dated 17th November, 1880.—(A communication from F. W. Minck and M. Quenstedt.) 6d.

This relates to freight cars fitted with springs between the body of the car and the axle-boxes. A bar E bearing in its centre an upright pointer D is fastened



to the axle-boxes B and C, and when loaded the pointer will move over a scale F fixed to the body of the car, and so indicate the weight in the latter.

4738. LOCKS, M. Volk.—Dated 17th November, 1880.—(Not proceeded with.) 2d.

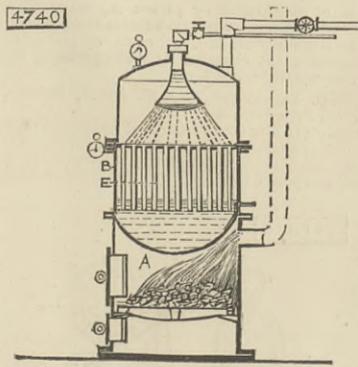
This relates to means for checking the number of times the lock is unfastened by clipping holes in a ticket.

4739. IMPROVEMENTS IN ELECTRIC BATTERIES, H. E. Newton.—Dated 17th November, 1880.—(A communication from L. A. W. Desruelles.) 4d.

The object of the invention is to prevent the liquid in batteries from spilling, and thus interfering with their portability. To this end the carbon and zinc plates are enclosed in a fibrous or spongy substance not affected by the acids of the battery, but which will, by capillary action, or molecular adherence, hold the exciting liquid in suspension. For this, asbestos and spun glass may be used.

4740. GENERATORS FOR HYDROCARBON ENGINES, J. R. Blumenberg.—Dated 17th November, 1880. 6d.

This relates to a combined apparatus for vaporising bisulphide of carbon or other hydrocarbon liquid, consisting of a bottom firing chamber or fire box A, arranged under a heating chamber B, containing



water or other suitable liquid, and a space for steam, and a system of pendent tubes E closed below, dipping into the water and open to an upper chamber in which the bisulphide of carbon is supplied in a spray form to the pendent tubes and the vapour is carried off by an outlet.

4741. CLIPPING HORSES, &c., E. de Pass.—Dated 17th November, 1880.—(A communication from La Société Guillaume and Cie.)—(Not proceeded with.) 2d.

The object is to ensure perfect contact between the movable comb against the fixed comb, by means of a jointed lever, one end of which is raised by a screw, while the other exerts a pressure on a notched plate, under which the movable comb slides.

4742. CAUSTIC COMPOUNDS, J. Bowing.—Dated 17th November, 1880.—(Not proceeded with.) 2d.

Caustic lime is slaked with hot water to a stiff paste, and is added to about its own weight of potassium or sodium carbonate, or an equivalent of potassium or sodium hydrate; to the whole, after perfect mixture,

about the same quantity of potassium or sodium silicate is added.

4743. SAND MOULDS FOR METAL CASTINGS, H. L. Wilson and J. Clegg.—Dated 17th November, 1880.—(Not proceeded with.) 2d.

This relates to improvements on patents Nos. 1440 and 4321, both in the year 1878, and consists in entirely dispensing with the hopper, thus avoiding the necessity of passing the sand through a sieve. The machine has two stands for the moulding boxes, and a plate or pattern on each side.

4744. WATERPROOF GARMENTS, J. Frankenburg.—Dated 17th November, 1880.—(Not proceeded with.) 2d.

This relates to making waterproof garments of waterproof fabric combined with imitation fur, plush, seal, real fur, or other hairy lining.

4745. IMPROVEMENTS IN ELECTRIC LAMPS, J. E. H. Gordon.—Dated 17th November, 1880.—(Not proceeded with.) 2d.

The object of the invention is to recover the metal dissipated in electric lamps, by causing a current of air to pass through the lamp, and afterwards through a flue in which a large surface of an inert material is exposed. The deposit is collected and reworked by ordinary refinery processes.

4746. PADLOCKS, D. Waine.—Dated 18th November, 1880.—(Not proceeded with.) 2d.

A blank is cut in a die and forms the upper side of the lock and the rim, and has projections to form the rivets. The rim is then raised, and the under side of the lock, made in the usual manner, is secured to it by the rivets.

4751. TREATMENT OF MAIZE, E. R. Southby.—Dated 18th November, 1880. 4d.

This relates to the preparation from maize of a saccharine matter adapted for brewing and distilling, and a cake adapted for feeding cattle, and it consists in acting on a large proportion of maize by means of a small proportion of malt.

4756. WIRE-SPRING MATTRESSES, J. B. Rowcliffe.—Dated 18th November, 1880. 4d.

A series of spirals of wire are connected to the head and foot of the frame parallel to each other, and at suitable distances apart, by means of wire links or rings and links. The invention further relates to the machine for making the spirals.

4758. MEASURING PIECE GOODS, G. Firth.—Dated 18th November, 1880. 6d.

The object is to obviate the creasing of the goods in machines for measuring, and consists in passing the piece over the top roller and then over a revolving brush, and in front of a shaft with radiating wings, over two or more rollers to the box. On the other side of the piece is a metallic apron, which is caused to oscillate by a crank or eccentric, so as to distribute the piece evenly into the box below.

4760. TREATING ORES, N. C. Cookson and T. C. Sanderson.—Dated 18th November, 1880.—(Not proceeded with.) 2d.

This relates to the treatment of mixed ores containing lead, with other metals, and as applied to ores containing lead with zinc, and, maybe, also silver and copper; it consists in roasting the ore and dissolving out the zinc by acetic acid. The copper will also be dissolved, and is precipitated by the addition of metallic zinc. To precipitate the zinc hydrogen sulphide is used.

4764. REGISTER STOVES, &c., J. Sawyer.—Dated 18th November, 1880.—(Not proceeded with.) 2d.

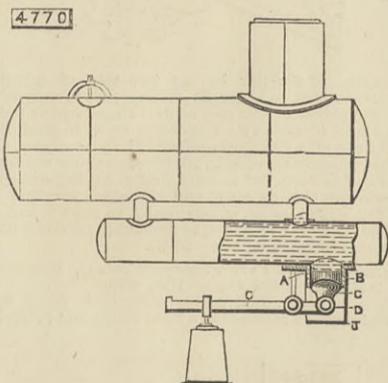
This relates to the application of a combustion chamber to the back of the stove, and having a slide door at the bottom and openings to the chimney. The flue from the fire consists of a descending pipe with a valve to regulate the draught.

4765. CUTTING THE OUTER SOLES OF BOOTS AND SHOES, G. F. Claypole.—Dated 18th November, 1880.—(Not proceeded with.) 2d.

A strip of leather is cut wide enough to correspond with the length of two soles, which are cut out at once by a knife or die of the shape of two soles of the same foot when fitted together after having been shaped at the back.

4770. STEAM SAFETY VALVE, P. M. Justice.—Dated 19th November, 1880.—(A communication from J. Barbe.) 4d.

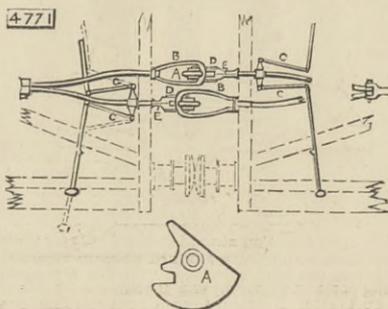
This relates to automatic safety valves governed or "set" by means of a lever and weight. The valve is preferably attached to the bottom or water surface of the boiler, and it consists of a hollow cup or piece A secured to the boiler, and within it is fitted a short



piece of flanged pipe B in which rests a movable plug valve C held in place by a lug D pivoted to the end of the weighted lever bar G. The whole may be inclosed in a case J to prevent contact with the furnace flame. When the pressure is too high the water forces down the valve C, and the water and steam then escape.

4771. COUPLING AND UNCOUPLING RAILWAY ROLLING STOCK, &c., W. P. Alexander.—Dated 19th November, 1880.—(A communication from E. R. Thomas and G. Cowdery.) 6d.

This consists in attaching to the several drawbars of the rolling stock self-adjusting hooks A and links B, alternately (or as the case may require in the making up of trains), and also of attaching to the drawbars on which these hooks A are attached levers C which



act upon stops D, which lock or unlock at the will of the attendants, the hooks A and the links B securing or releasing the rolling stock as desired. The levers C and stops D which are connected are caused to return (after the unlocking process) to their original position by means of springs E or balance weights or any other convenient arrangement.

4772. COMPOUND FOR POLISHING METALS, W. J. Clapp.—Dated 19th November, 1880. 2d.

The compound is made from slag from iron furnaces, and consists of from 30-67 to 35 or 36 parts silica, 18-29 to 20 or 22 parts alumina, 38 or 40 to 50-80 parts lime, small portions of sulphur, phosphorus, titanio acid, magnesia, manganese, and alkalis.

4773. MANUFACTURE OF DIPHENYLAMINE OR ANILINE, H. J. Haddan.—Dated 19th November, 1880.—(A communication from Dr. E. Drechsel.)—(Not proceeded with.) 2d.

Ten parts phenol, 4 parts sal-ammoniac, and 3 parts oxide of iron, are treated in a closed vessel for forty hours to a temperature of 260 to 300 deg. Cent., and well stirred. The cooled crystalline mass soaked with a colourless aqueous and with a dark green oily liquid, is first extracted in two operations by petroleum—ether, subsequently separated and dissolved in a small quantity of hydrochloric acid.

4775. SPINNING AND DOUBLING COTTON, D. Davies.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

A stationary bolster is fixed in a rail, and in it runs a loose tube which fits it at both ends only, and carries an inverted flyer with a ring fixed to the upper part of the wings to stiffen them. On the upper part of the loose tube, and below the flyer, is the wharve or driving pulley.

4776. OBTAINING, PRESERVING, AND REGULATING MOTIVE POWER, S. Daniels.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

This relates to machinery to obtain, preserve, and regulate motive power by the combined action of the wind and gravitation.

4778. DOUBLE-SIDED DRYING FELTS, E. Dordet.—Dated 19th November, 1880. 2d.

One side of the felt is made with a cotton or thread warp and cotton or thread weft, and the other side is made with a wool weft.

4780. BEER, F. Wirth.—Dated 19th November, 1880.—(A communication from L. Meller.)—(Not proceeded with.) 2d.

This relates to treating beer with an automatically controllable carbonic acid gas pressure, generated either by the mid or second fermentation stage of the beer, or artificially.

4783. DIRECTION LABELS, A. Gorse.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

This relates to machines for manufacturing labels of rectangular shape from pieces of paper, paper cloth, linen, or other material, with an eyelet to secure it to the package by means of a string. The labels are made from a strip of material.

4784. ALIMENTARY MATERIAL FOR MAKING A BEVERAGE, J. McWilliam.—Dated 19th November, 1880.—(A communication from W. Armstrong.) 2d.

Bran is saturated with syrup and dried by a gentle heat, and when thoroughly dry is roasted to a full brown colour. A beverage is made by making an infusion of this substance.

4785. LOOMS, J. Thomas and J. Pickles.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

This relates to mechanism for weaving two or more pieces at one time, with one warp, the pieces when cut presenting selvages differing but slightly in appearance from an ordinary selvedge.

4787. TREATING AND APPLYING SLAG PRODUCT OR SLACK WOOL, J. J. Sachs.—Dated 19th November, 1880. 6d.

This relates to the treatment of slack wool and its utilisation in the manufacture of papier maché roofing and similar felt, card, and pasteboard and other papers, and other similar purposes.

4789. OIL AND SPIRIT LAMPS, W. Green.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

To prevent the oil or spirit spilling when the lamp is upset, to the cone a tube is attached and passes down into the reservoir.

4790. METALLIC HURDLES, GATES, AND WIRE FENCING, &c., H. Skerrett.—Dated 19th November, 1880.—(Not proceeded with.) 2d.

The horizontal bars are connected to the upright by means of recesses formed in both, without rivetting or cottering. The wire of fences is connected by means of a short length of flattened tubing.

4791. METALLIC CARTRIDGE CASES, H. Skerrett.—Dated 19th November, 1880.—(Not proceeded with.) 4d.

Solid-headed cartridge cases are formed with a considerable thickness of metal both at the head or base part and for a short distance up the walls next to the head or base part, so as to strengthen the head and sides of the case nearest the head, thereby rendering them less liable to burst.

4793. BUTTONS, &c., T. Fairley.—Dated 19th November, 1880. 6d.

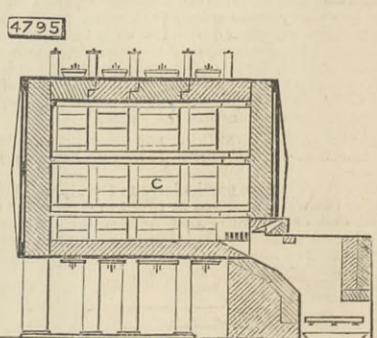
The back of the button has a short hollow stem with a slot in its closed end to admit a spring stem forming the other part of the fastening.

4794. BOXES OR CASES FOR PACKING, PRESERVING, &c., W. R. Lake.—Dated 19th November, 1880.—(A communication from P. Lehmann.) 6d.

The lid is so shaped as when open to form a spout to facilitate pouring out the material in the box, and over tightly lid when closed a separate cover is placed to more tightly close the box, such cover also forming a measure.

4795. GAS-MAKING APPARATUS, C. F. Dietrich.—Dated 19th November, 1880.—(Complete.) 6d.

This consists, first, in combining in a gas-making apparatus a vertical retort or series of retorts C having lateral openings at different heights for the escape of gas, uniting with channels leading to the stand pipes, and a heat-retaining chamber communicating with the



furnace and divided by partitions into a series of sub-chambers, whereby the products of combustion are caused to take a circuitous passage around or about the retort or retorts to the chimney; Secondly, in constructing the retort in horizontal sections, the opposing edges of which are notched, so as to form lateral openings in the retort when its various sections are placed in their proper relative positions.

4801. LIFE-SAVING BELT, &c., J. S. Comrie.—Dated 20th November, 1880.—(Not proceeded with.) 2d.

This relates to forming a considerable length of rope into a waist band or belt in such a manner that it may be easily and quickly unwound and made available for life saving.

4802. UTILISATION OF STEEL RAILS, &c., R. J. Letcher.—Dated 20th November, 1880.—(Not proceeded with.) 2d.

This relates to the conversion of steel rails, &c., into bars suitable for the manufacture of tin or terne plates, black plates, stamping or other sheets, or rods for wire. The steel is hammered and cut in lengths, which are filed up and heated in a furnace, after which they are hammered into a solid piece, reheated, and rolled to the required form.

**4804. GRIDIRONS, A. C. Henderson.**—Dated 20th November, 1880.—(A communication from L. P. Mallé.)—(Not proceeded with.) 2d.  
This relates to a gridiron in combination with an adjustable firegrate.

**4808. FASTENERS FOR STUDS, G. W. von Nauyocki.**—Dated 20th November, 1880.—(A communication from T. Fischer.)—(Not proceeded with.) 2d.  
The stud or front plate is connected to one-half of the circular back plate by a rivet, round which revolves an oval shaft carrying the other half of the back plate.

**4813. COUPLING AND UNCOUPLING RAILWAY CARRIAGES, &c., B. J. B. Mills.**—Dated 20th November, 1880.—(A communication from I. J. Becker.)—(Not proceeded with.) 2d.  
A coupling link with weighted arms is pin-jointed horizontally to a block, to which is also pin-jointed a pair of toggle levers, which at one end are connected vertically to a pair of parallel links. The latter are jointed at their other ends to a pair of toggle levers working in a slot in the draw-bar, and jointed vertically to a pair of links, also working in the slot and connected by a stud travelling in a slot in the draw-bar, and acted upon by a wedge operated by a screw.

**4814. SAMPLING FLUIDS, J. C. Shears.**—Dated 20th November, 1880.—(Not proceeded with.) 2d.

This relates to a vessel with a valve at top and another at the bottom, the two being connected together, so that when the vessel is inserted into the receptacle containing the fluid to be sampled, and the top valve opened, the bottom one will also be opened, thus admitting a sample of the liquid both at the top and bottom of the receptacle into the sampling vessel.

**4816. ARRANGEMENT OF THE "PICKS" IN LOOMS FOR WEAVING VELVETS AND VELVETEENS, T. Emmott.**—Dated 20th November, 1880.—(Not proceeded with.) 2d.

The object is to remove ribbiness and raciness from the face of fast pile velvets or velveteens. An ordinary loom is used with a tappet of twenty-two or other convenient number to the round, but instead of putting in the binder picks in regular succession they are put in irregularly.

**4817. MANUFACTURE OF DERIVATIVES FROM COAL TAR PRODUCTS, C. Love and J. Gill.**—Dated 20th November, 1880. 4d.

This relates to the manufacture of naphthol, resorcin and their homologues by the substitution of sulphurous acid for the hydrochloric or sulphuric acid hitherto employed to separate them from their alkaline solutions obtained in the ordinary process of manufacture; and also in the production and utilisation of residual or bye-products of greater commercial value.

**4824. SAUCES, &c., D. Henderson.**—Dated 22nd November, 1880. 4d.

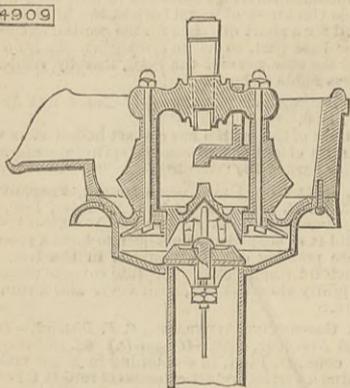
The sauce is used in a dry state, and consists of powdered baked farinaceous matter, herbs or vegetables desiccated and powdered, flavourings such as cloves and liquorice, a vegetable acid, a pungent material such as pepper and salt.

**4825. IMPROVEMENTS IN DYNAMO-ELECTRIC MOTORS, C. Kessler.**—Dated 22nd November, 1880.—(A communication from E. Kullo.)—(Not proceeded with.) 4d.

The object of this invention is to continuously cause the attraction of an electro-magnet to act on a conductor or transmitter of power without interrupting the current, and thereby preventing cessation of the power for a single moment.

**4909. DIAPHRAGM SHIP PUMPS, J. Edson.**—Dated 25th November, 1880. 6d.

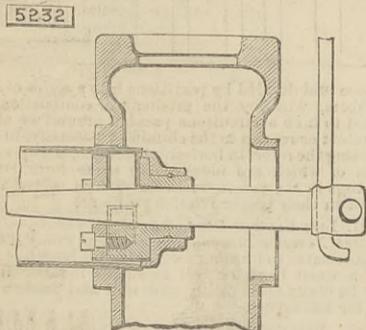
The casing is composed of two principal parts, first, the hollow base open at the top and communicating at the bottom with the section pipe; and secondly, the head and lever supporter, between the under side of which and the upper edge or flange of the base is secured the flexible rubber diaphragm. The upper part of the base is bell-mouthed, and provided with annular and radial grooves and corresponding ribs which support the outer portion of the diaphragm in its lowest position. The centre of the diaphragm is open and supports the discharge valve. Around the opening there is an upper and a lower ring of metal, between which the inner portion of the diaphragm is clipped by means of bolts, said bolts extending upward through the cross head held at the required distance by two vertical sleeves cast on the



upper ring and surrounding the bolts. The lower ring, which forms a reciprocating supporting surface for the diaphragm, is curved downwards, and provided near its outer circumference with radial perforations. The suction valve is a disc valve with bevelled cover-plates, and the guide ribs of the discharge valve are tapered at their lower ends parallel with the sides of the cover-plate of the suction valve. The top of the said cover-plate is hollowed out to permit the deposit of impurities contained in the water.

**5232. TUBE FASTENINGS FOR SECTIONAL STEAM BOILERS, E. H. Bennett.**—Dated 14th December, 1880. 6d.

This relates more particularly to the style of boilers having the water enclosed in tubes, and provided with small end chambers of cast iron, suitably connected together to form a single boiler of a great number of sections. The holes for the tubes may be produced in



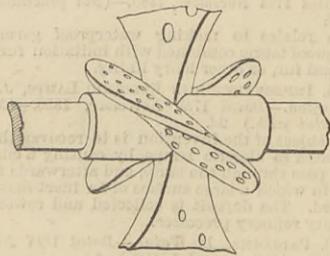
the act of casting in common green sand. The holes are made tapering, so that the outer end is the largest. An expanding tool is employed adapted to give the same taper to the tube end and force the metal of the tube into the corresponding conical form.

**SELECTED AMERICAN PATENTS.**

From the United States Patent Office Official Gazette.

**241,124. PERFORATED PROPELLER BLADE, Henry D. Deane, Brooklyn, N.Y.**—Filed August 17th, 1877.  
Claim.—A screw propeller, the several blades of which are provided with a series of perforations, such perforations being in the form of a cone, a truncated

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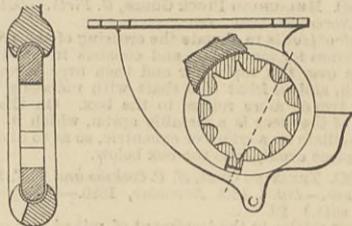


cone, or tunnel or funnel-shaped, such perforated propeller-blades applied and operating as and for the purposes substantially as herein shown and set forth.

**241,158. SEED-CUP FOR SEEDING MACHINES, John P. Rude, Liberty, Ind., assignor to Rude Brothers, same place.**—Filed April 5th, 1881.

Brief.—The ring or washer is cast in the end wall of the seed-cup. Claim.—(1) In the feed mechanism of seeding machines of that class which employs laterally sliding and adjustable feed-wheels, the rosette or washer through which the feed-wheel slides, and in which it has its bearing, in combination with and embraced by the end wall of the seed-cup, which is

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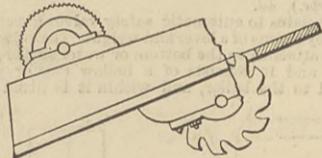


cast around it, substantially as described. (2) A feed-cup for seeding machines, having a rosette or washer for the feed-wheel to slide and rotate in cast into the end wall of said cup, substantially as and for the purpose specified. (3) A feed-cup for seeding machines, having a rosette or washer for the feed-wheel to slide and rotate in cast into the end wall of said cup, and having one or more openings upon the outer side of the bearing, to permit the escape of dirt and dust, substantially as described.

**241,200. BAND-CUTTER AND FEEDER FOR THRASHING MACHINES, James R. Ervin, Marshall, Mo.**—Filed January 24th, 1881.

Claim.—(1) In a thrashing machine, a band-cutter consisting of a series of discs having teeth forwardly inclined at their bases, substantially as shown and described, whereby they may hook under the bands as set forth. (2) In a thrashing machine, a feeder

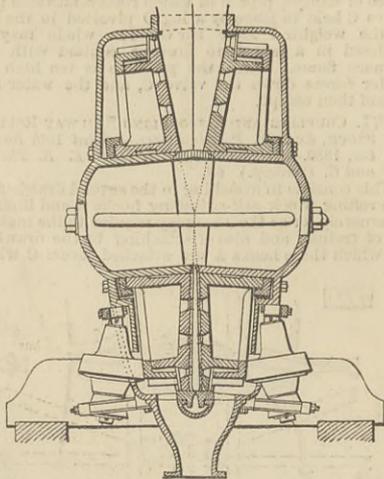
241.200



consisting of a roller having two sets of serrated annular flanges, so arranged with respect to each other that the planes of the two central rings, which meet and those of each two successive ones, if produced, shall form an acute angle, substantially as shown, and for the purpose specified. (3) In a thrashing machine, a reversible tooth for a band-cutter, having one edge smooth for cutting wire, and the other serrated for cutting straw bands, substantially as shown and described, the said tooth being reversibly inclined from its centre to its ends, as set forth.

**241,243. CONE PRESS, Johannes Selwig, Brunswick, Germany.**—Filed August 11th, 1879.  
Claim.—(1) Two circular perforated discs with conical surfaces enclosed in a fixed casing and revolving

241.243



in the same direction around inclined axes for pressing substances containing a fluid, in order to separate the fluid from the solid substance. (2) The arrangement of the press as described and shown.

**241,242. ARMATURE FOR DYNAMO-ELECTRIC MACHINES, William E. Sawyer, New York, and Edward R. Knowles, Brooklyn, N.Y., assignors to Eastern Electric Manufacturing Company, Middletown, Conn.**—Filed January 12th, 1881.

Brief.—The armature is composed of two concentric cylinders, the space between the cylinders forming a passage for water, whereby the armature is kept cool. Claim.—(1) A dynamo-electric machine, the armature

of which consists of two cylinders suitably secured to the armature-shaft in such a manner as to leave an annular water space between the cylinders larger than the opening through which the water flows into and out of said water space, substantially as described,

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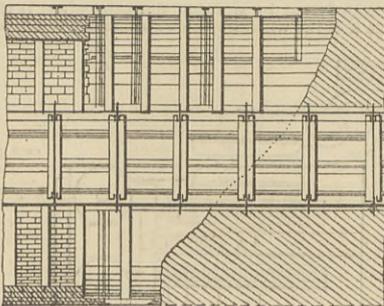


and for the purpose set forth. (2) A dynamo-electric machine, the armature of which consists of an outer and inner cylinder suitably secured to the armature-shaft, whereby an annular water space, as described, is provided between the outer and inner cylinder, substantially as set forth.

**241,272. CONSTRUCTION OF TUNNELS, John F. Anderson, Jersey City, N.J.**—Filed February 28th, 1881.

A removable central sectional tunnel is carried forward in advance of the main tunnel, whereby the

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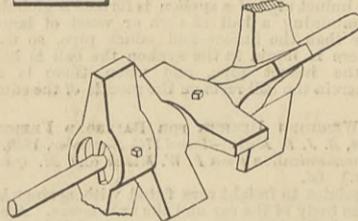


earth ahead of the main tunnel can be explored, and the head of the main tunnel supported from said central tunnel during construction.

**241,278. CONVEYOR, Heman A. Barnard, Moline, Ill., assignor to the Barnard and Leas Manufacturing Company, same place.**—Filed March 23rd, 1881.

Claim.—(1) A conveyor-screw consisting of a rotary shaft having a series of rigidly-secured blades and a series of alternate movable blades, the latter of which are adapted to automatically adjust themselves as the direction of rotation is changed and form a right or

241.278

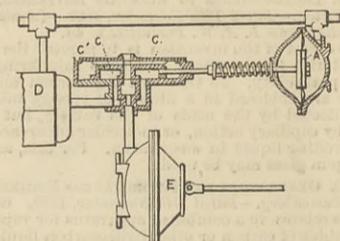


left screw, substantially as specified. (2) In combination with the fixed blades and the recesses provided with engaging lugs, the movable blades provided with lugs adapted to engage the lugs in the recesses, whereby the movement of the loose blades is limited, substantially in the manner and for the purpose specified.

**241,326. VACUUM-BRAKE APPARATUS, Frederick W. Eames, Watertown, N.Y.**—Filed October 20th, 1880.

Claim.—(1) A valve and diaphragm or piston so constructed and arranged that the application of the brakes will result whenever the pressure is increased or diminished beyond a regulated amount, substantially as set forth. (2) The combination of diaphragm

241.326



or piston A, valve C, valve-box C', and operating chamber E, substantially as set forth. (3) The combination of diaphragm or piston A, valve C, and in valve casing C', constructed substantially as set forth. (4) The combination of diaphragm or piston A, valve C, valve-box C', chamber D, and operating chamber E, substantially as set forth.

**241,346. TELEPHONE, Gay W. Foster, Chicago, Ill.**—Filed June 14th, 1880.

Claim.—(1) The combination of an image representing a man or other object, with a speaking-tube and electric telephonic transmitter, substantially as and for the purpose described. (2) The combination of an

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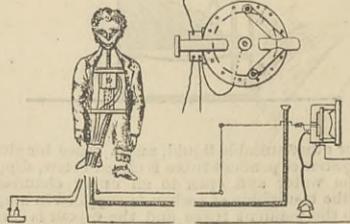


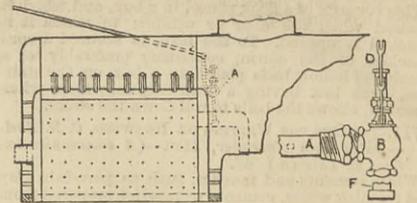
image representing a man or other object, with a speaking-tube, electric telephonic transmitter, and connected pair of acoustic diaphragms, substantially as and for the purpose described.

**241,360. DEVICE FOR REMOVING SEDIMENT FROM STEAM BOILERS, Samuel J. Hayes, Edward T. Jeffery, and Henry Schlaacks, Chicago, Ill.**—Filed July 6th, 1880.

Brief.—A perforated pipe is introduced between the crown-bars of the crown-sheet of locomotives, by which the mud and sediment are washed off. Claim.—(1) In a locomotive boiler, the pipe A, having a series of perforations along the line of the crown-sheet, and in combination therewith and with operating mechanism, substantially as described. (2) The com-

bination of the perforated pipe A, arranged across the boiler, with the valve B, lever D, and pipe F, as

241.360

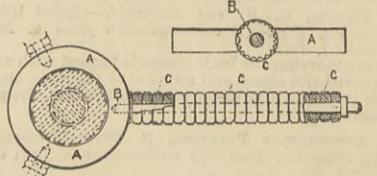


described, whereby the crown-sheet may be washed between it and the crown-bars, substantially as specified.

**241,351. MILLSTONE SHARPENER, Patrick Graham, Stockholm, Sweden.**—Filed January 26th, 1881.

Claim.—(1) A millstone sharpener constructed substantially as herein shown and described, consisting of one or more radial arms B, and one or more toothed discs, as set forth. (2) In a millstone sharpener, the

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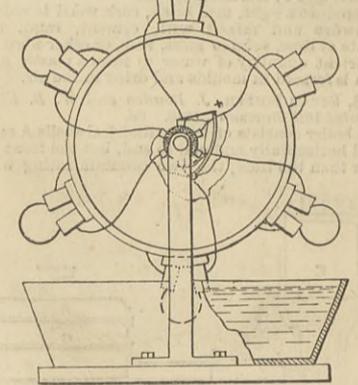


combination with the ring A of the radial arm B, and one or more toothed discs C, substantially as herein shown and described, whereby the grinding surface of a millstone can be broken or sharpened, as set forth.

**241,430. ELECTRIC LAMPS, William E. Sawyer and Robert Street, New York, N.Y., assignors to Eastern Electric Manufacturing Company, Middletown, Conn.**—Filed December 2nd, 1880.

Claim.—(1) An incandescent electric lamp provided with two or more carbons, in combination with a bath of hydro-carbon and connections as described, with a source of electric energy, whereby one carbon may be heated and renewed in the bath while the other is

241.430



being burned. (2) In an incandescent electric lamp, one or more carbon conductors and connections with a source of electric energy, in combination with an open bath of liquid hydro-carbon, whereby said carbon or carbons may be burned in open air and renewed when desired without removal from the lamp, substantially as set forth. (3) In an electric lamp, the combination of a wheel or disc, provided with a series of carbons, and connections with a source of electric energy, as described, said wheel or disc being adapted to be rotated, whereby pairs of opposing carbons may be brought into the electric circuit as described, and one carbon renewed in the hydro-carbon while the other is being burned, substantially as set forth.

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