GRAPHICS, OR THE ART OF MAKING CALCULATIONS BY DRAWING LINES.

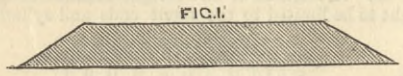
By Professor R. H. Smith.

No. II.

Instruments.—It is only with scrupulously exact drawing that the generally useful degree of accuracy can be obtained in graphic calculations. It is, therefore, of the highest importance that all the instruments used should be true.

The *Scale* is of the first importance. No better material can be chosen for the scale than boxwood. Cardboard scales are not sufficiently exact for this class of work. The oval section, useful as it may be for ordinary working drawings of details of machinery and structures, is unsuitable for graphic calculation, because of the unsteadiness with which a scale of this form rests on the paper. Long lines have to be marked off, and measured with exactitude; and as one cannot look fairly at both ends of a long line at once, one must be able to hold the scale firmly on the paper, secure against the slightest slipping, while one moves from end to end. The flat section shown in the accompanying sketch is therefore the best, offering as it does the fullest amount of frictional resistance to slipping

FIG.1.



over the paper. The flat underside should be plain, without markings of any sort. The two bevel edges may conveniently be divided in inches and in millimetres. It is important that the division should be decimal. Fig. 2 shows a small portion of the length of the scale used in the engineering classes of the Mason Science College. The numbering of the divisions proceeds in one direction only, from left to right. For each edge there are different lines of numbers. The first series on the inch edge reads inches, or $\frac{1}{10}$, or $\frac{1}{100}$, or $\frac{1}{1000}$ of an inch, or any submultiple of tenths of an inch. The second series is for reading to $\frac{1}{2}$in., or $\frac{1}{20}$ths, or $\frac{1}{200}$ths, &c. &c., of an inch. The third is for $\frac{1}{5}$th, or $\frac{1}{50}$ths, or $\frac{1}{500}$ths, &c. &c., of an inch. The millimetre edge has two similar series of numberings. The minute division to half millimetres and to fiftieth-inches is placed at both ends beyond the end line of the scale, and also on each side of the middle line of the scale. The length of the scale should not be less than 20in. Long lines, such as frequently occur in the diagrams, ought not to be measured in sections. The scale should stretch the whole length of the line, otherwise inaccuracies will accumulate, and much unnecessary loss of time will occur. A scale 30in. long is often useful.

T-squares are used in the same manner as in ordinary mechanical drawing. The straightness of the edge is of special importance.

Next to the scale the straight-edges and set-squares are of greatest importance. Two straight-edges—one about 18in. long, the other 3ft. 6in. or 4ft. long—are convenient. The longer one cannot be dispensed with. Mahogany is a good material, giving a good edge without special edging. If these are edged with ebony, the exactness and smoothness of the edge is greatly improved. It is essential that the straight-edges be kept dead true. They should, therefore, be frequently examined, and trued-up with scrupulous care, if they be found to have bent or warped in the least degree. The same remarks apply to the set-squares—their edges must be kept accurately straight. The right-angle of the set-square should be exactly correct. The accuracy of the 60 deg., 30 deg., or 45 deg. angle is seldom of any importance, but they should never be used to set off these angles unless they are known to be correct. Three set-squares must be provided: One 60 deg., of 12in. or 14in. length of side; one 45 deg., of about 6in. or 7in. side; and one 60 deg. of similar size. A large 45 deg., of 10in. or 12in. side, is also useful. Frame set-squares of mahogany edged with ebony are the best, but simple pear wood set-squares keep their shape and straightness of edge very well, if a number of round or oval holes be cut out of the central portion.

In graphic calculation lines have constantly to be drawn accurately parallel to each other, and frequently at a considerable distance apart. Parallel rulers are very inaccurate in doing this work. The only accurate and convenient method is to slide a set-square along a straight-edge—which may be an edge of another set-square, if this be of sufficient length. In performing the transfer of the direction across the paper it is important to make the operation as simple as possible. In nearly all cases it is possible to complete the transfer in one sliding operation. It is at first sometimes rather confusing to see in what way the set-square and straight-edge are to be arranged for this purpose, and a beginner has frequent recourse to a tortuous policy of many successive slidings of one set-square over the other. This is seldom necessary, even for the longest transfers. The long straight-edge should be laid on the paper always in the direction of the desired transfer, and as close as convenient to the positions of the line to be drawn and of the already drawn line to which it is to be parallel. Then this last line is found to make with the straight-edge some angle lying between 0 deg. and 90 deg. The set-square angle is now to be chosen which most closely approximates to this angle between the straight-edge and the line to be drawn, *i.e.*, between the desired direction of transfer and the direction to be transferred. With the two 60 deg. and 45 deg. set-squares there is a choice of six set-square angles. The 60 deg. set-square gives 30 deg., 60 deg., and 90 deg.; the 45 deg. set-square gives 45 deg. and 90 deg. By laying the side of one set-square against the straight-edge, and the side of the other set-square against the hypotenuse of the first set-square, there are obtained the two angles 15 deg. and 75 deg.; because 30 deg. + 45 deg. = 75 deg., and 45 deg. − 30 deg. = 15 deg.; or 60 deg. − 45 deg. = 15 deg. These last arrangements are shown in Fig. 3. Putting a set-square edge along the line to be transferred, we may thus place the straight-edge inclined to it by any of the six angles 15 deg., 30 deg., 45 deg., 60 deg., 75 deg., and 90 deg., which angles increase by a difference of 15 deg. Thus the setting of the straight-edge need never deviate from the exact desired direction of transfer across the paper by an angle of more than $7\frac{1}{2}$ deg. at the most. This will throw the position of the line to be drawn further from or nearer to the straight-edge than that of the line to which it is to be drawn parallel. Since the sine of $7\frac{1}{2}$ deg. is about $\frac{1}{8}$, the maximum amount by which it may be thus thrown to one side is about one-eighth the distance of transfer. The excess of the length of the edge of the set-square over that of the line to be drawn will generally cover this deviation of the straight-edge from the exact desired direction of transfer. If it does not do so the line of the edge of the set-square may be extended by laying another set-square against it. Sometimes the direction of the parallel lines nearly coincide with that of the transfer. In this case the straight-edge is simply laid along the given line; then near the position of the desired parallel, a side of a set-square is laid against the straight-edge. Finally, a second set-square is laid against this first, and the first is slid along the second into the required position.

In marking off lengths upon lines in the diagram, it is necessary, in order to secure exactitude, to prick them off with a needle point. An ordinary fine sewing needle, stuck in a small piece of wood to serve as handle, is a very much better instrument for this purpose than the prickers usually sold with mathematical instruments. If intersections of lines are pricked off with this needle point they become much more sharply defined. The pencil points of the bows and compasses used should be filed flat, with a rounded profile. This rounded profile is best obtained by filing one side of the pencil quite flat, and the other to a rounded conical form. The flat must be perpendicular to the line between the two points of the compasses. If this is not attended to, and if the profile be not well rounded, the compasses or bows will draw circles of slightly different radii according as they lean to the paper on one side or the other. These instruments should have sharp points, and stiff inflexible legs. Two pencils are desirable, one for drawing lines, the other for marking and lettering the diagrams. The latter may be a No. 4 Faber's, and is given a round point. The former may best be a No. 5, and its point should be filed flat and broad, and kept always perfectly sharp.

In many of the more complex graphic calculations curves need to be drawn. A set of pear wood curves assists greatly in this work. Of these, what are called "French" curves are frequently useful, but "ship" curves are more generally applicable. A good curve for this kind of work possesses the same character that a "ship" curve ought to have, namely, the curvature should change gradually and continuously from point to point. It is surprising what a variety of curves may be fairly drawn out with the help of only three or four wooden templates of this sort if these have been skilfully shaped. The characteristic shape of any portion of a curve depends upon the rate at which its curvature varies from point to point. It may be very conveniently stated by specifying the change in the length of the radius of curvature per unit length of arc. Thus the rate of change of radius of curvature might be $\frac{1}{2}$in. per 1in. length of arc. If one curve be derived from another by diminishing the lengths of successive small arcs, all in the same ratio, and at the same time diminishing in the same ratio the radii of curvature of these successive small arcs, the two curves will differ simply in the second being drawn to a smaller scale than the first—they will have the same general shape. It would be very convenient if the radii of curvature were marked in figures at the different points of the edges of wooden template-curves. A very useful description of curve is obtained by keeping the above rate of change of radius of curvature per unit length of arc uniform throughout the length of the curve. Take, for instance, the above given example of $\frac{1}{2}$in. change of radius per 1in. length of arc, and suppose this rate maintained uniform from point to point. Let the radius of curvature at point A be 12in.; let B C D E F be points in the curve whose distances from A measured along the arc are $\frac{1}{4}$in., $\frac{1}{2}$in., $\frac{3}{4}$in., 1in., and $1\frac{1}{4}$in. Call the radius of curvature ρ; for instance at A, $\rho_a = 12$in.; then $\rho_b = 12\frac{1}{8}$in.; $\rho_c = 12\frac{1}{4}$in.; $\rho_d = 12\frac{3}{8}$in.; $\rho_e = 12\frac{1}{2}$in.; $\rho_f = 12\frac{5}{8}$in. &c., &c. Let the point K be distant from A 24in. measured along the arc. Here $\rho_k = \rho_a + \frac{24}{2} = 12 + 12 = 24\text{in.} = 2\rho_a$. Take now on the curve points L M N O P distant from K by arcs of lengths $\frac{1}{2}$in., 1in., $1\frac{1}{2}$in., 2in., and $2\frac{1}{2}$in.; that is, at distances apart double those between B C D, &c. We then have $\rho_l = \rho_k + \frac{1}{2} \times \frac{1}{2} = 24\frac{1}{4}\text{in.} = 2\rho_b$; $\rho_m = 24\frac{1}{2}\text{in.} = 2\rho_c$; $\rho_n = 24\frac{3}{4}\text{in.} = 2\rho_d$; $\rho_o = 25\text{in.} = 2\rho_e$; and $\rho_p = 25\frac{1}{4}\text{in.} = 2\rho_f$. Thus this latter portion of the curve differs from the first only in that it is drawn double size. It is clear, therefore, that the different portions of the curve have all the same "shape" as defined above, and differ only in size or scale; each portion is simply a repetition of any other portion drawn to a larger or smaller scale. With a set of curve-templates designed on this principle and drawn to a suitably graduated series of "rates of change of radius of curvature per unit length of arc," a practically inexhaustible variety of curves may be fairly drawn, whether they be required to be drawn to a large or a small scale. For instance, the series may be the following: Template No. 1, rate of change of radius of curvature $\frac{1}{4}$in. per 1in. length of arc; template No. 2, $\frac{1}{2}$in. per 1in. length of arc; template No. 3, $\frac{3}{4}$in. per 1in. length of arc; template No. 4, 1in. per 1in. length of arc; template No. 5, $1\frac{1}{2}$in. per 1in. length of arc; template No. 6, 2in. per 1in. length of arc; template No. 7, $2\frac{1}{2}$in. per 1in. length of arc; template No. 8, 3in. per 1in. length of arc; template No. 9, $3\frac{1}{2}$in. per 1in. length of arc; template No. 10, 4in. per 1in. length of arc, &c.

FIG.2

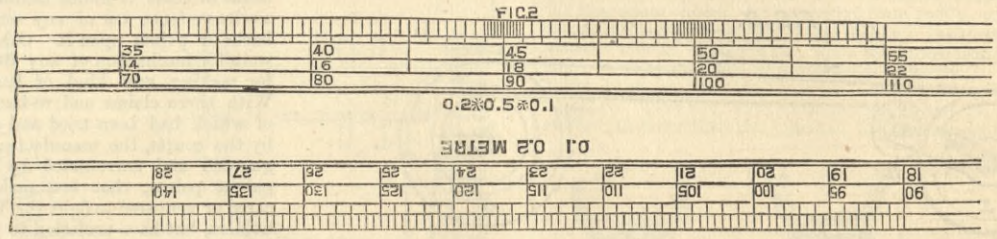
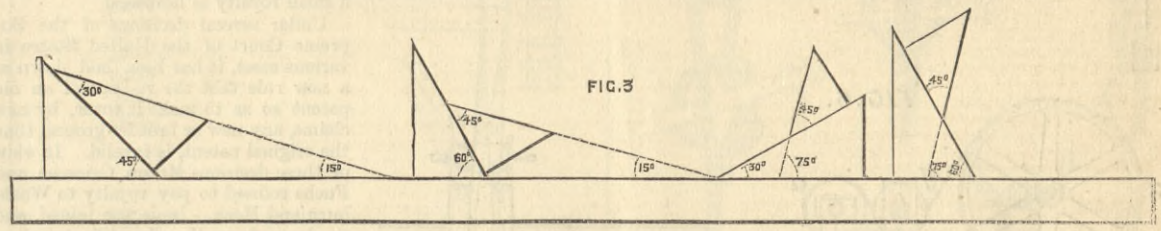


FIG.3



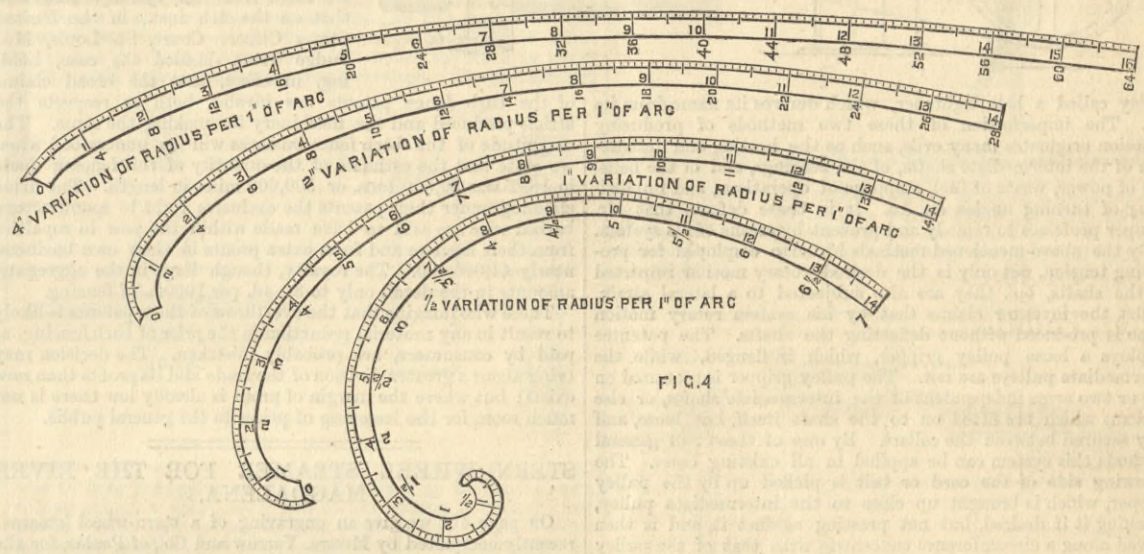


FIG.4

Figs. 4 shows three examples of these curves accurately drawn. A scale of inches is divided off on the edge, and the radius of curvature figured at the chief points. The scale should be marked on both sides for convenience in drawing two-sided symmetrical figures. To ensure perfect symmetry of the second side with the first, it is only necessary to plot off two points, and lay between them the reverse side of exactly the same portion of curve-template as has been used between the corresponding two points of the first side.*

Curves are frequently drawn with the help of splines of lancewood. If these are well-made and in good condition they answer the purpose very well, but if by warping or otherwise the spline has become irregularly bent, then it is very difficult to bend it so as to draw fair curves, the local natural bend or twist in the rod always being reproduced to a greater or less extent in its artificially bent condition. It is difficult to preserve splines, even if made of the best wood and perfectly straight and regular at first, so as to avoid comparatively speedy injury by local bending. This is partly produced by the use of the spline, whereby, owing to the imperfect elasticity of the wood, severe permanent set is produced in special places. Carefully made splines of slightly hardened steel of small section would not be subject to this disadvantage, but it would be difficult to harden them as much as would be necessary to avoid permanent set arising through their continued use, without twisting and bending them in the hardening.

* The equation representing the above kind of curve is—

$$\text{Radius of curvature } \rho = \epsilon^{c_2 - c_1 \tan. \frac{-1 dy}{dx}}$$

where ϵ^{c_2} is the radius at the point where the curve has its maximum height above the axes of x (c_2, therefore, merely showing the position in which the curve lies on the paper), and c_1 depending on the "shape," as defined above.

SAMPER'S PATENT PULLEY GRIPPER SYSTEM.

THE inventor of the "pulley gripper," an American, claims that up to the present year of grace the whole system of transmission of motion hitherto in vogue has been wastefully defective, and that he "was born to put it right." He has lately been exhibiting his invention applied in various ways to the machinery employed for the production of the electric light at the recent exhibitions at the Crystal Palace and at the Royal Aquarium; and as his system will be more extensively exemplified in the machinery shed at the Fisheries Exhibition, we give some notes upon it. The principal object of this invention is to increase the adhesion of the cords or belts employed for the transmission of motion, avoiding or nullifying the tension between the intermediate shafts, and guiding the cords or belts accurately. By the ordinary system the cords or belts embrace only half the circumference of the pulleys if these are of equal size, and less than half of one of them if they are unequal; but since the vibration of the belts while running causes them to lose their grip on a portion of the circumference embraced, it results that the adhesion is much less in practice than is expected, and in the majority of cases, being insufficient for the transmission of power, recourse has hitherto been had to two methods for establishing the adhesion and for supplying the want of points of contact between the cords or belts and the pulleys. These two methods are:—(1) Keeping the belts very tight; or (2) producing this same tension by means of a loose

FIG. 9.

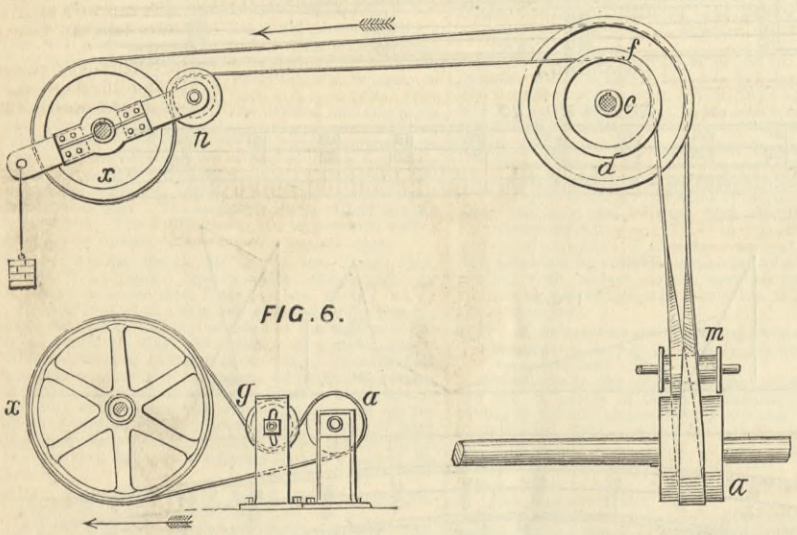


FIG. 6.

pulley called a belt tightener, which derives its name from its use. The imperfection of these two methods of producing adhesion originates many evils, such as the heating and destruction of the intermediate shafts, of the bearings, and of the belts, loss of power, waste of fuel, stoppage of operations, and impossibility of turning angles, &c. &c. It is these defects that Mr. Samper professes to remedy and prevent by means of his system.

By the above-mentioned methods hitherto employed for producing tension, not only is the desired rotary motion imparted to the shafts, but they are also subjected to a lateral strain, whilst the inventor claims that by his system rotary motion alone is produced without deflecting the shafts. The patentee employs a loose pulley gripper, which is flanged, while the intermediate pulleys are not. The pulley gripper is mounted on one or two arms independent of the intermediate shafts, or else on arms which are fitted on to the shaft itself, but loose, and only secured between the collars. By one of these two general methods this system can be applied in all existing cases. The following side of the cord or belt is picked up by the pulley gripper, which is brought up close to the intermediate pulley, touching it if desired, but not pressing against it, and is then moved along a circumference concentric with that of the pulley until it brings the following and leading sides of the belt nearly in contact, and in this manner the cord or belt embraces nearly the whole circumference of the pulley. The patentee has an idea, or appears to have, that this operation is executed without producing friction, "since the pulley gripper is loose, and the tension disappears in some cases, and is considerably reduced in others, because of the increase of adhesion." By these means the contact of the belt or cord with the driving pulley is increased from the ordinary average of 180 deg. to as much as 325 deg., thus causing the adhesion of the belt to the pulley to a point far beyond the centre of the shafts; and as the pulley gripper is always kept close against the intermediate pulley, it secures practically a steady adhesion of the belt throughout the whole circumference embraced. "The adhesion being thus increased, the necessity for tension disappears, and the following side of the cord or belt remains slack although the full motive force of the driving wheel is transmitted; and as the pulley-gripper has flanges for guiding the following sides of the cords or belts, Mr. Samper directs them at will, turns all kinds of angles, renders unnecessary the employment of toothed gearing, and obtains many other very important advantages." Such, at least, are the claims of the inventor in his pamphlet, from which we take two illustrations. The first, which is the sixth figure in his pamphlet, shows an arrangement by which the power is communicated from a large pulley to a very small one, the pulleys being very close together. As the pulley a is the only one that requires adhesion, the pulley-gripper g is placed close to pulley a, and in order to move it on a circumference concentric with that of the pulley, the slot i is made in the arm concentric with the pulley a, and in this slot the arm of the pulley-gripper is raised or lowered as required to regulate the tension of the belt. The second illustration we have selected shows a transmission in which, by means of two pulleys and one belt, he turns a right angle formed between two shafts on the same level. In the driven pulley a the pulley-gripper m is fixed, and in the driver x the pulley-gripper is regulating the tension of the belt. The shaft c makes the angle, and on it are two loose flanged pulleys, held by two collars screwed to the shaft. The larger pulley d carries the leading side of the belt, and the smaller pulley f the following side of the belt. In this case it is advisable to shorten the belt if it stretches, so that the two pulley-grippers may be kept on the same level, in order not to form a new angle, which would retard the working of the pulley f. In another illustration the inventor shows a transmission of power from a horizontal to a vertical pulley as used in mills; but we have no space for other blocks, and can only refer our readers to his pamphlet.

THE cutting of the new channel across the bar of the Brisbane River has been completed to a width of 200ft.

AN AMERICAN PATENT CASE.

THOSE who believe that the American system of granting patents is perfect, because the precautions taken by all the officials ensure the granting of valid patents, will do well to take the lesson conveyed by the following facts to heart. It is tolerably well known that a great demand has sprung up for barbed wire, that is fencing in the lines of which are fixed spikes or prickles, which serve to prevent animals from squeezing through or pressing against the fence. For several years past the manufacture of barbed fencing wire has been under the control, substantially, of a single concern, namely, the Washburn and Moen Manufacturing Company, of Worcester, Mass. They acquired an eminent position in the trade, in its early days, by the exercise of superior skill and enterprise in producing machinery to make the wire, by honest endeavour to furnish a first-class article, by promptness in filling orders, and finally by contenting themselves with a very small margin of profit. This was the original basis of their trade; it has been steadily maintained, and upon it has arisen the gigantic business now governed by a corporation. As soon as the barb fence business began to develope into large proportions, other makers became anxious to dip in and grasp a share. Thereupon Messrs. Washburn and Moen bought up all the principal patents relating to barb fences in order to prevent competition; they then applied to the Patent-office, and obtained re-issues of some of the oldest of these patents, on which new and broad claims were allowed. Some of these re-issued claims covered a wire or fence bar of any sort having barbs or points upon it. Other claims were for mechanism of any description for making any kind of barb fence. With these claims and re-issues, some of which had been tried and sustained by the courts, the manufacture was so guarded and surrounded by bristling patent points, that few makers have cared or ventured to fight the Worcester holders, but have preferred to pay them a small royalty as licensees.

Under several decisions of the Supreme Court of the United States in various cases, it has been laid down as a new rule that the re-issue of an old patent so as to make it cover, by new claims, any new or broader ground than the original patent, is invalid. In view of these decisions Messrs. Griesche and Fuchs refused to pay royalty to Washburn and Moen. Issue was joined, and we learn from the *Scientific American* that on the 4th inst., in the United States Circuit Court, St. Louis, Mo., Judge Treat decided the case, holding, in effect, that the broad claims of the barb fence patents are invalid, both as respects the article produced and the machinery for making the same. The magnitude of the barb fence business will be understood when we state that the estimate of the quantity of this fencing made in 1882 was 80,000 tons, or 500,000 miles in length. The firms claiming under their patents the exclusive right to manufacture barbed wire are said to have made within the year in royalties from their licences and from extra profits in their own business, nearly £1,000,000. The royalty, though large in the aggregate, amounts in the detail only to 8s. 4d. per 1000ft. of fencing.

Those who imagine that the overthrow of these patents is likely to result in any material reduction in the price of barb fencing, as paid by consumers, are probably mistaken. The decision may bring about a greater division of the trade and its profits than now exists; but where the margin of profit is already low there is not much room for the lessening of prices to the general public.

STERN WHEEL STEAMER FOR THE RIVER MAGDALENA.

ON page 491 we give an engraving of a stern-wheel steamer recently completed by Messrs. Yarrow and Co., of Poplar, for the navigation of the river Magdalena, in the United States of Colombia. It is generally known this firm has already built a large number of vessels of this type; they have been attended with very marked success. As a matter of fact, Messrs. Yarrow have obtained a speed of thirteen miles an hour in vessels 120ft. in length by 24ft. beam, having a draught of 12in.; and a speed of fifteen miles an hour in vessels 130ft. in length by 28ft. beam on a draught of 15in. Our engraving illustrates one of the largest of this type of vessel which Messrs. Yarrow and Co. have hitherto constructed. The dimensions, exclusive of the wheel, are 150ft. in length by 31ft. beam, with an estimated draught light of 15in., and it is confidently expected a speed of sixteen miles an hour will be obtained. The general design will be clearly seen from the illustration. There are three boilers of the return tubular type, adapted for a working pressure of 140 lb. per square inch, and of sufficient size and heating surface to give steam without a forced draught, they are placed on the main deck near the bow, and the engines are quite aft, on the usual American plan, so that the boat is on an even keel, whether light or loaded. This disposition of the machinery admits of a very light design of hull being made, the strain of these overhanging weights being taken by the system of diagonal ties. The engines are compound surface condensing, the high-pressure cylinder being 20in. diameter, and the low-pressure 33in. diameter, both having a stroke of 5ft. The air pump, circulating pump, and feed pumps, are worked by independent engines. The hull is throughout of steel, and is provided with three longitudinal bulkheads and five transverse bulkheads, subdividing the boat into twenty-four compartments. The cargo is carried on and below the main deck, and on the upper deck is the passenger accommodation. In comparing the efficiency of stern wheel boats with side wheel boats, we may remark that actual experience tends to show that with the same dimensions, displacement, and power, the stern wheel gives a little better result in point of speed. They are, however, quite unsuitable for withstanding rough weather, but for navigating smooth water only, where a shallow draught is an essential requirement, the stern wheel system undoubtedly offers many advantages.

AN OLD BRIDGE.—At the regular meeting of the Engineers' Club of Philadelphia on the evening of June 2nd, Professor L. M. Haupt exhibited a drawing of the Phœnixville Bridge, which was built by Mr. Moncure Robinson, C.E., honorary member of the club, in 1836, for the Philadelphia and Reading Railroad, over the River Schuylkill. It is an instructive and enduring monument of successful construction of cut-stone masonry. There are four segmental arches 72ft. clear span and 16½ft. rise; radius of arch, 47½ft.; voussoirs, 2ft. 9in. thick. One end abuts against a rocky bluff, while the other is supported by a heavy abutment with an earthen filling. It is believed to be one of the lightest and cheapest bridges of its kind in the United States, having cost but 48,000 dols.

HOW TO MANAGE WRECKED TRAINS.

WE publish the following article, which we extract from the *National Car Builder*, because it deals with a subject about which nothing, so far as we know, has been previously published in the English language. In this country engineers are not so much afflicted by derailments as they are in the United States and our colonies. But English engineers do not work exclusively at home, and those who contemplate going abroad may find the information we give very useful.

On a few roads the wrecking department is as complete in all its appointments as the master mechanic's department, of which it ordinarily forms a part, while on too many roads the only facilities for picking up wrecks are such jacks as can be spared from the machine shop, a pair of blocks and tackle, and a few pieces of timber picked up in a hurry, the rope of the tackle when wanted being usually unrove and carried off to take the place of a broken crane rope. Twenty years ago wrecking too often depended upon main strength combined with more or less stupidity, causing additional injury to cars and engines, so that when they were replaced on the track the damage from this source often exceeded that of the derailment and plunge down the embankment. It is a curious fact that broken rails and other causes of train accidents are too frequently found near bridges or on embankments, and the resulting damage is from this circumstance very much greater than it otherwise would be. A collision of two freight engines in which the damage ought to be limited to the front ends and cylinder heads,

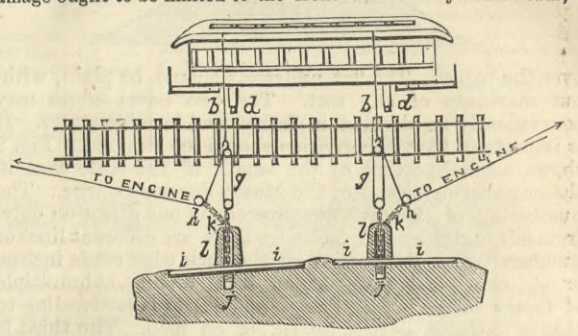


FIG. 1

will, in nine cases in ten, be supplemented by a roll down the bank, which is highest just at the spot where the collision occurs, while at a distance of 500ft. either way there is no bank at all. Broken rails, also, which throw trains off the track, are pretty sure to be in near proximity to bridges, and a simple derailment is consequently turned into a serious and expensive accident by the engine running over the ties to the bridge, breaking through the bridge timbers, and diving into a little stream which is not large enough to be of any practical use, but sufficiently large to make the job an ugly one for the wreckers. A large wreck is attended with something akin to the excitement of war. There is the same hurry and confusion. A big fire is built of whatever fuel comes handy; a crowd of half-frozen men gather round it if the weather is cold; no one knows how or when the next meal is to be obtained, all being on the alert to make the best out of the worst possible means. One poor fellow has injured himself by lifting, another has had a pick driven through his foot instead of into a tie, and another has been hurt, perhaps, by the recoil of a rope. A wrecking master must be largely endowed with the qualities of a military commander. He must be cool and self-possessed, and take time enough to form a

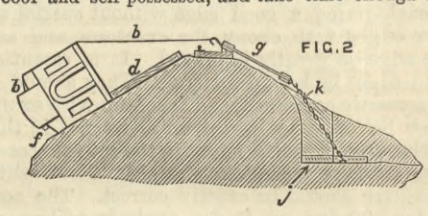


FIG. 2

definite plan before a move is made. He must receive suggestions, and never hitch on to an engine or car without knowing exactly what he is to accomplish by it. If the wreck is a large one, the president of the road company is usually present with a number of useless spectators. Instead of taking fifteen or twenty minutes to look over the ground and form an intelligent plan, as he would be capable of doing under other circumstances, the wrecking master, if he is a nervous and sensitive person, is apt to lose his head because the president is looking at him, and the train dispatcher sending messages every fifteen minutes asking how soon the track will be clear. The result is, that in his trepidation he hitches on anywhere, jerking as many cars on the track as he jerks off, and it finally turns out that between the original crash and the subsequent hauling and jerking, the cars are not worth picking up; and, as a last resort, they are got out of the way by setting them on fire, and reducing them to ashes.

There should always be found on each division of a road two derrick cars, each capable of lifting 20 tons. With these, and the ordinary tools of a wrecking car—jacks, 20ft. levers, blocks and tackle, plenty of extra rope and chain, &c.—a modern wreck of

FIG 3

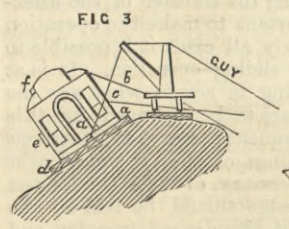
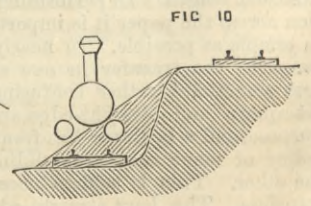


FIG 10

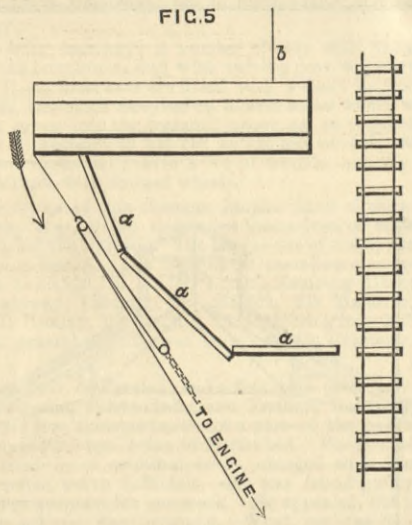


the average sort can be handled with comparatively little difficulty. Passenger cars must, of course, be handled with much greater care than freight cars, and it will now be shown what is considered the best practice in dealing with wrecks of this class of cars.

In Fig. 1 a passenger car is represented as having left the track and gone down an embankment, where it lies on its side lengthwise the track. Fig. 2 shows a section of the embankment and track, an end view of car, and wrecking tackle in place. Two ropes $b\,b$—Figs. 1, 2, and 3—are passed through the clear-story windows, as shown, and fastened to a plank f on the opposite side. Two pairs of blocks and tackle $g\,g$ are to be hooked to the ropes $b\,b$, and in the absence of trees or stumps to hitch to, an anchor, as shown, will be necessary. This anchor is made by cutting a trench long enough for the rail $i\,i$—Fig. 1. A cross opening $l\,l$ is then dug, and a tie $j\,j$ pushed beneath the rail, as shown. A chain or rope is fastened to the tie close to the rail, brought over the rail, and the block and tackle hitched to it. If the ground is soft, a plank should be used in place of the rail for the reason that it presents more surface. The tackle rope is then passed round an idler-block $h\,h$, and led to the engines, of which there is one at each end of the car. Two timbers $d\,d$—Figs. 1, 2, and 3—are placed as shown, and the engines are then started slowly. The car will then be pulled over on its bottom, as shown in Fig. 3, where it is held by the engines until two more pairs of blocks and tackles can be rigged to be pulled by hand, to a rope a, passing through the end side windows, and fastened to the plank e. The ropes $b\,b$ and tackles $g\,g$ may be removed and two derrick cars

placed one at each end of the passenger car. If the car is a sleeper, a guy-rope from the top of the derrick will be necessary; if it is an ordinary light passenger coach or baggage car, the derrick can be held in position by ice-tong clamps to the rails. The chain *c* of each derrick (Fig. 3) is fastened to the drawbars, and the weight of the car is then taken by the derricks, while the blocks and tackle hitched to the ropes *a* pull the car on the track between the two derrick cars. When the coach is resting squarely on the rails, one end is hoisted by the derrick and blocked; the derrick then picks up and places the truck on the track, and again takes the weight of the coach, while the blocking is removed to make room for the truck, which is then pushed under the coach into place. The other end is treated similarly, and the coach is ready to be removed. It may be laid down as a rule with passenger coaches and engines, that the first move should be to place them right side up. Coaches frequently in running off get turned so that their length is at right angles with the track, as shown in Fig. 4. In such case the hitch would be made as before, through the clear-story windows, the tackles placed as shown, and two engines employed. The timbers *a a a* should be placed and the car turned on its bottom. Fig. 5 shows the car in this position. A hitch is then made to the draw-bar, as shown, while a rope *b* is attached to the other end to keep it in position. The coach can then be pulled around parallel with the track. If soap is applied to the timbers *a a a* it will facilitate matters. When parallel with the track the coach is to be placed on it, as shown in Figs. 1, 2, and 3.

FIG.5



Freight cars are more easily handled. A derrick will pick one of them up bodily, as shown in Fig. 6, D being a bird's-eye view of derrick car, *b* the boom hitched to a freight car held in a rope sling *a*, *a*, and being lifted from the track to one side to clear the track. In replacing it on the track, it is first turned on its bottom, preferably by means of two or three 20ft. levers or derrick, when the derrick car would pick it up, and place it on its trucks on the track. Fig. 7 shows an old-fashioned way of putting freight car bodies on the track. A rope *a* is passed several times around the car, and the end fastened. It then passes around an idler-block *b*, and is hitched to the engine at *c*, which on starting up rolls the car toward the track.

Engines are more difficult to handle, especially the heavy Mogul and Consolidation types, because the weight is concentrated on the small surface of the drivers, which plough up and sink into the ground at almost every move. It is, therefore, time well spent to have plenty of heavy plank at hand to keep the engine out of the mud. In Fig. 8 an engine is shown off the track and crosswise of same, on its side and down an embankment, a combination of difficulties seldom met with. It would first be in order to place the timbers *e e* to receive the engine when right side up and to keep her out of the ground. Three jacks, *a*, *b*, and *c*—sometimes a block

FIG.6

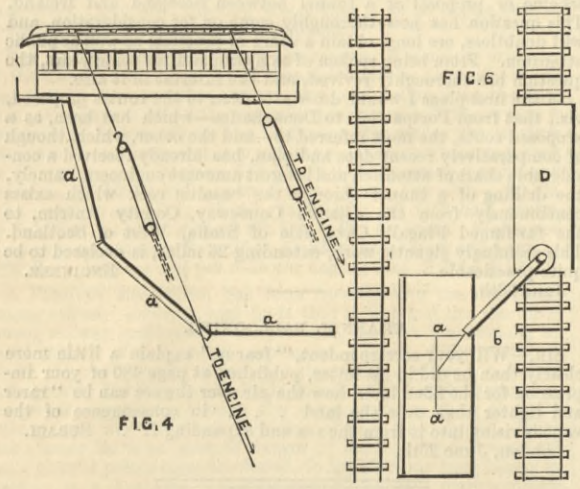


FIG.4

cut to the curve of the boiler is placed between the jacks and boiler—are placed as shown, beneath the boiler in pits dug for the purpose, and the engine raised from the ground. Two ropes *i i* are passed over each end of the boiler, as shown, and fastened to the frame on the bottom side. Two pairs of blocks and tackle are rigged and two engines used. The derrick car D can also be used to advantage if the engine is near enough to the track, and if not, the quick work performed by these cars will frequently pay to run two tracks out to the engine. Place a derrick car on each track and put the engine right side up by a direct lift with the two derricks. Guy ropes are then necessary from the top of the derrick to a good-sized tree or anchor, as the ice-tongue clamp will bring up the track with heavy lifts. Having the engine right side up, it should be jacked up so that the drivers will clear, blocking placed under the fire-box and cylinders and rollers *d d d* beneath this blocking and the timbers *e e*, as shown in the lower half of Fig. 8. A rope *g* will retain the back end of the engine in position, while a hitch at the front end with blocks and tackle as shown, will bring the engine in the direction of arrow on the timbers *f f* parallel with the track. Fig. 9 shows a bird's-eye view of the engine after it is parallel with the main track, which is cut and thrown to meet the engine. A line is hitched to front end of engine, by means of which it is pulled up the main track. Fig. 10 is a section of Fig. 9 at the front end of the engine, showing the bank cut away. When an engine lies half way down the embankment it is frequently necessary to cut large portions of the embankment away as well as to block up under the head of the engine when it does not lie parallel with the track. In old times, when an engine went through a bridge and down 70ft. or 80ft., it was frequently left there, it being considered that the expense of raising and repairing her would more than equal her value.

Fig. 11 is a bird's eye view, and represents an engine A, which is supposed to have gone down 70ft. It would be necessary to first bring her as close to the foot of the embankment as possible, by means already explained. Two derrick cars F F are placed, as shown, on temporary tracks, the booms extending over. The drivers, foot-board, cylinders and frames having been disconnected, the two derricks will readily lift the boiler. When the length of the derrick chain is raised the engine will necessarily have to be supported by slings and well anchored, until the derrick chains can be lowered and a second life made. When the engine is in water the difficulties are multiplied, although the derrick car affords a

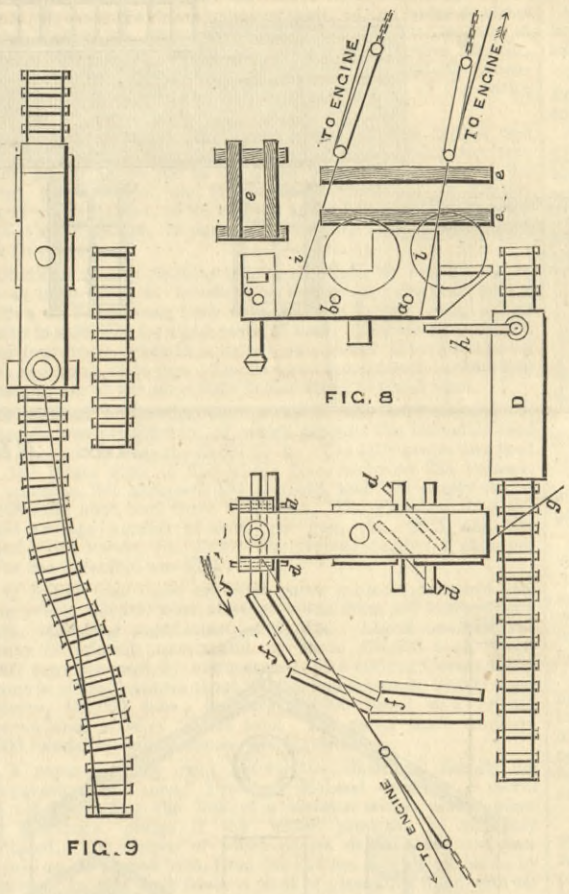


FIG. 8

FIG. 9

solution of almost any imaginable wreck. It is not, of course, necessary to suppose that the face of the embankment is perpendicular, nor does this make any difference, as the derricks will as readily drag the engine as lift it. We remember a case in which an engine was down a ravine about 60ft. below the track, in which case several weeks elapsed before she was raised. The plan adopted

FIG.7.

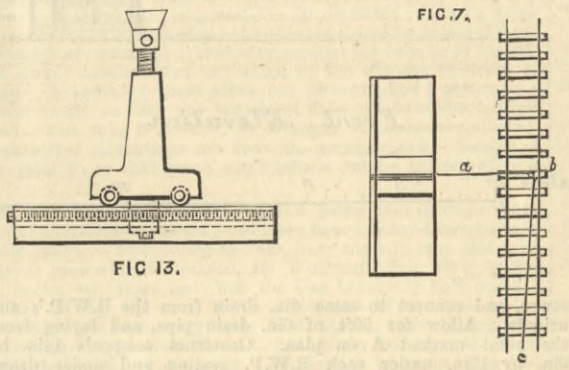
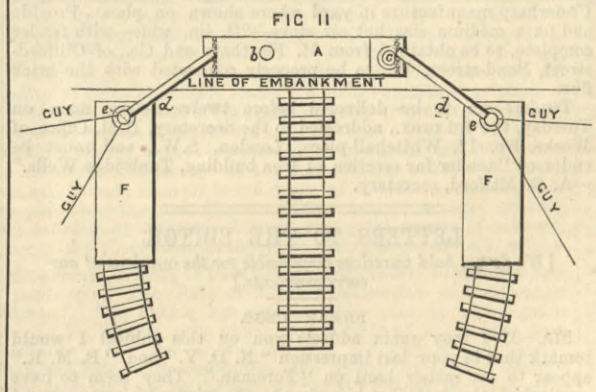


FIG 13.

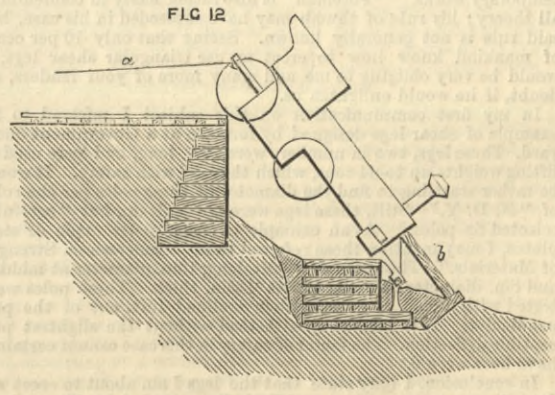
was to drag the engine several hundred feet up the ravine upon a long siding, a track being laid on this siding, and blocks and tackle used to pull her up the long steep incline. Fig. 12 shows a peculiar accident in which a dead engine was pushed off the end of a track, the bridge not being in place. In this case the back wheels did not leave the track, the front of the engine resting

FIG 11



on the ground. A rope *a* was hitched to the draw-bar of the foot-board, and two engines to the other end of the rope. The engines kept a heavy but steady strain on the rope. A timber *b* was placed as shown, to retain the engines in position while the excavation

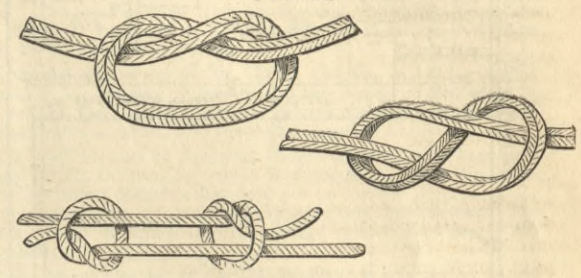
FIG 12



for blocking and jacks was made. Two jacks were then placed, one under each end of the bunter beam, as shown, and the engine jacked up a few inches, and then blocked. This was continued until the engine was level, with the back wheels resting on the main track. Two heavy square timbers were then placed, resting on the abutment and blocking. A freight car truck was then lowered, carried to the front end of the engine, and raised by blocks and tackle, and placed under the front end on rails spiked to the heavy timbers, when the engine was readily pulled on to the main track. Had the engine gone entirely down, as the distance was short, she could have readily been jacked and blocked squarely up to a level of the track. Several years ago an engine went off the track down an embankment, and turned completely over, resting on her dome. Both driving axles were badly bent, and were lifted out of the boxes and a new pair lowered into place, when the engine was turned over, and replaced on the track.

Fig. 13 shows a carrying jack, which used to be a very valuable tool in a wreck, although its usefulness is now superseded by the

FIG.14



derrick car. It consists of a jack on rollers, which, by means of the long screw shown, can be carried from end to end of the bed, which ordinarily allows a traverse of 30in. It can with another be placed under an engine or car, when the entire load can be carried 30in., and any distance by a succession of moves.

Fig. 14 shows different knots for fastening the ends of two ropes together. They are, with those in Figs. 15 and 16, shown as just started, in order that the course of the rope can be traced. They,

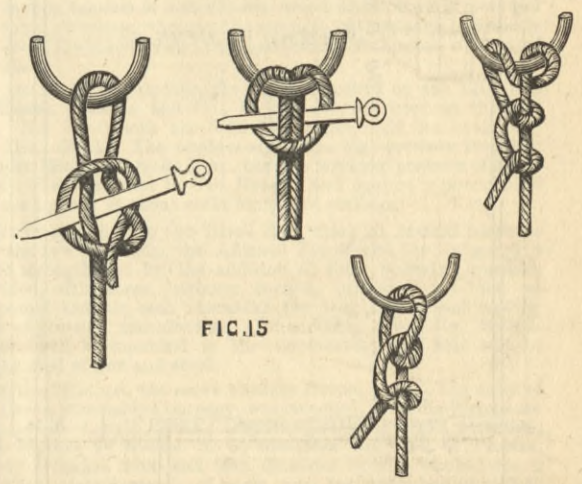
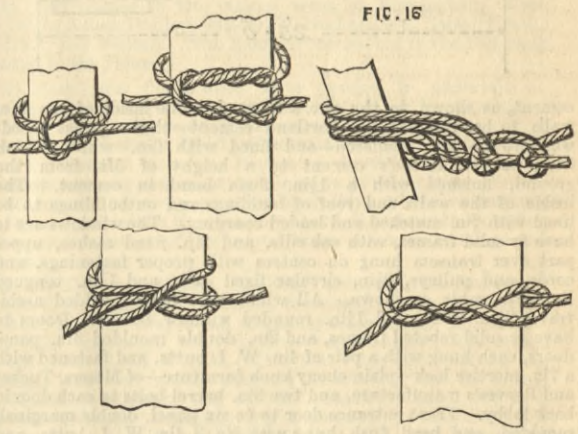


FIG.15

of course, only require to be drawn taut to complete the knot. Fig. 15 shows different modes of fastening ropes to the eye of a block or other similar ring. The two in which a coupling pin is not used can be continued for several turns more, and have ends fastened by binding with twine to the main rope. Fig. 16 shows different hitches to posts or trees; they are all quickly made and are reliable.

FIG. 16



The subject of wrecking is deserving of considerable study, as any one who has the superintendence of a big job will be pretty sure to discover. It might be supposed that the civil engineer of a road would make a good wrecker, from his knowledge of the handling of heavy structures. But this is not so. In carrying on his ordinary operations he has plenty of time at his disposal, with powerful derricks and other necessary appliances, but give him a small wreck with a flat car-load of timber, a few blocks and tackles and four or five jacks, and he would despair of accomplishing anything. The experienced and capable wrecking master, in handling heavy engines and cars with the usual limited means at his command, displays an amount of engineering talent that is none the less practical and effective because it has not been acquired by a regular course of technical education.

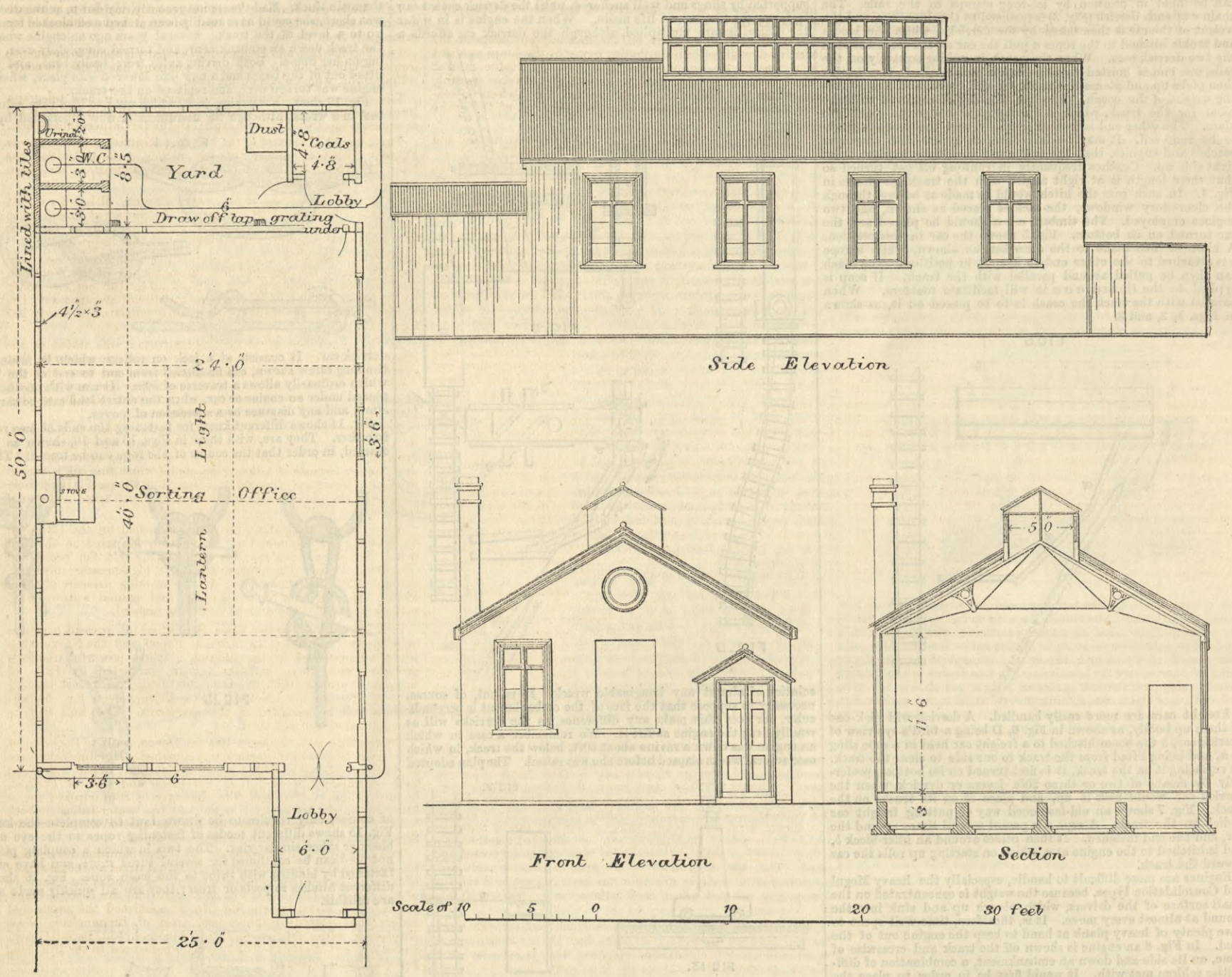
CONTRACTS OPEN.

IRON SORTING OFFICE FOR THE SOUTH-EASTERN RAILWAY COMPANY.

THE South-Eastern Railway Company wants tenders for the construction of an iron post-office sorting office at Tunbridge Wells.

The brickwork in the footings and sleeper walls to be of the best sound stocks and mortar, composed of one measure of the best fresh-burnt lias lime, of approved manufacture, and two measures of clean, sharp sand. To have York stone steps to entrances, 9in. longer than the openings, 1ft. wide, and 7ft. thick, and proper damp course of two courses of slates and cement on the top of all external walls. The framing to be formed with posts, cills, braces, window and door-cill and heads, and top and bottom plates, 4½in. by 3in., the posts being of the distances apart shown in the drawings. The floor joists to be 4½in. by 2½in., and plates 4½in. by 3in. The roof to have purlins, as shown, 5½in. by 2½in. and 2½in. by 2½in., secured by clips to the iron roof, with ridge, 9in. by 1½in., with fillets on each side. Curb for lantern, as shown. The whole of the timbers to be of the best Memel, free from sap, shakes, and large or loose knots. Provide and fix a lantern light, as shown on detail, with 2in. top, and side lights being hung on centres, with proper pulleys and lines for opening and closing, the flooring to be 1¼in. yellow deal, rebated and filletted and properly trimmed to hearthstone. Provide and fix in floor on brick foundation a York stone slab 4ft. by 3ft., and 3in. thick to take the stone. Build brick chimney breast and shaft, as shown on the drawings, and carry up flue, with 9in. unglazed earthenware pipes and build half brick walls in

CONTRACTS OPEN—IRON SORTING OFFICE.



cement, as shown, to the w.c.'s in yard. The inside of the w.c. walls to be rendered in Portland cement—that against woodwork to be lath rendered—and lined with 6in. white Dutch tiles, set in Keene's cement to a height of 5ft. from the ground, finished with a 1½in. flush bend in cement. The inside of the walls and roof of buildings and outbuildings to be lined with ⅞in. matched and leaded boarding. The windows are to have fir solid frames, with oak cills, and 2in. fixed sashes, upper part over transom hung on centres with proper fastenings, and cords, and pulleys, 2½in. circular fixed sash, and 1½in. tongued lining in gable as shown. All windows to have moulded architraves 2½in. wide, and 1½in. rounded window boards. Doors to have fir solid rebated frames, and 2in. double moulded 4in. panel doors, each hung with a pair of 4in. W. I. butts, and fastened with a 7in. mortise lock—plain ebony knob furniture—of Messrs. Tucker and Reeves's manufacture, and two 9in. barrel bolts to each door in back lobby. Front entrance door to be six panel, double marginal, moulded, and bead flush, hung with No. 3 4in. W. I. butts, and fastened with a 12in. drawback lock and two 12in. iron barrel bolts. Doors to have moulded architraves similar to those described for windows. The inner doors to entrance lobby to be 2½in., double hung and swing, lower panels double moulded, upper ones glazed with British plate glass, ¼in. thick. Provide and fix Cartland's swing hinge to each door, price £3 3s. each. Yard walls to have moulded coping as shown. W.C. doors to have lower panels bead flush and square, and upper panels filled in with rough plate glass, ¼in. thick, each door having a 6in. brass bolt and 6in. loop handle. The lobbies are to have boarded floors, but the w.c.'s and yard are to be paved with 3in. tooled York stone, the w.c.'s 1½in. seats, and 1in. risers on proper frames and bearers, with holes cut and dished, and beaded hand holes formed. Provide and fix 1½ W. and moulded barge boards and gables, as shown. Provide and fix dust-bin, where shown, with batten top and flap, and door at bottom to slide in proper grooves. Provide and fix where shown by dotted lines, W. I. principals, 2½in. by 2½in. by ⅜in. iron, tee, and ⅝in. rods, with C. I. ornamental struts and supports to lantern, the whole to be of the best Staffordshire iron. The walls and roof to be covered with galvanised iron, No. 20 gauge, all to be the make of T. Lysaght and Co. (Limited), Bristol, properly screwed up and caulked with red lead and tow where necessary, the ridges being covered with iron ridge-pieces, having 4in. lap with 5lb. lead flashings as required. Provide and fix a 4in. O.G.C.I., eaves gutter to the roofs with 3in. C.I. rain-water pipes, with proper heads, bands, and shoes to discharge over gratings. The inside of the iron roof to be covered with felt of the best quality, and in the walls the space between the iron and the matchboarding is to be fitted in with clean dry sawdust. All the sashes to be glazed with 21 oz. fluted glass, properly sprigged, puttied, and back-puttied; the top of the lantern to be glazed with rough plate-glass ¼in. thick. All matchboarding to be stained and twice varnished with the best copal, and all the other wood and ironwork, except the galvanised iron, both internal and external, to be painted four oils, of a tint to approval. Provide and fix two galvanised iron cisterns, 6ft. by 3ft. 6in. by 2ft. 6in., over the w.c.'s in yard, one to supply w.c.'s and urinals, and the other the draw-off tap, and bring in water from the main with 1in. service pipe, with 1in. stopcock in same, and copper ball cock to each cistern. Fit up each w.c. with Dalton's Staffordshire flushing rim pan, and syphon with Conolly waste-water preventer, and properly connect to drain. Fit up urinal with 1in. rubbed slate-black and divisions, and slate bottom, with channels and brass rim, and grate with syphon under, properly connected with the drains, and fit up Doulton's lipped urinal as shown. Construct 6in. potteryware glazed tubular drains set and jointed in cement from the w.c.'s to the main sewer, and connect to same 4in. drain from the R.W.P.'s and urinals. Allow for 50ft. of 6in. drain pipe, and laying from the point marked A on plan. Construct cesspools 14in. by 9in. by 12in. under each R.W.P. grating and under draw-off tap in yard in brickwork in cement, with York stone dished kerb and iron grating to be properly trapped and connected with the drain. Lay on water to each w.c. apparatus, draw-off tap, and urinal with ½in. pipe to the container of the waste preventer, and from thence with 1¼in. lead pipe to the apparatus, &c. Each ½in. branch pipe is to have a ½in. screw-down stopcock placed where directed. Provide and fix a ½in. screw-down tap of Underharp manufacture in yard where shown on plan. Provide and fix a medium size hot air stove—2ft. 4in. wide—with fender complete, to be obtained from M. Fleetham and Co., of Clifford-street, Bond-street, W., to be properly connected with the brick flue.

Tenders are to be delivered before twelve o'clock noon on Tuesday, the 3rd prox., addressed to the Secretary, H.M. Office of Works, No. 12, Whitehall-place, London, S.W., and must be endorsed "tender for erection of iron building, Tunbridge Wells." —A. B. Mitford, secretary.

LETTERS TO THE EDITOR.

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

SHEAR LEGS.

SIR,—If I may again address you on this subject I would remark that in your last impression "N. D. Y." and "E. M. R." appear to me rather hard on "Foreman." They seem to have overlooked the fact that he refers to the triangular arrangement of shear legs, and deals with a lighter weight on much shorter poles than was under discussion. With three poles of the dimensions he gives, viz., 20ft. long and say 9in. diameter as an average, and 14 tons suspended, the formula of Trautwine, as given by "E. M. R.," would show a factor of safety of 6, which is perhaps sufficient in temporary works. "Foreman" is also rather hasty in condemning all theory; his rule of thumb may have succeeded in his case, but said rule is not generally known. Seeing that only 10 per cent. of mankind know how to erect or use triangular shear legs, it would be very obliging to me and many more of your readers, no doubt, if he would enlighten us.

In my first communication on this subject I referred to an example of shear legs designed by foremen at a Government dock-yard. These legs, two in number, were 74ft. long, and were used in lifting weights up to 44 tons, which they did with safety. It would be rather startling to find the diameter of these poles per the rules of "N. D. Y." Still, these legs were not built up, but "carefully selected fir poles." As an example of shear poles made of steel plates, I may mention those referred to in "Anderson on Strength of Materials." The poles were 40ft. long, 15in. diameter at middle, and 8in. diameter at ends; plates ·185in. thick. These poles were tested with a load of 36 tons when inclined 15ft. out of the perpendicular. This load they withstood without the slightest perceptible deflection. The factor of safety in this case cannot certainly have been even 6.

In conclusion, I may state that the legs I am about to erect are for a temporary purpose, and I shall be guided by Trautwine's formula; but the factor of safety will be taken at 5.

Leith, June 27th. READER.

AN IRISH-SCOTCH TUNNEL.

SIR,—In drawing attention to a question which, though often considered, will yet receive a more practical treatment and study at the hands of the engineering profession, I would refer to the scheme or proposal of a tunnel between Scotland and Ireland. This question has now thoroughly come on for consideration, and will doubtless, ere long, obtain a share of practical as well as public attention. From being spoken of as a proposal for some years, the question has thoroughly revived, and the interest in it also.

In the first place I would draw attention to the routes proposed, viz., that from Portpatrick to Donaghadee—which has been, as a proposed route, the most referred to—and the other, which, though of comparatively recent date and plan, has already received a considerable share of attention and interest amongst engineers, namely, the drilling of a tunnel through the basaltic rock which exists continuously from the Giant's Causeway, County Antrim, to the far-famed Fingal's Cave, Isle of Staffa, West of Scotland. This seemingly gigantic work, extending 26 miles, is declared to be quite practicable. ENGINEER.

June 26th.

CHANNEL BALLOONING.

SIR,—Will your correspondent, "Icarus," explain a little more clearly than he did in his letter, published at page 480 of your impression for the 22nd inst., how the air over the sea can be "rarer and lighter than over the land . . . in consequence of the vapour rising into it from the sea and expanding it"? SURACI.

London, June 25th.

DEATH OF DR. SPOTTISWOODE.—We announce with great regret the death of Dr. Spottiswoode, President of the Royal Society. Dr. Spottiswoode died of the supervening effects of Roman fever, in the 59th year of his age, on Wednesday. He had been ill ever since a recent visit to Rome, but until the day before his death his recovery was confidently anticipated. Dr. Spottiswoode was in all respects an eminent man of science, and it is impossible in a brief space to do justice to his life and labours. For the moment it must suffice to state that he was born in London in January, 1825, and received the early portion of his education at Dr. Buckland's school at Laleham, whence he passed to Eton and Harrow. At Harrow he gained the Lyons Scholarship, and entered Balliol College, Oxford, in 1842. Graduating B.A. first class in mathematics in 1845, he gained various University distinctions, including the University Mathematical Scholarships of 1846 and 1847. In 1857-8 Dr. Spottiswoode was Public Examiner in Mathematics at Oxford, and also acted during the first year of operation as an examiner under the Civil Service Commission, as also at the Society of Arts examinations, and those of the Middle Class Schools Corporation. He was a Fellow of the Astronomical, Geographical, Asiatic, and Ethnological societies, and of the Society of Arts, and the Royal Society, of which he was appointed treasurer in 1871, and subsequently elected president. In 1871 he received the honorary degree of Doctor of Laws from the University of Edinburgh; in 1876 was elected a Corresponding Member of the Academy of Sciences of Paris; and in 1878 acted as president of the British Association, when the authorities of Trinity College, Oxford, conferred upon him the honorary degree of LL.D. Dr. Spottiswoode was the author of a work on the "Polarisation of Light," published in 1874 as a volume of the Nature Series; a volume of "Travels in Russia;" and a mathematical book entitled "Meditationes Analyticæ;" besides contributing various papers to the "Philosophical Transactions" of the Royal Society, the "Transactions" of the Astronomical Society, and to other English and foreign scientific publications.

RAILWAY MATTERS.

THE Canadian Pacific Railway land sales for May were considerably more than for some months previous. The average price was about 4·50 dols. per acre.

THE Queensland Government have called for tenders for the construction of the first fifteen-mile section of the railway from Brisbane to the Logan.

LARGE quantities of timber are being sent by rail to Quebec *viâ* the Canadian Pacific Railway, and it is considered likely that a considerable portion of the trade will hereafter follow this route.

A CONTRACT for the building of nineteen locomotives for the Canada Intercolonial Railroad has been secured by the Canadian Locomotive and Engine Company of Kingston. This is the largest order yet secured by this company.

A REGULAR service for the Canadian Pacific Railway is now provided from Prince Arthur's Landing westward to Medicine Hat, a distance of 1095 miles, and by the close of the season the road will be in operation on a continuous length of 1400 miles.

THE German Government has offered to buy the lines of the following six companies, in order to complete the State Railway system :—Upper Silesia, Berlin and Hamburg, Kiel and Altona, Oder—right bank—Breslau and Friburg, and Posen and Kreuzburg.

IN Switzerland in 1881 the average distance run per locomotive was 16,039; on the German railroads it was 17,185; and on the Austro-Hungarian roads 16,010 miles. In this country by the last census it was 22,355 miles. Here, therefore, 100 locomotives do as much work as 131 in Germany, 139 in Switzerland, and 140 in Austro-Hungary.

ON the Hamburg tramways a number of cars with flangeless wheels, much like omnibuses, and with turning gear, are working. To run on the lines, these cars are fitted with a shaft in front of the front wheels, this shaft carrying on a lever a disc wheel which the driver can lower into the tramrail groove as he requires, or raise it when it is necessary to get out of the way of obstructions. The arrangement works well, saves a lot of trouble, and the cars run easier than those with flanged wheels.

FORTY-FOUR towns of the German Empire have already constructed tramway lines, which they work themselves, or of which they have conceded the working. The largest net of tramway lines —124 miles—is at Berlin. The number of travellers conveyed in 1882 has risen to 65,218,792. After Berlin, Hamburg-Altona has 65 miles of tramway; Cologne, 27; Munich, 24; Hanover, 19; Nüremberg, 19; Breslau, 16; Leipzig, 15. Differing from Belgium and France, no general law has yet been made in Germany as to tramways.

CONSUL BERTHOLD, of Breslau, had a free pass given him as a director of the Breslau, Schweidnitz, and Freiburg Railroad. He used it to secure free transportation for a part of the baggage of his wife and daughter when going to Marienbad. For this he was arrested and tried by a criminal court, charged with illegally obtaining a service worth 1.38 dols. He was found guilty and sentenced to imprisonment for one week. He appealed, but in the higher court his sentence was confirmed. What, says the *Railroad Gazette*, if this were thus in America?

A DIRECT line is projected between Brussels and Maintz, which would put London within thirteen hours of the last-named town, and twelve hours of Frankfort-on-the-Main. Goods would also be conveyed direct from Antwerp and Ostend, with a great saving of mileage. The Belgian Government wishes to get all the railways into its own hand, but the state of the Exchequer scarcely warrants the necessary outlay. The promoters of the company, therefore, offer to make the line, to be afterwards bought or worked by the State, if the Government will bring in a Bill giving them the concession, and provided always that the German Government make that portion on its territory.

OUR Birmingham correspondent writes that in the widespread movement for lower railway freights the Midlands continue to take a not unimportant part. The latest in this connection is from Dudley. The chain makers have found out an anomaly under which higher rates have to be paid for chains that are undamageable than for those that are damageable and more valuable. The usual list of anomalies in the carriage of iron forms another subject of complaint. These grievances were ventilated at the beginning of the week by the Dudley Chamber of Commerce. This body is now in communication with the Associated Chambers, through whom they hope to obtain redress at the hands of the Railway Commission.

THE recently issued half-yearly statement of working expenses of the Stockton and Darlington Steam Tramways Company states that the six Merryweather engines employed are working the lines at an average cost of 3·12d. per mile per engine. This average is obtained as follows from the following figures, as the engines have been in use over eighteen months :—Average wages per week for 27 weeks on six engines, £10 10s. 11·11d. ; average repairs and renewals, £4 10s. 4·20d. ; coke (7 tons 14 cwt. 1 qr. 7 lb.), £5 12s. 1·3d. ; coal (6 cwt. 3 qr. 15 lb.), 4s. 7·11d. ; oil (113 half pints), £1 0s. 3·74d. ; cotton waste (15 lb.), 3s.—£22 1s. 3·86d. Water and preparing coke (per mile), ·26. Average number of miles run — 1850·85. Average cost per mile per engine, 2.86 + ·26 = 3·12d.

A FLEMISH statistician has been investigating the death-rate among railway servants, and finds that in England the mortality among railway employés is 21 per cent. greater than among an equal number of the general population, though while at the age of 25 the railwayman stands a better chance than his fellow. This greater liability to death is presumably largely because of dangerous occupation, though the same statistics show that the railway man has the greater number of days of sickness. Being sick oftener he is in greater danger of death. In Germany the same general percentages are found, to frighten one from taking up railway as a business. The *Railway Review* says, more complete figures in Germany show that the train-man is sick some 40 per cent. more than other railway men, and that his death-rate is 23 per cent. above the average.

AN official inspection by Major General Hutchinson was made on Tuesday of the South Staffordshire section of the South Staffordshire and Birmingham District Steam Tramway Company's line—a section about seven miles in length extending from Handsworth to Darlaston. The result was understood to be satisfactory, the only alteration required being the removal of a set of crossing points. The scheme was designed by Messrs. Lloyd and Kincaird, civil engineers, Westminster, and the contract for carrying it out was undertaken by the City of London Contract Corporation, Limited, who sub-let portions of it. The orders for the cars were given to Messrs. Starbuck, Birkenhead, and the Falcon Engine and Car Company, Loughborough; and the contract for the engines to Messrs. Beyer, Peacock, and Co., Manchester, who will supply twenty engines of Wilkinson's patent, each of about 40-horse power.

THE Mersey Railway Company, now constructing the tunnel railway between Liverpool and Birkenhead, says in a circular offering for subscription the balance of the share capital, that the works are so far advanced that the directors are now able with confidence to look forward to the completion of the entire undertaking at a comparatively early date. The following railways will use the line :—The London and North-Western, the Great Northern, the Lancashire and Yorkshire, the Manchester, Sheffield, and Lincolnshire, the Great Western, and the Midland. The directors have availed themselves of the resolution passed on the 6th instant by the House of Commons, sanctioning the payment of interest at 4 per cent. per annum during the construction of railway works, to introduce a clause for that object in the Bill now before Parliament As soon as it receives legislative sanction, interest at 4 per cent. per annum will accordingly be paid on the capital now for subscription from the date of payment of each instalment.

NOTES AND MEMORANDA.

THE organic impurities in the water supplied by the Lambeth Water Company during the month of May were greater than by any other company. Taking the organic impurity of the Kent Company's water as 1, the impurity of the Lambeth Company's water was exactly 4.

COLONEL HAYWOOD'S report on the incandescent lamps on the Holborn Viaduct gives the illuminating power of the lamps as about 1¼ times that of the ordinary gas lighting of the Viaduct, and at the same cost. The observations extend over twelve months, during which the total number of failures from defects in machinery and carbons was equal to about 0·3 per cent. of the entire lighting.

THE produce of labour has been divided between capital and labour as follows in the countries named :—Assuming the produce of labour to be 100 in Great Britain, 56 parts go to the labourer, 21 to capital, and 23 to the Government. In France, 47 parts go to labour, 36 to capital, and 17 to the Government. In the United States, 72 parts go to labour, 23 to capital, and 3 to the Government.

ACCORDING to the *Milling World*, sackcloth or canvas can be made as impervious to moisture as leather, by steeping it in a decoction of 1 lb. of oak bark with 14 lb. of boiling water. This quantity is sufficient for eight yards of stuff. The cloth has to soak twenty-four hours, when it is taken out, passed through running water, and hung up to dry. The flax and hemp fibres, in absorbing the tannin, are at the same time better fitted to resist wear.

THE amount of powder fired away in the bombardment of Alexandria was 131,856·5 lb., of which amount the Inflexible used 39,900 lb., and the Superb, 22,897·75 lb. The 3198 projectiles fired from the larger guns of the whole fleet, included 233 Palliser, 2246 common, 261 shrapnel, 154 segment, and 175 empty shells, and 126 solid shot, and three case shot. The Penelope fired the highest average number of shots per gun, viz., 28·8, and the Invincible the lowest, viz., 12·6. The average number of shots per gun for the Inflexible was 22·0.

IT is stated that there are 3985 paper mills in the world producing yearly 959,000 tons of paper made from all kinds of substances, including rags, straw, and alfa. About one-half the quantity is printed upon; and of those 476,000 tons, about 300,000 tons are used by newspapers. The various Governments consume in official business about 100,000 tons; schools, 90,000 tons; commerce, 120,000 tons; industry, 90,000 tons; and private correspondence another 90,000 tons. The paper trade employs 192,000 hands, including women and children.

IN a paper recently read before the Chemical Society on "Evaporation in Vacuo," Professor McLeod describes a useful valve for preventing the loss of a vacuum which occurs when using Körting's pump if the water pressure be suddenly diminished. The stream of water passes down a narrow glass tube into an elongated bulb, from the bottom of which it issues by a T-piece. In this bulb floats a piece of glass tube filled with air and closed at both ends, so that it just floats in water. The upper end of this float is ground, so that if the water stream stops the float rises and stops up the narrow glass tube; the vacuum is thus preserved.

PROFESSOR RAMSAY recently described and exhibited a new gas burner for heating combustion tubes. The burner consists of a Bunsen burner, on the top of which fits a brass T-piece. The top of the T is about 6in. long and 1in. in diameter; it has a longitudinal slit cut in it on the top; the ends are closed by pieces of sheet brass which are arranged so that they support the tube to be heated. By a simple arrangement any third of the slit can be closed or opened. A series of these tubes can be connected together by a bayonet catch, so that any length of tube can be supported and heated. The tube is covered by a length of asbestos cardboard. The principal advantages are that the arrangement is cheap and cools quickly, so that seven combustions can be performed in a day.

THE largest gas main in the world is being laid through Westminster. Its diameter is 4ft., and more than twenty-three miles of this 4ft. main, in four diverging lines, have already been laid from the great gasworks at Beckton, by Woolwich, the work having been begun ten years ago; but the Gas Company only began a month or two ago the work of continuing one of the lines of the great main from Horseferry-road, Westminster, right through the heart of London, to Goswell-road, St. Luke's, where is the chief district station of the company. The section of main being laid will be 3½ miles long, which will make the length of the entire main from Beckton on this route about 17½ miles. Some interesting experimental data on the flow of gases through a large long pipe ought to be obtainable from this.

THE chemical now mostly used in intensifying gelatine plates is bichloride of mercury in combination with ammonia, iodide or cyanide of potassium. The main difficulty of such intensification has been that it was not stable; in a short time the image on the plate, if exposed much to the light, would fade out, and spoil the negative. The intensifier given below, says the *Scientific American*, has been found to work well, and at the same time possesses the quality of being absolutely stable. A stock solution of sulphate of iron is made as follows :—Sulphate of iron, 15 grains; citric acid, 15 grains; water, 1 ounce. A second solution is made as follows:—Water, 1 ounce; nitrate of silver, 10 grains; acetic acid, 10 minims. To intensify, take enough of the iron solution to cover the plate, and add thereto from six to ten drops of the silver solution, flood the plate, and the intensification will proceed in a clear, gradual, and satisfactory manner. To produce a great degree of intensity more of the silver solution should be added, a few drops at a time.

AT a recent meeting of the Chemical Society Mr. V. H. Veley read a paper on "The Rate of the Decomposition of Ammonium Nitrate." The author has measured the rate at which gas is evolved by heating pure ammonium nitrate at a constant temperature. He has arrived at the following conclusions :—That the rate of decomposition into nitrous oxide and water is dependent not only on the mass of the salt but on the proportion of free nitric acid present. If the reaction of the salt be rendered alkaline, the rate gradually increases as the proportion of free acid increases; a period of maximum velocity is then reached, corresponding to the greatest proportion of free acid; the rate then slowly decreases with the decrease of free acid. An excess of ammonia completely stops the reaction even when the temperature is raised 50 deg. or 60 deg. above the normal temperature of decomposition. If the reaction of the salt be rendered acid at starting the rate of decomposition gradually decreases as the acid decreases. After heating the salt for thirteen to sixteen hours the rate of change becomes practically constant.

AT a meeting of the Chemical Society on the 21st inst. Professor McLeod read a paper on "Evaporation in Vacuo." The ordinary method of evaporation in vacuo over sulphuric acid is very slow. The author was led to try some experiments on the evaporation of water at low temperatures by some remarks of Professor Mallet—*Chem. News* xlvi., 62, 73, &c.—and the method was suggested by Wright's apparatus for the distillation of mercury—*Chem. News* xliv., 311. A somewhat similar apparatus is described by Mallet—*Chem. News* xlvii., 218, 252. In one form of apparatus the author used a Körting's jet pump to produce the vacuum; the water was evaporated in a glass dish with ground top which pressed a red india-rubber ring against a brass ring soldered to a copper dome. The aqueous vapour was condensed in a copper vessel consisting of a truncated cone within a cylinder. The tube by which the water to be evaporated is supplied ends in a small glass funnel, the mouth of which touches the inside of the dish. The dish is surrounded by a water-bath at 50 deg. The temperature of the water in the dish was found to be 26 deg.; 50 c.c. of water can be evaporated in two hours. Some modifications were described by the author.

MISCELLANEA.

THE Postal Telegraph Company of America has contracted for the laying of new Transatlantic cables, which are to be immediately constructed.

THE Melbourne Harbour Trust has recently decided to purchase another steam dredger of the most powerful type obtainable for raising silt from the bay.

THE Teesside Iron and Engineering Company is about to commence iron shipbuilding on the Tees. The company has a site, formerly rolling mills, which abuts on the Tees.

THE Chinese have determined to construct their new telegraph lines themselves. An imperial decree sets forth that the lines are to be constructed with Chinese capital and under Chinese supervision.

THE number of visitors to the Fisheries Exhibition last week was 81,168. The total number from the opening of the Exhibition has been 527,264. Upwards of 150,000 official publications have been sold in the Exhibition buildings.

UNDER the presidency of Mr. Jabez Church, M.I.C.E., a visit was paid on Wednesday by members of the Society of Engineers to the works of the Great Western Railway Company at Swindon. We shall refer more fully to the visit in another impression.

THE Commissioners on Accidents in Mines Commission have been engaged during the past fortnight in continuing at the Woolwich Arsenal, where apparatus has been put up for the purpose under the superintendence of Sir Frederic Abel and his assistant, Dr. Kellner, their experiments with a large collection of nearly 200 safety lamps.

AT the recent meeting of the Gas Institute it was stated as the result of half a year's machine stoking work in one gasworks, that every twenty-four hours 2000 additional feet of gas were made per "mouthpiece" employed; the wages paid were less, and the yield of gas per ton of coal was more. It was stated that in another place 9d. per ton of coal carbonised was saved.

Les Mondes states that a discovery has been made in Germany, which is at present kept a profound secret, but which promises to revolutionise the present systems of constructing ordnance. The new cannon consists of a steel tube, round which fine silk is wound in a spiral direction, whereby the strength of the steel is immensely increased, the whole being coated externally with some waterproof material.

A SMALL screw steamer, the Tigre, launched on the 12th inst. by Messrs. Cochran and Co., Birkenhead, was tried on the 23rd inst. Her dimensions are 51ft. 8in. length, 11ft. 6in. beam, and 5ft. 11in. depth. The engines are single high-pressure inverted, cylinder 12in. and stroke 15in., and the working pressure of boiler 80 lb. She was tried in the Mersey, and against a strong wind and sea a speed of about eight knots was realised.

THE Russian fleet in the Black Sea, which at present possesses only the two ironclads, the Admiral Popoff and the Novgorod, is to be strengthened by the addition of three powerful ironclads provided with three barbette turrets, protected by 18in. of compound armour, each mounting two long 12in. breech-loading guns of Russian manufacture. In addition, seven 6in. breech-loaders will be mounted in the casements. The hull will be constructed of iron and steel.

ON the 26th inst. the screw steamer Devon, built to the order of the Devon Steamship Company, was launched. Her dimensions are as follows :—Length, 220ft.; breadth, 31ft. 6in.; depth, 14ft. 6in.; with engines by Messrs. J. G. Stevenson and Co., of Preston, having cylinders 26in. and 50in. diameter by 36in. stroke; she is fitted for quick despatch of cargo, and has water ballast in both holds. Both hull and engines have been inspected during completion by Messrs. Flannery and Fawcus, Liverpool.

THERE is satisfaction throughout the Wolverhampton district that the Parliamentary preliminaries to the actual street and house supply of electricity are proceeding satisfactorily. On Monday the Examiner of the House of Commons, who had before him the Electric Lighting and Provisional Orders Bill (No. 3), confirmed the provisional orders that related to the various areas of Birmingham, West Bromwich, Aston, Dudley, Saltley, Wolverhampton, Balsall Heath, Redditch, and Walsall. The Examiner consented to the Bill being reported to the House.

THE Manchester Corporation have decided to undertake an important scheme of drainage, and are now asking for tenders for the work. This will consist of the construction of an intercepting sewer for the drainage of the Cheetham-hill district, which will divert the drainage from the Broughton district and carry away the storm water by means of overflows to the Broughton Brook. The scheme will involve a considerable outlay, and we understand, also, special difficulties in some portions of the excavations, owing to the peculiar nature of the ground which will have to be passed through.

ON the 21st inst. Messrs. Raylton Dixon and Co. launched a large mail and passenger steamer, the second of two vessels built by them for the Steamship Company's Insulinde, of Amsterdam. Her dimensions are :—Length over all, 311ft.; 37ft. beam; and 25ft. 9in. depth of hold. This vessel has been built for the passenger and mail service between Amsterdam and the Dutch East India possessions, and will be accordingly fitted out as a first-class passenger steamer. Her engines are to indicate 1200-horse power, and will be fitted by Messrs. R. and W. Hawthorn, of Newcastle-on-Tyne.

A BANQUET was given on the 21st inst. by the Paris Society of Electricians. M. de Lesseps delivered a speech in the course of which he announced his intention of introducing the electric light on the Suez Canal. He referred to the necessity existing for a second canal, and stated that he had just had a very satisfactory interview with Lord Lyons, adding that the British Government entirely approved the action of the Suez Canal Company. The agitation which had been going on with regard to the Canal question was consequently factitious. The cost of the construction of a second canal would, M. de Lesseps added, amount to 150,000,000f.

THE following shows the Port of London oversea trade for the week ended June 16th, 1883 :—Number of vessels entered in, 280; number of steamers entered in, 137. Number of vessels entered out, 123; number of steamers entered out, 90. Number of cargo vessels cleared out, 131; number of cargo steamers cleared out, 89. Tonnage of vessels entered in, 174,398; tonnage of steamers entered in, 97,865. Tonnage of vessels entered out, 75,519; tonnage of steamers entered out, 55,609. Tonnage of vessels cleared out, 79,120; tonnage of steamers cleared out, 57,150. Total number of British vessels cleared out, 103; British tonnage cleared out, 63,055. Number of British steamers cleared out, 70; tonnage of British steamers cleared out, 43,681. Number of British sailers cleared out, 33; tonnage of British sailers cleared out, 19,374.

A CASE of some importance to the iron trade has recently been decided. In June last year, Messrs. Latta and Castel bought 1000 tons of pig iron from the Maryport Hematite Iron Company. They obtained the "scrip" for it—the warrants, that is. They did not apply for the iron till December, though it had been paid for, and in that month the Iron Company went into liquidation. The trustees would not deliver it, and application was made at the London Bankruptcy Court for an order for the delivery. The decision has just been come to, and it is of very great importance to the trade. The registrar pointed out that when the warrants were given the iron was not made, therefore the iron could not be the property of the purchaser of the scrip, and the application was dismissed. It is a decision, the Newcastle *Daily Chronicle* remarks, that may have considerable effect, and it will be henceforth needful that the buyers of iron warrants should buy warrants of iron actually made—not to be made—and iron that is in the hands of the storers, and is described or pointed out in some way so that the warrants are warrants for the delivery of iron known and identified by the purchaser and seller.

WORSSAM'S GAS ENGINE.

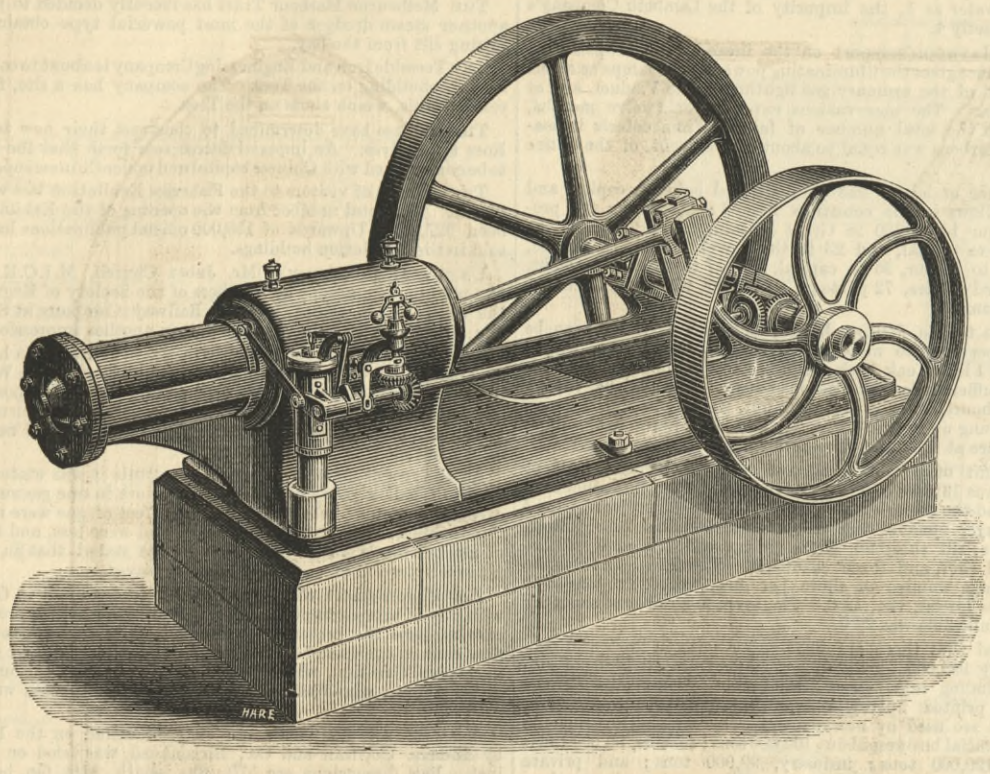


FIG. 2.

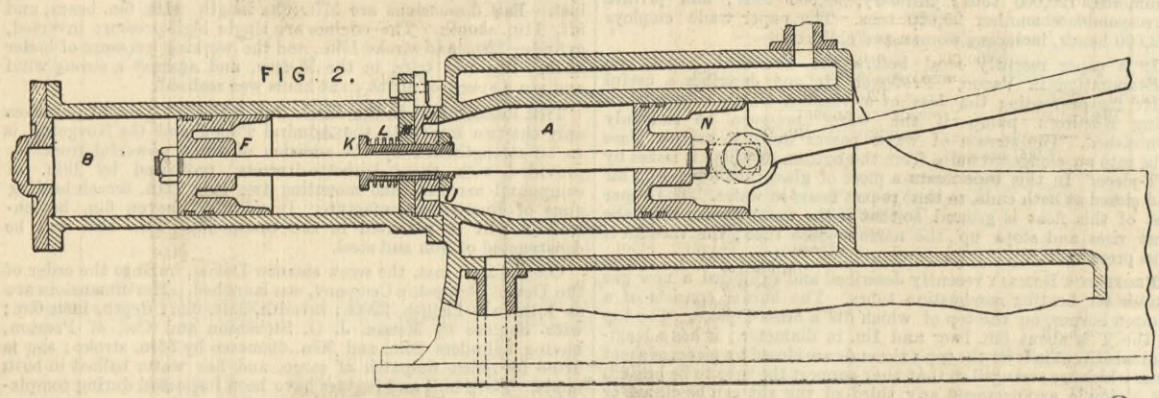


FIG 1

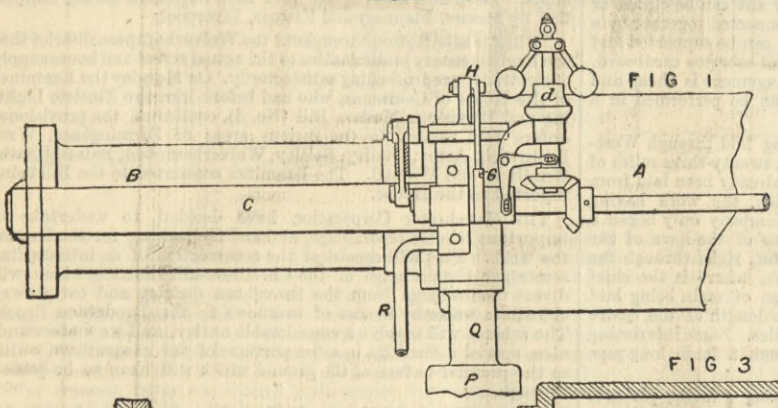


FIG 4

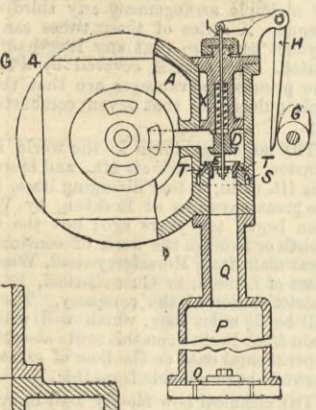


FIG 3

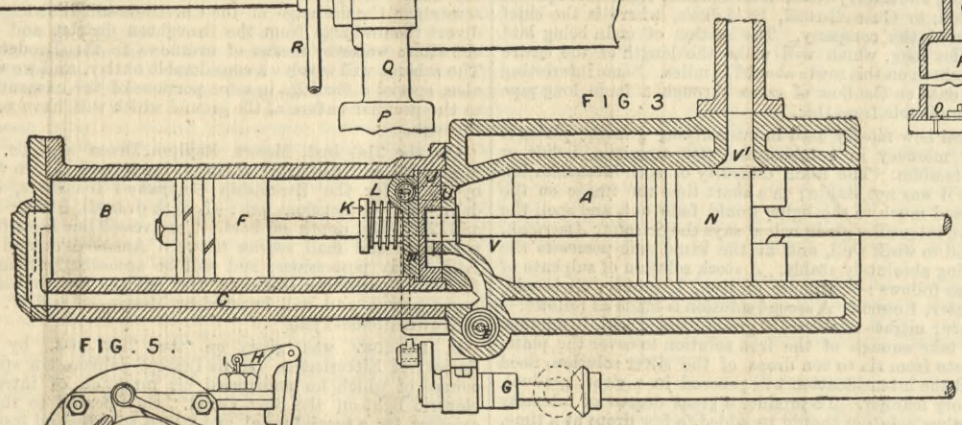


FIG. 5.

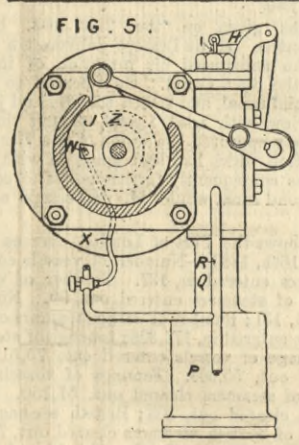
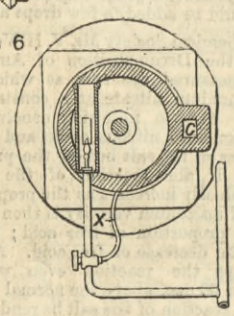


FIG. 6.

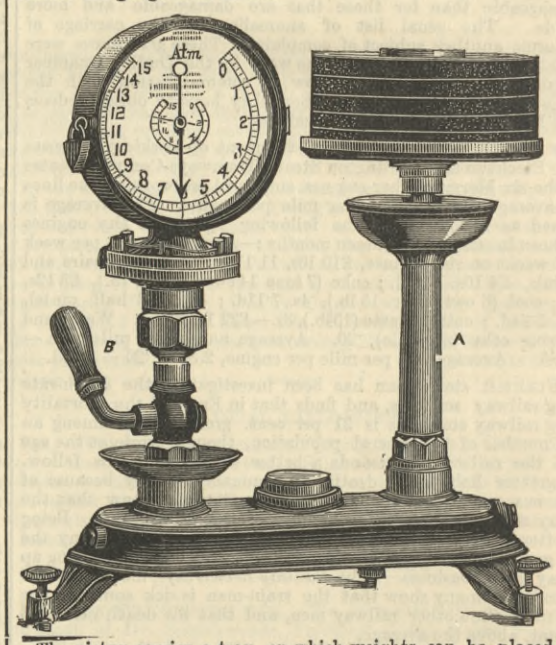


BY the accompaning engravings we illustrate a new and simple gas engine made by Messrs. S. Worssam and Co. Its operation is as follows:—Supposing the pump and power pistons to be at the ends of their respective instrokes and an explosion of the combustible mixture to have just taken place, they both move outwards together, the power piston communicating motion to the crank shaft. The pump piston at the same time draws in gas and air, the gas valve having been opened by its cam, and continues to do so for one half of its stroke or thereabouts, at which point the gas valve is closed. During the remainder of the pump's stroke air only is drawn in. When the power piston passes the exhaust port the gases in that cylinder escape, and immediately the crank has passed the centre their exhaustion is assisted by a stream of air delivered from the pump, which is now put in communication with the power cylinder by the rotary annular valve. As soon as the power piston has passed and closed the exhaust port in its in or backward stroke, compression commences, the contents of the pump being forced into the passages and the space between the motive power piston, and exploded or ignited at the commencement of the succeeding out or acting stroke. The ignition is effected by a jet in the annular valve constantly fed with gas and relighted from a permanent jet after each explosion or ignition. In our engravings Fig. 1 is a side elevation; Fig. 2, a longitudinal vertical section; Fig. 3, a sectional plan; Figs. 4 and 5 are end views partly in section; Fig. 6 is a section showing the igniting arrangement. A is the power cylinder in which the explosion of the mixed gas and air is effected; B is the pump cylinder; C a port, one extremity of which is commanded by the valves D E respectively for admission of air and gas to the engine. The air valve D is opened by air pressure when a partial vacuum is formed above it by the action of the pump piston F; thus it is caused to rise against the resistance offered by a helical spring x—Fig. 4—and the gas valve E is actuated by the cam G through the bell-crank lever H and vertical rod I. The cam G may slide on and off a feather fixed in its driving shaft, so as to be either fast or loose thereon, and is in turn controlled by the governor acting through a bell-crank lever as shown in Fig. 1.

The cam shaft is driven from the crank shaft as shown. J is the slide valve which partially rotates around the piston-rod on the fixed bush K and controls the admission to the motive power cylinder A of the mixture of air and gas previously drawn in past the valves D and E. This slide J is held against its seating by the spring L and cover plate M. The engine is shown at about half stroke, the piston N being impelled outwards by the expansive force of the air and gas mixture previously exploded on the termination of the instroke. During the course of the outward stroke the piston F draws air and gas into the pump cylinder B through the passage C, the air previously passing through an air valve O, chamber P, pipe Q, and valve D, and the gas through pipe R, annular passage S, perforations T, and past the valve E—Fig. 4—at which point the air and gas commence to mix together. On the return instroke the piston F forces the air and gas mixture then in the pump cylinder back through the passage C, thence through the ports of the partially rotating slide J and seating U into the motive power cylinder A, where it is compressed by the action of the piston N into the space V left between the end of the motive power cylinder A and the piston N when at the end of its instroke. When the engine is in this position the explosive mixture of air and gas in the motive power cylinder A is ignited by a travelling gas burner W—Fig. 5—supplied from a metallic pipe fixed to or embedded within the slide and having a flexible connexion X with any convenient gas supply pipe. This travelling burner W is carried by the slide J to and ignited at the stationary light Y once for every revolution of the crank. In Fig. 5 the travelling gas burner W is shown in the position for ignition by the stationary light Y. The gas at the travelling gas burner W having been ignited, the burner is then carried by the slide to the port Z in its seating, and ignition of the compressed mixture of air and gas in the motive power cylinder takes place, the force resulting therefrom driving the two pistons F and N outwards as before explained. The products of combustion escape through the exhaust passage V^1 when this is uncovered by the piston N. After the explosion has been effected and the light of the travelling burner W thereby extinguished, the burner is carried back again by the slide in its next oscillation and relighted at the stationary light Y, and so on continuously. Should the governor run too fast the cam G is thrown out of gear with the bell-crank lever H, by the arrangement shown in Fig. 1, consequently the valve E is not then actuated, and no gas is admitted until the cam G is once more thrown into gear by the governor balls falling.

PRESSURE GAUGE TESTING APPARATUS.

THE use of standard pressure gauges and pumps for testing and adjusting other gauges and dividing the dials exactly has several inconveniences. Pumps are difficult to keep in good order and to start, if they have been for some time out of use. The standard spring gauges employed for controlling others may become incorrect, and often indicate different pressures when two of them are placed beside each other on the same pipe. Mercurial gauges are certainly the most accurate instruments for measuring pressures, but cannot be used for high pressures on account of their very great height. They have become already inconvenient for the present medium pressures, without taking into account that the friction of the mercury, which increases with the pressure, necessitates a calculation in order to obtain the correct indications. These inconveniences have led Mr. Ruchholz to design the testing apparatus represented by the illustration with the view to remedy them. One person is sufficient to work it at any time, while the space occupied is small, and the employment of a standard pressure gauge for the purpose of comparison is avoided, the pressure on the spring of the gauge to be tested being produced by dead weights acting through the medium of a suitable liquid, such as pure glycerine. The apparatus consists of a base which contains a pipe that connects the two uprights which rise from it, and are also hollow. A is a cylinder bored true internally and receiving a steel piston ground to fit. The cock B is threaded to receive the gauge to be tested.



The piston carries a tray, on which weights can be placed, and is so proportioned that a pressure of one atmosphere per square inch is given by the piston itself, while each weight represents an additional atmosphere. When used the apparatus is placed upon a firm table, and adjusted by the set screws in its feet till the cylinder occupies a perfectly vertical position, which is indicated by the spirit level fixed upon the middle of the base plate. After taking the piston out, glycerine is poured into the cylinder till the liquid flows out of the upper end of the cock, which is left open, when the gauge to be tested is screwed on, and a further certain quantity of glycerine is poured into the cylinder. The apparatus having been thus filled, the piston, which must be kept perfectly clean, is inserted into the cylinder. The pointer of the gauge must then indicate one atmosphere, and maintain its position while the piston is lightly rotated, this rotation being necessary in order to annul the slight friction of the glycerine against the inclosing surfaces. The weights are then gently placed upon the tray, and the latter is each time rotated in order to obtain the exact position of the pointer.

If the piston should come in contact with the bottom of the cylinder after a certain time, or before the desired pressure is obtained, the cock B is closed in order to keep the gauge at the pressure prevailing at the time. The weights and piston are then drawn out so that a further sufficient supply of glycerine can be poured into the cylinder. When this is done, the piston is re-inserted, and the same number of weights placed on the tray as when the cock was closed. The latter is then opened, and further weights may be placed on the piston. In this way very high pressures can be obtained. When the testing or dividing of the dial is finished the discs are gradually removed and the piston withdrawn, and when the pointer has arrived at zero the cock is closed and the gauge unscrewed. The glycerine is finally drawn off by means of a small tap placed at one end of the base plate.

COAL WINDING IN DEEP SHAFTS.*

By Mr. ARTHUR H. STOKES, F.G.S., H. M. Inspector of Mines.

THE question of raising coal in deep shafts is slowly, but surely, demanding more and more attention from the mining and mechanical engineer. For obvious reasons our forefathers worked the coal lying nearest the surface, leaving future generations to solve the problem of deep mining. Every year the area of unworked coal, lying at shallow depths from the surface, is becoming less, and our resources, for supplying the current and increasing demand, lie at increasingly greater depths; hence many new sinkings have been carried down much deeper than those of earlier date; and, looking forward beyond immediate wants, the total area of unworked and unproved coal in the United Kingdom is no doubt very large, but much of it will be found at depths greater than any as yet reached. Some writers have quoted 4000ft. as the limit of accessible depth, beyond which the increase of temperature and other difficulties will prevent the mineral being worked; other authorities have estimated it up to 7000ft. In the year 1866, a Royal Commission was appointed to investigate the quantity of available coal, and the report placed the maximum depth at 4000ft., a limit which has been adopted by many scientific gentlemen. The deepest mine in England is Rosebridge, 2418ft, *i.e.*, 806 yards deep; this has been at work for some years, yielding a fair quantity of coal. The deepest coal mine in the world, the author believes, is one near Charleroi, Belgium, viz., St. André shaft, at the Poirier Colliery. The author has been down this shaft, which is 2724ft., *i.e.*, 908 yards deep—830 metres. The coal is raised by an iron wire flat rope, 7in. broad, and composed of eight strands, its weight being 9 tons 11 cwt.—9700 kilogrammes. The Simon Lambert shaft in Belgium is 3489ft., *i.e.*, 1163 yards deep, but this, the author is informed, is only an exploration shaft, and not worked, being partly filled with water. At the St. André shaft the winding is slow, and the quantity of coal raised about 260 tons per day. There is another deep shaft near Charleroi, the Sacré Madame Colliery, at Dampréney, which is 2498ft., *i.e.*, 833 yards deep, where the coal is raised from bottom to top in fifty-seven seconds. This is about the same speed as that run at Rosebridge. It may be inferred from these facts that the depth of 4000ft. is not too great an assumption of the ultimate limit of coal working, and considering the great area of unworked coal lying between the average or the greatest depth of our present shafts, and the contemplated depth of 4000ft., there is little necessity, at least for some time to come, of entering into any theoretical opinions or calculations to prove the possibility of raising coal, in one lift, from the greatest possible depth at which coal could be worked. It is probable that the limit of depth will not rest or be governed by the mechanical appliances used in raising the coal, but by temperature due to depth and the weight of the superincumbent strata.

England holds the proud position of being the first coal and iron producing country in the world. Her resources and engineers are equal to the task of maintaining this position, and it is probable that nature's laws, and not any lack of engineering skill, will limit the depth of her available resources. It occurred to the author some time ago that in winding coal from our present deep shafts there must be a great amount of power wasted in the ordinary mode of winding. The object invariably is to leave the bottom with the load as quickly as possible, and for this purpose full steam is put on the engine, and everything is strained to the utmost to get up the ascending velocity; the descending cage at the same time exerting its minimum amount of force to assist in obtaining such velocity; and then, when nearing the bottom, another great waste of power is employed in stopping the machinery. From this it is clear that whatever balance is used must exert its maximum power at the start, and, if possible, assist in stopping the velocity when nearing the top. The author has seen in Belgium the drum set direct over the top of the shaft, but he does not venture to give an opinion upon this appliance. There is also used in Belgium a balance rope connected to the bottom of each cage, and it is this application of a balance that he thinks will become more generally adopted. It is simple, and apparently effective. During the time the calculations were being made by the author for this paper, the above description of balance was successfully applied at one of the deep pits near Nottingham, and therefore its successful application has been practically tested. A very similar kind of balance has been used for many years in the old hydraulic hoists at blast furnaces, a chain generally being used in place of a rope, also in shafts of small depths in South Wales, but the author believes it has only lately been introduced in winding coal from deep shafts. In bringing this paper before the members of this Institute, the author trusts the great amount of detail given in the calculations will not be thought excessive. The formulæ and calculations might have been given in far less compass, but bearing in mind that there are students, as well as members, composing the Institute, he has endeavoured to make the calculations so plain that the youngest student may thoroughly understand them, and easily carry out the calculations for any depth of shaft. In calculating the power required, strength of ropes, machinery, &c., for raising coal from great depths, some data must be had to start from, and this is the amount or weight of coals required to be raised per day. Considering the large expenditure necessary for plant and sinking operations, also that for each shaft, or pair of shafts, the produce of large areas of coal will have to be brought up, the weight cannot be fixed at less than 1000 tons per day from each shaft, and supposing the quantity to be raised in eight working hours, then $\frac{1000}{8} = 125$ tons per hour. This is not too large a quantity to be expected from a shaft of three or four hundred yards deep, in fact the quantity is being raised from a few shafts in the district. At Rosebridge, before mentioned as the deepest coal pit in England, 806 yards deep, this distance is run in about 55 seconds, or including unloading, a cage may be said to be landed every 80 seconds; that is 806 yards travelled in 55 seconds, or $\frac{806}{55} = 14{\cdot}65$ yards, or say 44ft. per second. This is a great speed for winding coal, but the author does not see why even this speed could not be accelerated a little, so as to wind at say 45ft. per second, or a little over 30 miles per hour. Thus supposing a depth of 4000ft. to wind from, $\frac{4000}{45} = 89$ seconds in travelling the distance, say 90 seconds, or 1·50 minutes; and allowing 10 seconds for changing, 90 + 10 = 100 seconds from landing to landing of alternating cages, and taking 100 seconds for each journey, $\frac{60 \times 60}{100} = 36$ journeys in one hour; showing that to draw 1000 tons from a depth of 4000ft. in 8 hours, 125 tons must be drawn on the average per hour, and $\frac{125}{36} = 3{\cdot}47$ tons for each cage load. With these data for a starting point, and to cover slight stoppages in the winding, taking 4 tons as the weight of coal drawn, there are still other items besides coal to be considered, viz., tubs and cage. These weights may be stated thus:—coal, 4 tons; 6 tubs, 1 ton 10 cwt.; steel cage, 2 tons 10 cwt.; total, 8 tons. Then 8 × 20 × 112 = 17,920 lb. working load.

Having arrived at the working load, attention may be now directed to the rope. It will be seen by comparing the breaking strains on the cards of various makers, that for equal sizes of ropes equal breaking strains are given, or nearly so, but the working loads are very differently stated, some makers taking as low as one-sixth of the breaking strain for the working load, and others giving one-tenth as the working load. In selecting a winding rope, two very important points should be kept in view, viz., not only the working load of the coal, tubs, and cage, but also the weight of the length of rope equal to the depth of the shaft, or in other words, the working load at the pulley wheel when the loaded cage is being lifted from the bottom of the shaft. It will thus be seen that the weight of the rope is a serious addition to the working load when winding from great depths. Another important consideration should be—what will be the strength or working load of the rope a few days before being taken off, or when worn out? because it is very important that the working load of the rope should not be exceeded at any time; hence, then, to cover this loss in strength by wear and tear, some makers give one-tenth the breaking strain as the working load, and when it is remembered that the same rope which winds its 500 tons per day regularly also daily lowers and raises a proportionate number of men and boys, it is essential to allow a large margin for safety; therefore the author takes the working load as one-tenth the breaking strain. There are other reasons why a high rate of working load in proportion to the breaking strain should be adopted, viz., the extra weight put upon the winding rope by friction of the cage and the guides, friction of pulley wheels, resistance of the air, and chief of all, the energy exerted in imparting velocity to the load, or power to overcome the *vis inertia*. In shafts raising a heavy load at a great speed, this last is a serious addition to the strain or tension upon the rope, and may be approximately expressed by the formula, $\frac{W \times V^2}{2\,g.}$ W = The load in pounds; V = increase in the velocity in a second; $g = 32{\cdot}2$ gravity. For a working load of 8 tons, or 17,920 lb., and taking the load to be uniformly accelerated from a state of rest to a velocity of 30ft. per second $\frac{17{,}920 \times 32^2}{2 \times 31{\cdot}2}$ = 250,435 lb. work expended in creating velocity. The above only represents the work expended in creating velocity, or work accumulated in the load which is quite distinct from the work expended in raising the load. For instance, the force with which a stone falling to the ground strikes it, is wholly distinct and different from that with which it presses upon the ground when at rest. In coal winding the work expended in creating velocity is an ever varying strain upon the rope, whereas the load is a constant weight. Although the accumulated work is again expended in relieving the strain upon the rope when nearing the surface, yet it is the greatest strain that has to be considered. To obtain an approximate idea of what would be the strain upon the rope when raising the load from the bottom, to the above calculation must be added the power expended in raising the load, and for this purpose it is necessary to find the distance through which the centre of gravity would be raised. In the case under consideration—*i.e.*, from a state of rest to a uniformly accelerated velocity of 30ft. during the first second, and basing the calculation upon the first second, it is easily seen from the above remarks that the load would have been raised 15ft. Hence 17,920 × 15 = 268,800 foot-pounds, and 268,800 + 250,435 = 519,235. This will approximately represent the amount of work expended in raising the load 15ft. Then $\frac{519{,}235}{15} = 15\frac{1}{2}$ tons nearly. And calling this $15\frac{1}{2}$ tons the average tension of the rope during the first second, it is found that this tension is twice the tension due to the working load; hence the necessity of not only carefully, but daily examining winding ropes, and working them at a high standard of safety, allowing a good margin for such strains as can only be approximately calculated, and which perhaps in some cases are never thought of when ordering a new rope. Upon reference to the wire rope makers' cards, the breaking strain of an iron wire rope 3½in. circumference is given as 22 tons, but in these calculations it will be more convenient to take the area of a cross section of the rope under consideration; hence then circumference $^2 \times {\cdot}07958$ = area, that is $3{\cdot}50^2 \times {\cdot}07958 = {\cdot}9748$ area of cross section, or one square inch nearly: Then $\frac{1}{20}$th of 22 tons, or 440 cwt. = 44 cwt. or 4928 lb. working load. To simplify this matter, the working load of a charcoal iron wire rope may be taken as equal to 5000 lb. per square inch of cross sectional area, and this will hold good for any size of winding rope. Taking another example to test this rule, viz.:—a rope of 2 square inches of cross sectional area. Then 2 × 5000 = 10,000 lb. working load. And 10,000 × 10 = breaking strain, say 44 tons 12 cwt. Hence $\sqrt{\frac{2 \text{ sq. in.}}{{\cdot}07958}} = 5$in. circumference. Now by the rule above stated it is found that a rope 5in. in circumference has a breaking strain of 44 tons 12 cwt., and upon reference to the manufacturer's card this is—save the cwts.—the exact breaking strain given for a 5in. cir. iron wire rope. It would be tedious, and only a repetition of the above methods, to work out the working load for ordinary steel ropes, but it will be found to be equal to 8000 lb. per square inch of cross sectional area. There has lately been introduced, for coal winding purposes, a steel wire called "Plough Steel," which is professed to be of extraordinary strength and tenacity with very small sectional area. The Plough steel ropes appear so thin when hanging in a shaft that one feels almost afraid they would part by their own hanging weight. They have been so lately introduced, and so little tested for coal winding, that the author cannot even venture to express an opinion either as to their safety or economy.

Having defined the mode of arriving at the working load of ropes, and given the details in the case of charcoal iron wire, the following are the data so obtained;—Working load: Charcoal iron wire = 5000 lb. per square inch of cross sectional area; best steel wire = 8000 lb. per square inch of cross sectional area; Plough steel = 12,000 lb. per square inch of cross sectional area.

(1) $\frac{\text{Working load}}{5000}$ = square inch sectional area of charcoal iron wire rope necessary to carry such working load.

Then, for a working load at the cap or cage end of the rope equal to 17,920 lb., as previously stated, $\frac{17{,}920}{5000} = 3{\cdot}584$ square inches sectional area of charcoal iron wire rope.

(2) And $\sqrt{\frac{3{\cdot}584}{{\cdot}07958}} = 6{\cdot}71$in. circumference of rope.

Thus a rope of 6·71in. circumference has to be employed to carry a working load of 8 tons; but there is yet to be calculated the weight of such a rope for a depth of 4000ft.; because the rope must be of sufficient size to carry both its own weight and the working load. From the manufacturers' cards it appears that ropes of equal circumferences are of equal weight per fathom, whether iron or steel; hence another simple rule may be formed, viz.: From makers' cards, 3½in. circumference rope, or ·9748 square inch area, = 10 lb. per fathom. Say 1 square inch sectional area; whence—

(3) $\frac{\text{Weight per fathom}}{\text{Feet per fathom}} = \frac{10}{6} = 1{\cdot}67$ lb. per foot per square inch of cross sectional area of rope.

Thus, then, $3{\cdot}584 \times 1{\cdot}67 \times 4000 = 23{,}941$ lb. Hence it is shown that the weight of the rope is greater than the working load; for a charcoal iron wire rope, of uniform thickness throughout, and 4000ft. in length, simply suspended in the shaft, without any weight attached, will not safely carry its own weight as a working load—or, in other words, an iron wire rope will not carry its own weight as a safe working load in a depth of 4000ft., and exceeds it by 23,941 − 17,920 = 6021 lb., or nearly 2 tons 14 cwt. The length of a rope of uniform cross sectional area, at which the weight of the rope is equal to its working load, may be taken as follows:—Plough steel, 7185ft.; ordinary best steel, 4790ft.; charcoal iron, 3000ft. The rule for ascertaining this may be expressed thus—

(4) $\frac{W}{w}$ = length in feet.

W = working load per square inch of cross sectional area—one-tenth breaking strain; w = weight per foot of the rope. The above figures will be sufficient to show that it would be only a waste of time to calculate the size of an iron wire taper rope to raise a load of 8 tons from a depth of 4000ft. The working load of iron wire ropes, in comparison with the weight per fathom, is such as to preclude their use for winding direct from great depths.

Ordinary best steel ropes.—Attention must now be turned to steel ropes. It will be seen (by 1) that the working load of steel ropes, in comparison with the weight per fathom, is about 60 per cent. greater than iron wire. Taking, as before, a working load of 8 tons, or 17,920 lb. then (by 1)—

$\frac{17{,}920}{8000} = 2{\cdot}24$ square inches cross sectional area of steel wire rope;

and $\sqrt{\frac{2{\cdot}24}{{\cdot}07958}} = 5{\cdot}3$in. circumference of rope.

From the above it is seen that a working load of 8 tons requires a steel rope having a circumference of 5·3in.; but the weight of such a rope for a depth of 4000ft. has yet to be calculated. Then by (3), $2{\cdot}24 \times 1{\cdot}67 \times 4000 = 14{,}963$ lb., or nearly 6 tons 14 cwt. Hence the weight of the rope is nearly equal to the working load. Or a rope of 5·3in. circumference, hanging in a shaft 4000ft. deep, will only raise a working load from the bottom of the shaft equal to 17,920 − 14,963 = 2957 lb., or about 1 ton 6 cwt. Having now shown that the weight of a charcoal iron wire rope, of 4000ft. deep and constant sectional area, exceeds the working load of such a rope at the puiley wheel, and also that a steel wire rope, of constant sectional area, and of 4000ft. length, will only admit of 1 ton 6 cwt. being suspended to the end of it, without exceeding the working load at the pulley wheel, there remains to be calculated the size of a taper rope which would raise a load of 8 tons from a depth of 4000ft., and also carry its own weight, without exceeding the working load, having a strength at any two points proportional to the weight suspended from those points. From what has been previously stated, it will be seen that such strength would be in proportion to the cross sectional area at any point. First, to ascertain the cross sectional area of a rope at the cap, or cage end, of sufficient size to carry a working load equal to the weight of the coal, cage, and tubs suspended from such cap; and then the increase, or taper of the rope, taking that as due solely to the weight of such rope. In the first case the weight is constant from bottom to top, but in the latter it is constantly increasing with the length of the rope; in short, the taper of a rope is solely for the purpose of carrying its own weight. A formula for calculating the size of taper ropes is given as follows:—*

$$y = \frac{f}{m} \int \frac{A}{a} \frac{dx}{x}$$

Integrating the above equation between the limits A and a we get:—

(5) $$y = \frac{f}{m} \text{ hyp. log. } \frac{A}{a}$$

Let x = area of section at any point; f = strain in lbs. per square inch of sectional area produced by the safe working load; m = weight in lbs. of one cubic inch of the rope; y = length measured from lower end. Let A and a be any two sections at a distance y apart. For convenience of calculation, the above formula is here carried out fully in common logarithms, and applied to the case under consideration. The starting point in this calculation must be the cross sectional area of the rope at the lower end.

Then by (1) $\frac{17920}{8000} = 2{\cdot}24$ square inches area,

and $f = 8000$ lb.

$m = \frac{1{\cdot}67}{12} = {\cdot}13916$, say ·14 lb.

F = 4000 = length of rope in feet.

$y = 48{,}000$ = length of rope in inches.

$a = 2{\cdot}24$ cross sectional area of rope at the connection to the cage.

·4342944819 = the constant used for converting hyperbolic log. into common logarithms.

(Formula 5)— $$y = \frac{f}{m} \text{ hyp. log. } \frac{A}{a}$$

Hence $$y = \frac{8000}{{\cdot}14} \times \text{hyp. log. } \frac{A}{a}$$

$$\frac{y}{12} = F = \frac{8000}{12 \times {\cdot}14 \times {\cdot}4342944819} \times \log. \frac{A}{a}$$

$$= \frac{8000}{{\cdot}72961472959} \times \log. \frac{A}{a}$$

$$= 10964{\cdot}68 \times \log. \frac{A}{a}$$

$$= 10964{\cdot}68 \, (\log. A - \log. a).$$

and $$\frac{F}{10964{\cdot}68} = \log. A - \log. a.$$

By transposing $\log. A = \frac{F}{10964{\cdot}68} + \log. a$,

$$\log. A = \frac{4000}{10964{\cdot}68} + \log. 2{\cdot}24.$$

$$= {\cdot}364807 + {\cdot}3502480.$$

$$= {\cdot}7150550.$$

$$= \log. 5{\cdot}1887.$$

Hence A = 5·1887 square inches cross sectional area of rope at pulley wheel,

and $\sqrt{\frac{5{\cdot}1887}{{\cdot}07958}} = 8{\cdot}07$in. circumference of rope.

The conclusion arrived at from the above calculations is, that to raise a working load of 8 tons from a depth of 4000ft. with a steel wire taper rope, it would require to be 5·3in. circumference at the lower end, 8·07in. circumference at the pulley wheel. Having now determined the size of the taper rope, attention must be given to the weight of such a rope. This at first sight may appear a difficult matter to be calculated, seeing that every foot varies in weight, but when it is considered that the taper of the rope is that due solely to the weight of such rope, then the calculation becomes easy, because the rope has been increased in cross sectional area in proportion to carry its own weight, and each square inch of cross sectional area is equal to 8000 lb. working load. Hence,

(6) A = cross sectional area at pulley wheel; a = cross sectional area at connection to the cage; 8000 = lbs. working load per square inch of cross sectional area.

Weight of rope = $(A - a) \times 8000$.

$= (5{\cdot}1887 - 2{\cdot}24) \times 8000$.

$= 2{\cdot}9487 \times 8000$,

= 23,589 lb., or, say, 10 tons 10 cwt.

The weight of the rope may be calculated as follows:—

(7) W = weight of rope; A = cross sectional area of rope at wheel; 8000 = lbs. working load per square inch, cross sectional area; L = working load suspended from the cage end of the rope.

Then W = (A × 8000) − L.

= (5·1887 × 8000) − 8 tons.

= 41509 − 17920.

= 23589 lb., or 10 tons 10 cwt.

(To be continued.)

* Read before the Chesterfield and Derbyshire Institute of Mining, Civil, and Mechanical Engineers.

* *Colliery Guardian*, July 13th, 1877.

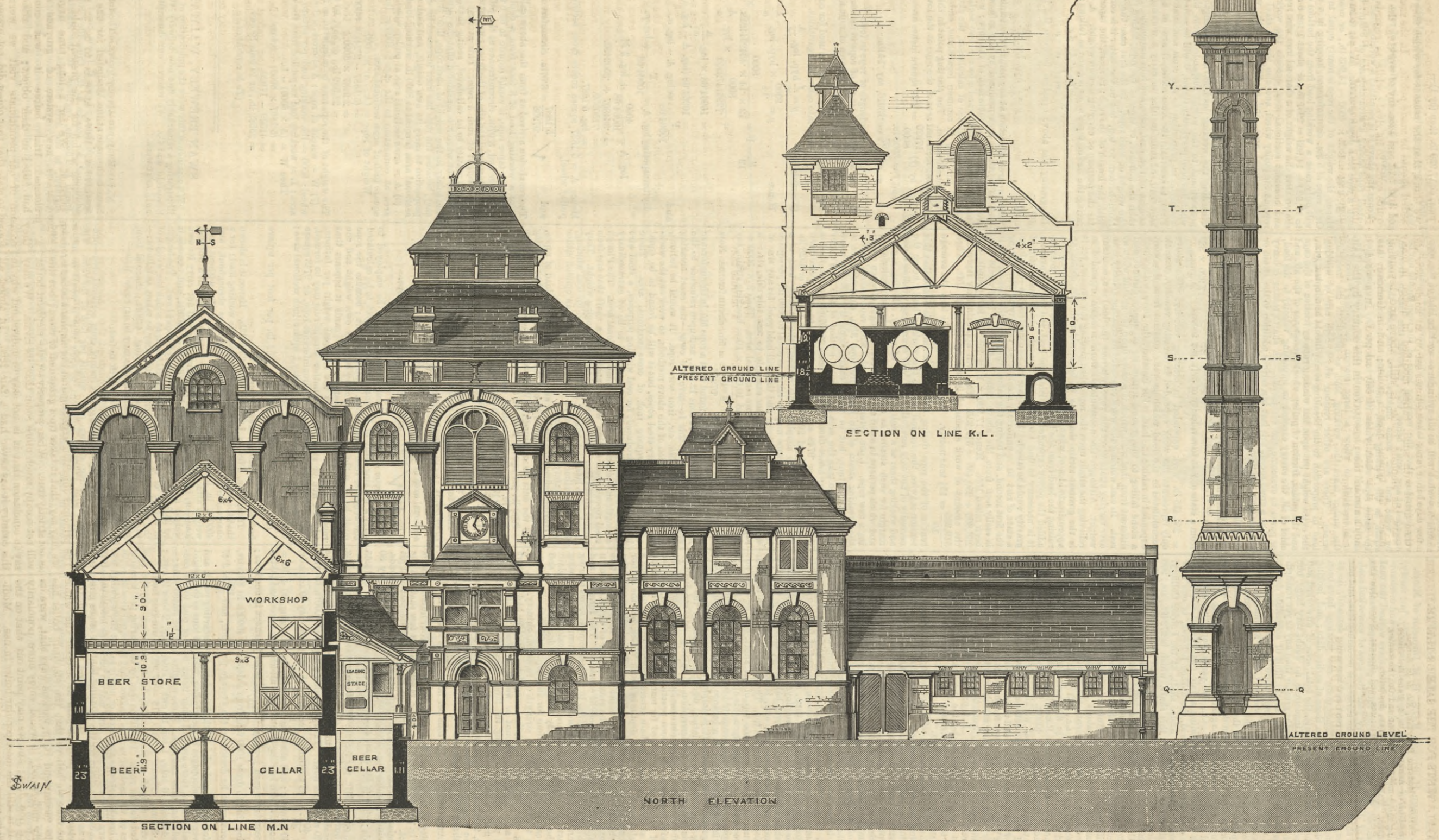
SWAN BREWERY, WALHAM GREEN.

WE commence this week the publication of a series of engravings illustrating a remarkably fine new brewery, the property of Messrs. Stansfeld and Co. We reserve our description of this brewery until next week.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—George J. Weeks, chief engineer, to the Malabar; Lewis P. Lewis, chief engineer, to the Asia, additional, for service in the Crocodile; Richard C. Willby and Josiah P. Thomas, engineers, to the Malabar; Robert Balcomb, engineer, to the Asia, additional, for service in the Crocodile; George Harding, engineer, to the Asia, additional, vice Whittaker; Thomas H. Harrup, engineer, to the Excellent, for service in the Kite, vice Harding; and James Armstrong and Henry J. Cram, assistant engineers, to the Malabar.

SWAN BREWERY, WALHAM GREEN.

MR. W. BRADFORD, LONDON, ENGINEER.



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TO CORRESPONDENTS.

*** *In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a* 1d. *postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions.*

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

*** *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.*

YOUNG ENGINEER.—*A worm inside the tank will answer perfectly.*

GRIMSTON GAS-BURNER.—*E. S. may apply to Mr. G. Bower, of St. Neots, Hunts, England.*

A YOUTHFUL READER.—*You can obtain full particulars by applying to the Secretary to the Admiralty, Whitehall.*

C. V.—*Send us a few small specimens of the sheets with white specks. Without seeing them we cannot advise you to advantage.*

LINOLEUM MACHINERY.—*Several letters on this subject await the application of our correspondent J. G. N. See conditions of correspondence.*

ASHBOURNE.—*In heating apparatus made of cast iron pipes of considerable diameter there is no pressure but that due to the weight of the water, which is practically the same hot or cold. In heating apparatus with small wrought iron pipes, the pressure is very considerable, sometimes as much as a ton on the square inch; usually about* 300 *lb.*

R. G. P.—*We know of no small work on the analysis of iron, but chapters containing all the desired information are to be found in Dr. Percy's "Metallurgy: Iron and Steel;" and in Watts' "Dictionary of Chemistry," vol. iii., see Detection and Estimation of Iron, in the chapter on "Iron." Every paper on the subject is extracted and noticed in the "Zeitschrift für Analytisch Chemie," edited by Professor Fresenius, of Weisbaden; and notices of most of them appear in the "Abstracts," published monthly in the "Journal of the Chemical Society."*

PUCK.—*There are two answers to your question; one for thick, the other for thin, cylinders. For thin tubes, to which we presume you refer, multiply the pressure by the diameter and divide by twice the tensile strength of the material. The result is thickness, all dimensions and pressures being taken in inches and pounds. To find the pressure, multiply the thickness by the tensile strength and by* 2, *and divide by the diameter. Applying this to a single rivetted boiler, we have* $T = \frac{P\,D}{2\,k}$ *and* $P = \frac{2\,T\,k}{D}$, *where* T = *thickness,* P *pressure,* D *diameter of boiler, and* k *a constant, varying between* 6200 *and* 3000, *according to the quality of the material. These formulæ give the working strain and thickness.*

STAR MAPS.

(To the Editor of The Engineer.)

SIR,—Would some of your astronomical readers kindly give me the name of the most correct star maps of both hemispheres, and where they can be obtained?

R. R. T.

MARINE GOVERNOR.

(To the Editor of The Engineer.)

SIR,—I would feel very much obliged to any of your numerous readers for a description and number of a patent marine governor having for its principal feature a valve under the ship's quarter, and worked by the rise and fall of the ship.

INQUIRER.

South Shields.

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DEATHS.

On the 16th inst., at 135, Highbury New Park, N., WILLIAM FOX MALE, Executive Engineer P. W. D., Meerut, India.

On the 27th inst., at 41, Grosvenor-place, WILLIAM SPOTTISWOODE, F.R.S., in the 59th year of his age; deeply lamented.

THE ENGINEER.

JUNE 29, 1883.

THE ELEPHANT BOILER.

NOT long since a brief correspondence on the relative merits of Lancashire and elephant boilers was published in our pages. We think it is to be regretted that the subject was not more fully discussed. We had written, it will be remembered, in favourable terms of the elephant boiler, and one of our readers, holding that we were mistaken, said so. His letter elicited one reply, and the matter dropped. We propose now to re-open the whole question, because we believe that the elephant boiler has so much to recommend it in various ways that, were its virtues only understood, it would enjoy more popularity here than it now does; and we may point out that on the Continent it is still the most popular boiler in use. Modified in various ways—sometimes with one, sometimes with two, or even three, small cylinders—or "bouileurs," as they are called in France—sometimes set on an angle, now and then fitted with small tubes, modified in design in many ways, the elephant boiler is still, above and beyond all others, the typical French boiler; and in Germany and Austria it is hardly less freely adopted. In a word, it holds abroad the place taken in this country by the Lancashire boiler. This is in itself a great point in favour of the type, and the fact that it is so extensively employed by men who are supposed to know what is and is not good for them, entitles it to full consideration.

Almost the most important thing about a boiler is its economy. We may assume for the moment that safety is provided as a matter of course. If the elephant boiler is not as economical as the Lancashire boiler, then it has no claim on steam users. No advantage which it may possess can compensate for the absence of economy. On this point, however, there is no room for discussion. It has never, so far as we are aware, been disputed that the elephant boiler when properly made, and properly set to work, is quite as economical as the Lancashire boiler. If it was not economical, French engineers, at all events, would not use it. There are not wanting, moreover, engineers and steam users who maintain that it is on the whole a more economical boiler than the Lancashire, and we believe that they have truth on their side; and this because the heating surfaces of the elephant boiler are more easily kept clean than those of the Cornish or Lancashire boiler, and the combustion of fuel can be more perfectly accomplished, because the length, breadth, and depth of the furnace may be made what we please, while the furnaces of the Lancashire boiler are obviously much restricted for room in every direction. This being the case, coal cannot be burned to so much advantage in the latter boiler as in the former. It is, of course, true that all kinds of coal and fuel are burned in internally fired boilers; but this is a different matter, and it is well known that much trouble is incurred now and then in keeping steam with Lancashire boilers, when the coal is not just what it ought to be. It is not necessary, however, to press this point. If it is conceded that the elephant boiler is not less economical than its rival, no more need be demanded.

We have alluded to the question of safety, and it is in this respect that the elephant boiler far excels its rival. It is by no means so well known as it ought to be that the Lancashire boiler is more prone to fail than any other in existence. But the boiler insurance companies know it only too well. A system has grown up in the management of their affairs, under which they always pay almost without question for the repairs of a collapsed flue, no matter from what cause the collapse takes place. A half-drunken stoker may at any moment take £60 or £70 out of the pockets of an insurance company by letting his boiler get short of water. If it were not for the expenditure incurred in this way the insurance of boilers would be an extremely lucrative undertaking, or the premiums would undergo a great reduction. If our readers will reflect for a minute they will see that insurance companies are seldom or never called upon to replace an exploded boiler. If they were premiums must be increased. Inspection properly carried out is a complete preventive of disastrous explosions of boiler shells, and, indeed, of those caused by collapsed flues; but no amount of inspection, however rigorous or exacting, will prevent furnace crowns from coming down. The collapse may be small or large. It may mean a mere flattening of the shell for a length of a foot and to the extent of half an inch or so, or it may mean the more or less complete flattening of the tube without fracture or explosion. In any case the insurance companies have to pay for the repairs, and we have only to refer to their books to learn that such collapses or failures are constantly occurring. Nothing at all is said about them. The flue is heated and jacked out, or a new crown-plate is put in, or even a new flue, according to the extent of the mischief, and this goes on week by week from one end of the year to the other. The insurance companies keep their own counsel; certain cases of failure are mentioned in general terms, and the engineer of any one insurance company is careful to publish all that he can learn concerning the bursting of all boilers either not insured at all, or insured by a rival company; but concerning these failures of Cornish and Lancashire flues little is heard. They are taken as a matter of course—events in the ordinary run of business, about which comment is unnecessary. It may be argued in justification of this that inspection can do nothing. In the first place, it can do nothing as against a drunken fireman, and in the second it cannot prevent collapses, because these are brought about by causes little if at all understood, and which are unaffected by inspection. It is not necessary that a boiler should be short of water in order that the flue may come down. We met with an instance not long since in which the flue collapsed upwards just beyond the bridge, the top remaining quite cylindrical. Long ago the engineer of a boiler insurance company pointed out in one of his reports that the Lancashire boiler was the most expensive to keep in repair that was to be found on land—Rastrick boilers excepted—and we can very well believe this.

On the other hand, the elephant boiler is never afflicted with collapses, and if properly made its plates will not crack, nor will it give any trouble whatever. It will go for years without repairs of any kind, and whereas with the internally-fired boiler the neglect of a few minutes may leave the crown plates bare, an elephant boiler might be run for an hour or more without being fed, and would take no harm. If boiler insurance companies had only elephant boilers to deal with, they would quickly realise fortunes; yet if they wholly supplanted the Lancashire boiler and its prototypes, we should hear so little about explosions that insurance would not be much in favour. The principal objection urged against the elephant boiler is, we may say, that it takes up a great deal of room; but this is not strictly true. When properly set, the elephant boiler will not occupy much more room than its rivals. We may say in conclusion that it is not easy to understand why in this country it has never had a fair trial. In almost all cases those who have had them once have retained them. There are, of course, exceptions, and it would be advisable, we think, that the reasons for which they have been superseded should be made public. In the matter of cheapness of first cost and economy of working, the elephant boiler is quite equal to its rival; while as regards safety, not only from disastrous explosions, but from minor failures, it is immeasurably its superior. What, then, remains to be urged against it?

THE HULL AND LINCOLN RAILWAY.

AFTER an investigation lasting nearly four weeks, involving the evidence of an unusually large number of witnesses for and against the scheme, and a corresponding proportion of speeches from counsel, the Bill for the Hull and Lincoln Railway has been thrown out by a Committee of the House of Commons. The project is important, as the proposed line, continuing northward, the recently made joint line of the Great Northern and Great Eastern companies to Lincoln, fills one of the few gaps still remaining on the map of England where a main route is evidently wanted. Although no reasons for rejection were given by the Committee, there is little doubt from the course taken by the inquiry that the success or failure of the Bill depended on the engineering evidence; and in this respect some account of it may be interesting to our readers. There was the usual opposition from other railway companies. The North-Eastern saw no reason why Hull should want a direct line south when such ample provision existed for traffic north and west, and south also by a westward route. The Great Northern Company by its counsel and by numerous witnesses demonstrated that no sane person could desire to get to London otherwise than *vid* Selby and Doncaster, a superior permanent way and quick trains amply compensating for a detour of thirty miles. The Manchester, Sheffield, and Lincolnshire Railway Company considered that it had such a vested interest in the port of Grimsby and in the New Holland ferry, that the construction of a bridge which would give direct communication and other advantages to the rival port of Hull ought not to be permitted.

All this opposition would probably have been of little avail, for Parliamentary Committees have of late years paid scant attention to the interests of existing lines when a new railway appeared to be for the public advantage, when the landowners and inhabitants of a district have desired it, and where no hindrance to other undertakings has been shown. It is on this last plea, however, that the Bill for the Hull and Lincoln Railway has been defeated, the case against the promoters being that the navigation of the Humber would be seriously impeded by a bridge. It was to escape opposition on this account, and to avoid also what, under ordinary systems of bridge construction, are undoubted difficulties, that a tunnel was proposed in previous schemes. The uncertainties and greater risks of a tunnel, however, led to its rejection by a Committee of the House of Lords, and the design of the Forth Bridge, and its authorisation by Parliament, decided its author, Mr. Fowler, who is also the engineer for the Hull and Lincoln line, to base his present scheme on a bridge similar to that over the Forth, but on a smaller and easier scale, one large span of 600ft. being proposed instead of the two spans of 1700ft. in the larger bridge, the relative heights being in proportion. Then the navigating interests of the Humber took the alarm. The town of Goole, to which sea-going ships, exceeding even 500 tons, regularly trade, had a right to be heard; but the city of York and the town of Leeds, though zealously stimulated by the opposing railways, had interests too remote, and could hardly make out a case deserving serious attention. The Marine Department of the Board of Trade, in performance of its usual functions where tidal waters are concerned, investigated the scheme, and, as in addition to numerous openings of 200ft., one of 600ft., with a clear headway of 90ft., was to be provided in mid channel, decided to abstain from opposition on the promoters engaging to keep the channel clear by dredging should occasion arise, and even to provide a tug steamer should the bridge prove a hindrance to navigation. On this latter point the most contradictory evidence was given by pilots, captains, and others, who had had a life-long experience of the river. The complaint as to deficient headway could not be seriously maintained, for it was shown that 93 per cent. of the vessels going to Goole could pass below the bridge at any time without alteration, and the remainder by striking their top-gallant masts. But what evidently influenced the Committee was the evidence put forward by the Humber Conservators as to the likelihood of the sand-banks shifting their position, so leaving the 600ft. span to bridge a shallow, and therefore useless, channel. Mr. Fowler asserted, and produced trustworthy witnesses to prove by a long history of the past, that there had always been deep water at the site chosen for the bridge; but the Committee were apparently unwilling to take the responsibility in the face of such contradictory evidence, and decided against the bridge.

Even if the allegations of the opposition were true, it would hardly be creditable to the scientific talent of the country that a communication so obviously required should be deemed impracticable. The balance of advantages and drawbacks is, however, so obviously in favour of a bridge that it cannot much longer be forbidden. It is not the only case in this country where important works are hindered and delayed by apprehensions insufficient, if duly weighed, to justify the effects they produce.

BRIGHTON BEACH.

THE "masterly inactivity" which seems now to characterise the operations designed for the protection of the foreshore at Hove, appears to us to represent the wisest course which for the present could possibly have been pursued. We for a long time urged that Mr. Ellice-Clarke's new system of groynes should have a prolonged trial before it was concluded that they had failed in their object; and although on the occasion of our penultimate visit we were reluctantly forced to state that that object did not appear to be likely of attainment, and that other means must be adopted to

check the inroads of the sea, we yet qualified our then expressed view by regretting that the length of trial the groynes had undergone had been so short. Whether a similar reflection has induced the Hove authorities to stay their hands or not we do not know; but it is certain that since we last wrote on the subject nothing whatever has been done beyond making good to a certain extent the breaches in the esplanade caused by the sea during the prevalence of the severe south-westerly gales early in the spring of this year. We are pleased that such a course has been followed, because it has enabled ourselves, as well as the engineers consulted, to ascertain the action of the groynes under those varying conditions, without experience of which it is almost impossible to conclude what is best to be done in cases of such extreme difficulty as that with which the Hove Commissioners and their engineer have so long struggled. It has been our view from first to last that Mr. Ellice-Clarke's experiments at Hove must furnish a most useful lesson to the profession all the world over. The protection of foreshores is undoubtedly an operation in which all previous experience is constantly falsified. We deal, in fact, with too fickle and changeable an element to be able to determine that a course of procedure which has successfully resisted encroachment in past cases shall have similar results in new experiences; but the further we enlarge these last, the more likely we are to arrive at a sound basis for future operations. Hence, we say, we feel extremely pleased that we have been enabled by the cessation of work at Hove for a time to lay before our readers the effects of the groynes erected there during a season of almost total freedom from those south-westerly gales which before proved so inimical to their efficient working.

In our last article on this subject, which appeared in our issue of February 23rd last, we stated that the trending groynes had, contrary to what was hoped and expected by their designer, accumulated beach to their leeward, and that on their windward faces, *i.e.*, those exposed to the prevailing currents and most severe winds and seas, they were almost completely denuded of shingle, the result being that the tie-balks inserted had had their functions reversed and were acting as struts. We may here remark that we have been courteously invited by Mr. Ellice-Clark—who, we believe, on several points considers our conclusions erroneously based—to a personal discussion. We have abstained from availing ourselves of that courtesy because it seems to us that, whether those conclusions of ours prove to be right or wrong, it will be more instructive if we criticise these works for our readers from altogether an independent standpoint; an advantage we hold we should not possess if we were perhaps insensibly induced to adopt the lines of argument upon which the engineer has based his theory and founded his practice. While, therefore, acknowledging the offer of, and duly valuing, Mr. Ellice-Clarke's proffered information, we hold it better to risk even the possibility of error than to abandon the course we have hitherto pursued in our notices of these works. We accordingly made our recent inspection, as on previous occasions, wholly unaccompanied, and unbiassed by any information save such as we could obtain for ourselves on the spot. It was observable that the cessation of the sea's action from the south-west had brought about quite a changed condition of affairs from that which we remarked upon when last writing on this subject. With the exception of two groyne intervals—those to the west at which the first inroads by the sea became apparent—the inequality of shingle accumulation before seen had nearly wholly disappeared, and all along the line of the sea face, with the exception of the locality above referred to, a firm beach had been formed, which showed no signs of scouring or of undue height on either side of the groynes. Such a result we had anticipated would probably follow due allowance being made for the balancing of seasonal influences; and it was in the hope of it that we strenuously advocated time being allowed for such influences to operate. In fact—always with the previously named exceptional spot carefully borne in mind—we should now say, were it not for possible after results, that the engineer to the Hove Commissioners had successfully met the difficulty on which his advice was sought. But, unfortunately, all experience with work of this nature forbids us to finally adopt so sanguine a conclusion. What we must still doubt will be the result of a resumption of attack from the south-west. Will that beach which we have named as now accumulated have acquired so defined a lodgment that it will not again be displaced? Should it be that it has done so, there will be no need for the construction of the sea-wall as to the necessity of which all of those interested seemed but lately to be agreed, and the interval of *quieta non movere* will have served to save the Hove Commissioners a very large outlay. Further experience is, however, as we have pointed out, still needed to determine if we may congratulate the ratepayers on the avoidance of such expenditure.

Leaving this section of the beach, we can now revert to the point at which we have stated there is no appearance of hopeful results such as we have above described. At these points, in spite of there having been no erosive action due to seas driven in from a south-westerly direction, there still remains the wholly unbalanced accumulation of shingle on the leeward side of the groynes, and the waves make a clean and unchecked wash up to the foot of the slopes of the lower walk. That these have not appreciably suffered since our previous visit is doubtless due to the comparative calmness of the sea during the lately prevailing direction of the winds, and a very different tale will have to be told should a change in the latter again send in heavy breakers. But it seems to us that, apart from this consideration, there is another factor in the question of the first importance. We have been told that the primary cause of all the mischief which has occurred to the Hove beach was the insetting of the current up a channel due to changed conditions brought about by the construction of defensive works further westward along the coast, and we hold that the continuance of that mischief under the circumstance of total freedom from south-westerly seas conclusively demonstrates that the cause assigned was the right one. It is manifest, therefore, if we be correct in this assumption, that from both causes combined, viz., the changed direction of the current and wave action from the south-west, no period of rest at this now unprotected point is ever to be relied upon. Further works here must consequently be a necessity; but, should the hopes we have expressed as to the much larger proportion of the shore line be eventually fulfilled, the expenditure required will be trifling in comparison with what had been at one time looked forward to with certainty. Already the esplanade at what we may term the danger-point, has protection for a short length by a sea-wall of comparatively inexpensive character, and it seems likely, from the results attained by it, that an extension of that wall throughout the two threatened intervals may prove to be all that will be required. The groynes as erected of course considerably break the direct force of the sea, and were the effect of the wash along their windward faces guarded against by substantial walling, not necessarily of great height or thickness, all that is desired may possibly be secured. Mr. Ellice-Clarke may in that case claim a success, which, if it is not entire, will at all events justify considerable congratulation. But no accumulations of beach, we fear, can ever be expected at this "danger point." We do not wish it to be supposed, because we have formed some hopeful anticipations, that we abandon the unfavourable opinions we formerly expressed as to groynes being constructed at a greater degree of divergence from the right angle with the shore line than 15 deg.

THE MARINE, MECHANICAL, AND METAL TRADES EXHIBITION.

ON the fifth of next month there will be opened at the Agricultural Hall, Islington, an exhibition devoted to the engineering and metal trades, which promises to be one of the most successful ever held in this country. It has been apparently organised by Mr. Samson Barnett in a manner which leaves nothing to be desired. Almost every branch of engineering will be represented — mining, metallurgical, hydraulic, pneumatic, marine, electrical, sanitary, civil, military, and railway—while, in all probability, no better collection of machine tools or machinery for treating raw produce has ever been brought together in England. That there was an opening for such an exhibition as this is clearly shown by the promptness with which Mr. Barnett's invitation to firms to exhibit has been answered, and the result will be seen next week in a hall crowded to overflowing by exhibits, contributed by the best firms in the trades represented, amongst whom we may mention the names of Messrs. Sir Joseph Whitworth and Co., Greenwood and Batley, John Fowler and Co., the Leeds Forge Company, Fox, Head, and Co., the Kirkstall Forge Co., Messrs. Hornsby, Kendall and Gent, Smith and Coventry, the Bowling Iron Company, Weardale Iron Company, Landore-Siemens Steel Company, &c. Some 500 exhibitors in all will send goods for display, and the only part of the hall which will not be quite full will be one of the galleries. For several months this space had been reserved for an electric railway, but at the last moment it was found impossible to get this ready for work in time, and the scheme having fallen through too late, it was decided to reserve the space for the use of the carpenters, sign writers, &c. The gallery at the west end of the hall will be fitted up as a lounge for smoking and reading, and adjoining this lounge a room is to be provided for the representatives of the press. Amongst the 500 exhibits there will be many remarkable for their size and novelty, those of the Leeds Forge Company, Messrs. Sir Joseph Whitworth and Co., and Messrs. John Fowler being particularly noteworthy. The Leeds Forge Company will show a fine collection of corrugated flues and plates, their chief exhibit being a single front marine boiler, one of eight being constructed for the Royal Mail Steamship screw steamer Moselle, fitted with two mild steel Fox's patent corrugated furnace flues 3ft. 7½in. in diameter, the corrugations being rolled at one heat in the patent mill of the same company. The interior of this boiler is to be fitted as a miniature boudoir, the upholstering being done by a well known Leeds firm, and is to be lighted with incandescent lamps from a storage battery, and by the new table incandescent lamp of the Duplex Electric Company. Messrs. Sir Joseph Whitworth and Co. will show, amongst a large collection of machines, guns, plates, &c., all made of fluid compressed steel, a hollow propeller shaft 55ft. long, 18¼in. in diameter, and having a hole 10in. in diameter through it, its entire weight being 15½ tons, also a double throw crank shaft 26ft. long, 18in. diameter, 24in. throw, and weighing 12 tons 12 cwt.; a single-throw crank shaft 10ft. 3in. long, 16¾in. diameter, 24in. stroke, and weighing 5 tons 4 cwt.; a cylinder liner for a marine engine, with the internal flange which has recently been introduced which enables the liner to be bolted through at the end; this liner weighs 65 cwt., and has a diameter of 7ft. Another interesting exhibit by the same firm is a 14in. air vessel to contain the compressed air for the propulsion of the Whitehead torpedo. These vessels are used by the English and other Governments, and are tested to a pressure of 1500 lb. per square inch. The length of the vessel is 5ft. 6in., thickness $\frac{5}{16}$in., and weight 207 lb. Amongst machine tool makers Messrs. Kendal and Gent, of Manchester, are making a fair show, their exhibits including Brown's patent screwing machine for screwing bolts and tapping nuts from ½in. to 2in. diameter, with all appliances for re-cutting the dies. This machine is capable of producing a complete thread at one cut, and will be shown fitted with Dixon's patent automatic motion for instantaneously releasing the dies at any given point. An improved planing machine will also be shown which is constructed to plane 4ft. long by 2ft. 6in. wide and 2ft. high, and is made self-acting in horizontal, vertical, and angular cuts by an improved feed motion, arranged for giving a great range of feed; the table is traversed upon flat slides with an automatic lubricating arrangement. Other exhibits by the same firm will include an improved sliding, surfacing, and screw-cutting lathe, 10in. centres, specially adapted for heavy cutting in wrought iron and steel; a patent wheel-cutting machine specially adapted for cutting spur, bevel, and worm-wheels with any number of teeth without the use of change wheels; improved cutter-making machine specially adapted for making milling cutters with either parallel, conical, or curved section of face, and fitted with Scott's patent dividing arrangement for giving any number of divisions to the cutter; and an improved radial drilling machine for drilling holes up to 6in. diameter and 14in. deep, and to admit objects up to 3ft. 6in. in height on base plate. In another class of exhibits Messrs. Frank Pearn and Co. are showing several of their patent pumps, including a vertical direct-acting ballast pump, with 9in. pump, 9in. steam cylinder, and 13in. stroke; a horizontal direct-acting pump, with 10in. diameter pump, 14in. steam cylinder, and 24in. stroke, and a double-ram "Manchester" pumping engine, with rams 4in. diameter, steam cylinders 7½in. diameter, and stroke 8in.; a "Manchester" wall pump, the "Robinson" hot-air engine of one-man and two-man power, and vertical boilers by Messrs. Tinker, Shenton, and Co. Messrs. John Fowler and Co. will exhibit amongst many other things a narrow gauge railway with its rolling stock. Not the least remarkable exhibit will be that of Mr. Linfield, who will show a screw sailing machine, which he has called "Shadow," and which is commonly known to the public as a "flying machine." It was designed and constructed as a test machine to reduce to practice the possibility of utilising the atmosphere as a roadway at high speed. The result of the test has not yet been made public. For the present we shall only add that every one can take an interest in the exhibition, from the youngest engineering student of King's or University Colleges—and they are amongst the exhibitors—to the oldest engineer in the country. It will be remembered that Mr. Barnett's exhibition of last year gave satisfaction to exhibitors and the public, and we see no reason to doubt that this will be equally successful.

CONTINUOUS BRAKES AND COMPULSORY LEGISLATION.

ON the 22nd inst. Earl De La Warr, in the House of Lords returned to the charge by putting a question to her Majesty's Government as to whether they intended to deal with the question of efficient brakes, and if so, whether in the manner described in the circular of the Board of Trade of August, 1877. It will be remembered the circular referred to is that containing the famous conditions of the Board of Trade, with which, in their opinion, continuous brakes should comply. Lord De La Warr pointed out from the Board of Trade Returns how unsatisfactory was the progress which had been made, and the contemptuous indifference with which some companies—naming particularly the London and North-Western and the Great Northern—had regarded the recommendations; and further proceeded somewhat unkindly to quote the reply which the President of the Board of Trade had made some time ago to a deputation. Mr. Chamberlain had then said, "If the companies set their backs against the wall, and will defy public opinion, and absolutely refuse to be guided by the recommendations to the Board of Trade, there will be no alternative but for the Government to lay a statement of the whole case before Parliament, and point out how ridiculous is our position, and ask for further powers as may be necessary." As Earl De La Warr said, the evil was admitted, the remedy was known and acknowledged, but six years had elapsed since the 1877 circular, yet nothing had been done, and under these circumstances his lordship, not unnaturally, wished to know what were the intentions of the Government. Lord Sudeley replied as follows:—"It is not possible during the present session for the Government to deal with the brake question, but the experience gained since the circular of 1877 was written only confirms the Board of Trade in the necessity for the conditions which were then set forth being adhered to in any system of brakes which may be adopted, and the necessity for uniformity is also made apparent every day. The Board of Trade regret that many of the railway companies have not thought it advisable to adopt a brake complying with the conditions suggested in the circular. If the noble earl were to introduce a Bill for the purpose of making it compulsory upon companies to adopt a brake complying with those conditions, the Board of Trade would support such a measure." After this strong expression of opinion, and of confident conviction in the justice of the position taken up by the Board, which every unprejudiced man who understands the subject feels to be reasonable, it would only be showing ordinary sense if those companies who have made the blunder of trying to satisfy the requirements by a bad brake should at once take the hint, and proceed to make the change which otherwise they will most certainly be forced into doing before very long.

OLD AND NEW ATLANTIC STEAMERS.

THE wonderful performances of Atlantic steamers, comparatively new, have been so prominently kept before the public that there is some danger that the efficiency of Atlantic steamers not quite so new will be overlooked. There are not wanting certain heretical individuals who maintain that the Alaska and other vessels of her type owe their speed to to the enormous power developed by their engines, and not to the inherent virtues of their model. The opinion is strengthened by some recent Atlantic performances. The Alaska and Britannic left Liverpool at 5 and 6 p.m. respectively, on Saturday, June 2nd, and both left Queenstown at 9.30 on the Sunday morning. The Alaska arrived at New York at 10 a.m., and the Britannic at 8 p.m. on the following Sunday, the mean time being about—Alaska—7 days 5 hours, and the Britannic 7 days 15 hours. Considering that the Alaska is a two-year-old ship of 6950 tons, indicating 10,500-H.P., and that the Britannic is nine years old, 5004 tons, and about 4500-H.P. only, this trial of speed is more creditable to the Britannic than to the Alaska. If the Britannic had the same horse-power in proportion to power as the Alaska, she would have 7500, or 3000 more than she has. These passages give for the Alaska a speed of 16·1 knots, and for the Britannic 15·2 knots. According to Mr. Froude, increasing the Britannic's power by two-thirds would increase her speed by 3·4 knots, raising it to 18·6 knots, equal to a passage of 6 days 5 hours, or one day shorter than the Alaska. As a matter of fact there is very small doubt that she would be little short of that speed. By increasing her power one-third, or to 6000-horses—the same as the Arizona—her probable speed would be 17 knots = 6 days 20 hours. In fact, when the boilers of the Britannic and Germanic require renewing two or three years hence, they could be made more than a match in speed for any steamers now running, by giving them the moderate power of 6000 horses, which their strength of construction would certainly well stand, as in the matter of model these vessels are apparently unequalled by those of any other line. Again, the Servia left New York at 1 p.m. on June 13th, and the Britannic left New York at 2 p.m. on June 14th. The Servia arrived at Queenstown at 9.40 a.m. on June 21st, and the Britannic arrived at Queenstown 11.30 a.m. on June 22nd. The Servia's mean time was 7 days 16 hours 15 minutes; the Britannic's mean time was 7 days 17 hours. In other words, a ship of 7390 tons and 10,000-H.P. only gained 45 minutes on the run from New York on a vessel of 5004 tons and 4500-H.P. The Britannic was built by Messrs. Harland and Woolf, and engined by Messrs. Maudslay, Sons, and Field.

LITERATURE.

A Manual of Marine Engineering, comprising the Designing, Construction, and Working of Marine Machinery. By A. E. SEATON. Octavo, pp. 437. London: Charles Griffin and Co. 1883.

ON the whole this is a very satisfactory work; one, indeed, in which we find theory and practice much better combined than is usually the case. It is difficult to say whether it does or does not come up to the ideas which may be formed from its title, because the title is so in-

BROWN'S RADIAL VALVE GEAR.

(*For description see page 498.*)

Fig. 8.

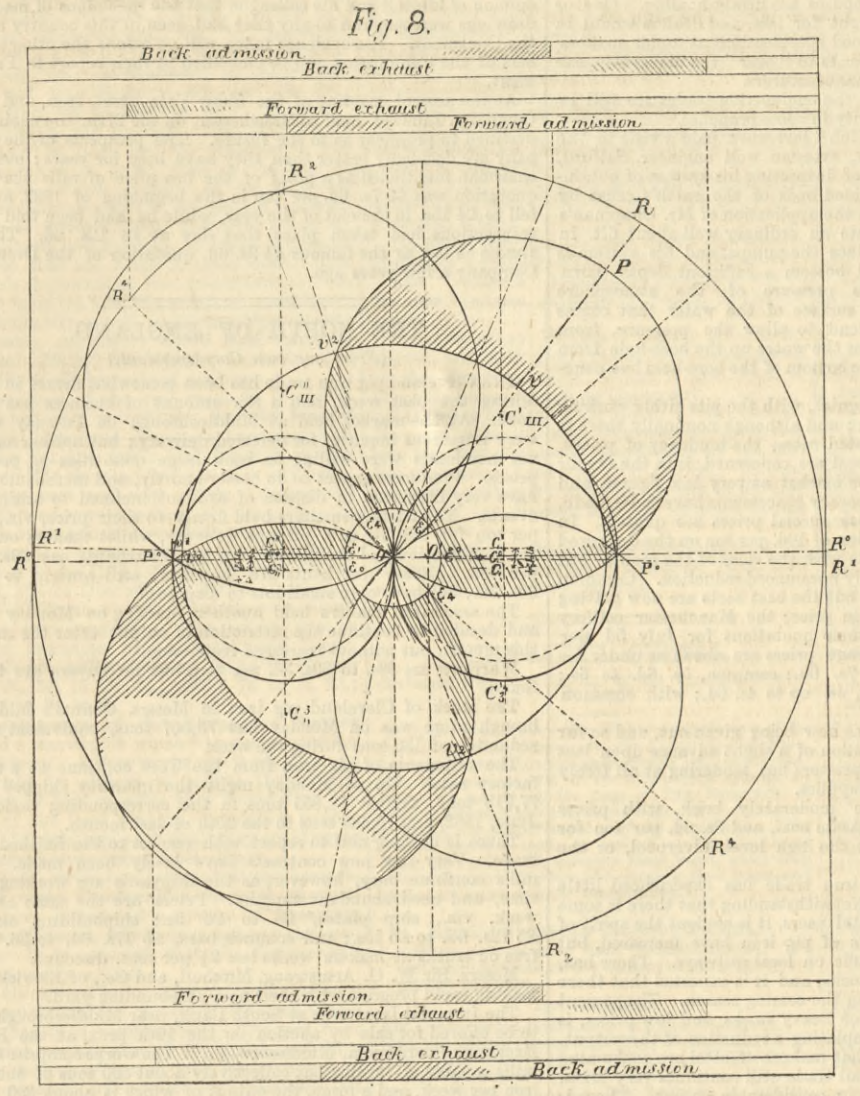


Fig 5

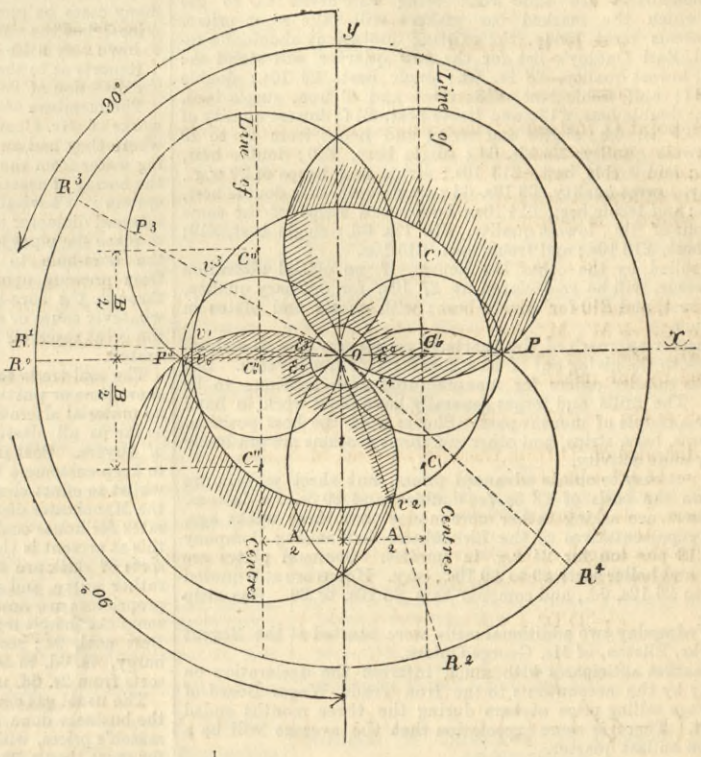


Fig 6.

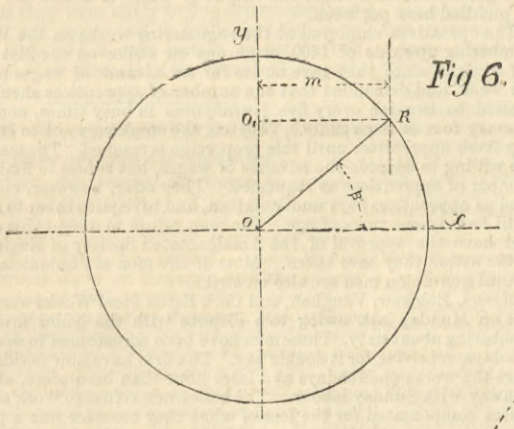


Fig. 7.

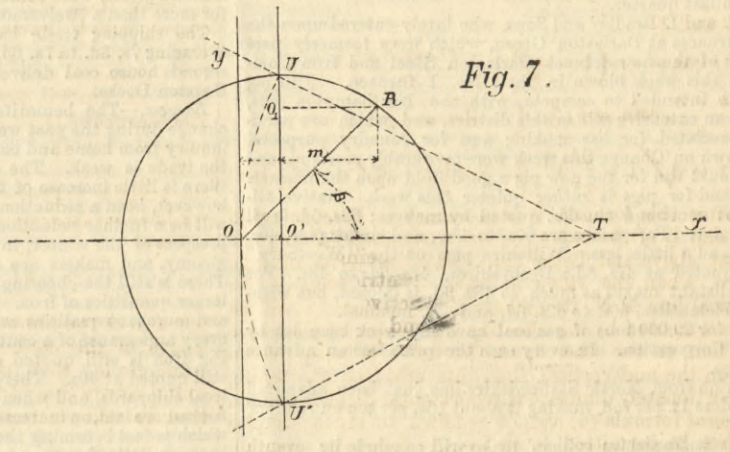
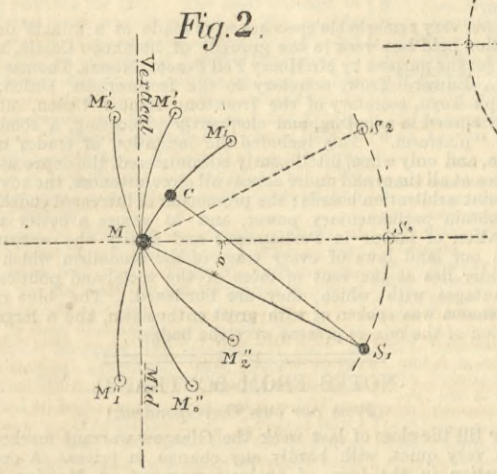


Fig. 4.

Fig. 2.



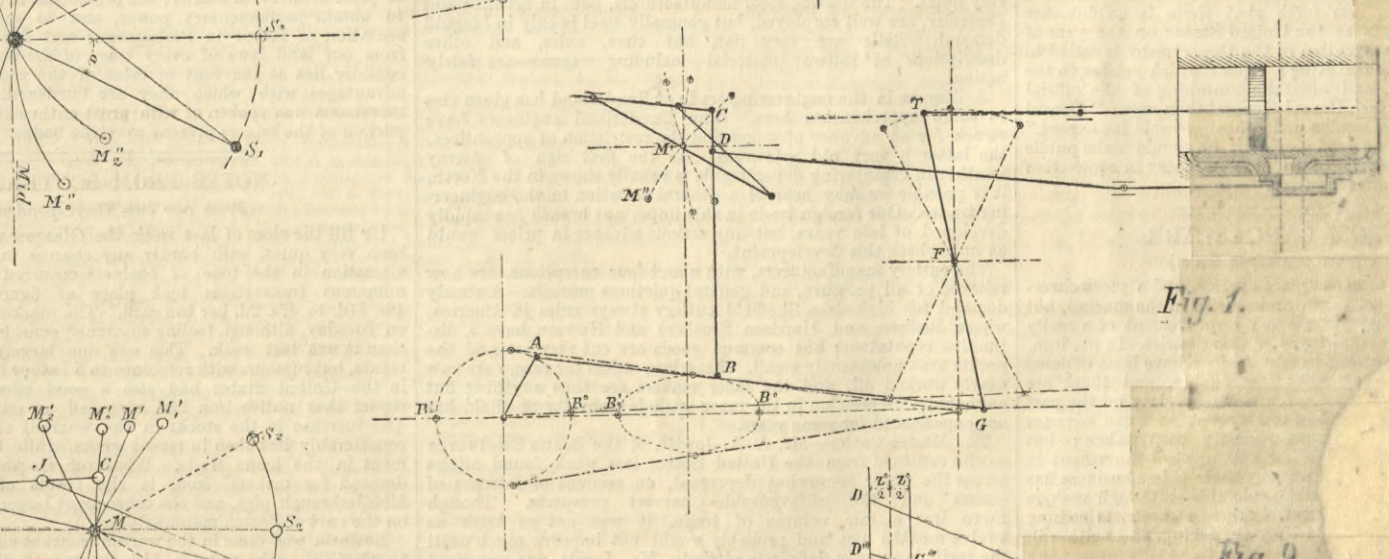


Fig. 1.

Fig. 3.

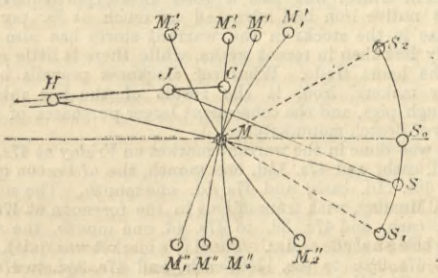
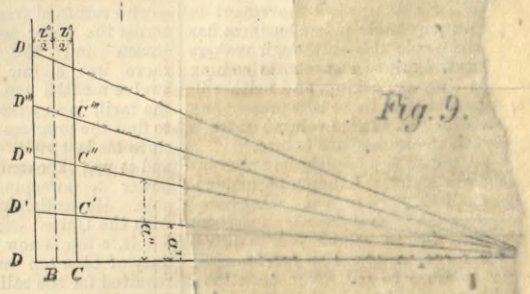


Fig. 9.



J Swain Eng

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

(*From our own Correspondent.*)

IN view of the circumstance that the midsummer quarterly meetings are fixed to come off a fortnight hence—in Wolverhampton on July 11th, and in Birmingham on July 12th—the probabilities are this week being canvassed as to the course which the marked bar makers will take as to prices. If, as seems most likely, the existing quotations should be re-declared, Earl Dudley's list for the new quarter will stand as: Rounds, lowest quality, £8 2s. 6d.; single best, £9 10s.; double best, £11; and treble best, £13; rivet and T iron, single best, £10 10s.; double best, £12; and treble best, £14; lowest quality of T iron, £9 2s. 6d.; angles and strips and hoops from 14 to 19 w.g., lowest quality, £8 12s. 6d.; single best, £10; double best, £11 10s.; and treble best, £13 10s.; strips and hoops of 20 w.g., ⅝in. only, lowest quality, £9 12s. 6d.; single best, £11; double best, £12 10s.; and treble best, £14 10s.; hoops and strips of the same gauge, but of ⅜in., lowest quality, £10 12s. 6d.; single best, £12; double best, £13 10s.; and treble best, £15 10s.

Bars rolled by the other list houses, if no official alteration should occur, will be re-declared at £7 10s. for ordinary quality, £9 for best, and £10 for double best; with sheets and plates in proportion.

The nearer approach of the quarterly gatherings acts as a check this week to the giving out of new contracts of much value. But numerous smaller orders for manufactured iron continue to be placed. The mills and forges generally have more work in hand than for a couple of months past. Sheets hold the best position. Still hoops, bars, strips, and other merchant sections are gradually showing more activity.

It is not easy to obtain advanced prices, but sheet makers are strong on the basis of £8 5s. for doubles, and £9 5s. for lattens. Galvanisers are asking rather more money than three weeks ago, and the representatives of the Birkenhead Galvanising Company quote £13 per ton for 24 w.g. in bundles. Common plates are £8 10s., and boiler sorts £9 to £9 10s., easy. Hoops are still quoted £6 10s. to £6 12s. 6d., and common bars £6 10s. to £6. Gas strip is £6 5s.

On Wednesday two additional mills were started at the Regent Ironworks, Bilston, of Mr. George Onions.

The market anticipates with much interest the declaration on Saturday by the accountants to the Iron Trade Wages Board of the average selling price of bars during the three months ended May last. There is some expectation that the average will be a reduction on last quarter.

Messrs. T. and I. Bradley and Sons, who lately entered upon the two blast furnaces at Darlaston Green, which were formerly part of the plant of the now defunct Darlaston Steel and Iron Company, have this week blown in their No. 1 furnace. The pig produced is intended to compete with the Northampton pigs, which have an extensive sale in this district, and which are particularly appreciated for bar making and for foundry purposes. Samples shown on 'Change this week were favourably received, and the price should win for the new pig a good hold upon the market.

The demand for pigs is rather quieter this week. Native all-mines cannot command the 65s. quoted by makers; 62s. 6d. is all buyers will give. Part mines are 50s. to 45s., and cinder pigs, 40s. to 38s. 9d., and a little less. Wiltshire pigs of the "Westbury" brand are quoted at 47s. 6d.; Derbyshires, 47s. 6d. to 48s. For some other distant makes as much as 48s. 9d. is quoted, but without sales. Hematites, 60s. to 62s. 6d. and 65s. nominal.

Contracts for 29,000 tons of gas coal have this week been let by the Walsall Corporation. In every case the price was an advance on a year ago.

Pottery mine from North Staffordshire has just been advanced by some vendors 1s. per ton, making it about 15s. per ton on vendors' premises.

The North Staffordshire colliers' strike will conclude its seventh week on Saturday. Both sides still hold out. Besides the usual weekly payment to the unionist hands of 10s. per man and 1s. per child, the non-unionists are receiving some help, but the majority of them are getting into a pitiable condition.

The South Staffordshire miners are counselled by their leaders to continue contributions to the north. For, it is urged, if these men go in at a reduction, the men of the south will not be in so favourable a position as they would otherwise be, when the new system of wages payment is discussed in a few weeks' time by the Conciliation Board in the South Staffordshire coal trade.

Contracts for roofing work, much of it to be sent abroad galvanised, are coming forward with rather more freedom, and the yards of some leading firms exhibit increased activity. Certain of the orders recently booked mean a full couple of months' work ahead.

For tanks, galvanised, a good demand is being expressed on home and foreign account. Ireland is an especially good customer to one or two firms in this district; and some manufacturers have determined to strengthen the hold which they have upon Irish buyers by prominently showing at the ensuing Cork Exhibition.

The operative chainmakers in the Cradley Heath district have decided to give notice for the 4s. 6d. list price upon all kinds of common hammered and dollied chains.

Mr. C. C. Hoare, one of the inspectors of factories in the Manchester district, has been relegated to South Staffordshire, in the place of Mr. J. A. Jones, who will leave about September for India.

The report of the U.S. Consul-General in London to the Department in Washington, sets forth that there is an increase in the Birmingham exports to the United States on the year of [illegible] 18 per cent., and the attention of the Department is called to [illegible] tion of Consul King's report which relates to the [illegible] testing, and also the stamping of the official [illegible] upon ship cables. The Consul-General then says: "Consul [illegible] has learnt that the condemned cables are sold for export." [illegible] King would be doing good service if he should make public [illegible] about a matter of so much delicacy in connection [illegible] leading Staffordshire industry.

[illegible] M LANCASHIRE.

(*From [illegible] Correspondents.*)

A steady [illegible] as regards prices, and a more cheer[illegible] the fu[illegible], are maintained in the market, but [illegible] said [illegible] there is any improvement of a really [illegible] the iron trade of this district. In pig iron, [illegible] weight of iron have been effected [illegible] at low figures, and there are [illegible] display of less anxiety on the part [illegible] business except at some advance [illegible] have recently been taken; but [illegible] follow any upward movement in [illegible] put up their prices business has [illegible] iron trade also—although makers [illegible] ness, except in sheets, is coming [illegible] as they are asking, and neither in [illegible] be said that there is at present any [illegible] on which any large volume of trade [illegible] in the immediate future.

[illegible] at the Manchester warrant [illegible] was quiet. Lancashire makers, [illegible] sellers, were firm at their quoted [illegible] for forge and foundry qualities [illegible] and for Lincolnshire iron prices [illegible] for forge to 45s. 10d. for foundry, [illegible] pressure to sell. For both local [illegible] moderate inquiries in the market, but [illegible] basis of the lowest prices taken a fortnight back, and they do not result in much actual business. In the finished iron trade sheets continue in good demand, and makers are now asking £8 to £8 2s. 6d. per ton delivered equal to Manchester as their minimum price. Hoops, however, still meet with only a poor inquiry at £6 10s. to £6 15s., and it is very difficult to get orders for bars at £6 5s. per ton delivered into the Manchester district, although this is the figure for which both North Staffordshire and the principal local houses are firmly holding. One or two local brands could be bought for less, and dealers would in many cases be open to book good specifications at under makers' prices; but the efforts of merchants to "bear" the market appear to have very little effect upon manufacturers.

Reports as to the condition of the engineering trades are still in the direction of decreasing activity in some branches.

The members of the "Joule Club" last week paid a visit to the works of Mr. Charles Chapman, artesian well engineer, Salford, where they had an opportunity of inspecting his system of obtaining water from the various stratified beds of the earth's crust by the boring of artesian wells. In the application of Mr. Chapman's system it is advisable to excavate an ordinary well about 6ft. in internal diameter in which to place the pumps, and his system is to place the pipes below the well bottom a sufficient depth down the bore-hole to prevent the pressure of the atmosphere from pressing upon the upper surface of the water that comes through the bore-hole, and instead to allow the pressure, from whatever cause or source, to press the water up the bore-hole from the great reservoir into which the bottom of the bore-hole has penetrated.

The coal trade continues very quiet, with the pits either working short time or putting into stock; and although nominally there is no material alteration in the quoted rates, the tendency of prices, so far as all classes of round coal are concerned, is in the favour of buyers. Coal is offered in the market at very low figures, and to keep customers together temporary concessions have to be made, whilst to effect clearances of stock special prices are quoted. In the Manchester district a reduction of 10d. per ton on the delivered rates for house coal is being made with the close of the month, but this at present is the only actually announced reduction. Common sorts of slack are still plentiful, but the best sorts are now getting rather scarce, and are stiffening in price; the Manchester colliery proprietors are now advancing their quotations for July 5d. per ton. At the pit mouth the average prices are about as under:—Best coal, 9s.; seconds, 7s. to 7s. 6d.; common, 5s. 6d. to 6s.; burgy, 4s. 6d. to 5s.; best slack, 4s. up to 4s. 6d.; with common sorts from 2s. 6d. upwards.

The usual gas coal contracts are now being given out, and so far the business done is in the direction of a slight advance upon last season's prices, with colliery proprietors not tendering at all freely for more than a twelvemonth's supplies.

The shipping trade has been moderately brisk, with prices averaging 7s. 3d. to 7s. 6d. for steam coal, and 8s. 6d. per ton for seconds house coal delivered at the high level, Liverpool, or the Garston Docks.

Barrow.—The hematite pig iron trade has experienced little change during the past week. Notwithstanding that there is some inquiry from home and continental users, it is evident the spirit of the trade is weak. The exports of pig iron have increased, but there is little increase of the traffic on local railways. There has, however, been a reduction in stocks, and it is expected that there will be a further reduction during the coming season. The present prospect of the winter, in face of heavy stocks and low prices, is gloomy, and makers are contemplating a reduction of the output. There is still the cheering fact that makers of steel are consuming larger quantities of iron. The rail trade still continues very brisk, and merchant qualities are also in considerable output. There is every appearance of a continued improvement in these departments. Pig iron is still quoted at about 50s. per ton, and No. 3 forge is still quoted at 49s. There is an increased vigour to be seen in the local shipyards, and when the new orders which have lately been booked are laid, an increased briskness will be imparted to the business which is fast becoming the chief industry of this district. Iron ore has seen little change, a very quiet tone prevailing. Prices remain steady, at from 9s. to 11s. per ton at the mines. The consumption of coal and coke still continues steady.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

IN my last letter the tonnage of coal sent by rail to the metropolis from the collieries of Messrs. Newton, Chambers, and Co., Thorncliffe, though it still topped the list, was 1000 tons short of the quantity. The weight should have been 19,955 tons.

The steam coal trade continues fairly active. Fully an average business is doing with Hull, particularly in the case of collieries in the Mexborough and Worth districts, which enjoy some advantage in the item of railway rates. The business doing with Goole has also increased of late. House coal, though quiet as usual this season, is in sufficient demand to keep the pits going about four days a week on an average, and five days are the rule in some quarters.

There has been little change in the iron markets since last report. If anything, prices are firmer, more business having been done, in spite of the tendency to hold off till quarter day.

The file trade is far from animated. Though the file smiths have abandoned their opposition and resumed work at a reduction of 10 per cent., the grinders have not yet intimated their acceptance of the reduced terms, and the strike can therefore scarcely be considered settled. A very brisk business is reported in saws, edge tools, and similar goods, but the silver and plated trades continue very quiet. The leading steel manufacturers, both in crucible and Bessemer, are well employed, but generally steel is only in languid demand. Rails are very flat, but tires, axles, and other descriptions of railway material—including wagons—are fairly active.

A dispute in the engineering trade at Sunderland has given rise to some apprehension here. The Sunderland engineers have struck for an advance of wages and the restriction of apprentices, the latter a very old grievance. As the first sign of stormy weather in engineering departments is usually shown in the North, it is possible we may hear of a general agitation in the engineering trades. Our foreign trade in this important branch has rapidly developed of late years, but any serious advance in prices would at once check this development.

The cutlery manufacturers, with about four exceptions, are now relieved of all pressure, and general quietness prevails. A steady demand for high-class Sheffield cutlery always rules in America, where Rodgers and Harrison Brothers and Howson have a distinctive reputation; but common goods are cut very low and the profits are unpleasantly small. American orders for razors are now nearly worked off, and the razor makers are thus anything but animated. Depression in the razor trade is a novelty Sheffield has not experienced for some years.

The Master-Cutler—Mr. A. A. Jowitt, of the Scotia Steelworks—who returned from the United States last week, found affairs across the water somewhat depressed, on account of lateness of season and the unfavourable harvest prospects. Though there was a fair volume of trade, it was not so brisk as twelve months ago, and probably would not improve much until the tariff laws were definitely settled. Mr. Jowitt was surprised to find the progress free-trade principles had made in the States since his last visit. Opinion appeared to be thoroughly changing, and it was expected and hoped that when the democrats came into power a sweeping measure in the tariff laws was inevitable. He anticipates, however, a heavy fall in business, both with the United States and with Canada. In Canada a duty of 5 dols. a ton is now levied on steel. On steel rails at £6 a ton, a duty of £1 a ton would be severely felt, but as the rails, tires, &c., required for the railways now in course of construction are admitted free, the new duty is practically inoperative on railway material. On cast steel at £50 and £60 a ton it is not appreciably felt.

Mr. B. Samuelson, M.P., chairman of the Royal Commission on Technical Instruction, accompanied by Mr. Swire Small (Keighley), one of the Commissioners, visited Sheffield on Friday, inspected the various institutions giving technical instruction, and took the evidence of the Master-Cutler and other leading townspeople. Mr. Samuelson, after examining the work of the senior boys at the Central School, said it was the opinion of himself and his colleague that the specimens of machine drawings were superior to any they had seen in this country or on the Continent. The evidence taken will go before the other members of the Commission and be embodied in their report to Parliament.

At the annual meeting of the Ebbw Vale Steel, Iron, and Coal Company, Limited, held at Manchester, on the 27th, the chairman declined to prophecy as to the future. The prospects of the company are decidedly better than they have been for years; but the chairman mentioned as a proof of the low price of rails that the quotation was £5 7s. 6d. per ton in the beginning of 1882, and it fell to £4 15s. in the end of the year, while he had been told that transactions had taken place that day at £4 12s. 6d. This is almost as low as the famous £4 9s. 6d. quotation of the Dronfield Company a few years ago.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THE Cleveland pig iron trade has been somewhat firmer in tone during the past week, and a fair amount of business has been done. At the market held at Middlesbrough on Tuesday there were numerous inquiries for deferred delivery; but neither makers nor merchants were willing to book large quantities at present prices. Producers expect to do better shortly, and merchants who have very little iron to dispose of are not inclined to anticipate events. The leading smelters hold firmly to their price, viz., 40s. per ton for No. 3 g.m.b. prompt delivery, whilst makers outside the combination and the majority of the merchants ask 39s. 6d. per ton. Some merchants are, however, still content to take 39s. 3d., but have only small lots to dispose of.

The associated makers held another meeting on Monday last, and decided to continue the restriction of output after the end of this month, but without increased restriction.

Warrants are 39s. to 39s. 3d. per ton, but no buyers are to be found.

The stock of Cleveland pig iron in Messrs. Connal's Middlesbrough store was on Monday last 75,507 tons, equivalent to a reduction of 130 tons during the week.

The shipments of pig iron from the Tees continue at a satisfactory rate. Up to Monday night the quantity shipped was 77,718 tons, against 51,855 tons in the corresponding period of June, 1882, and 70,483 tons to the 25th of last month.

There is nothing new to report with respect to the finished iron trade. Very few new contracts have lately been made. The mills continue busy, however, as the shipyards are working full time, and need abundant supplies. Prices are the same as last week, viz., ship plates, £6 to £6 5s.; shipbuilding angles, £5 12s. 6d. to £5 15s.; and common bars, £5 17s. 6d. to £6. All free on trucks at makers' works less 2½ per cent. discount.

Messrs. Sir W. G. Armstrong, Mitchell, and Co., of Elswick, are making rapid progress with their new shipbuilding yard.

The Imperial Ironworks at South Bank, near Middlesbrough, are to be offered for sale by auction on the 10th prox. at the Royal Exchange Board-room, Middlesbrough. The works comprise three mills capable of turning out collectively about 500 tons of finished iron per week, and a forge, the output of which is about 650 tons of puddled bars per week.

The operatives employed at the engineering works on the Wear, numbering upwards of 1400, came out on strike on the 21st inst. A fortnight since they gave notice for an advance of wages of 2s. per week, and demanded that the number of apprentices should be limited to two for every five journeymen in busy times, and two to every four in slack times. They ask the employers not to engage any fresh apprentices until this proportion is reached. The masters are willing to concede the advance of wages, but refuse to limit the number of apprentices as requested. They offer, however, only to bind as apprentices boys under sixteen, and to require them to serve until twenty-one years of age. The men refuse to accept this offer, and have the approval of the Amalgamated Society of Engineers in the action they have taken. Most of the men are unionists, but several non-union men are also on strike.

Messrs. Bolckow, Vaughan, and Co.'s Eston Steel Works were laid idle on Monday last, owing to a dispute with the boiler firemen, numbering about sixty. These men have been accustomed to work on Sundays, receiving for it double pay. The firm have now decided to start the works on Mondays at a later hour than heretofore, and so do away with Sunday labour. The boilermen refuse to work at all, unless compensated for the loss of what they consider was a privilege. Consequently they were all paid off on Monday, and fresh hands were engaged. The works are now in full operation without them.

Some very remarkable speeches were made at a miners' demonstration held last week in the grounds of Stanhope Castle, kindly lent for the purpose by Mr. Henry Fell Pease. Messrs. Thomas Burt, M.P., Edward Trow, secretary to the Ironworkers' Union, and Joseph Toyn, secretary of the Ironstone Miners' Union, substantially agreed in adopting, and eloquently advocating, a somewhat new "platform." This included the laudation of trades' unions when, and only when, intelligently administered, the deprecation of strikes at all times and under almost all circumstances, the advocacy of joint arbitration boards; the promotion of increased endeavours to obtain parliamentary power, and to secure a better representation of labour in Parliament; and finally the extirpation from our land laws of every trace of the feudalism which they consider lies at the root of most of the social and political disadvantages with which they are burdened. The blue ribbon movement was spoken of with great enthusiasm, and a large proportion of the miners present wore the badge.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

UP till the close of last week the Glasgow warrant market had been very quiet, with hardly any change in prices. A decided alteration in the tone of business occurred on Monday, when numerous transactions took place at figures advancing from 46s. 11d. to 47s. 2d. per ton cash. The market was again quieter on Tuesday, although feeling continued considerably more cheerful than it was last week. This was due largely to the good shipments, but rumours with reference to a rather firmer state of things in the United States had also a good effect, particularly the report that native iron had advanced as much as 8s. per ton. The increase in the stocks in the warrant stores has also been considerably less than in recent weeks, while there is little abatement in the home trade. Whatever slackness prevails in the demand for makers' iron, is the result of the low rates of Middlesbrough pigs, and the consequent larger purchases of these on the part of Scotch manufacturers.

Business was done in the warrant market on Friday at 47s. 0½d. to 46s. 11½d. cash, and 47s. 1½d. one month, the afternoon quotations being 46s. 11d. cash, and 47s. 1d. one month. The market was firm on Monday, with transactions in the forenoon at 47s. 1d. to 47s. 2d. cash, and 47s. 3d. to 47s. 4d. one month, the afternoon prices being a shade easier. Tuesday's market was quiet, with business at 47s. 0½d. to 46s. 11½d. cash, and 47s. 2½d. to 47s. 2d. one month. On Wednesday transactions took place between 47s. 0½d. and 47s. 1d. cash and 47s. 1½d. to 47s 2½d. one month. To-day—Thursday—the market was very quiet between 47s. and 47s. 1d. cash and 47s. 3d. to 47s. 2d. one month.

The quotations of makers' iron, which have varied but slightly, are as follow:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 57s.; No. 3,

53s.; Coltness, No. 1, 59s. 6d.; No. 3, 53s. 6d.; Langloan, 59s. 6d. and 53s. 6d.; Summerlee, 57s. and 50s. 6d.; Chapelhall, 57s. and 53s. 6d.; Calder, 58s. and 50s.; Carnbroe, 54s. 6d. and 48s. 6d.; Clyde, 50s. 6d. and 48s. 6d.; Monkland, 48s. 3d. and 46s. 3d.; Quarter, 47s. 6d. and 45s. 6d.; Govan, at Broomielaw, 48s. 3d. and 46s. 3d.; Shotts, at Leith, 59s. 6d. and 55s. 6d.; Carron, at Grangemouth, 48s. 6d. (specially selected, 54s. 6d.) and 47s.; Kinneil, at Bo'ness, 49s. and 47s. 6d.; Glengarnock, at Ardrossan, 54s. 6d. and 48s.; Eglinton, 48s. and 45s. 6d.; Dalmellington, 48s. 6d. and 47s. 6d.

The activity in the malleable iron department has continued so long, and the pressure on the manufacturers is so great, that in the case of small orders which require to be filled at once, an advance of about 2s. 6d. per ton has to be paid. These prices do not, however, affect the larger contracts now running, or those of greater importance that are being entered upon. The past week's shipments of iron manufactures from the Clyde included £36,812 worth of machinery, mostly locomotives and sugar-crushing plant; £3206 sewing machines; £3570 steel manufactures; and £26,000 iron goods, excluding the value of the week's exports of pig iron.

The condition of the coal trade is in almost every respect very promising. For the time of the year the household demand is very good, and the inquiry for the works and factories is very extensive. The shipping trade is also very brisk, both on the east and west coasts. During the week 6430 tons were exported at Grangemouth, 2000 at Bo'ness, and large quantities at Leith and Burnt Island. Among the orders despatched from Glasgow was 1135 tons to Demerara, 3500 to Montreal, 360 to Gothenburg, 380 to Bordeaux, 1000 to San Francisco, 2135 for steamers' use, and 5032 tons sent coastwise. The orders now in course of execution are comparatively heavy. Main coals are selling f.o.b. at 6s. to 6s. 6d. per ton; ell, 6s. 9d. to 7s. 6d.; splint, 7s. to 7s. 6d.; and steam at 8s. to 9s.

The coalmasters of the Slamannan district have held a meeting at which the wages question was considered. A few weeks ago it was thought they would be obliged to reduce the miners' wages, but at this meeting they found that the position of the local trade in its relation to that of other districts was such that they could agree not to disturb the present rates of pay.

A sectional strike has occurred at the Lassodie Collieries, near Dunfermline, because the employers have introduced a system of measuring the coals produced, which does not pay the men for dross. It is expected that the dispute will soon be amicably settled.

What threatened to be a serious dispute between the colliery owners and miners of Fife and Clackmannan has been compromised. The men have been asking an advance of 6d. a day, and they were on the eve of giving two weeks' notice of their intention to strike when—as I indicated last week that they were likely to do—the masters met the men half way; and if trade is satisfactory they are, it is said, almost certain to get the full amount of their demand in the month of August.

WALES & ADJOINING COUNTIES

(*From our own Correspondent.*)

THE steam coal export continues to increase steadily at all the ports, and if a slight falling away is to be noticed at the port of Swansea, it has been caused solely by the temporary closing of the North Dock for repairs. Both Cardiff and Newport show an increase, and the activity on the lines of rail is practically evidenced by a steady improvement in revenue. The returns of the Taff Vale Railway last week, for instance, show an increase of £2000 over the corresponding week last year. The official report of the Taff Vale Railway for last year showed that over 7 millions and a-half tons of coal and coke went down the line in the course of a year. The estimate is that this will be considerably exceeded, and will certainly be over 8 millions for 1883. The total tonnage of the Taff last year was 8½ millions. The weekly totals of coal, foreign and coastwise, from Cardiff now maintain an average of 150,000 tons, and, as a consequence, shipping is looking up, and no less than seventy steamers and other vessels are in hand at Chepstow, on the Tyne, and the Clyde. The yard at Chepstow continues very busy, and its repute well maintained. I hear that on the Tyne a perceptible advance in price has taken place for Cardiff steamers, consequent upon demand and forced expedition.

Quotations for first and secondary qualities of steam coal are not only maintained, but advancing, and this week best coal is fully 9d., and in some places 1s. per ton over last week's figures. Colliery screened seconds are 11s.

There is less discussion now about the Barry Docks Bill. Shippers and coalowners have as much as they can attend to. Still, interest in the fate of the Bill has not abated, and a stout fight is expected to begin in the House of Lords' Committee-room on Wednesday next. I visited Barry a few days ago, and quite agree with the engineering opinion that docks can easily be constructed there, and from certain winds the shelter of the island, which is about a mile in length, would be tolerably good; but the wisdom of leaving the old channels of traffic, which have been in use for half a century, and carving out new ones, when the coal output is passing its highest point, and one of the first coal valleys—that of Aberdare—begins to show signs of exhaustion, is open to question.

High-class scientific opinion points to the mouth of the Rhymney as better in every sense for docks, but this probably awaits the development of the lower measures of the Monmouthshire coalfield—the future field when the Rhondda is worked out.

Newport, Mon., continues to show proportionately quite as much coal prosperity as Cardiff. The exports last week amounted to 33,000 tons. The failure of the Newport Extension Bill was a loss to Newport, and I suppose will prompt to future efforts. The Risca and Cardiff Bill is also to be brought on again.

The patent fuel trade at Cardiff is slack. At Swansea it is fast attaining formidable proportions. The average dispatch is now over 10,000 tons weekly at that port.

There is not much vigour to report upon in connection with the iron and steel trades. In the Swansea district steel rails have dropped a little in quotations, and it is as much as can be done to maintain them in other quarters. This may be expected for a short time, but I have faith in prices hardening, especially as such close attention is paid to quality. The prices of Welsh bar always stood well up to a certain time as long as its character was retained, and it was only when quality deteriorated that prices sunk and the trade declined. From what I see, this article is looked after more carefully.

The Mountain Ash strike, consequent upon a dispute as to which doctor should be appointed to the collieries, has been amicably settled and a number of legal actions withdrawn.

Thos. Burt, M.P., is to address the Rhondda colliers this summer, and Sir H. H. Vivian is also invited to attend.

Tin plates are firm at last week's quotations. The trade is everywhere exhibiting improvement.

The "Golconda" Steamship Company is one of the new ventures, principally floated by Cardiff men.

Gilfach Colliery, Rhymney Valley, is to be restarted, and sinking operations are contemplated at the Bargoed Valley, where a fine seam of Mynyddyslwyn extends to Gellygaer.

I regret to announce the death of Mr. Dalziel. He came to Cardiff from Newcastle-on-Tyne, and was the first registered shareholder of the first line of steamers that ran from Cardiff. He was connected with every great movement in the coal history of the district, and the historian of the great strike.

An explosion occurred this week in one of the Rhymney Iron Company's collieries. Two men were killed and several injured.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

19th June, 1883.

3021. STOPPERING BOTTLES, J. Phillips, Walworth.
3022. SOLDERING IRONS, J. O. Fry, Nottingham.
3023. APPARATUS for MAKING WHEELS, W. Brierley.—(*Messieurs Deflassieux Bros., Paris.*)
3024. DIVIDING RAILS, &c., into SECTIONS, H. Britten, Sheffield.
3025. SPRING for LOCKS, E. Edwards.—(*L. Bourrié, Lyons, France.*)
3026. CARBON PLATES, R. Applegarth, London.
3027. HULLS of SHIPS, H. J. F. Russell.—(*M. Marzan, Havana.*)
3028. SEWING MACHINERY, A. G. Brookes.—(*R. Whitehill, New York, U.S.*)
3029. COUPLING, &c., SHAFTING, A. G. Brookes.—(*R. Whitehill, New York, U.S.*)
3030. APPARATUS for PROPELLING SHIPS, J. Robinson, Londonderry.
3031. PRODUCING LIGHT by ELECTRICITY, W. P. Thompson.—(*R. J. Sheehy, New York, U.S.*)
3032. DISTRIBUTING SAND, C. D. Abel.—(*E. Lesur, Paris.*)
3033. PREPARING WATER-TIGHT FABRICS, E. A. Brydges.—(*F. O. Spielhagen, Berlin.*)
3034. LEVELLING INSTRUMENTS, B. J. B. Mills.—(*J. Macdonald, New York, U.S.*)
3035. GEAR CUTTING MACHINES, H. J. Allison.—(*U. and H. E. Eberhardt, Newark, U.S.*)
3036. BOOTS and SHOES, H. J. Morgan, Frome.
3037. SAFETY LAMPS, H. Haddan.—(*J. Weig, Dortmund.*)
3038. ANNEALING IRON CASTINGS, W. R. Lake.—(*E. Jenkins and A. Law, Melbourne, and W. Price, Carlton, Australia.*)
3039. FAN WHEELS, W. Schmolz, San Francisco.
3040. LOOMS, J. Almond, Blackburn.
3041. GAS ENGINES, T. Russom, Leeds.
3042. BREECH-LOADING CANNON, &c., S. Pitt.—(*R. S. Ripley, St. Etienne.*)
3043. LOCKS, &c., W. R. Lake.—(*Messieurs Mayer, Langfelder, and Hammerschlag, Vienna.*)
3044. BEDSTEADS, R. B. Evered, London.
3045. PRESERVING ANIMAL LIVERS, A. M. Clark.—(*I. L. R. de Bretagne, Paris.*)
3046. LATHES, A. M. Clark.—(*H. M. Potter, U.S.*)

20th June, 1883.

3047. RENDERING DURABLE LAWN TENNIS &c., BALLS, Slazenger and Sons, Manchester.
3048. STOPPERS for BOTTLES, J. Jackson, London.
3049. BREECH-LOADING SMALL FIRE-ARMS, T. Perkes, London.
3050. ROTARY FANS, H. Aland, London.
3051. SURVEYORS PLOTTING SCALES, A. R. Cragg, Hereford.
3052. HOPPER DREDGERS, A. Bown & W. Simons, Renfrew.
3053. MAKING ANTISEPTIC FLUIDS, B. Nickels, London.
3054. ROUNDABOUTS, &c., E. G. Brewer.—(*S. J. Mignot and J. B. Franchelli, Paris.*)
3055. PERMANENT WAY, W. P. Thompson.—(*L. Harty, sen., and L. Harty, jun., Brussels.*)
3056. TOBACCO-PIPES, E. Ward, Liverpool.
3057. SPRING BEDS, &c., F. Ellisdon, Liverpool.
3058. PRESERVING FRUIT, &c., W. H. Thew, Waterloo.
3059. IRONING MACHINE, R. Mindt, Berlin.
3060. FEEDING APPARATUS for THRASHING MACHINES, R. R. Holben and S. Wilkerson, Cambridge.
3061. CRICKET BATS, A. J. Altman, London.
3062. PRODUCING WHITE LIGHT, C. D. Abel.—(*C. Clamond, Paris.*)
3063. FLY-WHEEL, H. Blank, Berlin.
3064. LATCHES, &c., J. D. Sprague, Upper Norwood.
3065. PLAIN METALLIC TIRES, T. Fox, Sheffield.
3066. GAS-MOTOR ENGINES, C. H. Andrew, Stockport.
3067. TRICYCLES, W. Jackson, London.
3068. HEATING, &c., FEED-WATER, W. Baragwanath, Chicago, Illinois.
3069. CONVERTING RECIPROCATORY into ROTARY MOTION in EXPLOSIVE, &c., ENGINES, H. G. Williams, East Greenwich.
3070. GAS MOTOR, &c., ENGINES, J. Fielding, Gloucester.
3071. HEATED AIR MOTORS, L. P. Martin, Vienna, and F. W. Gilles, Cologne.

21st June, 1883.

3072. APPARATUS to be USED in CASTING IRON, T. and J. Robinson, Widnes.
3073. ABSTRACTING HEAT from STOVES, C. J. Henderson, Edinburgh.
3074. DYNAMO-ELECTRIC MACHINES, M. Deprez, Paris.
3075. LOOMS, W. H. Tristram and H. Brereton, Bolton.
3076. FANCY WEAVING, W. H. Tristram and J. Whitehead, Bolton.
3077. SCARFS, T. Clegg, Hampton Court.
3078. TANKS for MELTING GLASS, E. Brooke, Huddersfield.
3079. GAS-MOTOR ENGINES, F. W. Crossley, Manchester.
3080. TELEPHONES, A. W. Rose, London.
3081. VENTILATING SEWER-TRAP, J. Moyes, Renfrew.
3082. WASHING MACHINE, A. I. Denny.—(*F. Yahnel, Zittau.*)
3083. BALING PRESSES, J. Watson, Westbourne Park.
3084. TREATING PRODUCTS of COMBUSTION of FUEL, J. H. Darby, Denby.
3085. HYDROCARBON HEATING STOVES, C. Butler, Birmingham.
3086. RAILWAY CHAIRS, J. Hopkinson, Rowsley.
3087. MECHANICAL RETORTS, J. Lyle, London.
3088. PRODUCING COLOURING MATTERS from PHENOL, H. J. Haddan.—(*The Leipziger Anilin-fabrik, Leipzig.*)
3089. MAKING AMMONIACAL PRODUCTS, L. Q. and A. Brin, Paris.
3090. PORTABLE FUEL, L. J. Cayé, Montreuil, France.
3091. ROPES USED for HAULING, &c., POWER, F. W. Walker, Leeds.
3092. MACHINES for FINISHING MOULDINGS, W. R. Lake.—(*J. Grossejambe, Evreux, France.*)
3093. EXTRACTING SUGAR from MOLASSES, J. H. Johnson.—(*J. E. Boivin and M. M. D. Loisseau, Paris.*)
3094. FRICTION GEARING, W. E. Ayrton, and J. Perry, London.
3095. RED COLOURING MATTERS, F. Wirth.—(*Messrs. Halle and Co., Biebrich, Germany.*)
3096. PREPARING FOOD for INFANTS, &c., H. J. Haddan.—(*W. Horlick, Washington, U.S.*)

22nd June, 1883.

3097. GAS MOTOR ENGINES, J. Doughill, Manchester.
3098. OIL BURNERS, J. C. Morrison, West Ham, and R. Smith, Bromley.
3099. BUILDING VEHICLES, R. Sunyé, London.
3100. INCANDESCENT ELECTRIC LAMPS, R. Harrison, Newcastle.
3101. PORTER PUMPS, &c., M. Cleary, Dublin.
3102. TELEPHONE, S. Coxeter and H. Nehmer, London.
3103. REFINING JUTE, E. T. Hughes.—(*W. Lakacs, Budapest.*)
8104. CHLORINE, H. A. Dufrené.—(*La Société Anonyme de Produits Chimiques, Paris.*)
3105. STEAM GENERATOR, &c., H. J. Haddan.—(*J. M. H. Menay, Havre.*)
3106. PERAMBULATORS, C. Thompson, London.
3107. MULTIPLE CYLINDER ENGINES, H. J. Haddan.—(*H. Toussaint, Pamiers, France.*)
3108. GRINDING APPARATUS, J. S. Dronsfield, Oldham.
3109. PAVEMENTS, &c., where it is REQUIRED to ACCOMMODATE TELEGRAPH WIRES, &c., E. Banner, London.
3110. APPARATUS for RAISING and LOWERING, H. Reichardt, London.
3111. SEPARATING ORTHO-TOLUIDINE from PARA-TOLUIDINE, J. Weiler, Cologne.
3112. CONTROLLING the FLOW of LIQUIDS, J. Pumphrey, Birmingham.
3113. WHEELED CARRIAGES, J. Harrison, Birmingham.
3114. MARINERS' COMPASS, W. Lake.—(*E. Bisson, Paris.*)
3115. DYNAMO-ELECTRIC MACHINES, G. Forbes, London.
3116. ARRANGING CIRCUITS, S. Pitt.—(*C. E. Scribner, Chicago, U.S.*)
3117. EXHAUST FANS, &c., G. M. Capell, Passenham.

23rd June, 1883.

3118. STOP MOTIONS for DRAWING FRAMES, J. Macqueen, Bury.
3119. SCREW PROPELLERS, F. Boshardt.—(*A. Zednicèk, Hohenmanth, Austria.*)
3120. TARGETS, R. Morris, London.
3121. SADDLE BAR, J. Passmore and E. C. Cole, Exeter.
3122. APPARATUS for DRIVING ENGINES, C. F. Pollak, London.
3123. ELECTRICAL APPARATUS, W. Hochhausen, N.Y.
3124. BOTTLE-FILLING MACHINES, C. A. Day.—(*E. L. Lloyd, and C. C. Joly, Philadelphia, U.S.*)
3125. SPADES, J. Sidaway, Halesowen.
3126. APPLYING GOVERNORS for MAKING and BREAKING CONTACT, D. Salomons, Tunbridge Wells.
3127. PREPARING a COMPOUND from VEGETABLE MATERIALS, E. C. T. Blake, Brixton.
3128. PRESSURE GAUGES, D. Salomons, Tunbridge Wells.
3129. KILNS, E. Edwards.—(*J. Beumier, Jemappes.*)
3130. RINGS, &c., of RING-SPINNING MACHINES, J. Wetter.—(*H. Dodt, Verviers, Belgium.*)
3131. TELEPHONING to DELIVERY-OFFICE without calling on INTERMEDIATE STATIONS, O. Schäffler, Vienna.
3132. MINERS' SAFETY LAMPS, J. Wetter.—(*H. Friedmann, Eisleben, Germany.*)
3133. COUPLING PIPES, J. C. Hudson, London.

25th June, 1883.

3134. COOLING LIQUIDS, F. T. Bond, Gloucester.
3135. GAS ENGINES, P. Neil, London.
3136. LACING GLOVES, &c., A. C. Mather, Liverpool.
3137. STEAM BOILERS, G. C. and J. H. Fraser, Bromley.
3138. VELOCIPEDES, &c., W. Wright, Droylsden.
3139. STEAM ENGINE INDICATORS, S. Moorhouse, Stalybridge.
3140. CLEANSING BOOTS and SHOES, J. H. B. Wigglesworth, Batley, York.
3141. ELEVATOR STOPS, F. P. Canfield, Boston, U.S.
3142. ROLLING MILLS, W. H. Ellis, Leeds.
3143. REGULATING PRESSURE of GAS, H. Devine, Manchester.
3144. MOUNTING, &c., SPINDLES of TEXTILE MACHINERY, J. Marsh, Ashton-under-Lyne.
3145. SADDLE CLOTHS, H. H. Lake.—(*G. Hüttemann and C. Wackerow, Vienna.*)
3146. FLUSHING APPARATUS, M. Syer, J. Gilmore, and W. R. Clark, London.
3147. SUPPLYING CHARGES for RE-FILLING CARTRIDGE CASES, R. Morris, Blackheath.
3148. GRANULATING LIQUID OILS, &c., A. M. Clark.—(*L. Roth, Brooklyn, U.S.*)

Inventions Protected for Six Months on Deposit of Complete Specifications.

3000. ELECTRIC ARC LAMPS, S. Pitt, Sutton.—A communication from N. H. Edgerton, Philadelphia, U.S.—*16th June*, 1883.
3001. DYNAMO-ELECTRIC MACHINES, &c., S. Pitt, Sutton.—A communication from N. H. Edgerton, Philadelphia, U.S.—*16th June*, 1883.
3007. INSULATORS for ELECTRIC WIRES, L. B. Gray, Boston, U.S.—*16th June*, 1883.
3035. GEAR-CUTTING MACHINES, H. J. Allison, London.—A communication from E. and H. E. Eberhardt, Newark, U.S.—*19th June*, 1883.
3039. FAN WHEELS, W. Schmolz, San Francisco, U.S.—*19th June*, 1883.
3050. ROTARY FANS, H. Aland, London.—*20th June*, 1883.
3059. IRONING MACHINE, R. Mindt, Berlin.—*20th June*, 1883.
3096. PREPARING FOOD for INFANTS, H. J. Haddan, London.—A communication from W. Horlick, Washington, U.S.—*21st June*, 1883.
3111. SEPARATING ORTHO-TOLUIDINE from PARA-TOLUIDINE, J. Wieler, Cologne.—*22nd June*, 1883.

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

2466. REGULATING FLOW of LIQUIDS, D. Young, London.—*18th June*, 1880.
2479. MAKING FURNITURE, J. Reilly, Manchester.—*15th June*, 1880.
2482. HEATING, &c., WIRE, J. Sykes, Huddersfield.—*19th June*, 1880.
2486. FURNACES for MELTING METALS, C. Carr, Smethwick.—*19th June*, 1880.
2742. MACHINES for MAKING CASKS, G. D. Terry, Marylebone.—*5th July*, 1880.
2513. MINING MACHINES, B. J. B. Mills, London.—*22nd June*, 1880.
2522. IRON, &c., VESSELS, H. Smith, Glasgow.—*22nd June*, 1880.
2542. EVAPORATING SOLUTIONS in CONTACT with GAS, S. Pitt, Sutton.—*22nd June*, 1880.
2610. TELEPHONES, &c., J. H. Johnson, London.—*24th June*, 1880.
2830. SECURING GLASS in SKYLIGHTS, &c., A. Smith, Goudhurst, Kent.—*9th July*, 1880.
2499. INJECTORS, &c., S. Borland, Manchester.—*21st June*, 1880.
2569. MAKING MACHINE SCREWS, J. Wetter, London.—*23rd June*, 1880.
2786. CRANKS for VELOCIPEDES, J. Turner, Coventry.—*7th July*, 1880.
2876. TEXTILE FABRICS, C. D. Abel, London.—*12th July*, 1880.
2502. CASTERS, W. Burgess, New York, U.S.—*21st June*, 1880.
2506. UNITING PAPER in LENGTHS, R. J. and A. Edwards, London.—*21st June*, 1880.
2539. OPERATING SIGNALS, &c., H. Johnson, [illegible].—*22nd June*, 1880.
2541. DAMPING BISCUITS, &c., C. Harvey, Preston.—*22nd June*, 1880.
2613. SUPPORTING BEARINGS of ROLLERS, H. Chandler and J. G. Richmond, Salford.—*26th June*, 1880.
2661. PRESSING YARN on BEAMS, A. Hitchin, Burnley.—*29th June*, 1880.
2523. PURIFYING LIQUOR, W. R. Lake, London.—*22nd June*, 1880.
2531. FEEDING APPARATUS for THRESHING MACHINES, J. W. Fison, Wicken, and C. Lack, Cottenham.—*22nd June*, 1880.
2590. PREVENTING CORROSION in BOILERS, G. and J. Wier, Glasgow.—*25th June*, 1880.
2602. RENDERING CASES of CARTRIDGES AVAILABLE for REPEATED USE, R. Morris, Blackheath.—*26th June*, 1880.
2774. CLEANING WOOL, D. H. Brandon, Paris.—*6th July*, 1880.
2558. COMBS of HORN, &c., F. H. F. Engel, Hamburg.—*23rd June*, 1880.
2619. INDICATORS, W. S. Smith, Barking, and W. O. Smith, Woodside.—*26th June*, 1880.
2705. ENGINES for PUMPING WATER under PRESSURE, A. B. Brown, Edinburgh.—*2nd July*, 1880.

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

2547. FLESHING MACHINES, T. W. and W. K. Appleyard, Leeds.—*20th June*, 1876.
2564. ELECTRIC TELEGRAPHS, J. Muirhead, jun., Wimbledon.—*21st June*, 1876.
2607. MACHINERY for BORING ROCK, J. Vivian, Whitehaven.—*24th June*, 1876.
2664. MILL FURNACES for MAKING IRON, J. Tibbs, Tipton.—*28th June*, 1876.
2653. MAKING WORKING DRAWINGS, H. and T. C. Batchelor, Cardiff.—*27th June*, 1876.

Notices of Intention to Proceed with Applications.

(*Last day for filing opposition*, *13th July*, 1883.)

778. BRUSHES, C. Jack, London.—*12th February*, 1883.
859. INDELIBLE INK, H. A. Dufrené, Paris.—A communication from Messieurs Fonesca et Compagnie.—*16th February*, 1883.
860. ADJUSTABLE RISING, &c., PIANO STOOLS, W Hemmingway, Northgate, and W. Bottomley, Brighouse.—*16th February*, 1883.
864. MAKING, &c., of WHITE LEAD, J. C. Martin, Richmond.—*16th February*, 1883.
873. APPARATUS for HOLDING ROPES, A. E. Maudslay Littlebourne.—*17th February*, 1883.
874. ENSURING STEADY LIGHT to CANDLES, J. B. Goodwin, London.—*17th February*, 1883.
886. DATING HAND STAMPS, G. K. Cooke, London.—*17th February*, 1883.
896. PRODUCING PRINTING BLOCKS, J. Meihe, London.—A communication from J. Allgeyer and Carl Bolhoevener.—*19th February*, 1883.
899. JOINT CONTACT for ELECTRIC FITTINGS, W. Defries, London.—*19th February*, 1883.
900. WATER HEATER, W. Carrington, Openshaw, and W. H. Bowers, Gorton.—*19th February*, 1883.
904. WASTE-PREVENTING CISTERNS, B. C. Cross, Leeds.—*19th February*, 1883.
906. LOOMS for WEAVING, J. Williams and H. Barnes, Burnley.—*19th February*, 1883.
915. UTILISING RAW VEGETABLE BATS, C. A. Meinert and P. Jeserich, Berlin.—*20th February*, 1883.
917. BREAD-LOAF CUTTER, D. M. Ford, Bristol.—*20th February*, 1883.
931. PRINTING TELEGRAPH, H. J. Allison, London.—A com. from S. D. Field.—*20th February*, 1883.
937. RAILWAY, &c., WHEELS, W. Eyre, Sheffield.—*20th February*, 1883.
938. STEAM BOILERS, J. Hall, Manchester.—*20th February*, 1883.
942. TREATING METALLIC ORES, J. H. Johnson, London. A communication from A. D. Ancel and J. M. A. Thiollier.—*20th February*, 1883.
947. LIFE-SAVING MATTRESS, W. R. Lake, London.—A com. from L. Heath.—*20th February*, 1883.
950. KNITTING MACHINES, W. Morgan-Brown, London.—A communication from G. A. Leighton and S. C. Forsaith.—*21st February*, 1883.
956. BASES for COLOURING MATTERS, E. G. Brewer, London.—A communication from Chemische Fabrik auf Actien.—*21st February*, 1883.
979. WORKING RAILWAY SIGNALS, H. O. Fisher, Cardiff.—*22nd February*, 1883.
994. FLOATING DOCKS, G. B. Rennie, London.—*23rd February*, 1883.
1036. CARTRIDGES, T. Nordenfelt, London.—*26th February*, 1883.
1040. VENTILATING SHIPS, G. A. Calvert, Cork, and C. Kelson, Liverpool.—*27th February*, 1883.
1058. CLIP PULLEYS, R., J., and H. Wilder, Wallingford.—*27th February*, 1883.
1061. SENSITISING PHOTOGRAPHIC PAPER, W. R. Lake, London.—A communication from [illegible] B. and B. West.—*27th February*, 1883.
1071. PRINTING MACHINES, W. R. Lake, London.—A com. from J. T. Hawkins.—*27th February*, 1883.
1218. ELECTRO-MAGNETIC SIGNALS, W. [illegible] London.—A communication from B. M. Plumb.—*7th March*, 18[illegible]
1228. BARBED FENCING WIRE [illegible] A com. from O. P. [illegible]
1282. VENTILATING [illegible] T. Crapper, Lo[illegible]
1294. RAILWA[illegible]
1368. [illegible]
1477. [illegible]
[illegible]

923. SASH FASTENERS, T. J. Mullings, London.—20th *February*, 1883.
933. CONSTRUCTION of BLOCKS, W. Lee and D. F. Beale, Maidstone.—20th *February*, 1883.
943. DRYING ANIMAL, &c., SUBSTANCES, W. R. Lake, London.—Com. from L. Maiche.—29th *February*, 1883.
949. MAKING INK, A. A. Nesbit, London.—21st *February*, 1883.
971. WINDOW FASTENERS, T. H. Collins, Winchester.—22nd *February*, 1883.
977. WEIGHING MACHINES, E. Wolner, Liverpool.—22nd *February*, 1883.
988. HEATING by HOT WATER, H. and C. F. Longden, Sheffield.—23rd *February*, 1883.
1002. FIXING BLADES of SCREW PROPELLERS, E. P. Timmins and J. Rose, Cardiff.—24th *February*, 1883.
1006. WARPING, &c., YARN, W. McGee and T. Watson, Paisley.—24th *February*, 1883.
1007. SUPPLYING SENSITIVE PLATES, J. H. Hare and H. J. Dale, London.—24th *February*, 1883.
1008. SADDLES of BICYCLES, &c., J. A. Lamplugh, Birmingham.—24th *February*, 1883.
1013. LADIES' COSTUME STAND, B. Sigrist, London.—24th *February*, 1883.
1023. MEASURING LIQUIDS, R. Jobling, London.—24th *February*, 1883.
1028. FURNITURE REPOSITORIES, W. Shepherd, London.—26th *February*, 1883.
1049. PRODUCING DESIGNS on TEXTILE FABRICS, C. D. Abel, London.—A communication from La Société A. Labrosse et J. Richard.—27th *February*, 1883.
1063. WATERING ROADWAYS, &c., W. Smethurst, Brynn, T. T. Crook, Bolton.—27th *February*, 1883.
1069. TRANSFORMING NAPHTHALINE-DI-SULPHONIC ACIDS into AMIDO-NAPHTHALINE-DI-SULPHONIC ACIDS, J. C. Mewburn, London.—A communication from L. Freund.—27th *February*, 1883.
1077. PLASTIC COMPOUND, W. Smith, London.—27th *February*, 1883.
1090. RAISING LIQUIDS, J. H. Kidd, Wrexham.—28th *February*, 1883.
1097. TOBACCO PIPES, O. Ber, Poland.—28th *February*, 1883.
1118. ROTARY ENGINES, T. A. Hearson, Blackheath.—1st *March*, 1883.
1138. APPARATUS for GIVING ALARMS, A. M. Gibson, Ravenstone.—2nd *March*, 1883.
1179. ROLLER MILLS, H. Simon, Manchester.—5th *March*, 1883.
1181. BUTTONS, H. E. Newton, London.—A communication from A. Mader.—5th *March*, 1883.
1189. RUNNERS of UMBRELLAS, J. Imray, London.—A com. from J. B. Wilson.—6th *March*, 1883.
1194. COP RETAINING SPINDLES, A. J. Boult, London.—A communication from W. T. Coggeshall and J. E. Rice.—6th *March*, 1883.
1206. PUMPS for DRAWING BEER, T. Woollerton, Leicester.—6th *March*, 1883.
1257. SHUTTLE-BOX OPERATING MECHANISM, J. Brownlee, Glasgow.—8th *March*, 1883.
1288. GUN CARRIAGES, W. R. Lake, London.—A communication from H. Gruson.—10th *March*, 1883.
1339. PRODUCING COAL GAS, H. E. Newton, London.—A com. from A. Klönne.—13th *March*, 1883.
1370. MECHANISM of ELECTRIC METERS, P. Jolin and J. Parsons, Bristol, and M. F. Purcell, Dublin.—14th *March*, 1883.
1413. RING SPINNING FRAMES, A. M. Clark, London.—A com. from J. J. Bourcart.—16th *March*, 1883.
1540. RING SPINNING FRAMES, A. M. Clark, London.—A com. from J. J. Bourcart.—24th *March*, 1883.
1554. COMPOUND for EXTINGUISHING FIRES, C. D. Abel, London.—A communication from E. F. Neveu.—27th *March*, 1883.
1618. ELECTRO MAGNETS, A. M. Clark, London.—A com. from L. d'Arlincourt.—30th *March*, 1883.
2419. FILLING, &c., BOTTLES, F. Foster, London.—12th *May*, 1883.
2579. ELECTRIC LIGHTING on RAILWAYS, W. Stroudley, Brighton, and E. J. Houghton, Peckham.—23rd *May*, 1883.
2590. ROLLING INGOTS, D. Evans, Blaenavon.—24th *May*, 1883.
2612. CHECKING GAMES of CARDS, G. F. Howard, London.—25th *May*, 1883.
2619. WINDING, &c., YARN, J. Boyd, Shettleston.—16th *May*, 1883.
2654. GAS COOKING APPARATUS, S. Leoni, London.—29th *May*, 1883.
2680. EXTRACTING FAT from BONES, &c., C. D. Ekman, London—30th *May*, 1883.
2716. SHIPS' BERTHS, H. J. Haddan, London.—A communication from G. O. Smith.—31st *May*, 1883.
2726. CUTTING CORNS, H. W. Sharpin, Bedford.—1st *June*, 1883.
2868. RAILWAY CAR COUPLERS, H. J. Haddan, London. A com. from N. P. Cowell.—8th *June*, 1883.
2952. STEAM BOILERS, W. R. Lake, London.—A communication from A. H. Crockford.—13th *June*, 1883.
3000. ELECTRIC ARC LAMPS, S. Pitt, Sutton.—A communication from N. H. Edgerton.—16th *June*, 1883.
3001. DYNAMO-ELECTRIC MACHINES, S. Pitt, Sutton.—A com. from N. H. Edgerton.—16th *June*, 1883.
3007. INSULATORS, L. B. Gray, Boston, U.S.—16th *June*, 1883.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 22nd June*, 1883.)

[illegible]. COVERING STAIRS with CARPET, H. Hawgood, Richmond.—14th *December*, 1882.
6161. HYGROMETERS, F. H. F. Engel, Germany.—23rd *December*, 1882.
[illegible], T. Hancock, Wolverhampton.—[illegible] *December*, 1882.
[illegible]. DROP-DOWN GUNS, J. H. [illegible], London.—28th *December*, 1882.
[illegible]. CONTROLLING CURRENT in ELECTRIC CIRCUITS, J. [illegible], Oldham.—29th *December*, 1882.
[illegible] BATTERIES, T. J. Howell, London.—[illegible]
[illegible], J. Edmondson, Halifax.
[illegible], W. E. Gedge, London.—[illegible]
[illegible], London.—5th [illegible]
[illegible]

6207. ATTACHING FALSE CUFFS, F. S. Turner, London.—29th *December*, 1882.
6210. HAMMER ACTIONS for PIANOFORTES, E. A. Brydges, London.—29th *December*, 1882.
6217. VELOCIPEDES, J. Harrington, Coventry.—29th *December*, 1882.
6224. SPINNING FRAMES for JUTE, &c., A. Frier, Dundee.—30th *December*, 1882.
6233. LETTERING ARTICLES in GLASS, W. B. Fitch, Deptford.—30th *December*, 1882.
6234. FURNACES for MELTING GLASS, W. B. Fitch, Deptford.—30th *December*, 1882.
6235. ELECTRIC ARC LAMPS, W. B. Fitch, Deptford.—30th *December*, 1882.
6236. MAKING SCREWS, W. R. Lake, London.—30th *December*, 1882.
1. DYNAMO-ELECTRIC MACHINE, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
2. STORAGE BATTERIES, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
3. ELECTRICAL APPARATUS for DOMESTIC LIGHTING, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
4. ARC ELECTRIC LAMPS, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
5. ARC ELECTRIC LAMPS, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
6. INCANDESCENT ELECTRIC LAMPS, F. J. Cheesbrough, Liverpool.—1st *January*, 1883.
8. SECURING RAPID, &c., COMBUSTION of FUEL, J. Howden, Glasgow.—1st *January*, 1883.
11. UMBRELLA FURNITURE, E. J. James, London.—1st *January*, 1883.
29. UTILISING WASTE HEAT, W. Hall, Cardiff.—2nd *January*, 1883.
30. FIREBRICKS, &c., J. Williams, Liverpool.—2nd *January*, 1883.
60. COUNTING REVOLUTIONS of WHEELS, G. D. Kittoe, London.—4th *January*, 1883.
62. POINTS for TRAMWAYS, A. H. Rowan, London.—4th *January*, 1883.
85. FOLDING BOXES, A. A. Barratt and G. Greenshields, Ditton.—6th *January*, 1883.
90. INKSTANDS, F. Wirth, Frankfort-on-the-Main.—6th *January*, 1883.
97. MAKING ALUMINIUM, W. Weldon, Burstow.—8th *January*, 1883.
101. APPLYING EOSINE in PHOTOGRAPHIC PROCESSES, C. D. Abel, London.—8th *January*, 1883.
156. CONTROLLING, &c., ELECTRIC CURRENT, W. M. Mordey, Putney.—10th *January*, 1883.
167. MIDDLING PURIFIERS, H. J. Haddan, London.—11th *January*, 1883.
185. HARNESS SADDLES, G. Craddock, London.—12th *January*, 1883.
210. KEY for SECURING RAILS on their CHAIRS, H. B. Morton, Cardiff.—13th *January*, 1883.
214. HOT-AIR ENGINES, H. H. Lake, London.—13th *January*, 1883.
254. POROUS SILICIOUS MATERIAL, A. Frank, Germany.—16th *January*, 1883.
327. NETTING MACHINERY, J. H. Johnson, London.—19th *January*, 1883.
337. GLAUBER'S SALT, H. J. Haddan, London.—20th *January*, 1883.
341. TOOLS for DRESSING, &c., F. Trier, London.—20th *January*, 1883.
400. ELECTRIC GENERATORS, W. M. Mordey, Putney.—24th *January*, 1883.
413. PRINTING MACHINES, A. Coates, Rawtenstall.—25th *January*, 1883.
414. GRINDING, &c., STONE, &c., G. and A. Coates, Rawtenstall.—25th *January*, 1883.
580. BREAKING MACHINE for FABRICS, C. Garnier, Lyons.—2nd *February*, 1883.
624. ELECTRO-MOTORS, W. R. Lake, London.—5th *February*, 1883.
688. HANDLING of DRIVING REINS, W. R. Lake, London.—7th *February*, 1883.
926. CARRIAGE WHEELS, J. A. Turner, West Gorton.—20th *February*, 1883.
1010. GAS ENGINE, C. H. Andrew, Stockport.—24th *February*, 1883.
1014. TRAMWAYS, M. H. Smith, Halifax.—24th *February*, 1883.
1084. MAKING PAPER, L. Zeyer, Germany.—28th *February*, 1883.
1264. AUTOMATIC GAS REGULATOR, J. and E. Tuckett, Exeter.—9th *March*, 1883.
1352. VELOCIPEDES, W. Morgan, Birmingham.—13th *March*, 1883.
1511. VALVES, B. W. Davis, London.—22nd *March*, 1883.
1560. PULSOMETER PUMPS, J. E. Hodgkin, London.—27th *March*, 1883.
1661. ROLLERS for WRINGING MACHINES, H. Clegg, Accrington.—3rd *April*, 1883.
1663. TREATING MILK for BUTTER, &c., H. J. Allison, London.—3rd *April*, 1883.
1791. APPLYING ELECTRICITY to VEHICLES, F. Wynne, London.—9th *April*, 1883.
1802. BRICK-MAKING MACHINE, P. M. Justice, London.—10th *April*, 1883.
1931. SEWING FABRICS, J. H. Johnson, London.—17th *April*, 1883.
2085. MAKING CORDAGE, H. H. Lake, London.—24th *April*, 1883.
2143. CLINOMETER COMPASS, W. R. Lake, London.—27th *April*, 1883.
2205. DYNAMO MACHINES, S. Pitt, Sutton.—1st *May*, 1883.
2241. FURNACES for STEAM BOILERS, F. C. Glaser, Berlin.—2nd *May*, 1883.
2297. FRAMES, &c., for SHAFTING, for LOOMS, J. H. Johnson, London.—5th *May*, 1883.

List of Specifications published during the week ending June 23rd, 1883.

5186, 2d.; 808, 2d.; 4162, 10d.; 4235, 4d.; 4707, 8d.; 4775, 4d.; 4845, 4d.; 4955, 2d.; 5043, 2d.; 5055, 8d.; 5058, 6d.; 5060, 10d.; 5070, 6d.; 5078, 2d.; 5079, 2d.; 5083, 4d.; 5085, 2d.; 5087, 2d.; 5107, 6d.; 5109, 6d.; 5113, 2d.; 5115, 6d.; 5116, 2d.; 5120, 6d.; 5121, 6d.; 5125, 6d.; 5128, 6d.; 5133, 2d.; 5135, 2d.; 5137, 2d.; 5139, 2d.; 5140, 2d.; 5141, 2d.; 5142, 4d.; 5145, 6d.; 5146, 2d.; 5147, 2d.; 5148, 4d.; 5149, 2d.; 5156, 2d.; 5157, 2d.; 5159, 6d.; 5160, 6d.; 5161, 2d.; 5162, 2d.; 5168, 2d.; 5164, 4d.; 5166, 6d.; 5167, 6d.; 5169, 2d.; 5170, 2d.; 5171, 2d.; 5172, 4d.; 5173, 6d.; 5174, 2d.; 5175, 2d.; 5176, 2d.; 5177, 2d.; 5179, 8d.; 5180, 8d.; 5181, 2d.; 5183, 6d.; 5184, 6d.; 5185, 2d.; 5186, 2d.; 5187, 2d.; 5190, 2d.; 5191, 10d.; 5192, 6d.; 5193, 4d.; [illegible]; 5195, 8d.; 5196, 4d.; 5198, 8d.; 5199, 8d.; 5200, 6d.; 5202, 10d.; 5203, 6d.; 5204, 2d.; 5205, 2d.; 5206, 6d.; 5207, 6d.; 5208, 2d.; 5209, 2d.; 5210, 2d.; 5211, 6d.; 5212, 6d.; 5213, 2d.; 5214, 2d.; 5215, 4d.; 5216, 2d.; 5218, 2d.; 5219, 6d.; 5220, 6d.; 5221, 6d.; 5222, 6d.; 5224, 2d.; 5225, 6d.; 5226, 2d.; 5227, 2d.; 5228, 6d.; 5229, 6d.; 5230, 2d.; 5231, 2d.; 5232, 2d.; 5234, 2d.; 5236, 2d.; 5237, 2d.; 5238, 2d.; 5239, 8d.; 5240, 8d.; 5241, 6d.; 5242, 2d.; 5244, 6d.; 5247, 2d.; 5248, 2d.; 5249, 4d.; 5250, 6d.; 5252, 6d.; 5253, 8d.; 5254, 6d.; 5255, 6d.; 5256, 6d.; 5257, 2d.; 5258, 2d.; 5259, 6d.; 5260, 8d.; 5261, 2d.; 5262, 2d.; 5263, 2d.; 5264, 8d.; 5265, 2d.; 5266, 6d.; 5267, 6d.; 5268, 2d.; 5269, 2d.; 5270, 10d.; 5271, 2d.; 5272, 6d.; 5273, 6d.; 5275, 6d.; 5276, 8d.; 5278, 4d.; 5282, 6d.; 5283, 4d.; 5285, 4d.; 5286, 6d.; 5288, 6d.; 5289, 8d.; 5290, 6d.; 5291, 6d.; 5293, 2d.; 5294, 4d.; 5295, 6d.; 5296, 6d.; [illegible]; [illegible]0, 4d.; 5303, 6d.; 5304, 10d.; 5306, 2d.; 5307, 8d.; [illegible]8, 6d.; 5309, 6d.; 5310, 6d.; 5311, 2d.; 5313, 6d.; [illegible]4, 2d.; 5315, 4d.; 5316, 4d.; 5317, 2d.; 5318, 10d.; [illegible]19, 6d.; 5321, 2d.; 5324, 2d.; 5326, 4d.; 5327, 6d.; [illegible]8, 2d.; 5332, 6d.; 5333, 2d.; 5334, 6d.; 5335, 4d.; [illegible]7, 6d.; 5342, 1s.; 5344, 6d.; 5353, 2d.; 5376, 6d.; [illegible]1, 6d.; 5411, 6d.; 5432, 4d.; 5499, 6d.; 5511, 4d.; [illegible]0, 6d.; 44, 8d.; 1120, 6d.; 1149, 4d.; [illegible], 4d.; [illegible], 8d.; 1204, 6d.; 1347, 6d.; 1375, 8d.

, 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.

4707. STAND FOR SUPPORTING BICYCLES, TRICYCLES, AND VELOCIPEDES DURING STATIONARY PRACTICE, AND DISTANCE-REGISTERING APPARATUS CONNECTED THEREWITH, *G. E. Vaughan and J. Walton, West Bromwich.*—3rd *October*, 1882. 8*d*.

The stand is provided with loose pulleys to receive the driving wheels, so that the latter may be caused to revolve by actuating the driving mechanism, while the velocipede remains stationary. The axis of one of the supporting rollers actuates suitable distance registering apparatus.

4775. FEEDING PAPER TO PRINTING MACHINES, &c., *F. Hoyer, Liverpool.*—7th *October*, 1882.—(*Provisional protection not allowed.*) 4*d*.

This relates to improvements on patents No. 2855, A.D. 1880, and Nos. 2457, and 5241, A.D. 1881. It consists, First, in means for regulating the lifting of the sheets of paper from the pile; Secondly, in controlling the movements of the sheets of paper on the feed table; Thirdly, in an improved side wiper on the feed table; Fourthly, in improvements in the lifting suction chamber; Fifthly, in mechanism for raising the rear table; Sixthly, in a blowing and under suction chambers in connection with the rear table. Other improvements are also described.

4955. PREVENTION OF WATCH SNATCHING, *M. Stuart, Seaforth.*—18th *October*, 1882.—(*Provisional protection not allowed.*) 2*d*.

A small horseshoe-shaped metallic piece is secured inside the pocket, and allows the chain to pass freely, but stops the watch, which can only be removed by pulling the guard or chain in a certain direction.

5043. BRACES FOR SUPPORTING TROUSERS, &c., *F. Hovenden.*—23rd *October*, 1882.—(*Provisional protection not allowed.*) 2*d*.

One brace is secured to a hind button, passes across the back under the arm pit, over the shoulder, again across the back and under the other arm pit to a front button. The other brace passes in the opposite direction and is secured to the other buttons.

5058. BATHING AND PROMENADE PIERS, *G. G. Page, London, and R. Nunn, Salisbury.*—24th *October*, 1882. 6*d*.

This consists in the construction and use of bathing apparatus in connection with piers and jetties. The apparatus consists of an open cage through which water can freely circulate, and which is supported by a staging so as to be capable of adjustment to suit the tides.

5070. REFRIGERATING MACHINES, *J. K. Kilbourn, Brixton.*—24th *October*, 1882. 6*d*.

This consists in the method of fixing or setting tubes in places where their ends are not accessible to use an expander. According to one method the end of the tube is formed with a slight flange which is inserted in an enlarged opening, and a nut is placed over the tube and screws into the opening, and bears firmly on the flange, after which heat is applied to sweat the whole thoroughly together. The invention further relates to so constructing cocks that the plug may be forced to its seat so as to prevent leakage.

5079. MOTIVE POWER APPARATUS, *W. H. Avis, Polegate, Sussex.*—24th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in the application of wheels to shafts to be driven, and provided with buckets to receive a constant stream of shot, water, or other substance, which is raised above the wheels by a chain or bucket elevator.

5083. GLASS AND METAL PLATES AND FRAMES FOR INDICATING, ADVERTISING, AND EXHIBITING, &c., *A. A. Hely, South Lambeth.*—25th *October*, 1882.—(*Provisional protection not allowed.*) 4*d*.

This relates generally to the production of advertisements on glass and metal plates, by perforating the same and then attaching them to a backing of any desired colour.

5085. FEEDING WOOLLEN MATERIAL TO CARDING MACHINES, &c., *B. Wilkinson, Marsden, Yorks.*—25th *October*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to present the material to the feed roller of a carding machine in a thin layer or sheet, so that any bits of rags or other matter may come under the action of the licker-in and be broken up before passing to the card cylinders. The material is placed in a hopper and carried by a travelling apron to a roller with spikes or teeth, between the rows of which a series of metal bands are placed, one end being fastened to a rod, and the other hanging loose and helping to straighten the fibre. A vibrating brush strips the roller, rows of stationary teeth preventing the fibre being taken off in lumps. The material falls on to a roller with bent elastic teeth, and delivered on to a porcupine roller with teeth arranged in parallel rings with curved metal bars between, on which the fibre is embedded and formed into a sheet by a dabbing brush.

5087. VELOCIPEDES, *R. C. Fletcher, near Preston.*—25th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This relates, First, to improvements in the double driving of velocipedes, and consists in improvements in what is known as balance gear, and ratchet gear; and Secondly, to an improvement in velocipede lamps.

5107. INSTRUMENTS FOR INDICATING EXCESSIVE VARIATIONS OF TEMPERATURE IN BUILDINGS, &c., *W. T. Goolden, Bayswater, and C. F. Casella, Holborn.*—27th *October*, 1882. 6*d*.

The relates to instruments for indicating when a certain temperature has been attained or exceeded, and consists in the combination of a thermometer with an electrical alarm, whose circuit is normally open, and is closed by the indices in the thermometer coming in contact with the mercury. A fixed wire is sealed in the glass beyond the reach of the mercury, and a movable terminal wire or index is in electrical connection with the fixed wire and adjustable in the thermometer tube.

5113. BRAKE FOR CARRIAGES, *E. Edwards, London.*—27th *October*, 1882.—(*A communication from M. Dirat, Paris.*)—(*Not proceeded with.*) 2*d*.

To a flat part of the axle which supports the springs is a support for an endless screw gearing with a toothed rack. By turning the screw the rack is actuated and depresses levers which applies brake blocks to the naves of the wheels.

5115. MANHOLE DOORS FOR PASSAGES LEADING DOWN TO SEWERS, &c., *T. H. Collins, Winchester.*—27th *October*, 1882. 6*d*.

The object is to provide means for disinfecting or rendering innocuous sewer and other gases and vapours, and it consists in applying to the manhole frames a perforated receptacle containing charcoal or other suitable disinfectant. Pipes are arranged to allow water to pass into the sewer without passing through the receptacle, and their ends are trapped so that the gases are obliged to pass through such receptacle, and the disinfectant contained therein before issuing from the sewer.

5120. MACHINERY EMPLOYED IN DIGGING POTATOES, *T. Hodgkinson, near Huddersfield.*—27th *October*, 1882. 6*d*.

A ploughshare is fixed at the foot of a frame, and lifts the potatoes on to a grate, through which revolving discs work and cause the potatoes to pass to a second grate, along which they are caused to travel by means of spiked bars actuated by an endless chain from the driving wheel.

5116. FIRE-ESCAPES, *J. Wetter, New Wandsworth.*—27th *October*, 1882.—(*A communication from C. H. Hohmann, Germany.*)—(*Not proceeded with.*) 2*d*.

This consists in the use of a band secured to a drum, capable of being attached to a part of a building, and used for the escape of persons from such building, or to enable persons to lift themselves up the side of the building by winding up the band.

5121. WINDING LINEN AND COTTON THREADS, &c., *J. H. Pickles, Burnley.*—27th *October*, 1882. 6*d*.

This relates to self-acting mechanism for regulating the drag on the warp bobbin or creel, whether the thread is being wound upon the small part or thick part of the spool, the object being to fill the spool hard with thread. A bell-crank lever is hinged on a lever operated by the "heart motion" of the machine, and one end rests on the warp bobbin, its weight thereon being regulated by the lever operated by the "heart motion," so that most tension is put on the thread while being wound on the small part and the least when being wound upon the thickest part of the spool.

5125. DOOR CHECKS OR GOVERNORS, *A. J. Boult, London.*—27th *October*, 1882.—(*A communication from The Elliott Pneumatic Door Check Company, Boston, U.S.*) 6*d*.

The object is to shut or close a door, and at the same time prevent the slamming thereof, and also to retain the door open when desired. A piston is arranged to work in a cylinder and is acted upon by a spring tending to force it in one direction, the end of the piston-rod being connected by means of links to the door to be opened and closed, while the cylinder is fixed to the door frame. When the door is closing the air behind the piston acts as a cushion and prevents slamming, suitable valves being provided to allow the air to escape.

5128. MACHINES FOR CRUSHING STONES, ORES, &c., *G. Dalton, Leeds.*—27th *October*, 1882.—(*A communication from S. L. Marsden, New Haven, U.S.*) 6*d*.

Instead of using a flat fixed jaw, a cylindrical jaw is employed, and the movable jaw is formed with a concave surface to correspond with the cylindrical jaw.

5133. TRAVELLING TRUNK, *D. Vinall, Brighton.*—27th *October*, 1882.—(*Not proceeded with.*) 2*d*.

The trunk is of sheet iron, and the cover is arranged to fit over it instead of being hinged thereto.

5135. SADDLES FOR BICYCLES AND TRICYCLES, *J. B. Brooks, Birmingham.*—28th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in the introduction of an inflated airtight bag between the leather seat and the frame to which it is secured. The front of the seat can be depressed or raised at will so as to keep it always in a horizontal position when travelling on an incline.

5137. VELVETS OR VELVETEENS, *D. J. Crossley, Hebden Bridge, and B. Cooper, Manchester.*—28th *October*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to obtain a fast pile, an improved face, and softer cloth than hitherto. An ordinary loom with eight shafts giving twenty-four picks in the round is used.

5139. "PLAQUE" FOR THE USE OF ARTISTS, *S. H. Sharp, Leeds.*—28th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in forming "plaques" of mill-board, stamped to the required form and coloured in imitation of terra-cotta.

5140. DOOR FASTENINGS FOR RAILWAY CARRIAGES, &c., *P. M. Justice, London.*—28th *October*, 1882.—(*A communication from J. W. Krepps, New York.*)—(*Not proceeded with.*) 2*d*.

This relates to improvements in door fasteners having a pair of hooked catches which open to receive a bolt on a sliding door and close into notches in the head of the bolt.

5141. APPARATUS FOR SIGNALLING, *J. Battye, near Leeds.*—28th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to a bell mounted on a frame, the hammer being acted upon by a spring so as to cause it to strike the bell after it has been forced back by a pawl.

5145. STRAIGHTENING RAILS FOR RAILWAYS, *L. Richards, Dowlais, Glamorgan.*—30th *October*, 1882 6*d*.

According to this invention the rail is passed between parallel surfaces, no space being left for the rail to deflect in, and is operated upon by hammering or pressure on both faces at the same time. This may be effected either by means of a steam hammer or by rollers and revolving discs.

5146. WASHING FABRICS, *J. Patterson, Belfast.*—30th *October*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to thoroughly wash fabrics when in the rope state or form, by causing each piece to cushion on an opposite piece while being squeezed in a wet state between rollers, and thereby kneading and cleansing each other while being acted upon by the water. The invention further relates to machinery for effecting this object.

5147. ELASTIC FABRICS APPLIED TO BOOTS AND SHOES, *A. C. Henderson, London.*—30th *October*, 1882.—(*A communication from H. Suser, France.*) 2*d*.

The material is made with both sides alike, and has a double selvage. The warp and weft threads are worked so that the warp threads, of which two sets are employed, instead of being white are coloured. So as to make a strong selvage, the motion of the shuttles is such that one is thrown a little in advance of the other, one finishing its course before the other.

5156. WIRE FENCING, &c., *E. A. Brydges, Berlin.*—30th *October*, 1882.—(*A communication from C. Klanke, Germany.*)—(*Not proceeded with.*) 2*d*.

The spurs are introduced into eye loops formed by bending the fencing wire, suitable machinery being described for forming such spurs and securing them to the wire.

5157. WINDING YARN AND THREAD, *J. Liddell and J. S. and S. H. Brierly, F. W. Hirst, and D. Hamer, Huddersfield.*—30th *October*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to means for preventing the breakage of yarn which occurs on account of it being sticky and twisted, and so prevents it freely leaving the swift without extra drag and friction, and it consists in interposing spring mechanism between the swift and bobbin, which will yield to the drag of the yarn, and when the drag is sufficient the tension thereof will stop the rotation of the bobbin.

5159. RECOVERY OF TAR AND AMMONIA FROM THE VOLATILE PRODUCTS OF COKE FURNACES, *J. Wetter, New Wandsworth.*—30th *October*, 1882.—(*A communication from J. F. G. Hornig, Dresden.*) 6*d*.

This consists in placing a three-way valve in the flues through which the gaseous products of two coke furnaces are discharged, so that either furnace may be shut off from the flues which lead to condensers. From the condensers the gases pass to an apparatus for separating the tar, and consisting of a jacketted vessel heated by the fumes of coke furnaces, and provided with partitions. A scrubber for separating the ammonia from the gases is also described, and consists in bringing them in contact with ammoniacal liquor which is caused to trickle over a series of inclined plates.

5160. ROLLER MILLS FOR GRANULATING, GRINDING, OR CRUSHING GRAIN, &c., *E. Fiechter, Liverpool.*—30th *October*, 1882.—(*A communication from J. Weber and Co., Switzerland.*) 6*d*.

This consists in arranging the bearings of the movable roller so that when guided laterally they shall be able to freely turn in their vertical centre lines with any angular alteration of the roller shaft. On the bearings above and below are formed pins in the central axis of the bearing, and carry slide blocks working between guides. The spring bears against a block with a round face, bearing on the horizontal central line of the bearing, whereby the spring is always caused to bear exactly in the centre. The

minimum distance between the rollers is regulated by set screws in the frame, and the spring can be adjusted to any required pressure by a screw.

5161. ROLLING CYLINDERS OF IRON OR STEEL, *B. Walker, Leeds.—30th October*, 1882.—(*Not proceeded with.*) 2*d*.
This consists in apparatus by means of which welded tubes of large diameter are manufactured with the metal worked or extended lengthwise by a rolling operation, as well as being worked or extended circumferentially by another rolling operation.

5162. REMOVING SMOKE AND FOUL AIR FROM TUNNELS. &c., *J. N. Moerath, Rome.—30th October*, 1882.—(*Not proceeded with.*) 2*d*.
The walls of the tunnel are lined with galvanised iron, such lining being about 1in. from the walls at the base, and leaving a considerable space between it and the roof. In the space smoke-removing channels are arranged and connected with the side spaces behind the lining by transverse passages.

5163. SAWING WOOD, &c., *W. Palmer, Bath.—30th October*, 1882.—(*Not proceeded with.*) 2*d*.
This relates especially to a manu-motive apparatus for actuating the sawing machinery.

5169. DECORATION OF DRY AND UNGLAZED EARTHENWARE, &c., *C. Barlow, Hanley.—30th October*, 1882. 2*d*.
The object is to produce ceramic wares with bright and dead gold or silver in design in combination with glazed or unglazed bodies.

5171. APPLIANCES FOR LOADING, UNLOADING, AND CONVEYANCE OF MERCHANDISE, &c., *Sir H. Bessemer, Denmark Hill.—30th October*, 1882.—(*Void.*) 2*d*.
This relates to the conveyance of merchandise partly on railway and partly on suitable trucks on public roads in such a manner that it is unnecessary to unpack and re-pack the merchandise. The trucks have ordinary road wheels, but are capable of running between trains or guides. A movable platform is provided to receive a number of the trucks described for travelling on railroads.

5172. GAS AND OTHER FURNACES, *T. Layton, Redditch.—31st October*, 1882. 4*d*.
This consists in building the sides of furnaces with movable blocks kept in position by metal studs or pins, so that they can be renewed or replaced when the retorts or flues are hot.

5173. FASTENERS FOR ARTICLES OF WEARING APPAREL, &c., *J. N. Aronson, London.—31st October*, 1882. 6*d*.
The fastener consists of a curved arm capable of sliding into a position for inserting one end into a button-hole or eyelet, and then back again when the pull of the article tends to force the free end of the arm towards the base plate. Modifications are described.

5175. BOBBINS, *E. Tweedale, Accrington.—31st October*, 1882.—(*Void.*) 2*d*.
The object is to strengthen and tighten the bobbins or tubes to receive thread, and it consists in forming them of sheet copper or other non-corrosive metal corrugated either longitudinally or transversely.

5176. CONSTRUCTION AND JOINING OF BANDS, *L. Binns, Bradford.—31st October*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to forming bands so that the ends may be joined without tying or lacing, and at the same time securing strength at the joint. A loop is formed at one end, and at the other end is a second loop, and a strand or strands. One loop is passed through the other and secured by the strands.

5177. COATING SURFACES OF METALLIC LEAD TO PREVENT OXIDATION AND CORROSION, *J. Mangnall, Manchester.—31st October*, 1882.—(*Not proceeded with.*) 2*d*.
The articles made from metallic lead are placed in a chamber and submitted to the action of superheated hydro-sulphuric acid gas.

5179. SEWING MACHINES, *G. Browning, Glasgow.—31st October*, 1882. 8*d*.
The improvements relate, First, to the presser foot; and Secondly, to mechanism for varying or regulating the speed at which such machines are driven.

5180. MECHANISM FOR SHAPING AND FOLDING THE ENDS OF LABELS, &c., *C. Anderson and T. Cormie, Leslie, N.B.—31st October*, 1882. 8*d*.
This consists in an improved device and mechanism for folding up and preparing the ends of labels in which the hole is punched and fitted with an eyelet, as is done in the case of the endless web label-making machine described in Keith's specification, No. 4677, A.D. 1879, whereby the said folding is more expeditiously and effectually carried out, and with a saving in driving power and less risk of breakage than has hitherto been accomplished.

5184. APPARATUS FOR MEASURING AND REGISTERING POWER TRANSMITTED BY DRIVING BELTS, *C. V. Boys, near Oakham.—31st October*, 1882. 6*d*.
This relates to arranging a counter worked by differential gear, so as to indicate the excess of travel of the driving part of an elastic belt over that of its driven part, the said elastic belt being applied to transmit either the whole or a known fraction of the power to be measured.

5185. SECURING THE PENDULUM OF CLOCKS, *J. Ganter, Clerkenwell.—31st October*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to a means whereby the pendulum may be securely fixed within the case so as to prevent it moving about when the clock is being transported from place to place.

5186. STOVE PIPE ATTACHMENTS, *J. Wetter, New Wandsworth.—31st October*, 1881.—(*A communication from C. Lovell, Massachusetts, U.S.*)—(*Not proceeded with.*) 2*d*.
The object is to connect two pipes arranged parallel or at an angle to each other, or a stove with a pipe leading from or to it more or less obliquely.

5186. SEWING MACHINES, *M. H. Pearson, Leeds.—28th November*, 1882.—(*Not proceeded with.*) 2*d*.
A straight needle is used, and the needle bar is fitted in a slide pivotted at its upper end. To this an intermittent radial reciprocating motion is given by a cam, and the vertical movement of the needle bar is effected by a heart cam attached to the slide. A circular shuttle is used, and is used in combination with an awl.

5187. UMBRELLAS, *W. E. Gedge, London.—31st October*, 1882.—(*A communication from H. Bollack and G. Mayer, Paris.*)—(*Not proceeded with.*) 2*d*.
The umbrella is made to open automatically, being actuated by a spiral or helical spring, which expands when it is desired to open the umbrella for use, remains compressed in the socket of the slider or runner while the umbrella is closed, and is held in this position by a kind of spring clasp or catch set in the handle, or by a suitable arranged cup or tip fastener, with or without spring.

5190. RETAINING NECKTIES AND SCARVES IN PLACE, *G. Schubert, London.—31st October*, 1882.—(*Not proceeded with.*) 2*d*.
The design consists of a piece of elastic webbing or other suitable elastic material, provided at one end with a metal or other ring, or other means of attachment, to the buttons of the trousers or drawers, and at the other end furnished with a pin or hook for insertion into the necktie or scarf.

5191. COMBINED REAPING AND SHEAF-BINDING MACHINES, *W. McI. Cranston, London.—31st October*, 1882.—(*A communication from the Walter A. Wood Mowing and Reaping Machine Company, Hoosick Fall, New York.*) 10*d*.
This relates to certain novel features in combined reaping and sheaf-binding machines, in or by which the straws cut are carried over a platform by rake teeth to within reach of fingers of the automatic binding appliances, and when the binding is completed the bundle is lifted over the framework covering the wheel and deposited into a carrier on the opposite side thereof, from which it can be released on to the ground, the releasing appliance being under the control of the driver or made to act automatically on a catch, being released by some moving part of the mechanism.

5192. APPARATUS FOR MEASURING WATER, &c., *J. A. Muller, Amsterdam.—31st October*, 1882. 6*d*.
This relates to improvements in apparatus for measuring water or other liquids, such apparatus being also applicable as a current meter, for which letters patent were granted bearing date 9th December, 1874, and numbered 4228.

5193 COMPOUND FOR PREVENTING OR RETARDING THE PASSAGE OF HEAT AND MOISTURE, *W. T. Whiteman, London.—31st October*, 1882.—(*A communication from R. J. Eberts and J. L. Lee, New York.*) 4*d*.
This relates to a heat insulating and water-repelling material, consisting of finely divided tan bark dried and coated with a suitable waterproofing material and mixed with cement, sand, and the like, or other material or materials capable of setting.

5194. FASTENINGS AND SAFETY APPLIANCES FOR BRACELETS, SCARF RINGS, BELTS, &c., *E. Jones, London—31st October*, 1882. 6*d*.
This relates to the combination with a bracelet with a central snap device of a safety appliance or protector fastened to said snap device, the protector having a guard at one end and the other end secured to the bracelet or snap fastening.

5195. AUTOMATIC WEIGHING AND PACKAGE FILLING APPARATUS, *W. T. Whiteman, London.—31st October*, 1882.—(*A communication from C. C. Clawson, North Carolina.*) 8*d*.
This relates to several improvements in the general construction of the apparatus.

5196. MANUFACTURE OF SOAP, &c., *J. T. Armstrong, Newcastle-under-Lyne, and W. Bostock, Liverpool.—31st October*, 1882. 4*d*.
This consists of a soap formed by the combination of starch-sugar (grape sugar or glucose) with fatty or oily matter and an alkali, with or without other ingredients ordinarily employed in the manufacture of soap.

5198. PRODUCTION OF BI-SULPHIDE OF CARBON VAPOUR, &c., *W. R. Lake, London.—31st October*, 1882.—(*A communication from W. S. Colwell, Pittsburgh, U.S.*) 8*d*.
This relates to methods and apparatus for the production of vapour from bi-sulphide of carbon, which is effected through the medium of the latest elements of static and specific heat transmitted to the bi-sulphide of carbon through the medium of steam generated from water; it also relates to the utilisation of said vapour of bi-sulphide of carbon for the purpose of operating machinery.

5199. COMBINED WATER AND AIR PRESSURE MOTORS, *A. J. Boult, London.—31st October*, 1882.—(*A communication from A. Botta, Trieste.*) 8*d*.
The movement of the machine is produced by compressed air acting upon a column of water.

5202. MANUFACTURE OF TUBES, &c., *G. Little, Oldham.—1st November*, 1882. 10*d*.
The tube after passing through the first pair of rolls is caused to pass between a second pair, placed at an angle to the first pair, said second pair being driven in circumference speed to the first pair. Another portion of the invention consists in the mandril, and a further feature consists in cleaning the tube before it passes to the die, and also arrangements for clearing the grooves of the rolls of slag, grit, or dirt.

5203. FURNACES FOR TREATING TOWN REFUSE, &c., *B. D. Healey, Brighouse.—1st November*, 1882. 6*d*.
The fumes which are evolved from the refuse under treatment are caused to pass over a reverberatory arch, which, being highly heated, renders the fumes inodorous. The reverberatory arch is built at a proper height from the fire-bars, to allow the refuse to be burnt, and at such a distance from the main arch as to insure the requisite flue area, whilst the length of the reverberatory arch is about two-thirds the length of the inclined part of the furnace.

5204. GAS LIGHTING AND REGULATING APPARATUS, *T. Thorp, Whitefield.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to produce a steady light without shadow, and to cause the air to become highly heated before it enters into combustion with the gas, also an improved mode of regulating the supply of gas.

5205. UTILISATION OF VARIOUS GUMS AS SUBSTITUTES FOR GUTTA-PERCHA AND INDIA-RUBBER FOR INSULATING, &c., *J. E. T. Woods, Peckham Rye.—1st November*, 1882.—(*Provisional protection not allowed.*) 2*d*.
This relates to the utilisation and purification of various natural gums, so as to render them suitable as substitutes for gutta-percha.

5206. RETENTION SPRINGS FOR UMBRELLAS AND PARASOLS, *W. H. Belknap, New York—1st November*, 1882 6*d*.
The inventor claims in a retention device for umbrellas and parasols, in combination, a narrow case having a slotted top, a catch projecting through said slot, and adapted to turn at its rear end in the case, and a spring located under the catch.

5207. APPARATUS FOR RAISING LIQUIDS AND SEPARATING SOLID MATTERS THEREFROM, *F. A. Bonnefin, London.—1st November*, 1882. 6*d*.
The inventor claims the means or apparatus for raising liquids, or for separating solid matters from liquids, or for both raising liquids and separating solid matters therefrom, the said means or apparatus consisting of a series of vessels in a tube or closed channel, which communicates with the liquid to be dealt with, and is provided with means for producing a vacuum therein, such vessels being fitted with wick tubes, through which the liquid travels by capillarity from vessel to vessel.

5208. MACHINERY FOR THE MANUFACTURE OF MOULD CANDLES, *J. J. Claret, Camberwell.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
The First part relates to the overflow; another part consists in introducing into the space, which in the ordinary machines exists between the row of moulds, which are four in number, two other rows of moulds, so as not only to utilise this waste or unoccupied space, but partly fill up the water box, thus displacing a certain amount of water and effecting a saving thereof.

5209. SEWING MACHINES, *F. Simmons, London.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to improvements in that class of sewing machines in which the head carrying the needle bar is caused to slide in a direction at right angles to the feed, for the purpose of giving a cross stitch when required, as, for example, in "hem stitching machines."

5210. APPARATUS FOR LOWERING AND LAUNCHING SHIPS' BOATS AND SAVING LIFE AT SEA, *R. B. U. H. J. Duncan.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to the arrangement of the davits.

5211. TRAWL NETS, &c., *G. Read, Deal.—1st November*, 1882. 6*d*.
This relates to a peculiar bonnet net constructed or arranged at the lower end of a trawl or stow net, together with the method of hauling it up and of opening the bottom end for the release of the fish therefrom.

5213. LININGS OR PADDINGS FOR SHIRT FRONTS, &c., *J. Wetter, New Wandsworth.—1st November*, 1882.—(*A communication from Kruse and Breying, Unter Barmen, Germany.*)—(*Not proceeded with.*) 2*d*.
This consists in making the lining of two layers or sheets of woven fabric, woven simultaneously and united at the outside edges and at the edges of the button-hole or holes.

5212. SCREW PROPELLERS, *W. Tate, Sunderland.—1st November*, 1882. 6*d*.
The inventor claims in a screw propeller of metal, such as cast steel, securing removable blades to the boss by means of recesses therein, into which the roots of the blades are stepped; in conjunction with arms cast with the boss, and to which such blades are bolted, and preferably, further secured by shoulders.

5214. APPARATUS FOR GENERATING AND BURNING PETROLEUM VAPOURS, *H. Swoboda, Berlin.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to the general construction of petroleum vapour stoves.

5215. METHOD OF MOULDING FOR CASTING METALS, *E. Peyton and C. Burley, Birmingham.—1st November*, 1882. 4*d*.
This relates to the method of moulding for casting metals by means of a set of pattern moulds and core moulds.

5216. MANUFACTURE OF SHIRT-FRONTS, *J. W. Frost, London.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to enable the front of a shirt to be readily reversed when soiled.

5218. PROPELLING BOATS, &c., *J. Y. Johnson, London.—1st November*, 1882.—(*A communication from H. Martin and F. Segondy, Cette, France.*)—(*Not proceeded with.*) 2*d*.
The means for propelling consists of two pumps placed at the hinder part of the boat or other vessel below the water-line, in which pumps either liquid or air is employed.

5219. REFRIGERATING OR COOLING ROOMS, &c., *J. Y. Johnson, London.—1st November*, 1882.—(*A communication from J. B. J. Mignon and S. H. Rouart, Paris.*) 6*d*.
This relates to the general construction of the apparatus.

5220. SAFETY VALVES, *D. Cockburn, Glasgow.—1st November*, 1882. 6*d*.
This relates to safety valves having a top plate, against which the steam acts so as to facilitate the rising of the valve when steam is blown off. The seat is formed with an inclined surface A projecting upwards all round, and the underside of the top plate C is flat, while the centre part D tapers down towards

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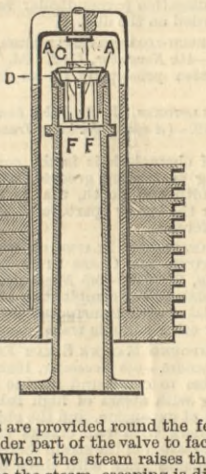

the seat. Hollows are provided round the feathers or guides F at the under part of the valve to facilitate the escape of steam. When the steam raises the valve in the slightest degree the steam escaping is directed up the annular incline of the seat, and strikes the flat plate of the valve where there is the greatest surface to act upon.

5221. APPARATUS EMPLOYED IN CONNECTION WITH PURIFIERS FOR COAL GAS, *C. C. Walker, Lilleshall, and W. T. Walker, Highgate.—1st November*, 1882. 6*d*.
This relates to centre valves, and the principal object is to provide means for working either the usual number of purifiers (leaving one out of action for replenishing) or all of the purifiers with which it is connected as may be desired. The valve is provided with an additional part capable of being moved independently of the main movable part, so as to either allow of the valve being used to work the purifiers in the ordinary way, or to allow the purifiers ordinarily out of action to be put into action. The invention further consists in forming the apparatus by casting with spaces between or in parts, afterwards connected up by wrought metal or equivalent means; also in forming the top flange of the syphon box of the centre valve so that it constitutes a support for the pipes for the purifiers; and also in joining the pipes which lead from the purifiers to the centre valve by elastic or yielding junctions.

5222. APPARATUS FOR SPINNING, DOUBLING, AND TWISTING FIBROUS SUBSTANCES, *E. Rushworth, near Leeds.—1st November*, 1882. 6*d*.
This relates to "cap frames," and consists in the employment of fixed and greatly reduced spindles, and of wharles revolving in a stationary position on the top of the roller rail of the frame. The wharles are fitted with metal tubes having one or more flat longitudinal surfaces, which work through washers secured in the bottom part of heads of bobbins or tubes for the purpose of driving the same.

5224. PLACING FOG SIGNALS UPON, AND REMOVING THEM FROM, RAILWAYS OR TRAMWAYS, *T. H. R. Guttridge, Camberwell.—1st November*, 1882.—(*Not proceeded with.*) 2*d*.
The detonating fog signals are secured to an endless chain passing over toothed wheels, and actuated from the signal-box in such a manner as to cause the signals to be brought in position on the rails.

5225. AXLES, HUB FITTINGS, SPRINGS, AND DOOR FITTINGS OF VEHICLES, &c., *H. Weatherill, Manchester.—2nd November*, 1882. 6*d*.
The hub bearing revolves between a fixed and an adjustable collar upon the axle, the latter screwing on to an extension of the axle, which has also an exterior screw thread. A slot is formed in the extension, and a number of slots in the collar, and when the latter is adjusted a recessed cottar is passed through the slots, and a nut on the collar is screwed up to the cottar, and a spring placed behind prevents the nut working back The invention [illegible] relates to the prevention of rattling in door lock fittings, and consists in forming the handle [illegible] tapering or coned where it fits the latch, [illegible] formed to receive it. On the inner end of the spindle is a metal sleeve also coned, and which can be screwed up so that the parts act as if made in one piece. Spring pistons are used to prevent the rattling of doors and windows. A further improvement consists in interposing elastic material between the ends of springs or between the parts of shackles, or of shackles and scroll irons or similar connections.

5226. CLOSING OR STOPPERING BOTTLES, &c., *J. Airy, Darlington.—2nd November*, 1882.—(*Not proceeded with.*) 2*d*.
This consists in the use of sheet india-rubber moulded to the desired form to close the mouth of the bottle, in place of corks or other stoppers.

5227. GOVERNORS FOR STEAM OR OTHER ENGINES, *[illegible] Browett and H. Lindley, Salford.—2nd November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to mechanism whereby the speed of rotation of the governor can be varied relatively to the main engine shaft, and it consists essentially of friction gear, one wheel of which is capable of being shifted along the face of its driving wheel. The invention further relates to means for causing the valves controlled by the governor to be closed, in case the belt or other mechanism which drives the governor should break or become deranged.

5228. VALVES, &c., FOR STEAM, WATER, GAS, OR OTHER FLUID UNDER PRESSURE, *G. Furness and J. Robertshaw, Manchester.—2nd November*, 1882. 6*d*.
This relates to valves which are lifted from their seat by a screw spindle. The valve is made separate from the spindle and has a recess to receive white metal, vulcanite fibre, or other suitable packing. The spindle is screwed at one end for connection with the valve. The case is in two parts, connected together so as to permit ready access to the valve and seating. The latter extends a little above the plane of the bottom flange, so as to allow of wear by grinding or filing the gear.

5229. TREATMENT OF LEATHER FOR THE SOLES AND HEELS OF BOOTS AND SHOES, &c., *T. Gare, Stockport.—2nd November*, 1882. 6*d*.
To render leather waterproof and more durable it is treated with a solution composed of two parts resin and two parts gum, dissolved in spirits of petroleum, benzoline, or bisulphite of carbon, to which is added a small quantity of gutta-percha or caoutchouc dissolved in boiled oil. Metal tips are made thickest at the parts which usually wear away quickest. Buttons are secured to boots by means of a wire link of U-form, with loops at the end through which a cord is passed.

5231. APPARATUS FOR USE IN SCHOOLS TO FACILITATE THE FORMATION OF WORDS AND NUMBERS, *J. Wetter, New Wandsworth.—2nd November*, 1882.—(*A communication from S. Ridel, France.*)—(*Not proceeded with.*) 2*d*.
This relates to the use of movable characters in combination with boards provided with grooves to receive them.

5232. BREAKING, SCUTCHING, AND SEPARATING FLAX, HEMP, &c., *J. Shinn, Philadelphia.—2nd November*, 1882.—(*Void*) 2*d*.
Feed rollers and a bed are arranged above the centre of a scutching cylinder, so that the fibre is fed in over the bed above such centre, and the paddles on the cylinder when striking them cause the stalks to bend under the bed, so that the fracture of the "bone" will be bent more than a right angle, and cause the fibres to hug the paddles. To separate the tow from the "shives" an endless slatted and travelling apron is used in combination with a roller having wings for brushing the tow off the apron, and a dividing partition for separating the tow from the shives.

5234. BICYCLES AND TRICYCLES, *G. Singer, Coventry, and W. R. Davies, Abergavenny.—2nd November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates, First, to transmitting power to velocipedes with a rotary pedal shaft, so as to obviate and compensate for the constantly decreasing leverage at certain points of revolution of the pedal shaft. The wheels over which the driving chain runs are oval, the greater diameters being placed at right angles to each other, and the two throws on the pedal shaft are nearly in a line with the greater diameter of chain wheel; Secondly, to an arrangement of driving crank so as to diminish the distance through which the feet travel without reducing the throw of the crank, and it consists in the use of an excentric fixed to each throw of and revolving with the crank; two rods carry the pedal, and each have a slot fitting over one of the excentrics; and Thirdly, to steering mechanism, whereby the vibration of the machine is prevented from being transmitted to the arm of the rider.

5236. STOPPING OF BOTTLES OR VESSELS, *A. M. Davis, Westminster.—2nd November*, 1882.—(*Not proceeded with.*) 2*d*.
A groove is formed in the neck of the bottle and receives an elastic ring. The stopper has a thread to fit a corresponding thread in the neck, and when screwed home a projection is caused to bear on the washer and form a tight joint.

5237. MUSICAL INSTRUMENTS, *A. Banger, Worcester.—2nd November*, 1882—(*Not proceeded with.*) 2*d*.
The instrument has a central sound board, with a set of wires on each side, the whole being inserted in a suitable case, so that the wires can be acted upon by studs mounted on a roller capable of being turned, whereby the wires will be more or less tightened, and the key of the instrument changed as required. The instrument is played like a harp through openings in the case.

5238. APPARATUS FOR USE IN CONNECTION WITH LAMPS OR OTHER BURNERS FOR ILLUMINATING AND HEATING PURPOSES, *A. H. Robinson, Dublin.—2nd November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to increase the illuminating power of the gas or oil; and it consists in placing a cap over the chimney, so as to fit close, but having side openings capable of being regulated. Modifications are described.

5239. FURNACES, &c., *A. J. Boult, London.—2nd November*, 1882.—(*A communication from W. P. A. Heiser, Berlin.*) 8*d*.
This relates to the use of one or several chambers, in which fuel is deprived of gases before passing to the furnace, the object being to prevent smoke and save coal. The chamber is separated from the furnace by a partition, from an opening in the bottom of which an inclined grate is arranged, so that the fuel can pass downwards and be burnt.

5240. FACILITATING THE STOPPING AND STARTING OF MACHINERY, *W. R. Lake, London.—[illegible] 1882.—(A communication from [illegible] Horton, Massachusetts.)* 8*d*.
One object of the invention is to provide a friction apparatus adapted to readily connect and disconnect a shaft, which operates a die in a drop press, or performs a similar function with and from the driving wheel, so that the shaft, after each performance of its allotted work, will be automatically disconnected from the motor, and become inoperative until again connected with the motor by the attendant. A [illegible] to provide means for stopping and st[illegible] driven by a continuously rotated [illegible] consists of automatic devices fo[illegible] and the mechanism operat[illegible] will [illegible] together, and [illegible] is enabled to instant[illegible] inoperative when d[illegible]

524[illegible] [illegible]

5249. WICKS OF RAILWAY CARRIAGE ROOF LAMPS, &c., *H. Defries, London.—3rd November, 1882.* 4d.

The object is to secure a proper adjustment and trimming of the wick, and it consists in making the wick of the exact length of the wick holder, and shaped both top and bottom to the required form, so that it is immaterial which end is inserted in the holder. To facilitate the introduction of the wick it is stiffened by means of a combination of paraffine, wax, and colza or rape oil.

5250. VALVE APPARATUS FOR SUPPLYING BATHS, &c., WITH WATER, *W. D. Scott-Moncrieff, Fulham, and W. Dodds, Westbourne Park.—3rd November, 1882.* 6d.

This relates to valve apparatus for supplying baths with water of different temperatures, and available for admixing other liquids, and consists in the combination of a series of valve casings, each with a separate valve, so as to form a continuous throughway into which the different liquids may be admitted separately, and from which they may be led to where required through the independent valves. The throughway, with branches to admit and allow the escape of the different liquids separately or mixed, may be formed of a length of pipe with elbows at intervals acting as valve casings to receive the independent valves.

5252. DISTILLATION OF COAL, &c., *G. R. Hislop, Paisley, N.B.—3rd November, 1882.* 6d.

The invention comprises, First, a novel arrangement and combination of horizontal with vertical or inclined retorts employed respectively for the distillation of the coal or other carbonaceous matters to obtain illuminating and heating gases and other products, and for the treatment of the coke resulting from the distillation to obtain ammonia and an additional production of heating gases; Secondly, means for separating the illuminating gases from the heating gases and ammonia or other gaseous products resulting from such treatment; Thirdly, means for treating incandescent coke separated from primary retorts for the production of ammonia; Fourthly, regenerative apparatus for heating air and superheating steam used in connection with primary and secondary retorts; and Fifthly, the treatment and utilisation of the residual ash or waste products from retorts. The horizontal flues for effecting the distillation of the carbonaceous matter are used in combination, with the vertical retorts located in front and below, to receive the residual coke for treatment by steam, and with furnaces, air heating flues, and combustion chambers in which gas and hot air are consumed to provide heat for the retorts.

5253. TOY LOCOMOTIVE ENGINES, *W. H. Hall, Beckenham.—3rd November, 1882.* 8d.

This relates to an improved automatic whistling toy engine consisting of a body having within it a bellows operated by means of springs, and by a string or elastic wound upon the main axle and combined with the whistle.

5255. APPARATUS FOR DECANTING LIQUIDS, &c., *D. G. Joy, Hull.—3rd November, 1882.* 6d.

The objects are, First, to enable liquids to be drawn off into casks, so that when full the liquid shall cease to flow; Secondly, to draw the liquid from the supply through an outlet at a constant velocity independent of the height of the liquid above; and Thirdly, to cool the liquids in the supply cisterns. The liquids are placed in air-tight cisterns, and a tube provided to admit air as the liquid is drawn off, the end of such tube being arranged so that the liquid drawn off will seal the same when it has reached the desired level in the vessel into which it is being decanted.

5256. MAKING ARTIFICIAL ICE IN BLOCKS OR SLABS, *T. D. Kyle, London.—3rd November, 1882.* 6d.

This consists, First, in the employment of pins or snags in the cells or flattened tubes of ice boxes, so as to cut up the flow of the cooling medium, and cause fresh parts to impinge against the surfaces of such cells; and Secondly, in the arrangement of the connecting pipes and cocks for conveying the cooling medium, so that the course of such medium can be reversed for the purpose of making the ice of uniform thickness, and also to effect the thawing off of the ice from the cells or flattened tubes without requiring a thawing-off pump.

5257. DEEPENING THE BEDS OF RIVERS, &c., *J. N. Mcerath, Rome.—3rd November, 1882.—(Not proceeded with.)* 2d.

This relates to means for removing mud and sand banks, and consists in the use of a rotary drag or dredge having toothed discs or cutters arranged on an axle supported by a raft or pontoons. This is towed by a tug or other means; and behind it is suspended a floating plough to throw off the water and heavier particles of mud and sand removed by the drag.

5258. LOCKS FOR CARRIAGE DOORS, AND HANDLES FOR OPERATING THE SAME, *J. Edwards, Hackney.—4th November, 1882.—(Not proceeded with.)* 2d.

This relates, First, to improvements in two-bolt locks; and, Secondly, to forming handles of locks so that one part can be renewed without necessitating the renewal of the whole handle.

5259. WINDOW FASTENERS, *A. E. Crisp, Stamford Hill.—4th November, 1882.* 6d.

The object is to prevent the locking lever of window fasteners being forced back from the outside, and it consists in the application of a catch or additional lever to ordinary fasteners, such lever being secured to the window sash near the hasp, and which can be turned on a pin so that its outer hooked end will engage with the locking lever when in position in the hasp, and prevent the same from being opened until the catch is turned back.

MECHANICAL STOPPER FOR BOTTLES, *C. A. ... Stockholm.—4th November, 1882.* 8d.

... consists of a tubular piece of elastic sub... a metal bar, and having a metal ... to it by a flange at bottom enter... interior, while at top is another ... the mouth of the bottle ... , and its top end ... The bar is pro... tubular elastic ...

off to the tar tank. According to one arrangement the main is provided with a series of hollow partitions, through which cold water is caused to circulate. To prevent stoppages in the ascension pipes the retorts are made flat, and the crowns protected against heating by an arrangement of perforated fire-clay plates placed above them.

5266. APPARATUS FOR CLOSING DOORS AND WINDOWS, *R. Chapman, Patricroft, and J. Hibbert, Manchester.—4th November, 1882.* 6d.

This relates to the combination of a spindle, double cam, and one or more loose tappets with two horizontal levers connected by springs and chains to the tappets.

5267. COUPLINGS FOR RAILWAY VEHICLES, *W. Wright and J. Pethick, Plymouth.—4th November, 1882.* 6d.

This relates to the employment of a draw-bar having a head with bevelled edges in combination with a slotted plate having ears or guides, whereby the said head is twisted to enter the slot in the plate and resumes its normal position at right angles thereto when past the plate.

5269. PRESERVING FOODS AND OTHER ORGANIC SUBSTANCES, *W. H. Thew, Liverpool.—4th November, 1882.—(Partly a communication from P. Forbes, Buenos Ayres.)—(Not proceeded with.)* 2d.

In preserving meats it is preferred to heat them to a point not exceeding, say, 200 deg. Fah., and then expose them to intense cold, by any of the methods for creating intense cold.

5270. ROWING BOATS, *A. J. Boult, London.—4th November, 1882.—(A communication from W. A. Rettig, Berlin.)* 10d.

The object is to considerably reduce the weight of the boat, and at the same time to so brace or stay the boat that the twisting is entirely obviated.

5271. INSTRUMENTS FOR MAKING DRAWINGS TO SCALE AND FOR MEASURING DISTANCES ON PAPER, *J. Wetter, New Wandsworth.—4th November, 1882.—(A communication from A. Wachs, Leipzic.)—(Not proceeded with.)* 2d.

A rule is mounted on a pair of parallel rollers fixed on a horizontal shaft, one of these rollers being adapted to impart rotary motion to a toothed ring, the motion of which is indicated on a dial by means of a pointer or disc fixed to the toothed ring or to the axle of the latter, in such a manner that the motion of the rule in a direction perpendicular to its edge is accurately recorded on the dial.

5273. BREECH-LOADING SMALL-ARMS, *A. Henry, Edinburgh.—4th November, 1882.* 6d.

This relates principally to an improved locking device.

5275. MILLSTONES, *W. R. Lake, London.—4th November, 1882.—(A communication from P. Verat, Paris.)* 6d.

The chief characteristic is the conformation of the distributing or feeding grooves, which are made of unequal width and depth, that is to say, wider and deeper near the eye or aperture of the stone than at the circumference.

5283. TRANSLUCENT PLATES OR SHEETS FOR USE AS SUBSTITUTES FOR GLASS IN ROOF LIGHTS, &c., *W. Kennedy, Glasgow.—6th November, 1882.* 4d.

This consists in the combination of perforated metal sheets or plates with translucent paper, woven fabric, gelatine, or other suitable translucent substance.

5282. COMPOUND MARINE STEAM ENGINES, *J. McFarlane, Dundee.—6th November, 1882.* 6d.

This relates to compound marine engines designed for working with steam of high initial pressure and with stages of expansion, and the object is to combine three cylinders with two cranks so as to obtain a better equalisation of the strain thereon. The drawing shows one modification with three inverted cylinders A, B, and C, the piston-rods of which are connected to

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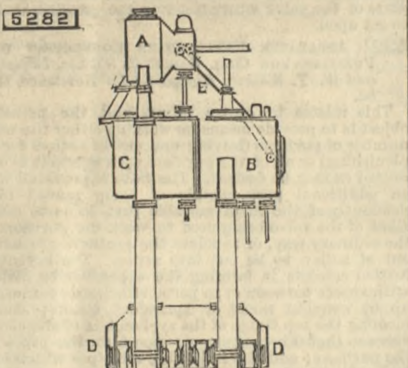

two cranks on the shaft D. The high-pressure cylinder A into which the steam is first admitted is placed in line with and above the low-pressure cylinder C, the two pistons being on the same rod connected to one crank. The steam passes by a pipe E from cylinder A to an intermediate cylinder B, which is placed over and its piston-rod connected to the other crank. From cylinder B the steam passes into the low-pressure cylinder C.

5327. VALVES FOR STEAM OR OTHER ENGINES, *F. Gill, South Shields.—8th November, 1882.* 6d.

The cylindrical valve C is fitted in a case and has steam ports D and D^1 and exhaust ports E and E^1 at either end. The valve is shown in such a position that the port D of the cylinder is opposite the steam port D of the valve, and through it with the steam chest, while the other cylinder port B^1 communicates with the exhaust port E^1 of the valve, and through it with the condenser or waste steam pipe. When the piston has completed its stroke in the direc-

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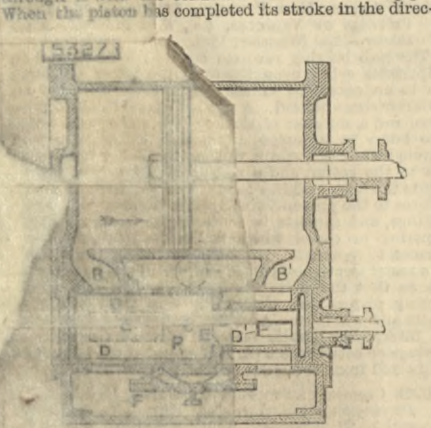

... C has by its operating ... quarter of a revolution, the port ... being then open through valve port D^1 with the steam chest, while port B is open through port E with the condenser or waste steam pipe. The valve is kept steam tight between one end and the other by a packing piece ... with an adjustable spring.

5332. ... AND HEAT, AND APPA-... *...Chaimsonovitz, Leytonstone.*

This relates to the production of light and heat from the evaporation of suitable hydrocarbons, including alcohol, wood spirit, and ethers, by means of an apparatus or lamp.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

278,078. HOISTING PULLEY, *Charles F. Batt, Schuylkill, Chester County, Pa.—Filed April 2nd, 1883.*

Claim.—(1) The combination of the chain wheel, pulley, or drum of a hoisting apparatus with a ratchet wheel secured or geared thereto, and a snail gearing into said ratchet, and to which power may be applied, substantially as described. (2) The combination of a chain pulley, of a hoisting tackle and ratchet wheel secured to the pulley, with a snail gearing into said ratchet, and a driving wheel or pulley B, operating

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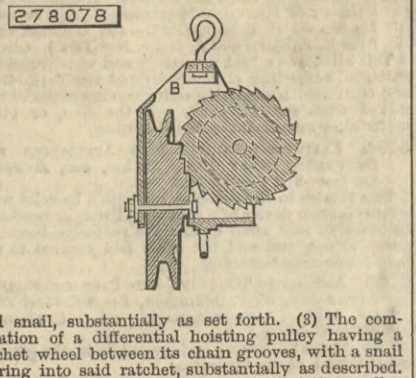

said snail, substantially as set forth. (3) The combination of a differential hoisting pulley having a ratchet wheel between its chain grooves, with a snail gearing into said ratchet, substantially as described. (4) The combination of a differential hoisting pulley having a ratchet wheel secured thereto, and a driving wheel or pulley having a snail secured thereto and gearing into said ratchet wheel.

278,256. GAS ENGINE, *Lewis H. Nash, Brooklyn.—Filed September 9th, 1882.*

Claim.—(1) That improvement in the method of operating a gas engine which consists in admitting into the cylinder a single stream of air under compression in large volume, and simultaneously therewith admitting a single stream of gas in large volume directly within the flowing volume of air, so that the latter will surround and carry the volume of gas with it into the cylinder in a single enveloped strata, substantially as described, for the purpose specified. (2) That improvement in the method of operating a gas engine which consists in admitting into the cylinder a single stream of air under compression in large volume, and simultaneously therewith admitting in a single stream of large volume the gaseous fuel mixed with a quantity of air less than that required to effect the complete combustion of the fuel charge, enveloped and carried by the air charged as a distinct volume, substantially as described, for the purpose specified. (3) The power cylinder of a gas engine, constructed with separate ports for the separate admission therein of air under compression and gaseous fuel, the issuing

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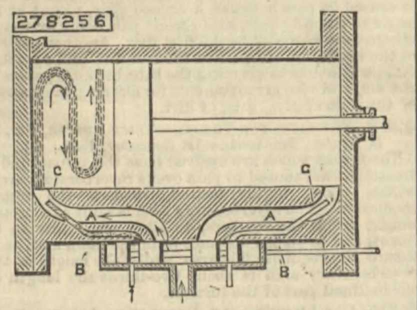

orifice of each gas port terminating within each air port, so as to be surrounded by a flowing volume of air, in combination with suitable valves for controlling the admission of the air and gas volumes, substantially as described, for the purpose specified. (4) The combination, in a gas engine, of the power cylinder, constructed with the ports A A, for the admission therein of air under compression, and with ports B B, for the admission of gaseous fuel, each in single volumes, the latter ports being separate and distinct, and having terminal tubes C C, projecting within the air ports at or near the entrance of the latter into said cylinder with a valve or valves, substantially as described, for the purpose specified. (5) The combination, in a gas engine, of the power cylinder, having separate ports for the admission therein of air and gaseous fuel in separate single volumes, with extension tubes of said gas ports arranged to project within the air ports at or near their entrance into the cylinder, the lighting wires connected with the issuing orifices of said terminal tubes, and a suitable valve or valves, substantially as described, for the purpose specified. (6) In combination, in a gas engine, the power cylinder having the air ports A A, the gas ports B B, the latter having the terminal tubes C C, the lighting wires connected with said terminal tubes at their outlet orifices, a valve or valves, and the piston, all constructed and adapted for operation, substantially as set forth.

278,387. BALL GOVERNOR FOR STEAM ENGINES, *William Badger, Quincy, Mass.—Filed March 29th, 1883.*

Claim.—(1) In a ball governor, a bent spring Q, in combination with two levers, each having three arms *c*, *d*, *e*, the balls P on the lower arms *c* of said levers

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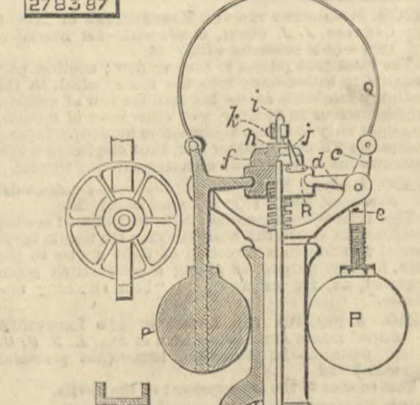

the pulley R, which engages with the inner arms *d* of said levers, and the valve rod movable up and down with said pulley, substantially as set forth. (2) In combination with an adjustable governor ball and its actuating devices, a suspensory for said ball, having a scale of numerals marked upon it to indicate the

number of revolutions of the engine, substantially as set forth. (3) The valve stem B, and the disc *f*, in which it terminates, in combination with the plate *h*, which bears against said disc, the rod *i*, rising from said plate, the hub R, held against the under side of said disc, the arm *j*, rigid with said hub, and having its upper end sleeved on said rod *i*, and the screw *k*, which holds said arm and pin together, substantially as set forth.

278,390. DRAIN AND RETURNING STEAM TRAP, *James H. Blessing, Albany, N.Y.—Filed April 6th, 1883.*

Claim.—(1) The combination of an automatic return trap and an automatic drain trap in one apparatus, whereby the apparatus may be used either for feeding the water of condensation into the boiler or discharging it into a suitable receptacle, substantially as

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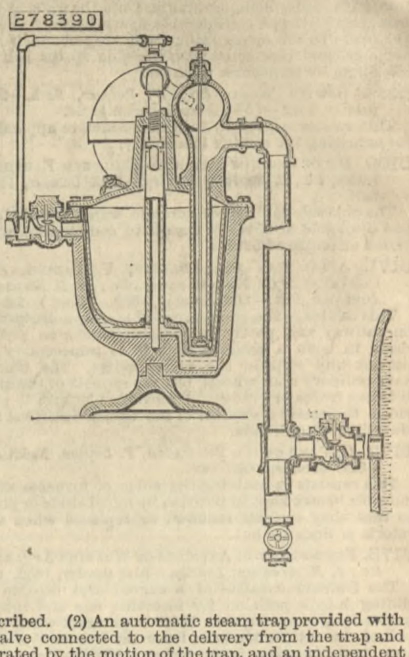

described. (2) An automatic steam trap provided with a valve connected to the delivery from the trap and operated by the motion of the trap, and an independent pipe connected to said return pipe from the steam trap to the boiler, and delivering to a sewer or water receptacle, substantially as described.

278,453. PLOUGH CLEVIS, *Andrew Patton, New Orleans, La.—Filed July 24th, 1882.*

Brief.—The rear of the hook or eye is inclined and grooved to retain a horizontal position on the beam

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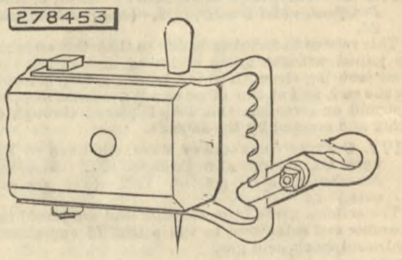

clevis, which may be swung upward and adjusted in notches therein. The pivot bolts are rivetted over their nuts.

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THE ENGINEER, June 29th, 1883. PAGE

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending J... —On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum ... mercantile marine, Indian section, and ... collections, 4799. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. ... Museum, 4719; mercantile marine, Indian section, and other collections, 1336. ... Average of corresponding week in ... , 18,839. Total from the opening of the Museum, 22,129,854.