THE ROYAL AGRICULTURAL SOCIETY'S SHOW AT YORK.

THE show of the Royal Agricultural Society at York promises to be in many respects a success. It is held on the racecourse at Knavesmire, about 1½ miles from the centre of York. The ground is flat and somewhat sandy and dusty; it lies low, but rain seems to pass freely through it. To provide for the worst, however, plank roads have been laid down to it and through it. The weather has, however, on the whole been satisfactory—windy, cloudy, cool, with occasional heavy showers, which did little more than lay the dust.

There is a very large display of implements, and an examination of the catalogue will reveal an unusually large number of entries, "New Implement," but a search through the show-yard will end in disappointment, for many of the novelties are absent, and not a few of the things shown are more novel in name than in reality. We do not propose here to reproduce the catalogue or anything like; it our functions are discharged by bringing under the notice of our readers all that we have found new and worth attention.

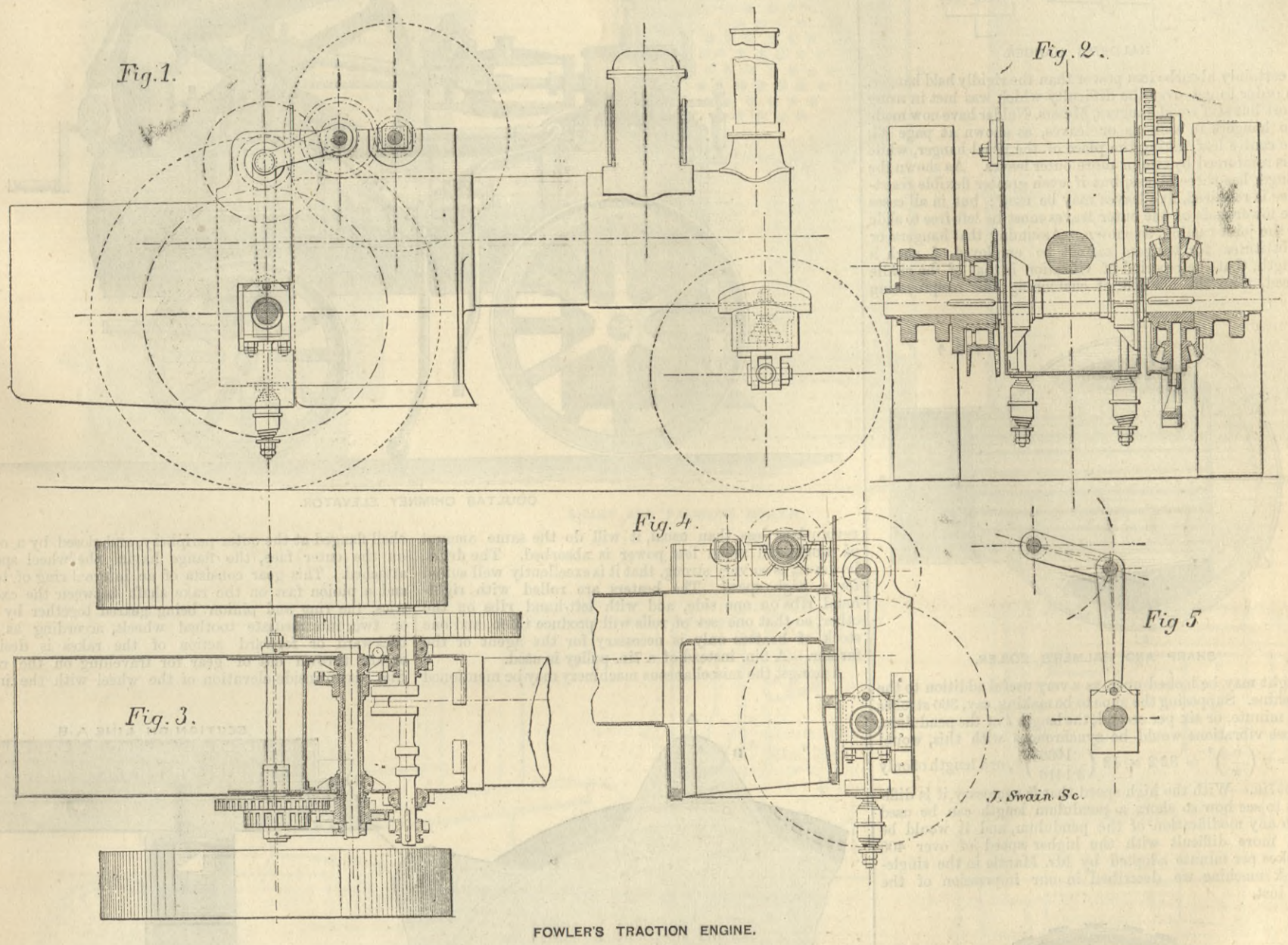
The judges have made several important awards. The prize of £50 for the best equipped dairy suitable for not more than fifty cows is given to Mr. Edward Ahlborn, the German exhibitor. This decision has occasioned surprise among many critical visitors, by whom it was anticipated that the prize would fall into the hands of Messrs. T. Bradford and Co, the only other competitors in the class. It seems, however, that this firm failed to comply accurately with all the conditions attached to the award. Nevertheless, Messrs. Bradford come in for a share of "Royal" honours, the judges having bestowed upon them a silver medal for their butter-worker and dairy table combined. The prize of £25 for the most efficient and economical straw compressor, to be worked in conjunction with a thrashing machine, is withheld, neither of the two competing inventions having sufficient merit in the eyes of the judges to entitle it to the sought-for distinction. At the same time, one of them has been thought worthy of a silver medal. This is the straw-trussing machine exhibited by Messrs. J. and F. Howard, of Bedford. As the price of this apparatus is but £45, the machine is placed within the reach of farmers of limited capital. The machine binds the straw into trusses as delivered by the thrashing machine, each truss being securely bound by two bands of hemp or other cord. Another appliance which has caught the approval of the adjudicators is Maynard's straw "yealming" or straightening machine, price £22. By its means the straw or hay is straightened before being cut into chaff, the only preliminary requirement being to throw the material on the machine by one man with a fork. Yet another silver medal is received by Mr. Charles Catley, of York, for his new steam-power plough, already described in THE ENGINEER. A similar recognition is given to a horse-hoe, price £13 10s., exhibited by Mr Frederick Savage, of King's Lynn, while the remaining medal is won by Messrs. George Cradock and Co., of Wakefield, for their wire rope for steam cultivation, which was described in our pages some time since. Other awards are referred to hereafter.

The novelty in thrashing machines is confined to the finishing machine exhibited by Mr. Edwin Foden, of Sandbach, in which the usual blast fans and second dressing shoe are dispensed with, the only fan used being an exhaust fan, which acts as a chaff lifter, and at the same time effects a specific gravity separation, instead of a separation by dimension, as when sieves are employed. In our engravings of the machine Fig. 1 is a side elevation partially in section, Fig. 2 is an end view partially in section, and Fig. 3 is a plan. F is the exhaust fan referred to. A A are air inlets to a vertical pipe or finishing exhaust-box B, through which the grain and chaff and other light corn fall after passing through the aveller P, and in so doing meet with the incoming draught or current of air proceeding to the exhaust fan F, and thus the light grain and other light particles are carried along with the current in the direction of the arrows, through the passage C, inside the framing C^1, into the light corn pockets D, where the velocity of the air is reduced, owing to the increased area of the passage, and which has the effect of at once liberating the light corn, short straws, &c., which drop down and are emptied at the light spout L L, whilst the grain is free to descend into the ordinary rotary screen R. The chaff and other light particles are drawn in the direction of the arrows through the pipe E and exhaust fan F, by which they are so delivered to the chaff bags G G. B^1 is an enlargement of the exhaust-box B, so that any heavy corn that may have been drawn up into this enlargement falls along with the other heavy corn. In order to ensure that the corn in passing from the aveller or scourer P shall be spread evenly over the entire area of the exhaust-box B, the mouth of the delivery to the exhaust-box is divided by ribs J, and for the same purpose ribs *j j* are affixed to the sides of the exhaust-box. At K is a sliding valve or shutter on the face of the aveller P, to vary the scouring action on the grain as required. The spout N N and valve O are used for permitting the wet corn and smut wheat to fall into the exhaust-box B, and thus all grain passing through the machine is dressed a second time and passed through the screen R. The first winnowing operation is performed in the dressing shoe T by means of the same exhaust fan F, which draws the chaff, &c., through the pipe or extra chamber S, and off the riddle T^1, and delivers it the same as in the case of the second dresser at G G, the chaff-cleaning being effected by the perforated fan casing M M, the air pressure being regulated by the sliding valve H H in the air chamber of the riddle-box, and the air inlet being arranged at U, Fig. 1. From this description it will be seen that Mr. Foden has made a distinct step in the simplification of the thrasher, and as far as can be judged by the work done by it in the show ground, the separations are equally as good, if not superior, to those made by the ordinary sieves. The removal of light but full sized grain cannot be effected by means of sieves, and this is particularly noticeable with oats. The specific gravity separation, however, of Mr. Foden's machine removes these light grains or grain shells, and the best sample obtained is remarkably good. With barley for malting purposes this separation by weight is very valuable.

A run was made on Monday with some rather rough wheat, under the inspection of the judges, and although this trial was only intended to show the efficiency of the exhaust separation, it was sufficient to enable the judges to see that the invention was worthy of the award of one of the silver medals at their disposal. It will no doubt be remarked by many that there is nothing new in the employment of an exhaust fan. There is, however, the difference which amounts to novelty between a proposal not carried out in a practically and commercially successful manner, and one which is successful in both respects. There is nothing new in the use of an exhaust fan, but it may be applied as part of a new combination.

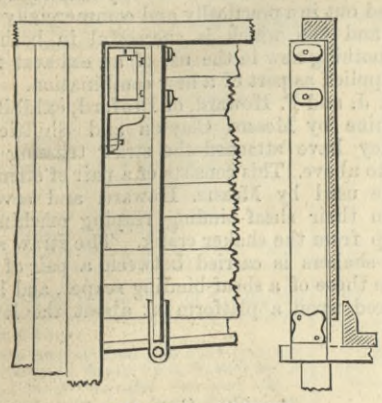
Messrs. J. and F. Howard, of Bedford, exhibit a thrashing machine by Messrs. Clayton and Shuttleworth, to which they have attached the straw trussing apparatus referred to above. This consists of a pair of string binders, like those used by Messrs. Howard and several other makers in their sheaf-binding reaping machines, driven by a strap from the shaker crank. The straw as it comes from the shakers is carried between a pair of travelling webs, like those of a sheaf-binding reaper, and by these it is delivered upon a platform at about the level of the caving riddle, where it is caught against a pair of arms, and packed against these by packing arms as in a reaper. When the straw has thus been collected in sufficient quantity to press hard against the first-mentioned arms, they move sufficiently to set the binding apparatus at work. Two strings are thus tied round the truss of straw, and the truss is ejected. During the working of the machine in the showyard the binding was effected with regularity and with sufficient neatness for all practical purposes. With ordinarily good straw instead of rather rough stuff, the trusses would no doubt be cleanly made, and even with that used the trusses were all distinct. There was a little roughness at one end of some of the trusses, but this appeared to be the result of want of adjustment, as it was caused by the tendency of the straw to deliver faster at one end of the platform than at the other. The problem of trussing may be considered accomplished, but whether the machine is likely to be extensively adopted we are not called upon to give an opinion.

Messrs. Nalder and Nalder exhibit the single crank machine for which they were awarded a silver medal last year at Reading. Since that time they have made some modifications in the connections between the ends of the shaker boxes and the main riddle shoe, and also some alteration in the wood hangers for this shoe. It has been asserted that a noticeable quantity of power is absorbed by the wood spring hangers, and Messrs. Nalder say that their attention has been directed to the reduction of this, and to opposing the momentum of the shoes of thrashers, which causes much stress, owing to the rapidity of the reciprocating motion. This they do by increasing the strength and the number of the spring hangers. This change has been accompanied by a difficulty. In starting machines so fitted the resistance of these strong springs has to be overcome, and this is effected by the use of much



FOWLER'S TRACTION ENGINE.

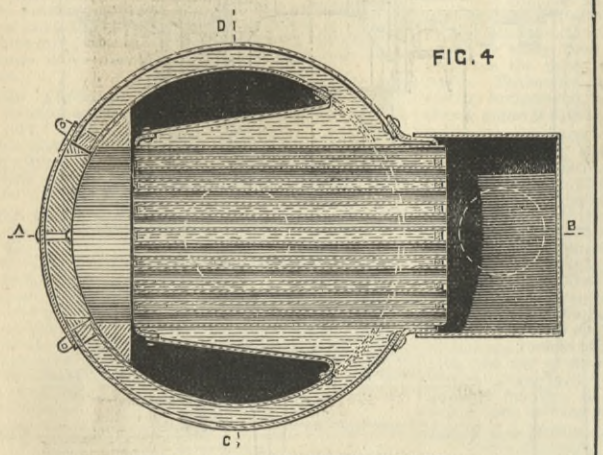
larger pulleys than in usual practice. A spring power is obtained, Messrs. Nalder say, about equal to three-fourths of the shoe momentum. The form of hanger illustrated has been for some time used in the new machine by Messrs. Nalder, the lower part of the hanger not being rigidly held by an attachment to the shoe, but provided with a wide joint, the pin of which is attached to the shoe as an axle. Some makers object to this form—see below—and ascribe to it the objection usually urged against joints. The joint bearing is, however, wide, and may run a long time without getting slack, and



NALDER'S HANGER.

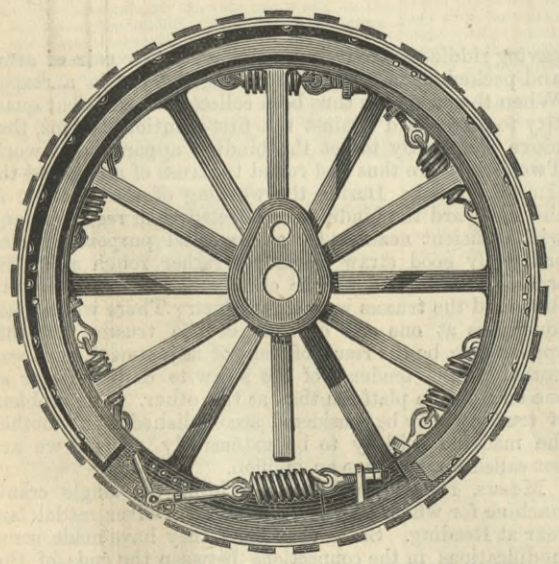
it certainly absorbs less power than the rigidly held hanger. In order to get over the difficulty which was met in using short but stiff wood hangers, Messrs. Nalder have now made the hangers in sections or leaves, as shown at page 43, the centre leaf taking the place of the usual hanger, while it is reinforced by two or more outer leaves. As shown the hanger has three leaves, but if even greater flexible resistance is required, five leaves may be used; but in all cases the lower ends of the outer leaves must be left free to slide in the joint casting, as shown. Assuming that hangers or substitutes for hangers cannot be employed of such a length, that their period of vibration is that of the riddle speed, then the method of cushioning this reciprocating

FIG. 4



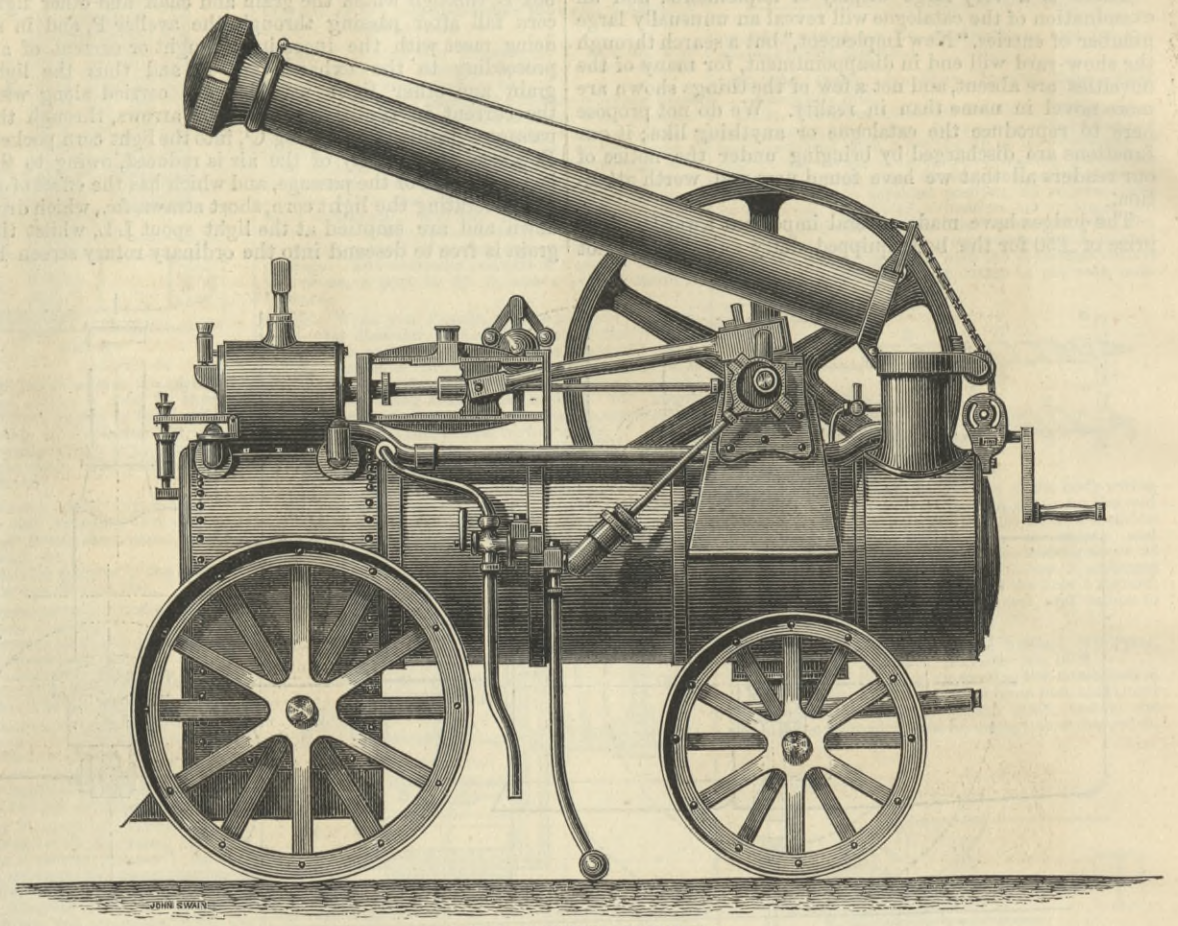
SHARP AND PALMER'S BOILER.

weight may be looked upon as a very useful addition to the machine. Supposing the shoe to be making, say, 360 strokes per minute, or six per second, the length l of the pendulum, whose vibrations would be synchronous with this, would be $= g\left(\frac{\tau}{\pi}\right)^2 = 32{\cdot}2 \times 12\left(\frac{{\cdot}1666}{3{\cdot}1416}\right)^2$, or a length of only 1·0857in. With the high speed that is necessary it is difficult to see how so short a pendulum length can be used with any modification of the pendulum, and it would be still more difficult with the higher speed of over 400 strokes per minute adopted by Mr. Mantle in the single-crank machine we described in our impression of the 6th inst.



MESSRS. AVELING AND PORTER'S SPRING WHEEL.

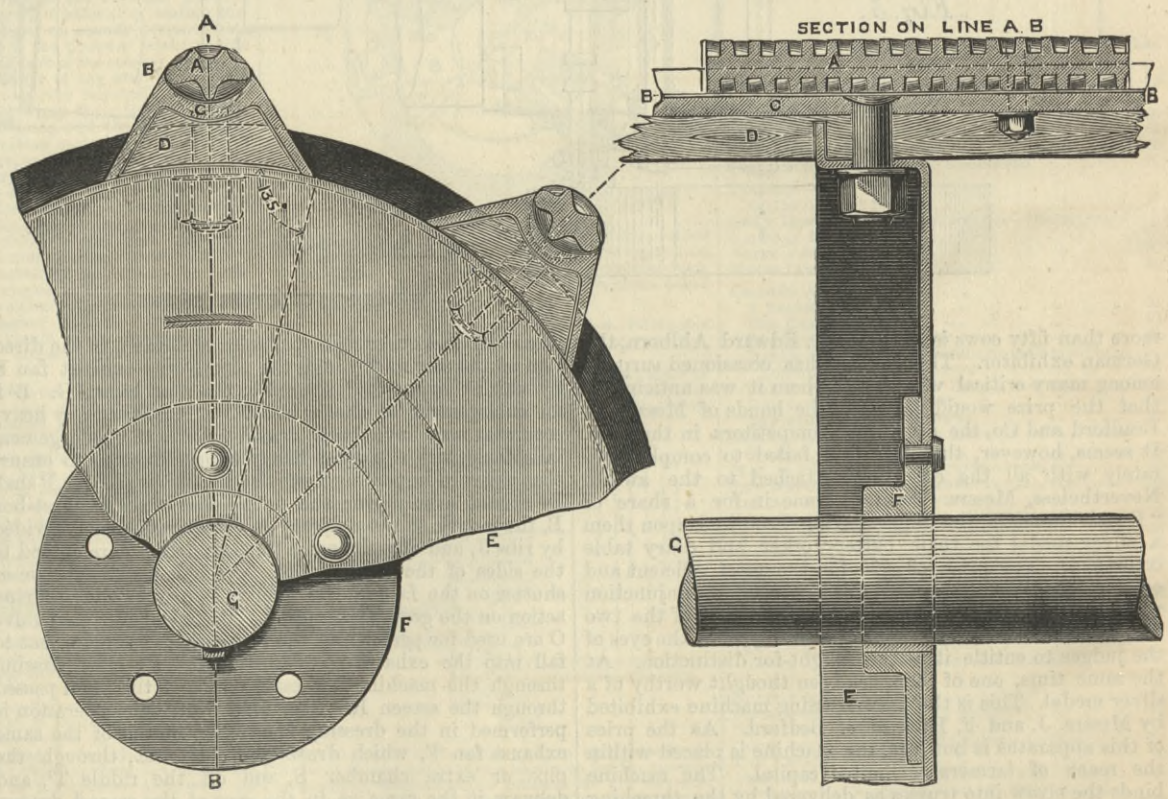
Messrs. Richard Garrett and Sons show one of their new thrasher drums. This is, perhaps, the best drum yet brought out. It is illustrated by the annexed engravings, and differs essentially from any drum previously tried. The beaters A are of the Garrett-Ellis steel longitudinal ribbed pattern, and have such a section that they may be used on both sides, and as they may be turned end for end in the usual way, four wearings may be obtained. The beaters are deep or thick, thus giving greater wearing time, and the whole rib is thicker and deeper than usual. This gives the drum a form which enables it to get a better hold of the straw. The drum heads E are of stamped steel, produced by means of a Piedbœuf press, and the chairs C on which the drum beaters rest and are held, are also of rolled steel, and present a deep surface to the corn, the beater being bedded on the steel chair with a piece of papiér maché between them. They are bedded on a wood-liner, which keeps out the dust, and thus assists in maintaining balance. The bolt holes are filled with a piece of lead composition pipe a little longer than the depth of the wood, so that when the bolts are screwed up the pipe is compressed, fills the hole, and keeps all tight. As a proof of the value of this form of beater and chair, it may be mentioned that it has been experimentally proved that with 200



COULTAS CHIMNEY ELEVATOR.

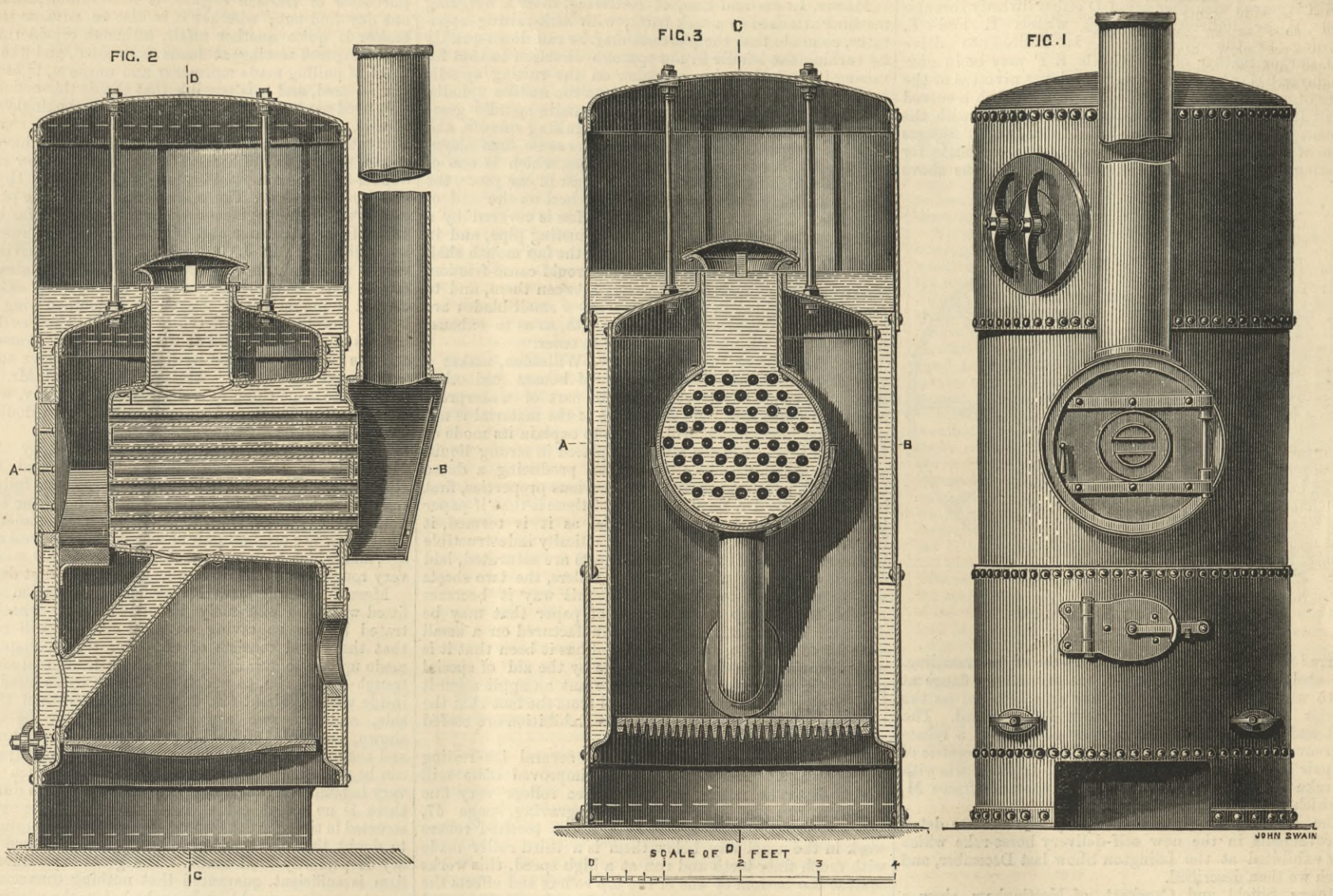
revolutions less than usual, it will do the same amount of work, and much less power is absorbed. The drum, however, is so very strong, that it is excellently well suited for a high speed. The beaters are rolled with right-hand ribs on one side, and with left-hand ribs on the other, so that one set of rolls will produce them, and one stock of beaters only is necessary for the agent or the farmer. A 9in. instead of a 7in. pulley is used.

Amongst the miscellaneous machinery may be mentioned the haymaker exhibited by Messrs. Dening and Co., Chard, which, though brought out last year, has not been described by us. The novelty consists in the arrangement of the gear by which the spindle is carried through the wheel naves, so that a haymaking head may be placed outside each travelling wheel. A haymaker narrow enough to pass through the narrowest field gates, but to which may be applied the outer heads, so as to make a wide machine, is thus secured, with the advantage also that in a very heavy crop the machine without the outer heads may be used, the heads being detached in one minute. The gearing by which this arrangement is possible is shown in the engraving, page 44. The travelling wheels turn upon discs or bosses, through which the rake drum shaft passes excentrically, and turns in bearings therein. These excentrics are adjustable in order to raise or lower the rake drum to suit heavy or light crops, and also to vary its position, according as the forward or backward action of the rakes is required, so that in the turnover action the wheels are in rear of the rake drum, thus enabling the rakes to clear the hay before the wheels, and *vice versâ* in the back action. In neither case do the wheels pass over any portion of the finished work, the excentrics being locked in whatever position they may be set. Each wheel turns upon a pair of such excentrics, and the nave of the wheel itself is constructed of a hollow shell flanged at the outer periphery, and closed by a cover on the outer face, the flange having the wheel spokes attached. This gear consists of an internal ring of teeth and a pinion fast on the rake shaft between the excentrics, the ring and pinion being geared together by one or two intermediate toothed wheels, according as the backward or forward action of the rakes is desired, or are thrown out of gear for travelling on the road. Fig. 1 is an inside elevation of the wheel with the inner

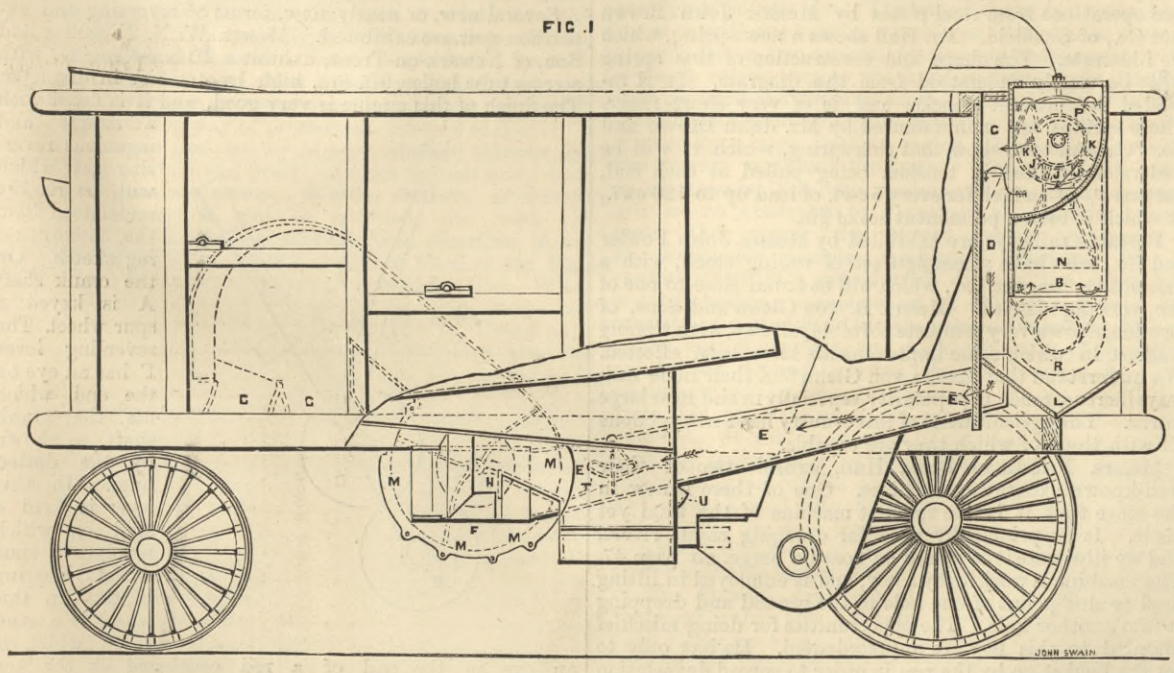


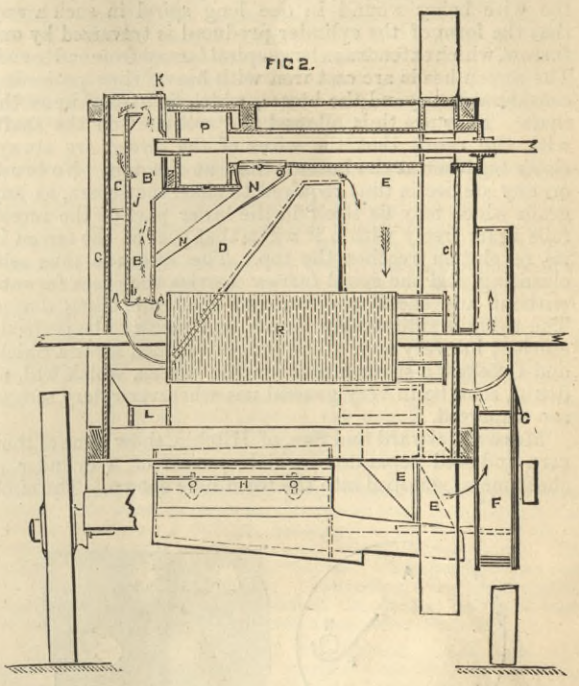
GARRETT'S DRUM.

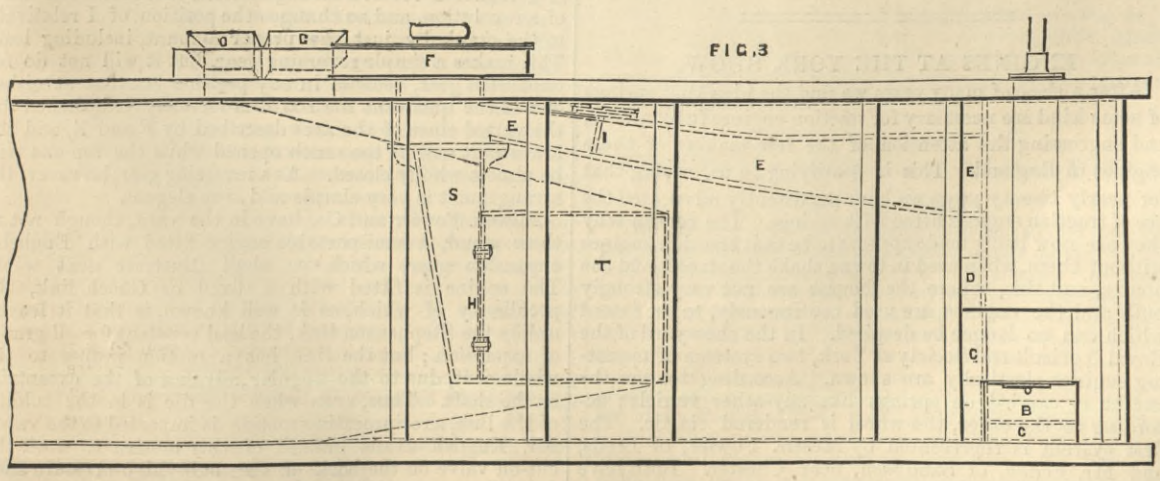
EXHIBITS AT THE R.A.S. SHOW AT YORK.



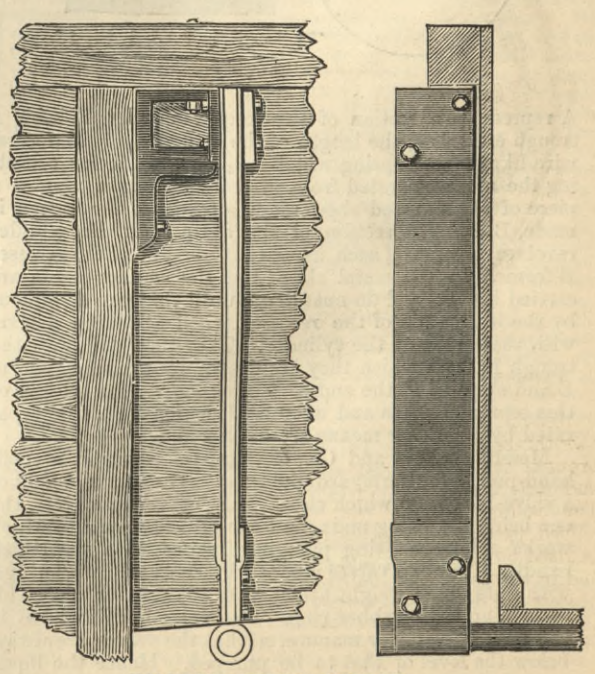
SHARP AND PALMER'S BOILER.





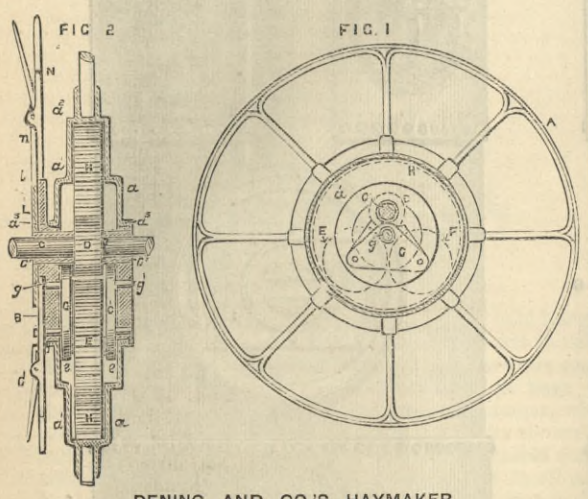


FODEN'S THRASHING MACHINE.



NALDER'S SPRING HANGER.

teeth within the nave of the wheel A, with which wheel F is always in gear. By oscillating plates G on the stud g either of the two wheels E F may be thrown into gear with the pinion D on the rake drum shaft, so that the ring of teeth H is geared with the pinion D either directly through wheel F, or indirectly through wheels E and F, according to the direction it is desired to drive the latter, or neither of the wheels E F may be in gear with pinion D for travelling. G^1 is a lever pivotted at the centre of, and having a stud which passes through a curved slot in the inner excentric. The stud engages with the adjacent plate G, and the lever has a latch, which engages in one of three notches in the flange of the excentric, for adjusting the plates G in either of three positions above



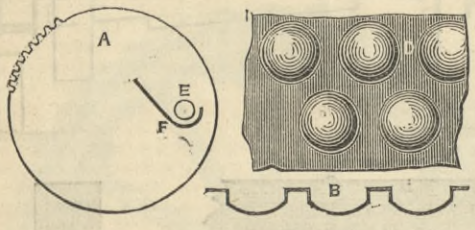
DENING AND CO.'S HAYMAKER.

referred to for forward or backward gear or for travelling. The shell a of the wheel hub A has an exterior flange at a^2, to which the wheel spokes are attached, and on the interior of which the ring of teeth H is formed. The shell and cover also have flanges a^3 received in a rebate or groove around the excentrics. The inner excentric of the pair has in front of it a plate or disc L, concentric with the rake shaft C, and fixed rigidly to the main frame M, to which the shafts are attached.

The Reading Ironworks Company show some detail improvements in the new self-delivery horse-rake which they exhibited at the Islington Show last December, and which we then described.

Messrs. Shield and Crockett, of Nottingham, show a most ingeniously simple corn screen. It is a wire screen, the wire being wound in one long spiral in such a way that the form of the cylinder produced is traversed by one furrow, which extends as a large spiral furrow from end to end. The screen heads are cast iron with heavy rims projecting considerably beyond the bosses, which fit loosely upon the shaft. They are thus allowed to "wobble" on the shaft, with the result that the wires of the screen are always closer together at the bottom than at the top. No brush or any device is thus required to clean the screen, as any grain which may fix itself in the lower part of the screen falls again freely within it when that part of the screen in its revolution reaches the top. The screen is thus self-cleansing, and the spiral furrow carries the grain forward without any sheet iron worm or other propelling device. The thing is ridiculously simple, and seems to be perfectly efficient in every way. The judges awarded Messrs. Shield and Crockett a silver medal for the screen, which will, no doubt, soon be in very general use wherever rotary screens are employed.

Messrs. Gatward and Son, of Hitchin, show some of their corn and seed separators, which consist of a cylinder of sheet metal stamped into the form here shown. The circle



A represents a section of the screen cylinder, F being a trough extending the length of the cylinder, and E a spiral wire like a spiral spring which acts as a worm for collecting the seeds separated from the corn. D is a view of a piece of the stamped sheet metal of which the screen is made, B being a section of the same. As the cylinder revolves, the grain, such as wheat, falls out of the recesses B formed in the metal sheet, but the smaller seeds are carried higher, and do not fall out until they are tipped out by the inclination of the recesses, when about on a level with the centre of the cylinder. They then fall into the trough F, from which they are drawn by the spiral worm E and emptied at the end of the cylinder. By means of this separator seeds and weed seeds which cannot be separated by any other means are extracted.

Messrs. B. Reid and Co., of Aberdeen, exhibit a small hand pump for farmyard purposes. It consists simply of a valve-box, from which rises a pair of vertical pipes, the one being the rising main, and the other a barrel in which works a loosely-fitting plunger attached to a wood stick handle. The two valves are of the form of half an egg, with a stem and weight attached to the smaller end. This rests in an india-rubber ring. The valve-box is placed in the tank of water or manure, so that the valves are always below the level of that to be pumped. Hence the liquid must find its way into the pump, and almost any quantity of straw and similar material likely to be found in the liquid manure tank in a farmyard will pass through the pump, as was shown by the maker by forcing whisps of straw into the openings at the bottom of the valve-box.

Messrs. Lewis and Son, of Kettering, show a weighing machine attached to a sack truck, with sack-raising apparatus, so made that the platform may be run down quickly by turning the handle in the opposite direction to that for raising it, and throwing a pinion on the raising spindle into gear with one of the same size on the handle spindle. For raising the load a pinion on the handle spindle gears into an internally-geared wheel on the raising spindle, and thus the two speeds are obtained. The same firm shows an exhaust fan for rick-drying purposes, which is one of the type which has blades and casing cast in one piece, the whole revolving as an unenclosed fan-wheel on the end of a spindle. The central mouth of the fan is covered by a casting, to which is attached the exhausting pipe, and in order that the joint between this and the fan mouth shall not necessarily be a close one, which would cause friction, a sixteenth of an inch or less is left between them, and to prevent air rushing in at this place a few small blades are cast on the fan case close to the mouth, so as to exhaust from this joint rather than allow air to enter.

The Waterproof Paper Company, Willesden, makes a very large and interesting display of houses and other structures, constructed wholly or in part of waterproof paper and millboard. As the nature of the material is not understood generally, it will be well to explain its mode of formation here. Copper strips are placed in strong liquid ammonia, which dissolves the copper, producing a dense blue liquid, which possesses several curious properties, first investigated by Dr. Scoffern. One of these is that if paper be saturated with cupro-ammonia, as it is termed, it becomes not only waterproof, but practically indestructible by the weather. If two or more sheets are saturated, laid on each other, and passed through rollers, the two sheets will be cemented together, and in this way it becomes possible to build up any thickness of paper that may be desired. The material has been manufactured on a small scale for some years, and so successful has it been that it is now manufactured on a great scale by the aid of special plant. Of how extended and important an application it is capable, some idea may be formed from the fact that the temporary buildings of the Fisheries Exhibition are roofed with it.

Mr. Hall, of Sheffield, exhibits several interesting small things. Among others an improved bone mill which deserves notice, as with three rollers very fine grinding can be effected. The engraving, page 47, shows the mill in section. The two upper toothed rollers work in the usual way, below them is a third roller made with much finer teeth and run at a high speed, this works against the bottom of one of the top rollers and effects the further reduction of the material. On Mr. Hall's stand will also be found some small railway wheels, stamped at two operations from steel plates by Messrs. John Brown and Co., of Sheffield. Mr. Hall shows a new spring, which we illustrate. The shape and construction of this spring will be easily understood from the diagram. It is intended to prevent shocks, and is of very short range. These springs are manufactured by Mr. John Brown and Co. Careful tests show that this spring, which it will be understood is used in tension, being pulled at each end, flattens $\frac{1}{16}$ of an inch for every 5 cwt. of load up to 120 cwt., at which it took a permanent set of $\frac{3}{8}$in.

Portable railways are exhibited by Messrs. John Fowler and Co., who have a complete set of rolling stock, with a locomotive, wagons, &c., which will be found close to one of the working dairies. Messrs. R. von Glehn and Sons, of London, show a very complete portable railway, with tipping wagons, in which some improvements have been effected. We understand that Messrs. von Glehn find their little railways increase much in popularity, especially in and near large towns. The agriculturists of this country have not yet done all with them of which they are capable.

Messrs. Priestman Bros., Hull, exhibit two of their well-known excavating machines. One of these is new in the sense that it is the smallest machine of the kind yet made. It is principally used for dredging small rivers, and we illustrate it as placed on board a barge, on page 47. The machine is worked by a boy, and is employed in lifting mud or sludge out of one hole in the ground and dropping it into another hole. The opportunities for doing mischief afforded to this boy are unprecedented. He has only to let the bucket go by the run in order to spread devastation in the shape of a shower of mud on the crowd surrounding Messrs. Priestman's stand. The boy has hitherto resisted the temptation to which he has been submitted. If the trial were prolonged, he must break down under the mental strain. Probably, however, he is safe for the moment.

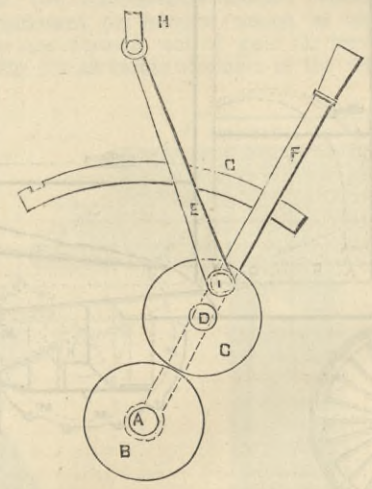
ENGINES AT THE YORK SHOW.

After a sleep of many years we find the idea that springs of some kind are necessary for traction engines fully awake, and engrossing the attention of the few makers of these engines in England. This is gratifying to us, seeing that for nearly twenty years we have persistently advocated the use of traction engines fitted with springs. The reason why they are now being made appears to be that traction engines without them, when used in towns, shake the streets and the houses, and this, where the houses are not very strongly built and the engines are used continuously, to an extent which can no longer be despised. In the showyard of the Royal Agricultural Society at York, two systems of mounting engines elastically are shown. According to one the engine is carried on springs like any other vehicle; according to the other, the wheel is rendered elastic. The first system is represented by Messrs. Fowler, of Leeds, and Mr. Foden, of Sandbach, near Chester. Both have followed the same lines; springs are coupled to the driving wheel axle-boxes, and radius rods are used to keep the cogged wheels in gear. But Messrs. Fowler put their springs under the axle, and Mr. Foden puts his above it. We illustrate Messrs. Fowler's arrangement on page 41, and we give on page 47 an engraving of Mr. Foden's engine. This last we may say is very well designed and well built, and has two cylinders. The advantage of two cylinders to the purchaser of traction engines is indisputable, as he will one day find out; whether it is also an advantage to the maker is quite another affair, although considering that snatching and tearing at loads is avoided, and the whole work of pulling made more easy and uniform, lighter gear can be used, and it is possible that the double-cylinder engine need not cost much more to make than the single engine. Messrs. Fowler, we may add, who have been consistent advocates of the single-cylinder system, seem to have come round to our way of thinking, for they are now making double-cylinder compound ploughing engines. However, this is a digression. There is nothing new in the principle employed by the engineers we have named; as far back as 1860 Messrs. Gardener and Wilkinson, of New Cross, made an engine for Mr. J. Barrans, in which the driving axle moved up and down in vertical slides or horn plates. The crank axle was directly above the driving axle, and carried a pinion which geared in a toothed ring bolted to the inside of the driving wheel. The crank-shaft brasses ran in horn plates as the driving axle brasses did, and the two were coupled by links so as to move together and not get out of gear. Messrs. Fowler and Mr. Foden do just the same thing in a slightly different way, with the second motion shaft, and we see no reason to doubt that the result will be satisfactory.

The spring wheel system is represented by Messrs. MacLaren, of Leeds, and Messrs. Aveling and Porter, Rochester. The spring wheel of the former we fully illustrated and described in our impression for June 1st, and nothing has occurred since to shake our good opinion of it. They show the original pair of wheels made several months ago, and which have run much more than 2000 miles over very rough roads, and remain as good as the first day.

Messrs. Aveling and Porter show a traction engine fitted with the extremely ingenious spring wheel illustrated by the engraving on page 42. It will be seen that the wheel consists of an outer trough-shaped rim, made up of the tread and two angle irons, and an inner trough-shaped rim, to which the spokes are secured. The inside wheel is about 6in. less in diameter than the outside, and the two are held together by the springs shown, one end of each being jointed to the outer wheel and the other end to the inner wheel. Perfect adjustment can be effected by the screws. The elastic action of this very ingenious arrangement is perfect; as to its durability there is no direct evidence, as the engine was only constructed in time for the Show. We see no reason, however, to doubt the success of the wheel, which we need hardly say is perfectly well made. The great experience of the firm is sufficient guarantee that nothing connected with traction engines would be brought before the public unless it stood more than a chance of being quite satisfactory.

Several new, or nearly new, forms of reversing and expansion gear are exhibited. Messrs. W. N. Nicholson and Son, of Newark-on-Trent, exhibit a 10-horse engine, with a cross tube boiler, 9ft. 6in. high by 4ft. 3in. in diameter. The finish of this engine is very good, and it is fitted with



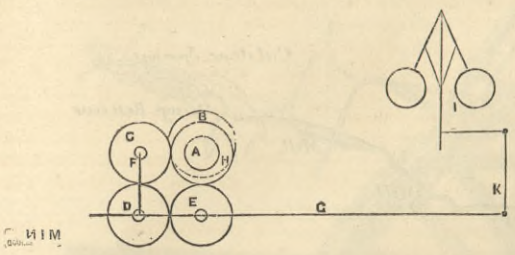
a simple and ingenious reversing gear which will be readily understood from the accompanying sketch. On the crank shaft A is keyed a spur wheel. The reversing lever F has an eye on the end which fits the crank shaft, as shown by the dotted lines. In this lever is fixed a stud on which revolves a spur wheel C gearing in B. In this wheel is a stud I, on which is an eye in the end of a rod connected at the top to the valve rod H. This second wheel is obviously the equivalent of the excentric; and by moving the reversing lever F from one end to the other of the quadrant G the engine can be made to go ahead or astern, because the crank shaft being at rest, the moving of F makes C revolve through a little more than one third of a revolution, and so changes the position of I relatively to the crank by just the proper amount, including lead. This makes a simple reversing gear, but it will not do for expansion gear, because in any position but that at either end of the quadrant the rod E is virtually lengthened by the versed sines of the arcs described by F and E, and the lower port will be too much opened while the top one will be almost wholly closed. As a reversing gear, however, the arrangement is very simple and even elegant.

Messrs. Fowler and Co. have in the yard, though not at their stand, a semi-portable engine fitted with English's expansion gear, which we shall illustrate next week. The engine is fitted with a fixed or Gooch link, the peculiarity of which, as is well known, is that it leaves, unlike the Stephenson link, the lead constant for all grades of expansion; but the link has a motion proper to the whole of it, due to the angular advance of the excentrics on the shaft. Thus, even when the die is in the middle of the link, a reciprocating motion is imparted to the valve. Mr. English avails himself of this motion to work the cut-off valve on the back of the main high-pressure slide valve in a way which will be at once apparent to any one familiar with valve gear. In effect, the third excentric, which would be required to produce the same effect, is dispensed with—whether the rocking shaft used instead is

better remains to be seen. The gear is elegant in idea, and has been very well worked out by Messrs. Fowler.

Messrs. Shanks, of Arbroath, show a compound launch engine very similar to that which they exhibit at the Agricultural Hall, but fitted with an extremely neat valve gear, a description of which we could not make intelligible without drawings, which we shall publish in an early impression.

Messrs. W. Foster and Co., Lincoln, show a good, well-finished portable engine, 10-horse power, fitted with Starke's patent automatic expansion gear. The accompanying diagram will make the action of this gear intelligible. Here A is the crank shaft, B is the excentric loose on the shaft, and fitted with a spur wheel H. On the same shaft, and beside H, is keyed another precisely similar wheel. The wheel C gears with H, but the wheel E gears with that on the crank shaft, and with D, which gears with C, which gears with H. The result is that the



excentric receives motion from the crank shaft through the fellow wheel to H, through E, thence to D, and through it to C. The wheel D is carried on the swinging link F, to the lower end of which is coupled the rod G which takes on to the bell crank K, operated by the governor I. As this rises or falls, so E, drawn backwards or forwards, will move in advance of, or fall behind the crank, and so shift H, and with it the excentric B round on the crank shaft, and so varying the point of cut off. In effect the action is very similar to that of Nicholson's gear. But this is a true expansion gear, which Nicholson's is not. Both are distant imitations of Sell's patent reversing gear, used twenty years ago in Messrs. Maudslay and Field's three-cylinder marine engines. So history repeats itself. Sell's gear is a true reversing and expansion gear in one; but Nicholson's is only a reversing gear without power of expansion, and Starke's is only an expansion gear without power of reversing. Starke's gear worked very well when we saw it in action, and is fully under the control of a not very powerful governor.

Of steam engines in general, it may be said that those shown are at least equal in workmanship and design to any which have been exhibited of late years, and we may mention as particularly excellent those at the stands of Messrs. Marshall, Sons, and Co., Gainsborough; E. R. and F. Turner, Ipswich; Ruston and Proctor, Lincoln; Robey and Co., Lincoln; Clayton and Shuttleworth, Lincoln; and Messrs. Ransome, Head, and Jefferies, Ipswich. On the stands of many other firms excellent engines may be seen; yet we are not quite sure that any firm has recently done much in the way of promoting economy of fuel.

The example first set by Messrs. Richard Garrett and Sons has been followed pretty extensively, and many compound engines are shown. Messrs. Garrett, of course, show such engines, and in addition, one with the patent boiler, which has already been described in our pages. The fire-box of this boiler is fitted at the back end with a pair of folding doors made of fire tiles. When these doors are open they lie against the sides of the box out of the way, and it is then fired with coal in the ordinary manner. When it is desired to burn straw, the doors are shut, and a bridge is thus made, over the top of which the flame must pass; but in doing this it encounters a current of air brought in from the smoke-box end by a few of the boiler tubes used as air passages, prolongations of these tubes passing through the smoke-box front. Thus combustion is promoted. Messrs. Garrett are very careful and accurate experimenters, and we have reason to know that an exhaustive test of this system of burning straw and coal has been made by Messrs. Garrett, extending over several months, and tabulated with thousands of figures. This inquiry showed conclusively that the saving effected in the case of coal varies with the kind of coal used, but may be taken as usually about 5 per cent., but the saving in the quantity of straw used is over 20 per cent. It may be said that the straw is valueless; but this is not quite true, and in any case the more of it burned, the greater the cost of handling it; but besides this, it is clear that the greater the efficiency of it, the more freely will the boiler steam, and this is a very important point. It is found that for coal-burning engines the saving effected is not worth the augmented expense of the boiler; but in straw-burning districts the system enjoys great favour, and is rapidly gaining in popularity.

Messrs. Turner, of Ipswich, show for the first time a compound engine, which we shall illustrate in an early impression, and concerning which we shall say nothing more at present. Messrs. Ruston and Proctor also exhibit a compound engine; so do Messrs. John Fowler and Co., and Messrs. Richard Hornsby and Sons.

Messrs. Burrell, of Thetford, show the indestructible portable engine, which, owing to its massive proportions, we have called "Lady Jane." All the engines shown by the firm are fitted with a new and extremely simple governor, consisting of two balls sliding on a transverse rod. The balls are prevented from flying off the rod when the engine is at work by two steel tapes—clock springs—which pass over pulleys and down to the governor sleeve; when the balls fly out, they pull on the tapes which lift the sleeve against a spiral spring keeping it down. This is one of the neatest governors we have seen—small, compact, and extremely efficient.

Vertical engines and boilers are shown by a great many firms, too numerous indeed to mention. At the stands of the Reading Ironworks Company, Messrs. Robey and Co., Messrs. Marshall and Co., and Messrs. Turner, of Ipswich, will be found very excellent examples of this class of machinery. Messrs. Riches and Watts, of Norwich, exhibit the greatest novelty in the showyard in this class of machinery, viz., a tandem vertical compound engine, and boiler, provided with a condenser and air pump. This engine will indicate, we are told, about 10-horse power. The air pump is worked by gearing, and the whole arrangement is very satisfactory, and the finish good. We shall probably illustrate this engine.

The vertical boilers of Messrs. Cochran, of Birkenhead, are shown by several firms, and at the stand of Messrs. E. R. and F. Turner will be found a very neat boiler of something the same type. Messrs. Abbott and Co., of Newark-on-Trent, show two Sharp-Palmer vertical boilers, one of which we illustrate on page 43. The drawing explains itself. Careful experiments made by Mr. Wilson Hartnell show that this is at once a good steamer and an economical boiler, a result due in large degree to the large fire-box, which permits combustion to be carried on very perfectly. The firm exhibit other boilers, and the following figures are not without interest:—The 12-horse power Sharp-Palmer boiler is 10ft. high and 4ft. diameter. It weighs 37 cwt., and has 141 square feet of heating surface, and 9 square feet of grate. Its price in the official catalogue is £108 15s. The common cross tube boiler is 12ft. high, 4ft. in diameter, weighs 44 cwt., and has 120 square feet of heating surface, and 9 square feet of grate. Its price is £107 15s. The saving in the weight of material used pays, we understand, for the extra labour in the Sharp-Palmer boiler.

In connection with boilers we may mention a very simple device shown by Mr. James Coultas, of Grantham, which we illustrate. A handle on the smoke-box works an endless screw, which turns a small windlass, and thereby winds up the chimney. It is well known that under the present system a man has to stand on the top of the engine to raise or lower the chimney, and the muddy boots of a farm labourer do not improve an engine, either in the matter of paint or bright work; and, besides, accidents have now and then occurred, the recurrence of which it is just as well to avoid. The cost of Mr. Coultas' improvement is very small, and we see no reason to doubt that the invention will become extremely popular.

We never saw so many hot-air engines at one time as may be seen at York. Of the Buckett caloric engine no fewer than thirteen are shown by the York Engineering Company, Leeman-road, York; Messrs. Oliver and Co., Chesterfield; Thomas Piggott, Birmingham; and the Caloric Engine and Siren Fog Signal Company, London. Messrs. W. H. Bailey and Co., Salford, show two hot-air engines, one of which we have recently illustrated; the other is similar in principle but different in design. These engines work in the showyard in a most satisfactory manner. Messrs. Hayward Tyler and Co. show the Rider hot-air engine applied to pumping. A very large number of these engines has now been sold, and it appears that they give very great satisfaction. The use of them for organ blowing is rapidly extending; a small one being quite powerful enough for a two-manual fifteen-stop instrument. The Buckett caloric engine we have so lately fully described that we need say nothing more concerning it here. The York Engineering Company exhibit a new rotary blower, worked by a large Buckett engine, which deserves notice, and which we shall illustrate. There are no valves or abutments, but two radial pistons, each of which acts as an abutment to the other; the pistons hunting each other round the blower casing by means of an extremely simple mechanical device. Of gas engines there is a considerable display, the most noteworthy being a complete set of Dowson's plant. This consists of a modified Otto gas engine, indicating 30-horse power, with a generator and gasholder complete, as worked out by Mr. Dowson and Mr. Holt, of Leeds; the engine manufactured by Messrs. Crossley. As we shall illustrate this plant we shall not minutely describe it at this moment. It will be enough to say that the gas used is made by sending a jet of steam into a small stove containing burning anthracite coal. The result is carbonic oxide and carbonic acid with hydrogen and nitrogen. This gas is produced in very large volume, and about four and a-half times as much of it is required to produce a horse-power as would suffice if coal gas were used, but the cost of the Dowson gas does not exceed a few pence per thousand cubic feet. Careful experiments which have been made go to show that 1-horse power indicated can be had for 1·4 lb. of anthracite coal. The producer and holder occupy the same space almost as a boiler would.

Messrs. Cobbham and Co., of Stevenage, Herts, show the simplest gas engine we have ever seen. It has no slide valve, runs steadily and at a good pace, and seems to be just the thing wanted where small powers are required. Concerning this also we shall have more to say. Messrs. Andrew and Co., of Stockport, show Bisschop's engine; so do Messrs. Cowley and Son, of Hyde; while Messrs. Müller, of Birmingham, show their well-known apparatus for making gas by drawing air through petroleum spirit, and a small gas engine.

THE WATER SUPPLY OF SMALL TOWNS.

No. VIII.—CALNE.

THE borough of Calne, containing 3400 inhabitants, was until the present year dependent for its water supply on shallow wells sunk in the oolitic rock on which the town is built. To remedy this state of affairs a local company was formed to supply the town with water, and in the Session of 1881-2 a Provisional Order was obtained authorising the construction of works and the abstraction of water from the proposed source.

Source of supply.—About 2½ miles from the town a series of powerful springs, issuing from the greensand, form the source of the river Marden. Their total yield varies from 3,200,000 to 10,000,000 gallons daily; they are about 100ft. above the town, and therefore available by gravitation; and they are of exceptional purity, poisonous metals and ammonia being absent, and albuminoid ammonia only present in the proportion of 0·01 of one part per million. A few of these springs yielding not less than 250,000 gallons daily in time of drought were selected for the town supply. Fig. 1, page 46, shows the position of the springs, town, and mills on the river.

Compensation to millers.—There being nine mills situated on the river between the springs and the town, the question of compensation had to be met. The greater part of the springs are collected in a pond which is used by the millers as a storage reservoir for the night water, and which had a superficial area of two acres and a capacity of 1½ million gallons. By increasing the capacity of this pond to 4 million gallons extra storage to the extent of 2½ million gallons is provided. As the abstraction of water by the company is limited under the terms of their Order to 100,000 gallons daily, storage is provided equivalent to 25 days town supply supposing the statutory limit to be reached; but as it is not expected that the consumption will exceed 60,000 gallons daily, storage is practically provided equivalent to 40 days' supply. The dam was also put in thorough repair by the company, and sluices were provided to enable the millers to utilise the reservoir to the fullest extent. The cost of the compensation works was £1200.

Works.—The storage reservoir was originally formed by a masonry dam thrown across the valley. Behind the dam stood a mill worked by water supplied by the springs now taken for the town supply; the position of the mill wheel is marked *b b* on Fig. 2, and it will be seen that the old channel for conveying the springs to the overshot wheel is now utilised to feed the service reservoir. The springs are arched over and allowed to flow through the reservoir, which, as their dry-weather flow is nearly equal to the capacity of the main, will be always full. The surplus water can be turned either into the storage reservoir or straight into the river. The service reservoir, which contains 6500 gallons, stands on rock, and is built of brick in cement; it is arched over and supplied with water from the old channel, as shown on Figs. 2 and 9. Old work is marked *a a*. The cost of the reservoir was £90. The capacity of the storage reservoir was increased by taking out 10,000 yards of mud, and by raising the water-level. This necessitated strengthening the dam, which was in bad repair. This was done by backing it up with spoil excavated from the pond, and by refacing it with 9in. of concrete and 14in. of brickwork in cement. The arrangement of the dam and sluices is shown on Figs. 2, 3, and 4, old work being lettered *a a*. A Kennedy's patent meter was provided to register the amount of water consumed (Figs. 5, 6, and 7). 4·569 miles of cast iron mains were laid 3ft. below ground and jointed with lead, each length being tested by means of a force pump before being covered in. The mains were delivered at Calne at prices varying from £4 17s. 6d. to £4 12s. 6d. per ton. The following table gives the weight and cost per yard, and the length of mains laid:—

Size of main.	Length laid, in yards.	Weight per yard, in lbs.	Cost per yard laid complete.
in.			s. d.
6	4692	87	5 6
5	441	70	4 9·6
4	153	51	3 9·6
3	732	36	2 11·3
2	2024	22½	2 3·2

The meter, hydrants, sluices, and other fittings, were made by Messrs. Kennedy and Co. Messrs. Firmstone Bros., of Stourbridge, supplied the pipes, and Messrs. Ambrose and Son, of Bath, had the contract for the reservoir and laying the pipes. The works were completed and formally opened on Friday, 9th of June last. The cost of the scheme is £5000. The works were designed and carried out under Messrs. Dudley and De Salis, 1, Westminster-chambers, S.W.

THE SIEMENS GOLD MEDAL.—The gold medal recently founded by Sir William Siemens, D.C.L., F.R.S., with the object of stimulating the students of King's College, London, to a high standard of proficiency in metallurgical science, has this year been awarded to Mr. Edward Burn. Mr. Burn joined the evening classes in 1875, and continued to study in them until 1880, when he obtained a Clothworkers' Exhibition, having previously distinguished himself by the character of his work. In October, 1880, Mr. Burn entered the Applied Science Department. In his first year in the department he gained prizes in mechanics, chemistry, mineralogy, and workshop, as well as a Sambrooke Exhibition; in the two following years he was also awarded several prizes, including the Engineering Society's prize for sketching. The Siemens medal and prize of the annual value of twenty guineas are open to those who have, as matriculated students, studied in the Applied Science Department for two years, and who either in their third year, or if they remain in the department for three years, in the succeeding year, make metallurgy a special study. The award depends partly upon an essay on some particular subject, partly on a written examination on the metallurgical lectures, and partly on actual work done in the laboratory. The subject for the essay for 1884 will be "Cast Steel, its Past and Probable Future Development." The essays are to be illustrated by freehand sketches and mechanical drawings to scale, and must be sent in to Professor Huntington on or before June 14th.

INSULATING SUBSTANCES.—M. Eric Gerard, the Belgian telegraphic engineer, professor of applied electricity at the Liège Mining School, has recently published a treatise on the insulating substances used in the various applications of electricity. He remarks that glass may be called the classical insulator, but its fragile and hygrometric properties are to a certain extent inconvenient. Porcelain he considers an excellent substance, its slight porosity being corrected by the process of enamelling. He urges the necessity of keeping insulators well cleaned, as dust is capable of impairing their properties. Horn, bone, and ivory, are often used in delicate telegraphic appliances, but M. Gerard does not recommend their adoption, as they contain in various proportions organic substances liable to decomposition. Wood has the disadvantage of being hygrometric. He considers ebonite as more suitable for use in instruments of precision than the foregoing substances. Silk is in itself a suitable material, but it is recommended not to employ that substance when dyed in the salts of copper or iron—as is usually the case with green shades—because it thereby acquires a certain amount of conductibility. Gutta-percha and india-rubber are well known in connection with the purposes indicated, but M. Gerard gives special prominence to a combination of the latter with a large proportion of sulphur in the form of ebonite. He, however, remarks that it is after a certain length of time affected by the oxygen in the air, with which the sulphur unites; the surface of the ebonite becoming greenish and dull. Among various other systems which have been tried for cables, that of Brooks is referred to, which includes an iron tube containing the conductors simply covered with cotton and soaked in petroleum. A Swiss firm of electrical engineers, Messrs. Berthond, Borel and Co., are said to have resolved in the following manner the questions affecting the use of paraffine. The conductors are covered with a wrapping of cotton, and are made into a cable which is plunged into boiling paraffine. The cable subsequently passes through an appliance which gives it successively one layer of resin and two coverings of lead separated by a layer of bitumen. It is said that the electrical properties of such a cable differ but little from those of cables with gutta-percha covering, while its price is notably lower. It is further remarked that for industrial purposes it is not generally necessary to have perfect insulation, but rather to employ such insulating substances as are but little affected by air and heat.

WATER SUPPLY OF SMALL TOWNS.—CALNE WATERWORKS.

MESSRS. DUDLEY AND DE SALIS, WESTMINSTER, ENGINEERS.

(For description see page 45.)

FIG. 1.

GENERAL PLAN.

Scale of Feet

100 500 1000 2000 3000.

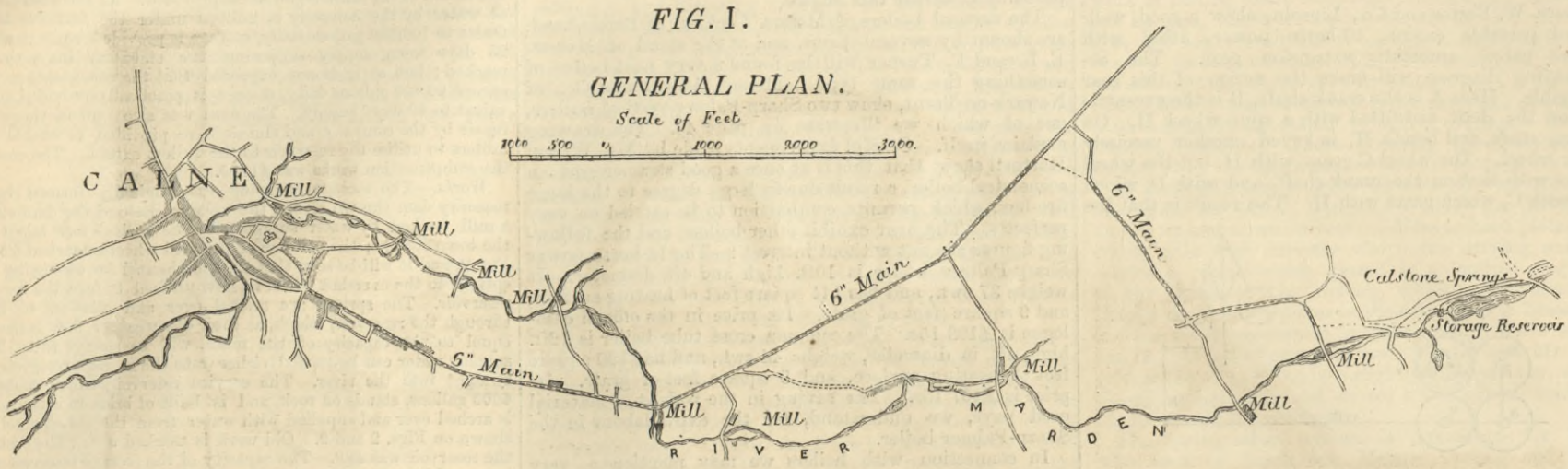


FIG. 2.

PLAN of DAM and RESERVOIR

Scale of Feet

10 5 0 1,0 2,0 3,0

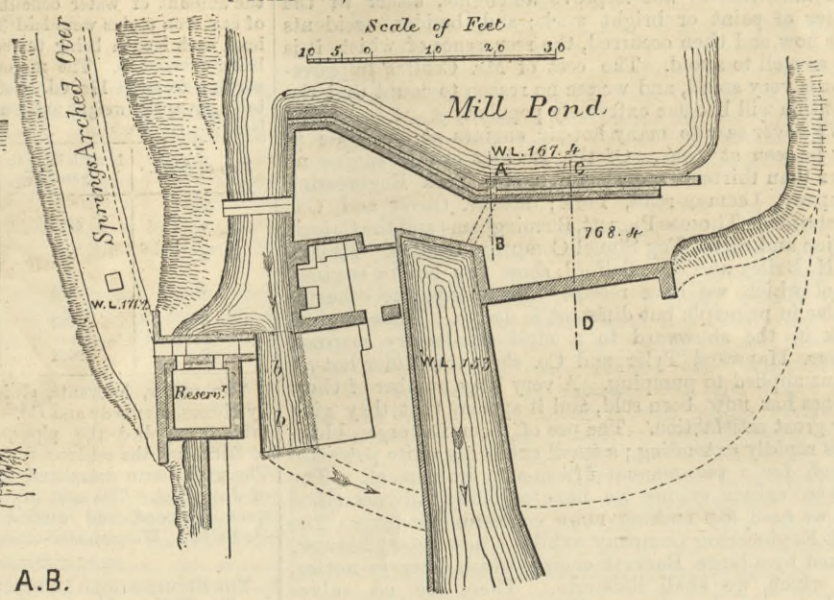
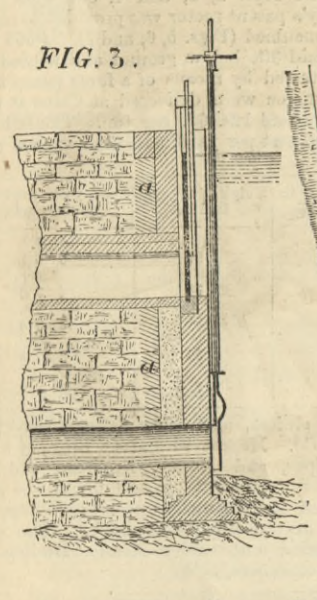
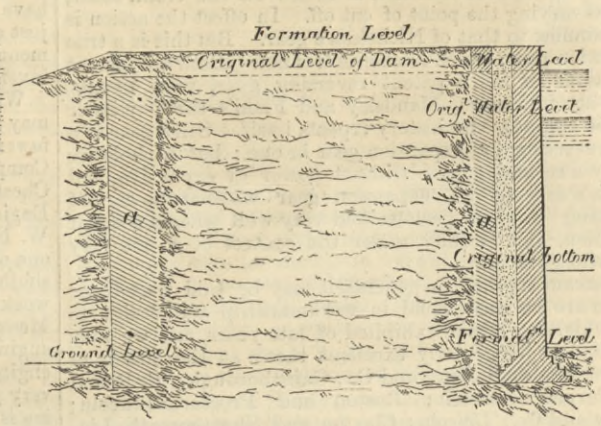


FIG. 3.



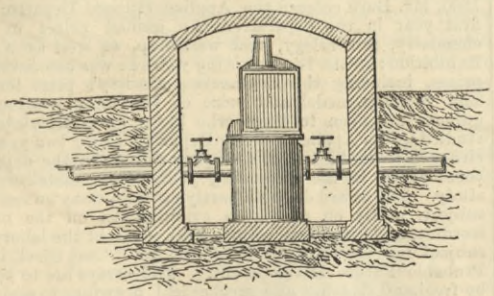
Section on Line A.B.

FIG 4.



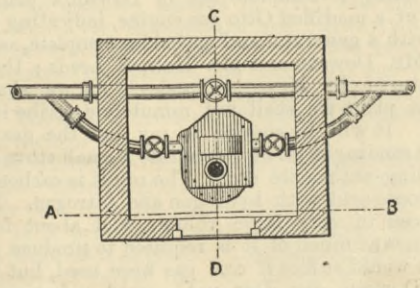
Section on Line C.D

FIG. 5



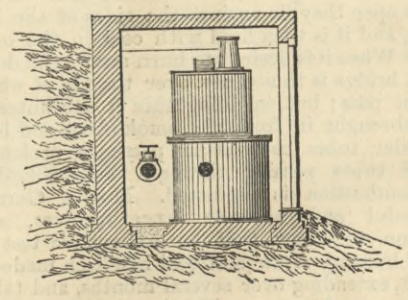
Section on Line A.B.

FIG. 6.



Plan

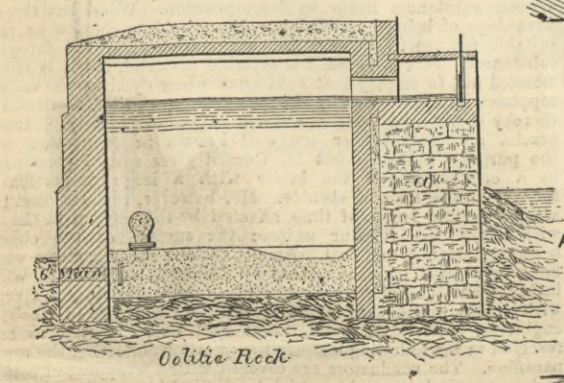
FIG. 7.



Section on Line C.D.

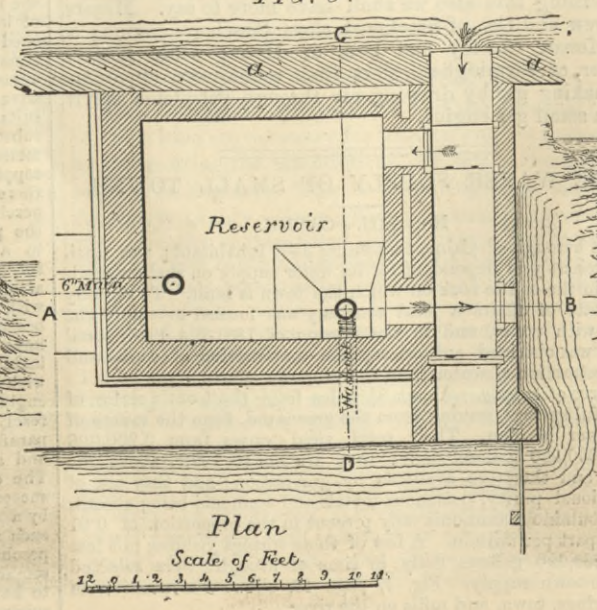
RESERVOIR

FIG. 8.



Section on Line A.B.

FIG. 9.

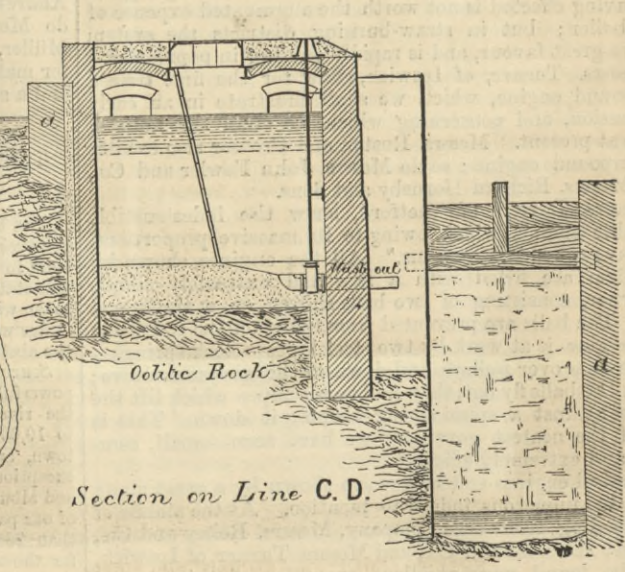


Plan

Scale of Feet

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

FIG. 10.



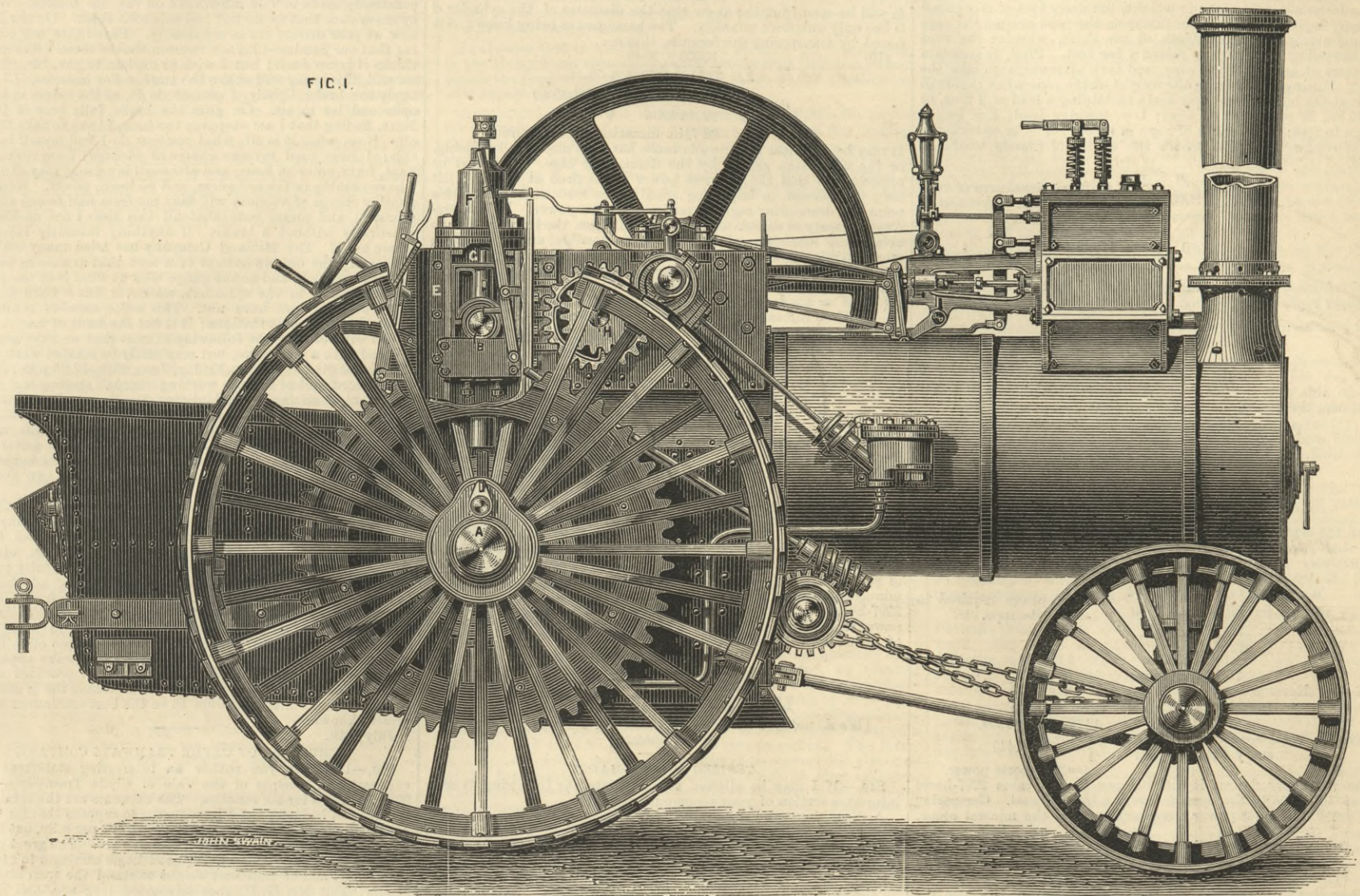
Section on Line C.D.

J. Swain Eng.

EXHIBITS AT THE R.A.S. SHOW AT YORK.

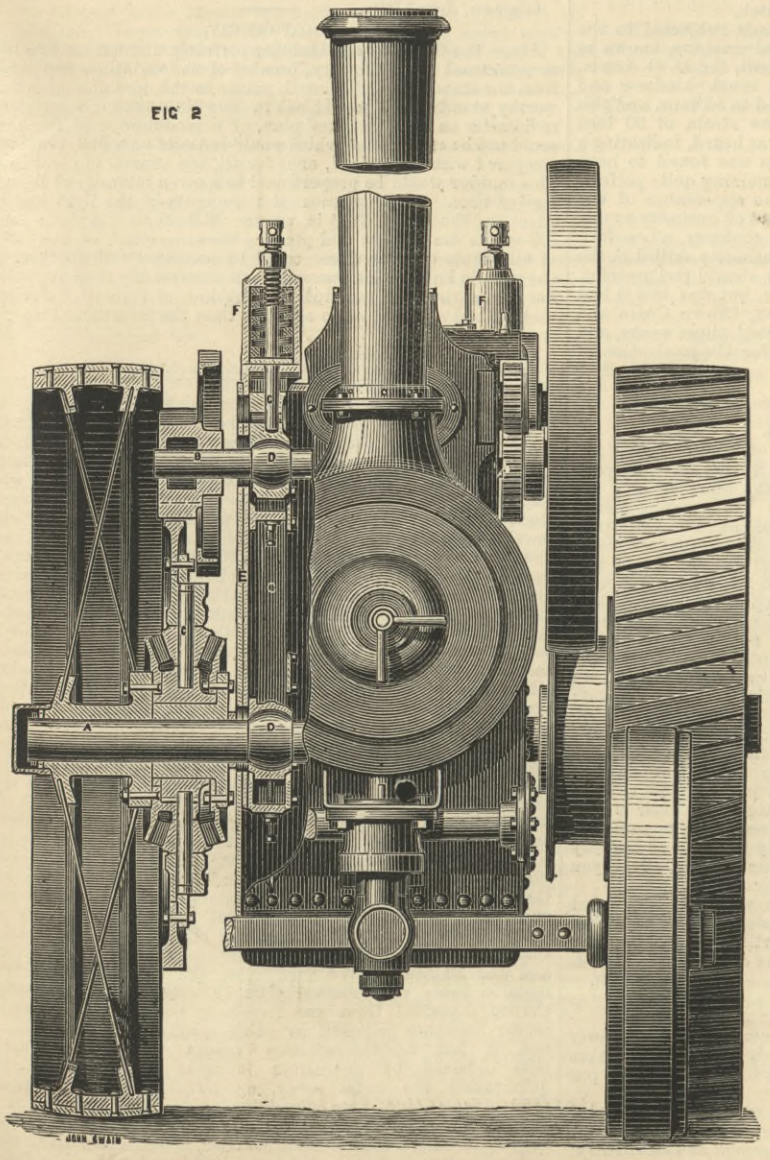
(*For description see page* 41.

FIG. 1.

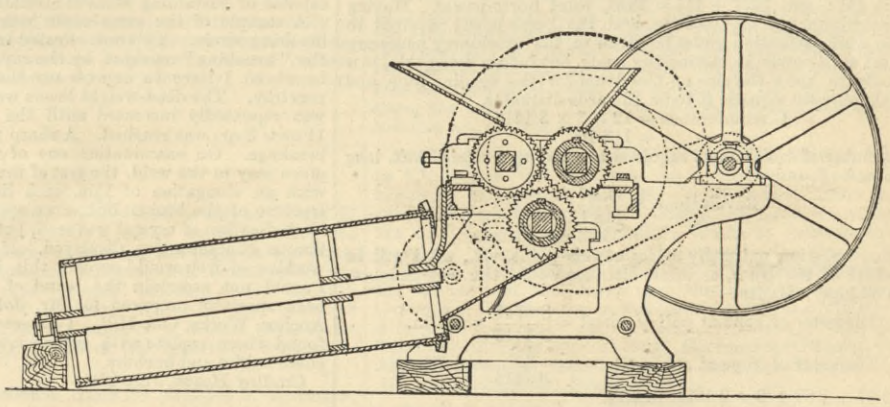


FODEN'S TRACTION ENGINE.

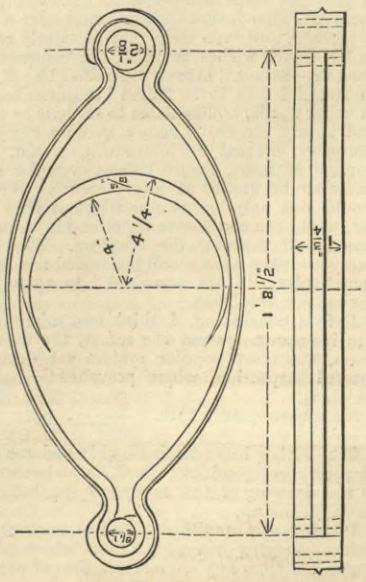
FIG 2



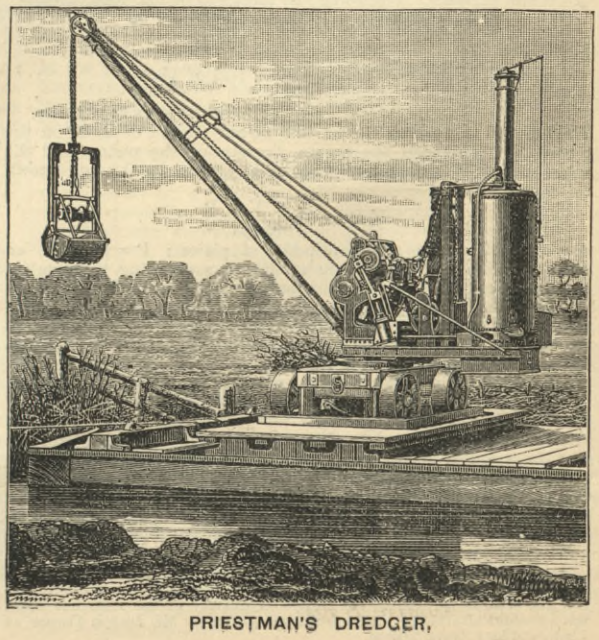
FODEN'S TRACTION ENGINE END VIEW.



HALL'S BONE MILL.



HALL'S SPRING.



PRIESTMAN'S DREDGER.

COAL WINDING IN DEEP SHAFTS.

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

(*Continued from page 493.*)

HAVING now found both the size and the weight of the taper rope, it becomes necessary to know the horse-power required in winding such a rope. The horse-power requisite to raise the load is easily calculated, but it is far different with the rope, because every foot of the latter not only varies in weight, but every foot of it is raised different degrees in height; for instance, the rope nearest the cage is raised nearly the whole depth of the shaft, whereas the rope near the pulley wheel is only raised a few feet. First, to ascertain the centre of gravity of the rope, and then afterwards to take the load.* Having 23,589 lb. as the weight of the rope when the small end is at the bottom, and this again sustaining a load of 8 tons, or 17,920 lb., W = weight of rope; L = working load; F = length of rope in feet; Y = length of rope in inches; a' = cross sectional area of rope at the point where the centre of gravity would be found.

Then, $$a' = \frac{(W \div 2) + L}{8000} =$$ Cross sectional area of rope equal to the suspension of such a load.

$$= \frac{(23589 \div 2) + 17920}{8000} = 3{\cdot}714 \text{ square inches.}$$

Upon reference to the formula previously given to find the size of the taper rope, and repeating.

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

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

But in this case a and a' are known quantities, and F is the unknown, therefore—

$$F = 10964{\cdot}68 \times \log. \frac{a'}{a}$$
$$= 10964{\cdot}68 \text{ (log. } a' - \text{log. } a)$$
$$= 10964{\cdot}68 \text{ (log. } 3{\cdot}714 - \text{log. } 2{\cdot}24)$$
$$= 10964{\cdot}68 \text{ (}{\cdot}5698419 - {\cdot}3502480)$$
$$= 10964{\cdot}68 \times {\cdot}2195939$$
$$= 2407{\cdot}766\text{ft.}$$

Thus the centre of gravity of such a rope of 4000ft. suspended in the shaft would be equal to 4000 – 2407·766 = 1592·234ft. from the surface.

(8) Hence then—

$$\frac{\text{Weight of rope} \times 1592{\cdot}234}{\text{Time in minutes} \times 33000} =$$ Horse-power required to wind the rope.

$$= \frac{23589 \times 1592{\cdot}234}{1{\cdot}50 \times 33000}$$
$$= 759\text{-horse power.}$$

And— Horse-power required to raise the load $= \frac{17920 \times 4000}{1{\cdot}50 \times 33000}$
$= 1448$-horse power.

Hence— Total horse-power in winding every 4 tons of coal $= 759 + 1448$
$= 2207$-horse power.

From the above figures it will be seen that it takes 2207-horse power to bring to the surface every 4 tons of coal. Comparing therewith the horse-power necessary to raise the mineral alone, viz.:—

Horse-power to raise 4 tons of coal 4000ft. in 1·50 minute $= \frac{4 \times 2240 \times 4000}{1{\cdot}50 \times 33000}$
$= 724$-horse power.

It thus appears that 724-horse power only is required to raise the coal from the bottom to the surface, and that the remainder, *i.e.*, 2207 – 724 = 1483-horse power is expended in raising the cage, tubs, and rope; or, the useful work done in raising the coal is only 33 per cent. of the actual power expended. The above calculation gives only the horse-power required to raise the load and its connections, but it must not be forgotten that there is a certain amount of power expended in overcoming the frictional resistance arising from the machinery, guides, resistance of the air, &c., and for this another 20 per cent. may be added. Then 20 per cent. of 2207 = 441; and 2207 + 441 = 2648, total horse-power. Having now calculated the size of rope, and the horse-power required to do the work, attention must be given to the machinery necessary to exert such power in raising the coal; but before doing this, it is requisite to know the size of the drum for the winding rope, and for this purpose suppose it to be 12 yards diameter.

$$\text{Circumference} = 12 \times 3 \times 3{\cdot}1416$$
$$= 113{\cdot}1\text{ft.}$$

The number of revolutions required to wind up a rope 4000ft. long can now be found—

$$\text{Revolutions} = \frac{4000}{113{\cdot}1}$$
$$= 35{\cdot}36 \text{ revolutions.}$$

Another question naturally arises at this point, viz., what will be the width of the drum, or what distance would the rope traverse in 35·36 laps? Hence—

$$\text{Diameter of rope at pulley wheel} = \frac{8{\cdot}0741}{3{\cdot}1416} = 2{\cdot}57\text{in.}$$

$$\text{Diameter of rope at cage end} = \frac{5{\cdot}3}{3{\cdot}1416} = 1{\cdot}69\text{in.}$$

and 2·57 + 1·69 ÷ 2 = 2·13in. nearly.

Thus the rope winding round the drum would average a little over 2·13in. diameter, but to allow a good margin call it 2¼ or 2·25in. Then— Traverse of rope $= 2{\cdot}25 \times 35{\cdot}36$
$= 79{\cdot}56$in.
$= 6$ft. 7½in.

And allowing for laps round the drum for safety, the width of the drum should be, say, 10ft. To compute the dimensions of engines and steam pressure; Supposing the stroke to be 6ft. long, then—

$$\text{Revolutions per minute} = 35{\cdot}36 \div 1{\cdot}50$$
$$= 23{\cdot}57$$

And—

$$\text{Velocity of piston} = \text{revolutions} \times \text{feet of piston}$$
$$= 23{\cdot}57 \times 6 \times 2$$
$$= 282{\cdot}84\text{ft. per minute for each cylinder.}$$

The amount of working power in a steam engine depends on the tension, or pressure of the steam, the size of the piston, and the rate at which it travels, and may be expressed by the well-known formula—

(9) $$\text{H.P.} = \frac{A \times V \times P}{33000}$$

A = area of pistons; V = velocity of piston; P = pressure on piston in pounds per square inch. Before proceeding to calculate the size of engine required, the steam pressure must be first determined. The author presumes that our future engines will not be constructed on such a wasteful principle as some of the present winding engines, where the steam enters the cylinders at about 40 lb. per square inch, and is then wastefully driven up the exhaust pipe into the atmosphere, where it expands itself with a loud noise, as if mocking with laughter at the little use that has been made of it. In some cases it is, however, used to heat the water for feeding the boilers; but even when this is done, a great number of units of heat are lost which otherwise might be turned into motive power. Hence, then, steam power ought, and it is assumed will be, used more economically, either by steam engines being provided with condensers; or, after the steam has been used at a high pressure, by letting it pass into a large cylinder at the back to be again used on a larger piston at a lower pressure, and then condensed. This, however, belongs to the mechanical engineer, and is merely mentioned here to explain the high pressure of steam—average pressure of steam—or power exerted on the piston taken in the following calculations, and which the author assumes at 50 lb. per square inch for the whole length of the stroke. Then (by 9)—

$$\text{H.P.} = \frac{A \times V \times P}{33000} = 2650\text{-horse power.}$$

$$\text{H.P.} = \frac{2 \times d^2 \times {\cdot}7854 \times 282{\cdot}84 \times 50}{33000} = 2648\text{-H.P.}$$

It will be seen from the above that the diameter of the cylinder d is the only unknown quantity. The horse-power being known, d is found by transposing the formula, thus:—

(10) $$d^2 = \frac{33000 \times 2648}{2 \times {\cdot}7854 \times 282{\cdot}84 \times 50}$$

$$d = \sqrt{\frac{87384000}{22214{\cdot}2536}} = \sqrt{3933{\cdot}69}$$
$$= 62{\cdot}71\text{in. diameter of each cylinder.}$$

It may be said here that no allowance has been made for balancing, or the advantage gained by the descending cage.* It must be remembered that the greatest power is required at the first lift from the bottom, in imparting speed to the load, and that at this point the descending cage is exerting its least power. It is therefore necessary to calculate for a sharp lift from the bottom so as to obtain the maximum speed as soon as possible, and this will be more strikingly seen in calculating the work accumulated, or energy expended, in getting up the velocity for the ascending load as shown by the following formula:—

(11) W = the load in pounds = 23589 + 17920 = 41509.
V = Increase in velocity in a second = 4000 ÷ 1·50 × 60.
g = Gravity = 32·2.

$$\text{Pounds work accumulated (or expended) in the first second} = \frac{W \times V\,2}{2\,g.}$$
$$= \frac{41509 \times 44{\cdot}4^2}{64{\cdot}4}$$
$$= 1270639 \text{ pounds.}$$

Summary of steel wire rope calculations.—It will be seen from the foregoing calculations that it requires no extraordinary stretch of mechanical appliances to wind 1000 tons of coal per day from a depth of 4000ft., and that the following dimensions of the various appliances are approximately what would be required; or the whole calculations may be summed up as follows:—1000 tons of mineral per day; 4000ft., depth from which the mineral is raised; 4 tons, weight of mineral drawn at each lift of the cage; 5·3in. circumference of rope at connection to the cage; 8·07in. circumference of rope at the pulley wheel; 10½ tons weight of the rope; 1·50 minutes in raising the load; ·16 minutes in banking the mineral; 2207-horse power to raise the load, rope, cage, &c., or, 2648-horse power expended to raise every 4 tons of mineral; 62·71in. diameter of cylinders, coupled engines.

(*To be continued.*)

* The artifice for finding the centre of gravity of the rope has been, with a slight alteration, taken from one given by Mr. Joseph Timms, of Linby Colliery, Nottingham.

* This is calculated in another place, and can be applied to the above if wanted.

LETTERS TO THE EDITOR.

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

TESTING PITCH CHAINS.

SIR,—If I may be allowed to contribute the following, it may interest a section of your numerous readers:—

A short time ago I was privileged to witness the testing of a large "pitch" or pulley chain at the Netherton Public Testing Works. The chain was one of 1¾in. diameter, with external and internal dimensions 9¾in. by 6¼in. by 6¼in. by 2¾in., without stud or stay pin, and was so accurately made that in twelve links a variation of less than an eighth of an inch over the whole was not found. As I have had considerable experience in the manufacture of pulley-block chain, I felt curious to know how the chain could be tested to the highest possible strain without alteration of pitch. This was accomplished in the following manner:—Several links being selected, centre "pops" were placed on the ends and middles of each; needle-pointed compasses were set, and lines struck. The pumps were then started, and the strain gradually applied until 30 tons were reached, when the compasses showed a slight "thickening" of the lines. This indicated the exact strain a chain of this class was capable of sustaining without alteration of pitch.

A sample of the same chain was afterwards subjected to the breaking strain. This was effected in a special machine, known as the "breaking" machine, by the superintendent, Mr. D. G. Lewis, to whom I have to express my thanks for much kindness and courtesy. The dead-weight levers were loaded to 55 tons, and this was repeatedly increased until the enormous strain of 95 tons 11 cwt. 2 qr. was reached. A sharp report was heard, indicating a breakage. On examination one of the links was found to have given way in the weld, the rest of the link remaining quite perfect, with an elongation of 1½in. each link. The appearance of the fracture of the broken link was a special object of curiosity to me. No indication of crystal was seen, but, on the contrary, a beautiful fibrous character was displayed. If some authority skilled in the working of iron would explain this, I for one should feel grateful. I could not ascertain the brand of the iron, but was told it had been specially prepared for Mr. John Green, Crown Chain and Anchor Works, Old Hill. I afterwards visited these works, and found them replete with every convenience for the production of chain cables and anchors. E. H. S.

Cradley Heath, July 17th.

ELEPHANT BOILERS.

SIR,—I was rather surprised this evening, on again opening my ENGINEER, that the closing remarks in Mr. Swift's letter in your last issue had hitherto escaped my notice—the more so as I am generally so eager to first look through the correspondence column. In the absence of Mr. Swift, or anyone else, producing conclusive evidence that "the [boiler] insurance companies are glad to get hold of any sort of boiler," &c., I beg to give his statement emphatic contradiction. Fortunately, engineers of boiler insurance companies have a reputation of their own to sustain, and even were they so utterly regardless of everything, as Mr. Swift wishes to infer, the insurance companies are not so hard up—at least, after a somewhat lengthened service, I have not so found it—as to be "glad" to insure bad or indifferent boilers; in other words, boilers liable to explode or collapse at any moment; and surely Mr. Swift knows, as does any unbiassed man, that no company, mutual or joint-stock, would, for the sake of a few pounds at most, insure boilers even for a small sum which they knew to be unsafe at any pressure. Were they to do so, they would not only lose pecuniarily, but they would also lose that, so far, unshaken confidence which steam users repose in their inspection in all parts of the kingdom. This alone being so patent to everyone save that small interested minority to be found in every community, "I am surprised," to again quote Mr. Swift, "you cannot see this" too.

Before concluding, I think one might as well ask, Is or is not the insurance system the safest, the cheapest, and, with steam users, the most popular system yet devised for preventing, by careful inspection, where preventible, boiler explosions? If not, which is? J. SMITH.

Manchester, July 11th.

SIR,—I beg leave to thoroughly endorse your remarks in answer to your correspondent "Teak," who has surely made some mistake in his drawing of the setting of the boilers he states to have put down in India.

I think any qualified practical engineer would have hesitated before carrying out such a plan, which plan, I should say, never emanated from any engineering firm of any repute in this country. The elephant boilers—or rather, French boilers, as they were then termed—I instanced in my last letter, were made by Benjamin Hick and Son, Bolton, in 1847 or '48, and were working, I believe, in 1878.

Birmingham, July 17th. JOHN SWIFT.

CONTINUOUS BRAKES.

SIR,—We engine-drivers always quite agree with the remarks constantly made in THE ENGINEER on vacuum brakes. We know by experience that we do not feel safe with them. On the Midland now we poor drivers are in a difficulty. Passengers are complaining that our Sanders-Clayton vacuum shakes them. The company thinks it is our fault; but I wish to explain to you, Sir, that do as we will, this brake will shake the train. For instance, if I wish to apply the brake lightly, I cannot do it, as the valves in the vans open and let in air. On goes the brake full; here is jerk one. Next, finding that I am stopping too soon, I have to take the brake off. Now, when it is off, what position do I find myself in? Just this: I have used my one charge of vacuum; I am running, perhaps, forty miles an hour, and although my gauge may show 20in., I have nothing in the cylinders, and no brake power. Now, to get another charge of vacuum will take me from half to one and a-half minutes; and please note that all this time I am dashing along practically without a brake. If anything instantly takes place, where am I? The Midland Company has tried many brakes, but I am sorry the one we have is of a sort that as soon as put on it begins to leak off, and as the gauge tells us what is in the pipe, but not necessarily in the cylinders, we never know when we have a brake and when we have not. This is the cause of running into buffer-stops and past stations; it is not the fault of us.

You will see from the following extract that we have not only to contend with a bad brake, but may easily be scalded when parts of the ejector give way:—On Friday, June 29th, 12.33 p.m., Keighley to Bradford, nut of spindle working through stuffing-box of small ejector blew off inside, and ejector handle came completely out. Steam blew out of boiler, and driver had a narrow escape from being scalded. This occurred at Shipley, just after the train was starting. The brake did not stop the train, but the driver had to stop it by regulator. Ten minutes' delay was caused to the train.

July 17th. MIDLAND DRIVER.

SIR,—I have read with pleasure your able article of the 13th, concerning the fatal collision at Lockerbie. Without any bias in any direction, is it not time that the best continuous brake in practical use should be, in the interests of the public, adapted to all trains? Although in some cases there is a difficulty caused by railway companies running through traffic, having adopted different systems, still, they might take an example from the North-Eastern Railway Company, which has now fitted most of its engines and coaches with both Westinghouse automatic and Smith vacuum brakes and connections, thereby not causing, as too often happens, an engine efficiently fitted with continuous brake apparatus to become useless when coupled to a train not provided with the necessary couplings and gear. I write as taking the Westinghouse automatic and Smith's vacuum to be the best continuous brakes at present known. S. H.

July 18th.

THE VALE OF CLYDE TRAMWAYS COMPANY.

SIR,—I enclose you rather an interesting statement of the expenses and receipts of the Vale of Clyde Tramway up to the 30th June last for six months. The expenses are the total, including law and leakage; but I have reason to suppose that the expenses of the running have not been more than 5d. per mile, but this only shows how very erroneous low estimates are. The great profit on this line is derived from having good bogie carriages to carry sixty passengers, and of sufficient weight to stand the wear and tear of steam. This Mr. H. Hughes advocated long ago, and if it had been carried out we should not have heard of overturning cars. The Board of Trade ought to see that the ordinary cars are not used for steam. The great profit in the use of steam is not that the expenses are less, but the receipts may be more.

Vale of Clyde Tramway, worked by Kitson's engines, 1¾ miles open:—Receipts six months ending 30th June, 1883, £7297; expenses, including repairs to tramway and cars, £3210; profit, £4087. Mileage, 3200 per week; expenses, £123 per week, or 9½d. per mile. VIATOR.

Glasgow, July 17th.

PHOTOMETRY.

SIR,—The difficulty of obtaining perfectly uniform conditions of measurement in photometry, because of the variations inseparable from the standard candles used, points to the need of a more trustworthy standard. I would ask in THE ENGINEER if a registering radiometer on Prof. Crookes' plan, or a modification of the same, could not be constructed which would indicate on a dial, previously compared with a standard, once for all, the number of revolutions. This number would be proportional to a given intensity of light for a given time. I am not aware if the quality of the light has any effect on the speed, that is, whether 100-candle gas flame and a 100-candle arc light would produce the same effect on the vanes; at all events one gas flame could be compared with another, and one electric light with a second, much more readily than at present. For registering the amount of sunshine, or rather, of daylight, this method would be more accurate than the present burning-glass system. F.

Pontefract, July 18th.

A NEW INCANDESCENT LAMP.—Messrs. Boullon, Probert, and Soward, of London, patented on the 10th of November, 1882, a curious method of making incandescent electric lamps, which they thus describe:—We take a suitable gas or vapour and subject it, as hereinafter described, to the action of the electric spark, which may be produced by any suitable generator of high tension electricity. For this purpose we provide a globular or other suitably shaped vessel or casing of glass, in which we insert metallic conductors or electrodes. We prefer to use platinum for the said electrodes, the ends thereof being arranged at a suitable distance from each other within the globe. These metallic electrodes may be either solid or tubular; if made tubular, we make the interior ends conical and closed at the point, and the conical part is provided with apertures. In some cases carbonaceous gas or vapour, such as marsh gas, or coal gas, is introduced into the glass vessel and is decomposed by the passage of electric sparks through the same. A slight deposit of carbon takes place upon the end of one of the electrodes, which deposit is gradually built up by means of a rapid succession or continuous flow of sparks, and a bridge of carbon is thus formed, so that the space separating the said metallic electrodes, between which the spark passes, is completely arched over. This bridge forms the filament to be used as the light-emitting conductor. After exhausting and sealing the glass vessel in any of the usual manners the lamp is ready for use. But when the metallic electrodes are made tubular, we inject into them a suitable conducting paste after the filament is completed; this paste passes through the tubes and issues from the apertures at their conical ends and surrounds the parts where the ends of the filaments are attached, thereby making a more efficient connection between the electrodes and the filaments. We then close the exterior ends of the metallic tubes with melted glass or other suitable material. Carbon deposited from gas has been heretofore employed to render filaments prepared by other means more homogeneous, and it has heretofore been sought to use the carbon thus obtained by depositing it upon a metal and then deflagrating the metal away, or by depositing it upon a soluble metal and then dissolving away the metal. But we deposit our carbon gradually by means of the electric spark, thereby forming a carbon filament unsurpassable in purity, whose molecular constitution is such—the filaments having been formed under the influence of the electric current—that the prolonged action of electric currents does not result in disintegration.

RAILWAY MATTERS.

M. ACHARD has presented a Bill in the French Chamber for a railway viaduct over the Channel.

THE Walsall Town Council have this week granted the application of the Staffordshire Tramways Company, and of the Walsall and District Tramways Company, to use steam upon their lines, should they consider it desirable.

THE branch of the South Staffordshire Company's tramways, extending from Darlaston through Wednesbury and West Bromwich to Handsworth, near Birmingham, has been opened for traffic this week, and has been well patronised.

THE surveys for the new railway—route New Zealand—at date of late news, were proceeding in the King Country. The natives generally were friendly, but evidently opposed to Europeans visiting the country, and a special dislike was shown to the railway surveyors and land prospectors.

A SELECT Committee of the House of Commons, Admiral Egerton in the chair, on Tuesday threw out the Ennerdale Railway Bill, promoted for the purpose of constructing a line of railway, six and a-quarter miles in length, starting from Eskett, by a junction with the Whitehaven, Cleator, and Egremont Extension Railway, and ending at the head of the Ennerdale Lake, in Cumberland.

IN the course of the inquiry into the cause of the Huddersfield tramcar accident, which was proceeding last week at Huddersfield, one witness said that the curve on which the accident occurred was so laid that the outer rail was lower than the inner rail, and that when the cars stood on the line they leaned the wrong way. He had drawn the borough surveyor's attention to this, but had been told to mind his own business.

M. G. MARIE, engineer on the Paris, Lyons, and Mediterranean Railway Company, found that the consumption of fuel on the Paris and Montereau line has often been brought down to 1½ kilogs., or 3·3 lb. per indicated horse-power per hour, measured by the brake on the wheels. This has been confirmed by careful experiments, undertaken at the instigation of M. Hirsch, engineer-in-chief of the Department des Ponts et Chaussées.

AN accident occurred at Bacup station about half-past four o'clock on the 12th inst. As a well-laden passenger train was entering the station the engine left the metals at a crossing and turned completely over on its side. The stoker escaped by jumping from the tender, but the driver was caught and seriously injured. The first carriage, which was fortunately empty, was telescoped. All the passengers received a severe shock, and some of them are under medical treatment.

IN his report on the collision of the passenger train from York to Hull, on the 19th May, with the buffer stops at the end of one of the platform lines at the Paragon station, Hull, when sixteen passengers were injured, Major-General C. S. Hutchinson says :—"The collision would not have happened had the engine been in its proper place in front of the train, as the driver would then have had a full view of where he was going, and would have regulated his speed accordingly. As this is the third instance within a comparatively short time in which collisions have resulted on the North-Eastern Railway from the practice of pushing trains into terminal stations, it would certainly seem expedient that the practice should be abandoned."

THE April accidents on the railways of the United States are classed, as to their nature and causes, as follows, by the *Railroad Gazette*: —Collisions: Rear collisions, 23; butting collisions, 9; crossing collisions, 3; total, 35. Derailments: Broken rail, 4; broken bridge, 3; spreading of rails, 7; broken wheel, 1; loose wheel, 1; broken axle, 3; broken truck, 4; accidental obstruction, 3; cattle, 5; wash-out, 3; land-slide, 2; wind, 4; misplaced switch, 7; open draw, 1; malicious obstruction, 4; unexplained, 16; total, 68. In boiler explosion, 1; broken wheel not causing derailment, 1; car burned while running, 1; total, 106. Five of the collisions, or one-seventh of the whole number, were caused by trains breaking in two, one each by a misplaced switch, by mistake in orders, by failure to send out signals, and by a car carelessly left on the track. In three other cases it is almost certain that collisions were caused by the want of proper signals or the failure to use them properly.

IN a report to the Master Mechanics' Association, by Mr. F. W. Dean, on "Improvements in Locomotives," the writer says :—This Association has for a long time considered the matter of the best form and material for coupling-rods with somewhat satisfactory results. A rod made of solid drawn weldless steel tube would possess excellent qualities for this purpose. It would be strong, light, elastic, and reasonably cheap. If one of these tubes 3·5in. in outside diameter and 0·5in. thick be passed between rolls and flattened to a thickness of 2in. and then welded to solid eye ends it would make a good rod, provided the welding could be well done. This rod would have a depth of about 4·375in., and if 8ft. 6in. long would have a factor of safety of 3·75 when making 300 revolutions per minute, against 4·5 for the heaviest I-form used. This is rather small, but probably larger than that of many rods in use. The writer regrets to say that he is unable to find out the elastic limit, ultimate strength, elongation and contraction of area of this material, but he hopes to lay them before the Association atrsome other time."

IN a report to the American Master Mechanics' Association Mr. F. W. Dean says :—"The Joy valve gear seems to have well fulfilled its purpose, and the opinion among men best able to judge is that it is destined to supersede the Stephenson link. The supposed hurtful effect of the rise and fall of the axle has no foundation in fact, and the performance of engines to which the gear is applied appears to be unusually good. Like all new things its proper design is yet a problem, at least for American locomotives. The following official figures, giving the actual weights of a link motion and a Joy motion, as they were built for the same locomotive on one of our leading lines, are remarkable: Total weight of link motion, 1651½ lb.; total weight of Joy motion, 828½ lb.; or almost exactly 2 to 1. Besides the cheapness of the gear, its accessibility, accuracy, the possibility of excluding dust from the wearing surfaces, the opportunity for increasing the grate area on account of the absence of excentrics, its capability of allowing the steam to follow the piston nearly to the end of the stroke, its rapid opening and closing of the valve, the small area of frictional surfaces and the ease of handling, are excellent features."

FROM the reports for 1882 of the Austrian railways guaranteed by the State, it appears that the amount of the contribution required from the Government to make up the guaranteed interest for 1881 was £1,188,916, while the amount which will be required for last year is £1,154,499, so that there is a diminution of £34,417. It is noteworthy that three railways, the Hungarian Galician Railway, the Hungarian Western Railway, and the Vorarlberg Railway, the receipts of which for a number of years did not cover the working expenses, these deficits having to be made good by the State in addition to the guaranteed interest, show surpluses from the working for last year, which of course will diminish the demand for interest. Two Austrian railways only have been enabled to repay to the State part of the accumulated debt for guaranteed interest advanced—the Kaschan and Oderberg Railway, which has refunded £15,342 to the Treasury, and the Brünn and Rossitz Railway, which is in a position to repay £1015 from its last year's profits. The total debt of all the railways for guaranteed interest advanced by the Government amounts, including the figures for 1882, to £20,000,000. The heaviest debtors are the Crown Prince Rudolf Railway, which owes the State £6,750,000; the Francis-Joseph Railway, £2,166,000; the Lemberg-Czernowitz-Jassy Railway, £2,166,000; the Southern North-German Connecting Railway, £1 666,000; and the Austrian North-West Railway, £1,540,000.

NOTES AND MEMORANDA.

ACCORDING to M. Dieulafait in the "Comptes Rendus," the mean daily evaporation of sea water in the south of France is at least 6 mm.

A PAPER on the determination of the dimensions of machine tool fly-wheels was read before the Académie des Sciéncés on the 18th ultimo.

AT a recent meeting of the Paris Academy of Sciences, M. Deprez read a paper on demagnetising time pieces which have been affected in a powerful magnetic field.

IT appears that in 1882 the exports of metallic tin from Perak, in the Malay Peninsula, amounted to no less than 7000 tons, which equals the production of Cornwall; and about 40,000 Chinese are now engaged in mining works there.

ACCORDING to a recent German patent, No. 22,091, for process for preparing a pressed enamel on glass, a mixture of dry enamel, thick pine oil, and dammar lac is laid on the glass in a semi-dried state. After drying the drawing is pressed in. The enamel is then burnt. Thus it is possible to reproduce the forms of figures in slight relief, also the feathers of birds, hairs of animals, and veins of leaves.

FOR preparing unglazed pottery in order to write thereon with ink, under a German patent No. 22,313, the patentee makes use of whey, which is obtained by adding a small quantity of acid to skimmed milk and separating the precipitate by filtration. The plates prepared from white pipe-clay are impregnated with the filtrate and dried, after which it is possible to write on them as on imperfectly sized paper.

BRICKS impregnated at a high temperature with asphalt are being successfully used in Berlin for street pavement. By driving out the air and water the bricks will take up 15 or 20 per cent. of bitumen, and the porous, brittle material becomes durable and elastic under pressure. The bricks are then put endways on a beton bed and with hot tar. The *Scientific American* says pavement has been laid down in a part of a thoroughfare where neither granite nor compressed asphalt had hitherto withstood the wear.

THE City of Rome, having had additional boilers put in and other improvements made, is now probably one of the fastest of Atlantic steamers, as on her trial recently she reached a maximum speed of 18·7 knots, or 21½ miles an hour. The engines developed 12,000-horse power, as against 8000, which was all that could be obtained from them previously. The City of Rome is over 8400 tons measurement. The new Cunard liner Aurania, which enjoys the reputation of being the broadest vessel afloat in connection with the Atlantic trade, also attained a maximum speed of 18·7 knots. The Aurania is 470ft. long, 57ft. broad, and 38½ft. depth of hold. She measures 7500 tons, and has engines capable of indicating 10,000-horse power.

A METHOD for the manufacture of a blasting material containing an alkaline sulphate, saltpetre, glycerine, an alkaline chlorate, and carbonaceous substances, has been thus described: Two mixtures are prepared, the first one consisting of 36·06 parts of potassium or sodium bisulphate, 28·60 parts of potassium nitrate, and 9·20 parts of glycerine; the second one of 50 to 55 parts of a chlorate, and 45 to 50 parts of a body rich in carbon. The latter mixture on igniting produces heat enough to convert the glycerine of the first mixture into nitroglycerine, which at once explodes. The carbonaceous material is saturated with concentrated solutions of the bisulphate, nitrate, and chlorate, and dried. The mass is then mixed with glycerine and made up into cartridges.

THE rate of mortality for the week ending July 14th, in twenty-eight great towns of England and Wales, averaged 22·2 per 1000 of their aggregate population, which is estimated at 8,620,975 persons in the middle of this year. The six healthiest places were Cardiff, Halifax, Birkenhead, Plymouth, Norwich, and Bradford. In London 2534 births and 1736 deaths were registered. Allowing for increase of population, the births were sixty-two below, whereas the deaths exceeded by 155 the average numbers in the corresponding weeks of the last ten years. The annual rate of mortality from all causes, which had steadily increased from 16·9 to 20·1 per 1000 in the four preceding weeks, rose to 22·9 last week. During the thirteen weeks of last quarter the death-rate averaged 20·5 per 1000, against 20·2 and 19·5 in the corresponding periods of 1881 and 1882.

HERR VIERORDT has studied the estimation of the intensity of sound by the process of dropping a body upon a sonorous plate. The intensity of the sound produced is proportional to h^e, where e is a co-efficient to be determined experimentally. A formula, given by Oberbeck, is—

$$e = \frac{\log \frac{P}{p}}{\log \frac{H}{h}}$$

if h is the height fallen through by the heavier weight P, and H the greater height fallen through by a lighter weight p, when the intensity of the sound produced by striking the plate is the same. A large number of measurements are recorded, from which the author concludes that there is a general measure of the strength of sound. With spheres of the same material, and plates of definite material and weight, the value of e, *Science* says, varies but slightly with increasing weight of the sphere, or with variation in the height of fall.

OXYGENATED water, a common name for peroxide of hydrogen, has attracted within the last few years a good deal of attention, and it has been successfully employed in bleaching and for other applications. It is now stated that Mr. P. Ebell, of Pfungstadt, near Darmstadt, has succeeded in preparing economically a product pure, stable, and of constant strength, and capable of being easily transported to long distances, and to be kept for years without losing its bleaching properties. Among other applications of this product, that of the decoloration of animal fibres is the most important, as it does not contain some of the disadvantages of other bleaching agents. For wool and silk, it is advisable before bleaching to cleanse the materials thoroughly, so as to eliminate all the greasy substances and impurities. For this purpose, Mr. Ebell recommends a bath in a solution of five parts carbonate of ammonia to 100 of water, this bath being followed by a soaping and thorough washing with water. The bleaching itself is performed either by immersing the materials in the solution of oxygenated water, and left there at a temperature of from 20 deg. to 30 deg. C., until the decoloration is complete, or the materials are impregnated, when they were rung out and exposed in a room heated to about 20 deg. C., where they are left to dry.

THE "Annuaire de la Ville de Paris" for 1881, recently issued, shows how few are the residents in Paris who are Parisian born and bred. Indeed, out of every 1000 inhabitants only 322 are born in the metropolis, while 38 come from the other communes of the department, 565 from the various departments or colonies, and 75 from foreign countries. Other continental capitals do not contain so many foreigners as Paris, Berlin only possessing 13 out of 1000 and Pesth but 14. At the time of the census of 1881, there were in Paris 45,281 Belgians, 31,190 Germans, 21,577 Italians, 20,810 Swiss, 10,789 English, 9250 Dutch, 5927 Americans, 5786 Russians, 4982 Austrians, and 3616 Spaniards. The German element has very largely increased since 1876, at which period they only numbered 19,024. It is most abundant in the outer arrondissements of the city, and particularly in the 19th. The Dutch and the Belgians—the latter numbering but 34,192 in 1876—are found indiscriminately throughout Paris; the Swiss are powerful in the commercial localities; the Italians, who have almost doubled since 1876, in the 11th and neighbouring arrondissements; while the English chiefly inhabit the 8th, 16th, and 17th. Foreigners, as a whole, increased from 119,349 in 1876 to 164,038 in 1881, and formed nearly a fifth part of the total increase of the city.

MISCELLANEA.

IT has been notified from the Foreign-office that the Cagliari Exhibition will open about the 15th November, and that the last day for sending in applications for admission to the competition is the 1st of November next.

MESSRS. ATKINSON AND PHILIPSON, of the Northumberland Carriage Works, Newcastle, have published a number of illustrated specifications of vans, carts, trucks, and hand carts, designed by them for the parcels postage service, and which have been approved by the Postmaster-General.

THE Cunard Company have contracted with Messrs. John Elder and Co. for the construction of two steamships, of 8000 tons and 13,000-horse power each, with a guaranteed speed of nineteen knots per hour. These vessels are for the North Atlantic service between Liverpool and New York. Their dimensions will be—length, 500ft., beam, 57ft.; depth, 40ft.

THE 80-ton guns mounted in the new turret on Dover pier were fired on Monday last, from about one to three p.m., five rounds in all, three with battering charges, at two degrees elevation, level, and two degrees depression. Beyond scraping the surface of the cement, and breaking the glass of the lighthouse, no bad effect was produced by the firing. The concussion inside the turret was very slightly felt by those manning the guns.

A REPORT to the Board of Trade has been made by Mr. E. Samson, under the Boiler Explosions Act, 1882, on the explosion of a Cornish boiler at Stirling Foundry, Stirling. The flues collapsed completely, the water gauge being stopped, and the thing called a safety valve was provided with a long stem, which passed through a packed gland in the safety-valve casing. The pressure was thus anything the gland packing happened to make it.

IN Birmingham and the district satisfaction is expressed that on Tuesday, in the House of Commons, the report of the Special Committee, to which was referred the Bills to confirm the Provisional Orders of the Board of Trade, under the General Electric Lighting Act of 1882, relating to Aston, Dudley, Saltley, West Bromwich, Wolverhampton, Balsall Heath, Birmingham, Redditch, and Walsall, was considered and agreed on, and the Bills ordered for third reading.

A RECENT return issued by the Canadian Public Works Department states that, up to the present time, 90,729,662 dols. have been expended on Government railways, and in subsidising public railway companies; 23,447,564 dols. on canals; 5,106,802 dols. on public buildings; 6,750,663 dols. on ports, harbours, and rivers; 8,875,035 dols. on harbours and breakwaters; and 2,677,738 dols. on lighthouses; besides sums on other works that have also had an important influence on the development of the country.

THE foundation stone of the new waterworks for the Staffordshire Potteries Waterworks Company at Stockton Brook was laid last week. The works are intended to supplement the supply to the Potteries, and will be carried out according to plans prepared by Mr. G. D. Harrison, the company's engineer. The water will be obtained from a 12ft. shaft, 50 yards deep. Two engines of 250-horse power will be supplied by Messrs. Hathorn, Davey, and Co., Leeds, and fitted with Davey's patent differential gear. Each engine will work pumps capable of delivering 1,000,000 gallons per day into a tank 500ft. high and seven miles distant.

AT a meeting of science and art teachers, held on Saturday, June 2nd, at the Manchester Technical School and Mechanics' Institution, an Association of Science and Art Teachers was formally inaugurated by the appointment of an executive board, the adoption of rules, enrolling of members, and other business. The Association is established to effect the general advancement of the profession of science and art teaching, by securing improvements in the schemes of study and advances in the standard of teaching. The next general meeting will be held on Saturday, September 1st, at 7.30 p.m. The hon. sec. is Mr. W. E. Crowther, and the address, Technical School and Mechanics' Institution, Manchester.

M. H. GEOFFROY proposes to coat electrical conductors by rolling round them asbestos fibres underneath the usual lead pipe cover. It is actually stated that, from experiments made in Paris by M. H. Lippmann, engineer to the Faure Electric Accumulator Company, a wire thus insulated may be completely volatilised without a spark being transmitted through the covering. Although the experiment was made with a strong current over a short length, the lead showed no sign of fusion. The volatilisation is effected in the tenth part of a second, and the lead cannot be melted because the current becomes interrupted. It has also been proved, by another experiment, that no portion of the current is shunted along the asbestos. The sizes of the wire and coating and lead covering are not mentioned.

THE applications for space in the Vienna Exhibition have risen to 570 within the last few days, the space in the Rotunda begins to be crowded, and the north-eastern court has been adapted for placing exhibits. Among the most recent applicants are the Belgian Ministry of Public Works at Brussels, the Danish Navy and War Ministries at Copenhagen, the English Post and Telegraph Administration in London, the French Ministry of War, the Ministry of the Navy and the Colonies, the Ministry of Commerce, the Ministry on Public Education, the Ministry on Post Affairs and Telegraphy, and the Police Prefecture at Paris, the Italian Telegraph Administration at Rome, the Imperial Ottoman Telegraph Administration at Constantinople, and the Russian Telegraph Administration at St. Petersburg.

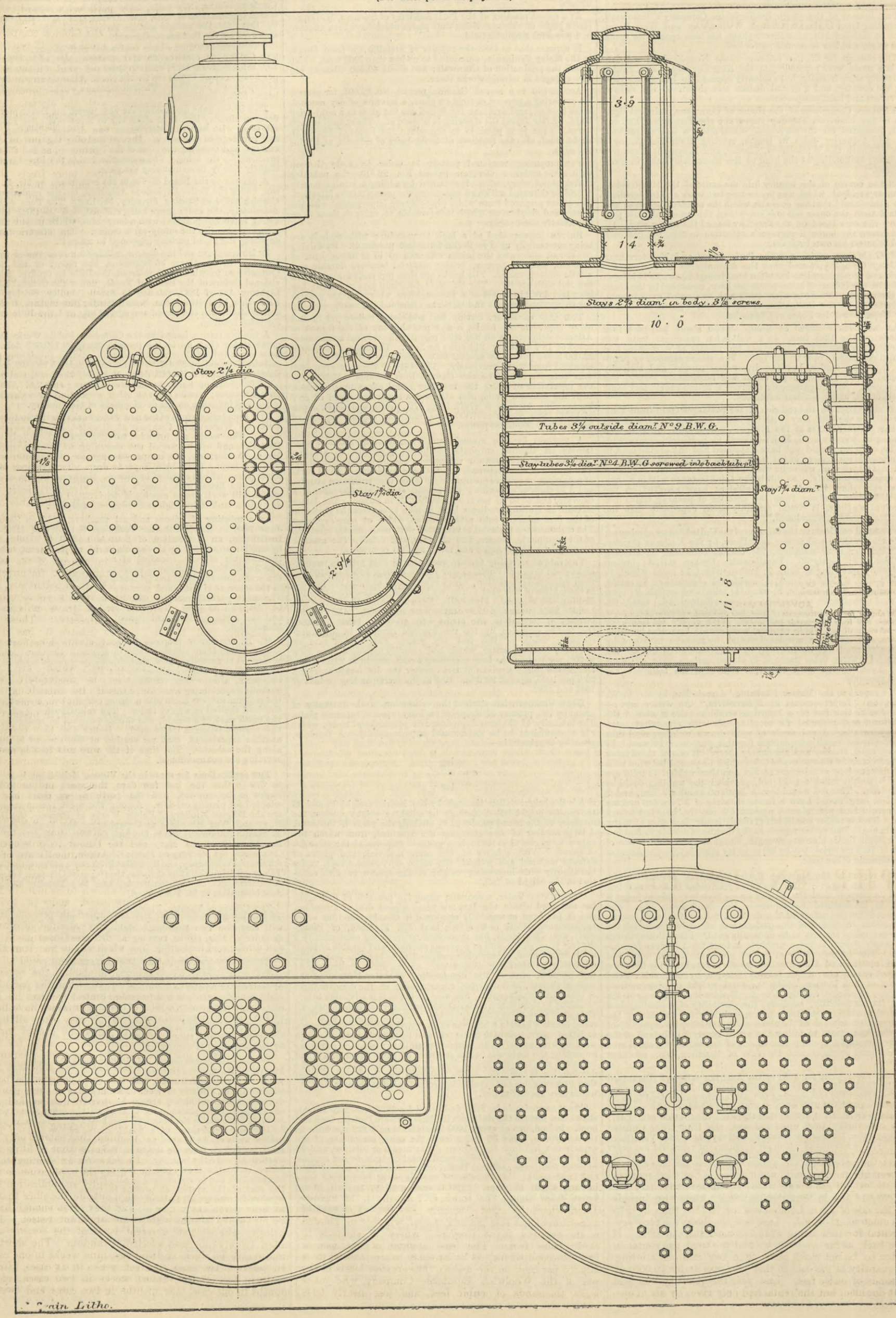
THE Criterion Theatre, Piccadilly, is to be lighted throughout with about 600 Edison incandescent lamps. The generating plant will comprise two horizontal high-speed engines, having 13in. cylinder by 13in. stroke, running at 275 revolutions per minute, and driving countershafting, from which will be run four Edison dynamos, each capable of sustaining 150 16-candle lamps. Each engine will be capable of indicating 84-H.P. at 70 lb. pressure, and either engine will thus be able to take the whole load in the event of accident or repairs to the other. The wiring will be arranged on eight circuits, each under independent control by means of a specially-designed regulator, capable of lowering or raising the brilliancy of the lamps from normal candle power to *nil*. The contract for the work, which will be carrried out by the Edison Electric Light Company, Limited, stipulates for the completion of the installation by the beginning of September.

A PROSPEROUS townsman of Parkersburg, in Pennsylvania—Mr. G. L. Huston—is erecting for himself a new dwelling-house which is to be constructed, with the exception, of course, of the window-panes, entirely of iron. The floors of the entrance hall, drawing-room, and library are to be covered with polished plates of cast iron. The plates in these, as in all the other floors, will be securely fastened to the beams of iron beneath. The walls will be hollow, and constructed of a double course of iron plates. These hollow walls are to be used as chimneys and as heating apparatus, receiving hot air from the stoves in the cold weather and diffusing warmth all over the building. By this method of heating the projector estimates that even in the coldest season a comfortable temperature can be maintained in all parts of the house at one-half the cost of the system at present in operation. The doors and window-frames are all to be of iron, and so fixed or hung as to be as easily movable as if they were of wood. The interior walls of the sitting and other principal rooms are to be of steel, polished and beautifully ornamented. In the dining-room the decorations will consist of hunting scenes engraved on the walls. Mr. Huston estimates that the cost of his iron house will be from two to three times as much as if it had been erected of the usual materials. But against this initial extra outlay he sets off the permanent saving in fuel, the fact that no repairs will be required, and that there will be no need to insure the building. The foundation walls of the iron edifice consist of large solid blocks of rock quarried in the neighbourhood.

BOILERS FOR S.S. CLAREMONT.

MR. A. TAYLOR, NEWCASTLE, ENGINEER.

(*For description see page* 56.)



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

MEETING NEXT WEEK.

INSTITUTION OF MECHANICAL ENGINEERS.—At Liège, on Monday, July 23rd, the following papers have been offered for reading and discussion:—"History of the Iron and Coal Trades in Belgium," by M. Edouard de Laveleye, of Liège. "On the Manufacture of Zinc in Belgium," by M. St. Paul de Sinçay, of the Vieille Montagne Zinc Company. "On the Manufacture of Sugar from Beetroot," by M. Mélin, of Wanze. "On the Application of Electricity to the Working of Coal Mines," by Mr. Alan C. Bigot, of London. "On Compound Locomotive Engines," by Mr. Francis W. Webb, of Crewe, Vice-President. "On the St. Gothard Railway," by Herr E. Wendelstein, of Lucerne. "Description of the New Harbour Works at Antwerp," by M. G. A. Royers, of Antwerp.

THE ENGINEER.

JULY 20, 1883.

THE GAS SUPPLY.

WHATEVER may be the future effect of the electric light on the fortunes of the gas companies, the sale of gas in London continues to increase, judging by the statistics which carry us to the close of last year. On this point we gain ready information from the yearly "Analysis" of the accounts of the metropolitan and suburban gas companies, prepared by Mr. John Field. The particulars for 1882 have just been published, and afford a large amount of very useful information. Comparing the present "Analysis" with previous issues, we find that the consumption of gas in London has been increasing lately with growing rapidity. Thus, the sale in 1882 exceeded that in 1881 by 809,091 thousands of cubic feet. In 1881 the excess over the year preceding was 748,070 thousands, while 1880 exceeded 1879 by 456,603 thousands. The constant rise is thus obvious, and is not to be accounted for by the mere increase in population. But while there is a growing increment in the statistics of consumption, it is not quite so with the revenue. The gas rental of the last three years has been about three millions sterling. But the receipts from the sale of gas were £50,541 less in 1880 than in 1879, and £57,616 less in 1881 than in 1880. Thus the income from the sale of gas in London was less in 1881 than in 1879 by as much as £108,067. Last year we observe a recovery, the rental for 1882 being £116,713 more than in 1881. If we go back as far as 1869, we find the total gas rental in London to be not much more than two millions sterling. The quantity of gas sold in that year was under 10,000,000 thousands of cubic feet. Last year the quantity was just about doubled, but the rental had only risen by about one-half—that is to say, in round numbers, from two millions sterling to three millions. Consequently we may reckon that gas in London was three-fourths the price in 1882 that it was in 1869. Mr. Field shows that the average price of gas in London in 1869 was nearly 4s. 2d. per thousand feet, whereas in 1882 it was less than 3s. 2d. Another item of interest is that in 1869 each ton of coal corresponded to the sale of 8438ft. of gas, while in 1882 the product was 9417ft. Rather more than 5 per cent. of the gas made last year was lost. In 1874 the waste was nearly 9 per cent.

The capital employed by the London gas companies has risen from £7,828,844 in 1869, to £13,393,104 in 1882. The capital required at the earlier date to carry on the entire business was £6 13s. 8d. per ton of coals. It has now shrunk to £6 10s. 5d. The difference is not great, but it is in the direction of economy, and is equivalent to 13s. 8d. per thousand feet sold instead of 15s. 10d. The consumption of coal is a striking indication of the magnitude of the gas interest in London. Last year it was more than two million tons, or not much less than forty thousand tons per week, and considerably more than five thousand tons per day. It may be well to remember here how largely the London gas companies contribute towards defraying the cost of metropolitan improvements. The coal tax is a most important revenue to the Metropolitan Board, and is also of value to the Corporation of the City; the former taking 9d. per ton, and the latter 4d. Accordingly the gas companies provided last year a revenue of £77,000 for the Metropolitan Board, and £34,000 for the Corporation. The entire income of the Metropolitan Board from the coal tax last year was under £295,000; so that the gas companies furnished more than one-fourth that total. Supposing the electric light to become general, it is a curious question as to the reduction that would take place in the consumption of coal. As steam or gas would be employed to work the dynamo-electric machines, coal would still be consumed, but evidently in a reduced quantity. If the coal tax is allowed to expire in 1889—as will possibly be the case—there will be an end of this argument. But the extent to which the gas companies have acted as tax collectors for the local authorities should not be forgotten. This part of the question also includes the suburban gas companies, as the coal tax operates over the entire Police District. The coals carbonised last year by these companies—fourteen in number—amounted to 289,000 tons, thus furnishing a contribution of more than £15,000 in aid of metropolitan improvements. In London itself the coal tax represents more than a penny per thousand feet of gas.

In estimating the progressive consumption of gas, it should be observed that there are two well-marked periods in the last six years. From 1876 to 1879 there was a rapid rise, the last-named year exceeding its predecessor by 1,341,132 thousands of cubic feet. But 1880 showed a slackening of the pace, the increase over 1879 being only 456,603 thousands. Afterwards the progress is more rapid. Another statistical fact is that the total increase in the consumption of gas in the four years, 1879-82, is less than in the four years preceding. The extraordinary leap upwards in 1879 has something to do with this. That the manufacture of gas will ever cease is a conclusion scarcely to be expected, except it be at some very remote date. Should illuminating gas become obsolete, there would very probably arise a demand for heating gas. The sudden extinction of so vast an industry as that which is connected with the manufacture of gas, would be a national misfortune. The total paid up and borrowed capital of the gas companies of England and Wales at the close of 1881—the latest date available—was £30,586,622, while the capital employed by local authorities in possession of gas undertakings was £14,039,583, thus making a total of nearly £45,000,000, while the authorised amount exceeded £60,000,000. The gas sold by the local authorities in 1881 was less by 2,226,000 thousands of cubic feet than the quantity sold by the London gas companies, while the capital employed by the companies was nearly a million less than that employed by the authorities—a fact which says something for the exercise of "due care and management" on the part of the companies. The coal carbonised by all the companies and the authorities in 1881 amounted to 6,365,336 tons, the London companies taking not very far short of a third of this enormous aggregate. The gas actually sold by the companies and the authorities in England and Wales during 1881 was nearly 58,000,000 thousands of cubic feet. The average sale of gas per ton of coal was 9092 cubic feet, while the London average was 9497, and the surburban 9342.

We have on a recent occasion called attention to the progress of amalgamation among the metropolitan gas companies, the latest instance being the absorption of the London Company into the Chartered; thereby reducing the number of gas companies in the metropolis to three—the Chartered, the South Metropolitan, and the Commercial. The suburban gas companies are less capable of amalgamation, being scattered round the "outer ring." The largest of these is the Brentford Company, with a capital of £595,000, and a gas rental of £125,777. It affords a striking comparison between the magnitude of things in London and the provinces, to observe that the Brighton and Hove Gas Company had a paid-up share and loan capital of £284,180 in 1881, in which year the capital employed by the Brentford Company was £548,607. The Brighton Company carbonised 35,511 tons of coal, and the Brentford Company 67,727 tons. At the close of 1882 the Crystal Palace Gas Company had a capital of £313,000, the next in magnitude being the West Ham Company with £185,000. There are two companies at Woolwich, the aggregate of their capital accounts being £91,000. Apart from these, the smallest company is at Colney Hatch, where the capital is only £34,560. The highest proportion of gas sold per ton of coal, whether in London or the suburbs, is at Croydon, where it amounts to 10,068 cubic feet. The least amount of lost gas, or "gas unaccounted for," is at Bromley, where this waste is only 2·5 per cent. on the make. The greatest loss is in the case of the Woolwich Equitable Company, who make 69,000 thousands of cubic feet, and lose nearly 6949 thousands, or more than 10 per cent. The loss of 5·27 per cent. among the metropolitan companies shows an improvement on previous years. In the matter of working expenses the London companies exhibit a decline of nearly twopence per 1000ft. since 1878. Residual products, which brought in a revenue of £935,000 last year, are less satisfactory than in 1881, when they realised £986,000. What kind of figures future years may show with regard to the gas supply it may be difficult to conjecture. But, thus far, all has gone on well. Last year the London companies realised a net profit of £1,170,590, equal to 10·42 per cent. on the stock and share capital raised. In 1881 the net profit was £1,105,601, equal to 9·96 per cent. on the stock and share capital. These figures accrue after paying interest on borrowed monies. It is too early yet to speculate on any marked results from competition with the electric light, and certainly none can be observed in the published returns. If, as an absolute fact, the electric light has intercepted some of the accustomed gains of the London gas companies, on the other hand it has stimulated the public desire for a good light, and it is quite possible that gas is burned more freely than heretofore. Street lamps palpably call for burners of greater power than those of the departing era, and the gas companies have given proof of how great an improvement may be effected if the ratepayers will only bear the cost. The latter seem ready enough to pay for the electric light, but are not so willing to bear the expense consequent on an advanced style of gas illumination. As for the opinion which the gas companies have of the situation, some proof of their confidence is afforded by the operations of the Chartered Company, who are expending enormous sums of money in laying down new and gigantic gas mains, so as to provide the metropolis with an abundant supply of gas under all contingencies.

AMERICAN PATENT LAW.

AT this moment, while the Patents for Inventions Bill is still pending before Parliament, it may not be unprofitable to refer a little more in detail to the practical results obtained by, and the working of the system of examination for novelty in North America, both in the United States and in Canada. Probably the system of examination for novelty has attained its greatest perfection in the United States. There it requires the exclusive services of a numerous staff, consisting of twenty-nine examiners, —three examiners-in-chief and twenty-six principal examiners—with a large force of assistant examiners and clerks, which is continually being enlarged to meet the increasing number of applications, as well as the laboriousness of the task, which is being augmented each week with the number of patents granted. The average weekly issue of the seven weeks ending on the 12th of June was 424 patents. This does not include trademarks, labels, designs, and re-issues, which are in charge of the same staff. As we have stated before, examination for novelty, in theory, is perfection itself as a feature of patent law, but in practice—that is in the practical results yet obtained and likely to be ever obtainable—it has grave evils in its train, manifested directly and indirectly. There is no denying that in the United States it has done some good, but it is yet questionable whether the game is worth the candle. As a matter of fact, patents are often granted for inventions which are not new, and this every man who is moderately well informed can ascertain for himself by consulting the official gazette. Then there is as much, and most probably more, patent litigation in the United States, in proportion to the number of patents granted, than there is in Great Britain. Again, not seldom the prosecution of an application before the Patent-office itself amounts to a law-suit, both as to expense, delays, red tapeism, and accompanying annoyances. References are continually being cited which are not in the least pertinent to the case; and modifications insisted on which in one way or another tend to weaken the patent. Patent agents, who generally work for a stipulated fee in each case, are careful in drawing the claims, covering little enough rather than too much, for the sake of saving excessive labour in prosecution, and passing their cases quickly. Amendments are often made by them for the mere sake of peace, and to avoid the appearance of wanting all their own way, and thus points are frequently waived which are known to be more or less important. Yet patent agents must make a living, and knowing the average time consumed in prosecuting a case, they charge accordingly, and the patentee, of course, has to pay the piper at two ends, viz, the Government for examining his application and his attorney for promoting it; for without examination the Government could afford to charge a lower fee without diminishing the revenue derivable from patents; and after all, when the patent is granted and issued, is the patentee quite sure that he has got a good patent? Not at all. His claims may have been unjustly mutilated or curtailed, or he may after all have something granted, the claim to which he cannot maintain before a court of law if called into question, for the Government does not—nor can it be expected—guarantee the validity of its grant. With not a few solicitors the examination system has given rise to the "no patent no pay" condition, and the only object of a majority of these gentlemen is to get a patent, no matter what it is, so long as it is a patent, and it often is only a nominal one. Then look at the delay it entails. Cases are often dragging on for years and years, and we must bear in mind that patents only become protective when issued, not from the time of filing the application, as with us. A case takes on an average eight months to pass, from the time of filing the application to the issue of the patent, and not unfrequently an application lies for months before there is any sign outside the office that it has been taken any notice of, and they often enough hang fire for twelve months without any apparent reason. For curiosity sake we took a recent issue of the *Gazette* and noted twenty-one cases selected at random. The shortest time was seven weeks in two cases, nine weeks in one case, ten weeks in two cases, fourteen weeks in six cases, fifteen weeks in two cases, seventeen weeks in two cases; eight months in one case, nine months in two cases, and twelve

months in two cases, fifteen months in another, twenty-four months in one case, and forty-seven months in another, averaging a little over eight months in each case, while four months is perhaps of most common occurrence. In justice to the office it must be said that there is not the slightest reason theoretically for any unjust concession that may be made in an application in deference to the whims of an examiner; for if the cause is good and the examiner is not amenable to sound argument, the case may be brought by appeal before the Examiners-in-Chief, and failing these, to the Commissioner of Patents in person, and from him again, in certain cases, to the Secretary of the Interior, of whose department the Patent-office forms a part; and before when all these resources are exhausted, a just and common-sense decision is generally arrived at. But all this means expense—great expense—which every patentee is not able to afford.

In Canada the office practice is to some extent modelled after that of the United States. The Canadian Patent-office forms part of the Department of Agriculture, and the Minister of Agriculture is the Commissioner of Patents, which, unlike the corresponding position in the United States, is almost a mere nominal one, the chief clerk of patents being the actual head of the office. Examination is not directly provided for by the patent law; but the Commissioner of Patents has power to refuse patents for want of novelty, and this power is exercised. At present, or rather lately, an average of about 180 to 190 patents are issued a month, including what used to be called extensions, or what is in reality merely a payment of stamp duty before the expiration of the first and second five years, and now under the new Amendment Act not recognised as new grants under a new number. The work of examination is performed by two examiners, and naturally the result is often unsatisfactory, and as a matter of course not very uniform, necessitating very persistent prosecution and careful manipulation by the agent. Under the genial management of the present chief clerk the office is making, however, good progress, and possibly the next session of Parliament will bring further important reforms both in the law and practice. Reform, respecting examination, is urgently needed; either it may be confined to mere examinations for legal form and patentability, or it will be necessary to provide for a much larger staff. Canada does not print the specifications, the latter have to be furnished in duplicate, and one copy is attached to the patent, much the same as in France. The office issues a monthly publication giving the claims of all patents issued, and one sheet of drawings very much reduced by photo-lithography.

It may be noted as a feature peculiar to the United States and Canada that a very large proportion of what may be termed small inventions are patented, which, here in England, very often are not considered worth securing, or which will not stand the heavy stamp duties of an English patent. But these small patents, comparatively inexpensive to obtain, are generally very profitable on the other side of the Atlantic, and, as a matter of general experience, inventions possessing any practical merit at all are easily and profitably sold.

MADRAS AND COLOMBO HARBOUR WORKS.

Events in connection with the recently damaged breakwaters at Madras are proving the truth of the old saying, that there are two sides to every question. It is one thing, it is evident, for the Commission appointed on the advice of Sir John Hawkshaw to recommend the reconstruction of these works on an amended design, at an estimated cost of £480,000 above the estimate originally submitted for them; but it is another to find the means wherewithal to carry out that recommendation; and just at present it seems very likely that the now almost perfectly useless breakwaters, or what remains of them, will have to be left in their present state, exposed to the nearly certain fate of gradual entire demolition. For if the sum to be expended on renovation and completion is such, that to cover the interest and sinking fund on capital already and to be expended such impositions upon the shipping using the harbour will be required that they will be prohibitive against vessels resorting to it for commercial purposes, it is quite certain, we deem, that the Imperial Government will not come forward to aid, on the ground of any useful purpose, works that might subserve for the harbourage of men-of-war. Madras is never likely to be made the head-quarters of any of England's naval operations. Trincomalee, on the eastern coast of Ceylon, has long fulfilled this function, and possessing, as that port already does, considerable conveniences for a naval store and depôt, the natural advantages secured by its almost unrivalled harbour are never likely to be abandoned for the southern Indian port. Hence the cry is loudly raised in Madras that, necessary as the works recommended by Sir John Hawkshaw's Commission may be, it would be an act of wasteful expenditure to carry them out at local cost; and if the force of that cry be admitted, the ruined breakwaters must either be left to their fate, or be completed within the original estimate in so unsubstantial and inefficient a manner as to render it almost certain that not many years can pass before a second catastrophe, similar to that which so recently overtook them, will again be experienced.

That the public voice of Madras in this matter represents the main body of commercial opinion in that presidency is evident from a recent report of the Madras Chamber of Commerce. This body has addressed a remonstrance to the head of the Public Works Department, in whose charge the stayed operations on the harbour are for the present vested, against any further "taxing local trade to such an extent as might seriously detract from the usefulness of the port, and drive the trade itself to less burdened ports along the Coromandel or Malabar coast." Already it appears that Madras is most disadvantageously handicapped in this direction, and according to the report already quoted from, when the dues are considered relatively with those of Bombay, "Manchester and Glasgow manufactures can be imported into Madras almost as cheaply, *viâ* the railway from Bombay, as by sea direct." It certainly seems to us that it will be most impolitic to try and secure a harbour for Madras by means which are pretty likely in the end to leave no vessels willing to resort to it. It does not appear, however, that this remonstrance, which had received no official reply, embodied any alternative recommendation; but it strikes us that it would not be outside expectation that so grand a work as the Madras harbour should be removed from the position of a mere local question, and ought to be considered on a wider basis; one, indeed, which would entitle it to aid from the Central Government. The coasts of India furnish but few examples of ports where vessels of even moderate tonnage may seek safety under stress of weather; and the multiplication of these is a necessity felt by the British mercantile marine throughout India. Why, therefore, should the Indian Central Government refuse to regard the matter from the same standpoint as does our home Government in the case of similar provisions on our own coasts? The formation of a harbour of refuge at Filey, to cite an instance, was never held to be contingent upon the amount of revenue that could be obtained from the shipping using it; and we fail to see why our Indian Governor-General should be less locally cosmopolitan in his views than are our own authorities. It seems tolerably certain that unless the "will it pay" test is abandoned in the case of the Madras harbour, the inhabitants of that city now living, are scarcely likely ever to see the realisation of their former expectations; while their sons and grandsons, if unmindful of the results of the traditionally known surf of Madras, may be taken out to view down in the depths the little that may then remain of the boasted works of their forefathers.

Since we last noticed the sister works at Colombo, very material progress has been made with them, and we are now enabled to estimate the extent of the advantages which Sir John Coode's design has already secured. The main breakwater has, it may almost be said, been entirely finished so far as regards the body work is concerned. Indeed, there appears nothing more of importance to be done to it but the paving of the head work and the erection thereupon of the guiding lighthouse and of the landing pier required for its service. For this the moulding of the concrete blocks required is in full operation; and the next north-east monsoon, when smooth water can be ensured, will see the completion of the whole of the constructive operations. As to the advantages already apparent, we read in the *Ceylon Observer* that there are, or shortly will be, moorings laid in perfectly sheltered water for twenty-four of the largest class of ships. The distribution of these is thus described by our contemporary:—"There are five large buoys floating about 100 yards from and parallel with the breakwater pier, each 600ft. distant from its neighbour, in the first row. In the second row, 600ft. from the first, there is another set of five buoys, and in the rear of the second set a third, also made up of five buoys, and a fourth incomplete set of only two buoys 2100ft. from and parallel with the pier. All these buoys are fixed to a double set of screw piles with connecting saddle chains, and will form squares whose sides are 200 yards each way. When completed, there will be four rows in all, each containing six buoys, capable of mooring not less than twenty-four steamships drawing from 25ft. and upwards." We conjecture that the last word is a misprint; otherwise the draught of the vessels might be without limit. Dredging operations have been actively kept up since shelter for them was obtained, and the Colombo municipal authorities, regretting to see the large amount of raised stuff daily carried four miles out to sea, are considering proposals for further reclamation works, which, if executed, will greatly improve the aspect and convenience of their very extended city.

THE EXAMINATION OF ILLUMINATING GAS.

A paper on this subject has recently appeared—by C. v. Than—in the *Berichte Chem. Gesellschaft, Berlin*, xv., 2790, 2802 He remarks that it is well known that when illuminating gas is mixed in a closed space with air it becomes dangerously explosive; and he has gone into the question of the proportion in which the mixture is most liable to explosion. The apparatus employed was a graduated glass tube, 50 centimetres long and 3 centimetres in diameter, closed at one end. Fifteen experiments were made, with percentages of gas and air varying from 4 to 40 per cent. When the amount of gas was under 5 per cent. the mixture was not inflammable; from 5 to 20 per cent. the explosions became more violent in proportion to the gas present; from 25 to 30 per cent. they gradually decreased; and between 30 and 40 per cent. the mixture burned at the mouth of the tube quickly and without explosion. The chemical composition of the gas has an undoubted influence on the explosiveness of the mixture. The rapid discovery of leakages in gas fittings is a matter of great importance, and the author criticises Ansell's indicator, which is supposed to give an alarm when dangerous leakages occur. He considers it untrustworthy, and he describes an invention of his own, which he calls a diffusometer. It consists of a porous earthen cell, such as is employed in galvanic batteries, inverted, closed with a perforated india-rubber plug, through which it is connected with a manometer, the lower limb of which is bent, and contains a little water coloured with litmus. The cell stands on a small table capable of holding a bell-glass cover; this bell-glass is filled with air to be examined and placed in position, the mixture of gas and air diffuses into the interior of the cell, and causes an alteration of level in the coloured fluid. The author graduated the instrument with measured volumes and found that its indications were very trustworthy. Attention must be paid to difference of temperature; if the instrument is brought into a room where there is an escape of gas it will very closely point out whether the escape is within dangerous limits or not. Various applications of the instrument are given, such as drawing samples of air from the highest parts of theatres, public buildings, &c., for the purpose of examination. The precise locality of leakage is often difficult to find, the ordinary plan of using a light being dangerous. The author has constructed another little apparatus for this purpose which he calls a diffusioscope, which may be described as a very flat glass funnel, closed about half way from the edge with a very thin, circular, porous earthen plate. The stem of the funnel is provided with a tap to admit air to equalise the pressure on a miniature manometer, which is connected with the stem of the instrument. The portion containing the porous plate is placed over the suspected spot and the tap closed, when, if there is leakage, the rise of the column in the manometer is instantaneous. The apparatus is so sensitive that when an argand burner is gradually turned down until it will no longer ignite, and the instrument is held over it, the manometer rises 7 centimetres in four or five seconds; held over an ordinary burner, letting so much gas out as will just kindle, the fluid rises very rapidly and is almost ejected from the tube. If the manometer be graduated to millimetres, one half a per cent. can be detected in a room. An instance is given of a case of sickness, which, in the opinion of the physician, was due to gas poisoning, but could not be traced, as there was not a service of gas in the house. The instrument was used, when it was found that a pipe three metres from the house had burst underground.

THE STRIKES AND OUR EXPORTS.

It is by no means a new feature when strikes occur that a total absence of a degree of knowledge prevails wherewithal the working men can present a case in justification of their movement, and interfere with the growing importance of British iron industry. Previous strikes have tended, directly or indirectly, to encourage foreign countries to enter into competition with the interests of British iron industry. The facts are these:—There are fourteen different States on the Continent which, for more than half-a-century, have year by year grown into importance as customers of British iron and steel. During a period of six years, comprising 1870 to 1875, Great Britain exported to these countries an aggregate of 8,670,086 tons of iron and steel, in a crude and manufactured state. This quantity has been reduced during the succeeding five years, *i.e.*, 1876 to 1881, to an aggregate of 8,028,564 tons, in other words, Great Britain's trade has suffered a decline in exports to the extent of 641,522 tons in relation with the European Continent. This amount in tonnage is largely augmented by a further falling off of shipments to the United States of America and a number of other States on the American Continent. On the other hand it is to be noticed that these losses have been partly recouped by greater expansion in the activity of British colonies and dependencies. An eminent American statesman, who has beyond doubt deeply studied the question, gives full credit to the "pluck" of the working man of Great Britain as the predominating characteristic of the nation. "It is," he says, "the result of centuries of a national training in a school from which all the softer attributes were excluded as tending to effeminacy. The rough-and-ready spirit of Englishmen to give and take has thus been generated, and displays itself sometimes in riot and violence, and at other times in that indomitable courage which has made the British flag feared and respected—a long strike or a Waterloo." The British workman indulges too often in the erroneous belief that the employers seeks a reduction of wages in wanton hostility to labour. He is often apparently unable to look beyond the surface of his own circle, and overlooks the fact that the manufacturer at all times sacrifices much to English pride, and it must be added, to the honour of character. He runs his establishment often at a loss rather than cease working altogether, and cause a direct suffering to the working man. In how much American ideas find an illustration in what ironmasters have done during late years is shown in the decline which has been pointed out. There are seven European countries which have during six years, 1876-81, taken less than in 1870-75 of British iron and steel, an aggregate quantity of 1,161,395 tons. The seven other countries include, for the most part, the Southern Group, Spain, Portugal, Italy, and others. They have not too great facilities, owing to climatic and other drawbacks, and continue to augment their custom in respect to British iron. This augmented our exports for the last period under review by 519,872 tons. The old customers, who have taken to manufacturing iron and steel for themselves, have compelled the British employer to seek work elsewhere, and the success of the year 1882 has evidently turned the head of the leaders of a class of men who look with leather spectacles on the efforts made by employers to maintain the efficiency of their workshops. The man who listens to ill-advised persons who induce him to strike, forgets that capitalists cannot afford to remain in view of unprofitable investments, and the working man should be wise enough to learn the consequence which inevitably follows the withdrawal of capital.

FLAMELESS COMBUSTION.

Two papers have recently been published on this subject which are of considerable interest. One by Mr. Fletcher, in Dingler's *Polyt Journal*, 246, 293-5, states that in experimenting with gas and air burners, the author found that the smaller the flame produced, the greater was the heating effect which could be obtained from the consumption of a given quantity of gas. This result led him to reduce the flame as much as possible, and ultimately it was proved that under the most favourable conditions the flame would disappear entirely. If, for instance, a ball of iron wire be heated in the flame of a gas blowpipe, and the supply of air be gradually increased, the jet of flame will become smaller and the temperature will gradually rise. Then, if after the ball has been heated, the gas tube be pinched for an instant so as to extinguish the flame, it will be found that there is a sudden increase of heat, and that the iron will be melted. A similar increase of heat during flameless combustion is shown if a lump of fireclay be substituted for the iron wire, and petroleum vapour may be used in place of coal gas. The author's experiments are still in their infancy; it is hoped, however, that they will be the means of effectually utilising much of the heat at present wasted. These experiments of Mr. Fletcher's have been repeated by Mr. F. Fischer—Dingler's *Polyt. Journal*, 247, 32-35—with the view of investigating the combustion products. For this purpose iron wire was wound round the end of a thin clay pipe, so that a ball 6 to 8 cm. thick was produced. This was treated as suggested by Fletcher, and whilst the ball was at its most intense heat, a sample of gas was withdrawn from the interior, the gas being drawn through the clay pipe and examined over mercury. The experiments corresponding to samples of gas I. and II. were made with the ordinary gas pressure; in experiment III. the pressure was increased, whilst the pressure in experiment IV. was still greater. The ball in experiment II. was made of very thin wire; in experiments I. and III. the wire was 1 mm. in thickness, and in experiment IV. the ball consisted of a mixture of both wires:—

	CO_2	CO	CH_4	H	O	N
I.	5·11	—	—	—	6·26	88·63
II.	5·03	—	—	—	3·34	91·63
III.	6 60	—	—	—	4 98	88 42
IV.	7·72	1·08	traces	0·32	traces	90·88

The composition of the gas corresponds with that of the gaseous mixture at the point of the flame of a blow-pipe or Bunsen burner; the smaller proportion of oxygen, however, shows that part of it is retained by the iron; moreover, it was found that when thin wire was used, one half of the fused mass consisted of ferrosoferric oxide. Referring to the practical application of

flameless combustion, the author considers that it is not available for solid fuel.

ENGLISH AND FOREIGN NAVIES.

ON Monday Mr. Campbell-Bannerman made a very remarkable statement in the House of Commons. Criticising suggestions by Mr. W. H. Smith, he said :—"He was surprised to hear his right hon. friend advocate increased expenditure, seeing that he had not made any such suggestion when the shipbuilding policy of the Government was discussed in May. If the Navy were deficient now, it was because the late Government had not provided for the building of more ships. We had, however, twenty-five ironclads in commission and eight more in reserve, which was *almost equivalent to the combined naval forces of France. Italy, Russia, and Germany.*" The italics are ours. The "almost" here may have a very wide meaning. It is well known that there is a wide diversity of opinion as to how ships ought to be classified in commission, but even when the greatest latitude is allowed in this respect, it still seems clear that Mr. Bannerman is completely mistaken. In our impression for May 11th, we published, on page 363, a statement of the relative strength of the English and French navies, and we showed that on the basis of tonnage alone, which is surely wide enough, France by herself nearly equals England. Of iron and steel-built ironclads England has complete 315,390 tons ; France, 101,319 tons. Of wooden ironclads England has 19,560 tons, and France 166,412 tons, giving England, in round numbers, a total of 335,000 tons, against a total for France of 268,000 tons. Thus the strength of France is to that of England as 26 to 33, or nearly as 8 is to 11, and if we argue on the basis of guns and armour instead of tonnage, the comparison is quite as much against England. If to the French fleet we add the great war ships of Italy, and those of Germany, it will be seen that England's boasted superiority has no existence; and if we take into account further the ships which are being built in France, and compare them with those being built by England, it will be found more than ever difficult to understand on what Mr. Campbell-Bannerman bases his statements.

THE STATE OF TRADE.

JUDGING from the reports just issued by the trades' union societies connected with the engineering branches of industry, the present demand for labour, whatever may be said with regard to the future prospects of trade, is now very satisfactory. With the exception of one or two districts where there are disputes going on, trade is returned as generally good; and but for the strike at Sunderland, where there are between 500 and 600 men out, there would be a decrease in the number of men on the books of the societies as out of employment. In fact, the returns of the Amalgamated Society of Engineers would be better than they have been for the past six months, and in the Steam Engine Makers' Society it was anticipated that an improved return over its two predecessors would have been issued this month. The dispute in the north had, however, put additional men on the books, but even this had not much increased the total number of members unemployed. Pattern makers and smiths especially are in full work, and the Amalgamated Society of Engineers has extremely few of this class of men on the books. The returns for the Lancashire district show a decrease as compared with last month in the number of men on donation, the greatest proportion of unemployed being not more than two per cent. of the total membership, and with the exception of machinists all branches are returned as well supplied with work, whilst Bury is the only district where trade is reported not to be good. In the Steam Engine Makers' Society the applications for work have been more numerous than for some time past, and the reports of the Lancashire districts on the whole are very satisfactory, no town returning trade as actually bad. There are only 61 members of the Steam Engine Makers' Society on the books as out of work. Of these 33 are fitters, 14 turners, 5 millwrights, 6 pattern makers, 2 sea-going engineers, and 1 smith.

THE IRONWORKERS' STRIKE.

OUR correspondence this week does not show that matters have very greatly improved in the localities mostly affected by the strike of ironworkers against the drop of 3d. per ton in puddlers' wages awarded under the operation of the wages' sliding scale in South Staffordshire. Most of the North Staffordshire men seem to have resumed at the reduction, but the Lancashire and the Yorkshire men are working upon the old terms, subject to the final issue where the strike hands are showing most obstinacy. This is in South Staffordshire, though there, too, more is being done this week, mainly by the millmen. It is regrettable that although the police arrangements are much more complete than they were when the rioting was started, and the men are kept from doing violence in riots, yet the ironmasters are subjected to that sort of violence which is implied in clandestine attempts to destroy machinery. The recent leader of the men, who is still indeed the operatives' secretary upon the Wages' Board, is loyal to the arbitration agreement. Mr. Capper is advising the men to resume at once, and, all of them becoming subscribers, to send representatives to the Board, there to consider the best means of regulating wages in the future. We are not without hope that this advice may soon be acted upon. Meanwhile we note that orders are going from the district, and non-offending workmen in the engineering and hardware establishments, as well as at the collieries, are seriously suffering. Already £150,000 has probably been lost in wages and profits to the South Staffordshire and Birmingham districts.

THE RAILWAY (CONTINUOUS BRAKES) BILL.

IN bringing forward this Bill for the second reading in the House of Lords on the 13th inst., Earl De la Warr did good service by obtaining an assurance from Lord Sudely that the Board of Trade undertook to introduce a measure dealing with this subject next year, and upon this Earl De la Warr asked leave to withdraw the Bill. The object of this Bill is practically to compel railway companies by the year 1885 to equip their trains with brakes complying with the Board of Trade conditions, and so far, Lord Sudely said, the Board of Trade endorsed the Bill. Lord De la Warr clearly showed from the Brake Returns that it was hopeless to expect the railway companies to arrive at any satisfactory result if left to themselves. "Scarcely two railways had brakes that would work together," said his lordship, and indeed a glance at the returns might convey the impression that the Board of Trade had all along been urging the railway companies to adopt different brakes, instead of pressing upon their attention the advantages of uniformity. Lord De la Warr said, "Uniformity was a most important and essential element" in this question. His lordship complained that only one-third of the stock was fitted with brakes which complied with the conditions; but we may point out that in reality there is only about one-fifth so fitted. For it is a libel on the Board of Trade to suggest that the leak-off arrangement in use on the Great Western and Midland Railways complies with their conditions, if indeed it deserves the name of brake at all.

THE ENGINEERING AND METAL TRADES EXHIBITION.

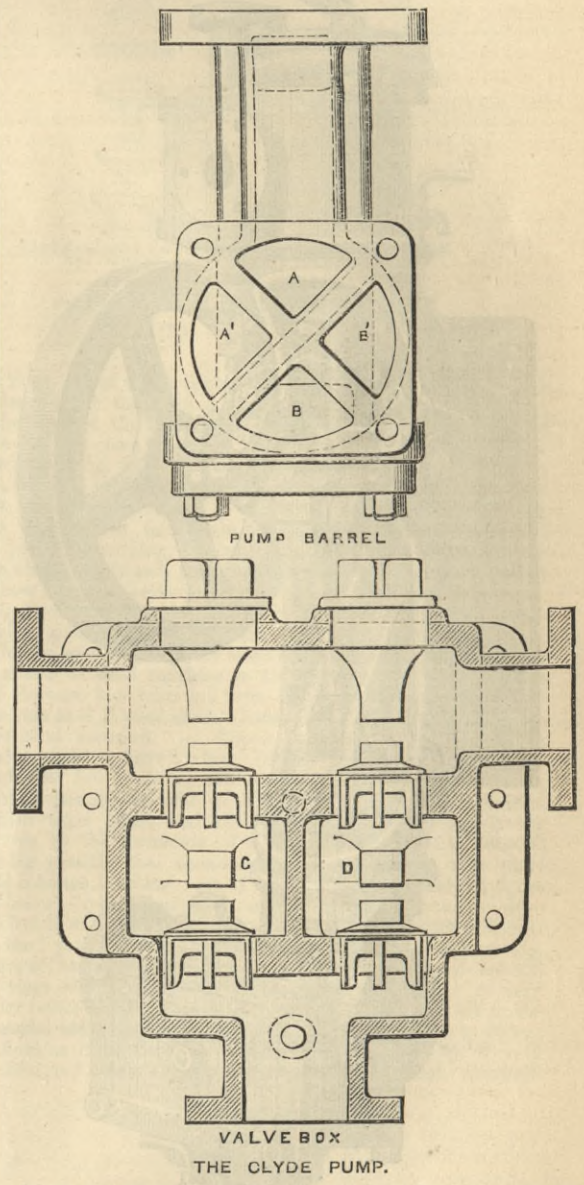
No. III.

WE resume our notice of the exhibits at the Agricultural Hall. A number of firms show samples of iron. Among them we may specially draw attention to the exhibit of Messrs. Fox, Head, and Co., Middlesbrough, who have a large display of boiler plates and specimens of welded and flanged work made from Cleveland iron, arranged in the form of a trophy. Here will be found ordinary boiler plates, uptakes, flanged conical tubes, circular flanged plates, and a variety of other objects all testifying to the excellent quality of the material from which they have been made. The Weardale Iron Company also has numerous samples of pig iron, and of plates, bars, angles, &c., of both iron and steel, which have been subjected to numerous tests by twisting, bending, and the like. Samples and tests of S. C. Crown and other iron are also shown by Messrs. Moses and Sons, Southwark. Steel castings have now become so necessary in machinery of all kinds, that it was to be expected in an exhibition of this kind that a great number of manufacturers would be represented. Messrs. Ridley and Co., Newcastle-on-Tyne, show a case of admirable tool steel made at their Swalwell Works, and have besides a number of castings of various descriptions, among which is an ordinary tub wheel, broken, hammered out, and punched in different ways, to show the quality of the material. Another wheel is turned up on the rim and polished, and exhibits a close sound surface, quite free from the blow-holes and other defects which unfortunately often find their way into steel castings. Cases of samples showing the fracture of Styrian tool steel in bars, billets, and ingots, are exhibited by Messrs. Bohler Brothers, Sheffield, as well as samples of the ores from which the steel is made, and fractures of puddled and refined forge steel, all of which are extremely interesting and well worth notice. Messrs. Hathorn and Co., Charing Cross, show a number of general steel castings and tools, and special tool steel for all purposes, shear, blister, and spring steel, and a special tough quality of drill steel for granite and other hard rocks. A good display may be found at the stand of Messrs. Seebohm and Dieckstahl, Sheffield, who show a series of bars and fractures of Swedish iron and crucible cast steel illustrating the process of manufacture from iron into the various descriptions of tool steel, also the appearance of the fracture according to the variations of temper, and the effect of the addition of tungsten, chromium, manganese, and so on. Messrs. Marshall and Co., Smethwick, near Birmingham, exhibit samples of iron and steel manufactured specially for high class engines and machinery, as well as guns, rifles, &c. These samples have been subjected to all sorts and conditions of tests, to show the ductility of the material and its soundness. A selection of samples of Siemens steel is shown by the Landore-Siemens Steel Company, Limited, South Wales. These apply to such steel as is used in the construction of ships, boilers, and bridges, and plates, angles, tees, bulbs, bars, and rivets, &c. Test samples of dished plates, bent bars, deep stampings, and other forms of manufacture demonstrating the malleability and ductility of the metal, are also shown. Messrs. Southerst and Southorn, Guisborough, exhibit crucible steel castings in great variety, including permanent way crossings, dredger links and bucket backs, propeller blades, spur and bevel wheels, and colliery tub wheels and fittings. These are excellent samples of work, and merit attention.

The Light Railway and Equipment Co., Westminster, which supplies every description of iron and steel permanent way and rolling stock, adapted for either light portable railways or for those of a more lasting character, exhibits specimens of several specialities. The permanent way has been designed to give ready and cheap communication and means of transit between towns, villages, farms, and works, and for connecting them with main lines of railway, ports, market centres, &c. It also offers an easy means of bringing into profitable use valuable forests and iron mines, and for military purposes it gives advantages of the greatest importance. The rails used are the ordinary flat bottom section weighing from 10 lb. to 18 lb. per yard, and these are laid on light iron sleepers, like an inverted trough. The rails and sleepers are easily put together by unskilled labour, and when once connected need not be separated again, as when it is required to remove the road to another situation it can be taken up bodily in sections by simply uncoupling the joints at convenient distances. For temporary purposes it is only necessary to lay the road on the ground, but for more permanent use it is advisable to make the surface tolerably even, and when practicable to use a few inches of the kind of ballast that can be readily obtained, in all cases taking care that provision is made for permitting the surface water to escape. The wagons constructed by the company for these light railways are arranged for the transport of every description of material. They are generally made entirely of iron or steel, and fitted with buffers and axle boxes for lubrication with oil. They can go round curves of four metres radius, and each wagon can be arranged to form a bogie truck for carrying logs of timber, iron bars, rails, or other long material.

Messrs. Amos and Smith, Hull, are again present with the steering gear which attracted so much notice at the North-East Coast Exhibition, and which we are told has given the most satisfactory results wherever it has been adopted. They are also exhibitors of Seaton and Cameron's spring safety valve, the peculiarity of which lies in the form of valve and its envelope, the arrangement being such that as soon as steam blows off an injector action is set up and utilised for inducing a current of cold air through the spring case, which keeps the spring cool, and at the same time the partial vacuum formed above the valve causes it to rise gradually from its seat and prevents the shocks and oscillations to which the ordinary spring valves are liable.

Mr. Beauchamp Tower, Fulham, exhibits his patent indicators for marine engines, many of which are in use in ships of the British Navy. The revolution indicator is an apparatus for indicating the speed in revolutions per minute of an engine, at any distance from it and in any number of places. In steamships it is of course very desirable that the speed of the engines should be indicated on deck as well as in the stokehole and engine room ; while in vessels with twin screws it is specially convenient to have the speeds of the two engines indicated on dials, side by side, so that the speed may be made to agree as closely as possible. In Tower's indicator air is forced by a small pump driven by the engine to escape past a valve, the pressure necessary to lift the valve of course depending upon the extent to which it is loaded. In this case the load is caused by the centrifugal action of a revolving weight, which increases or decreases as the speed of rotation is more or less, so varying the air pressure according to the speed. This air pressure is conveyed by pipes to the places of indication, where it acts on gauges graduated in such a manner as to show the speed of the engine. The pipes may be connected to any number of gauges, and may extend to any distance. The direction, or ahead and astern indicator, is generally combined with the revolution indicator, but is sometimes made as a separate and distinct apparatus. Its object is to indicate upon deck the exact moment when the engines of a ship are started, stopped, or reversed, this knowledge often being extremely useful to a captain when navigating his vessel in narrow waters, where the helm has frequently to be shifted simultaneously with the reversal of the engines.



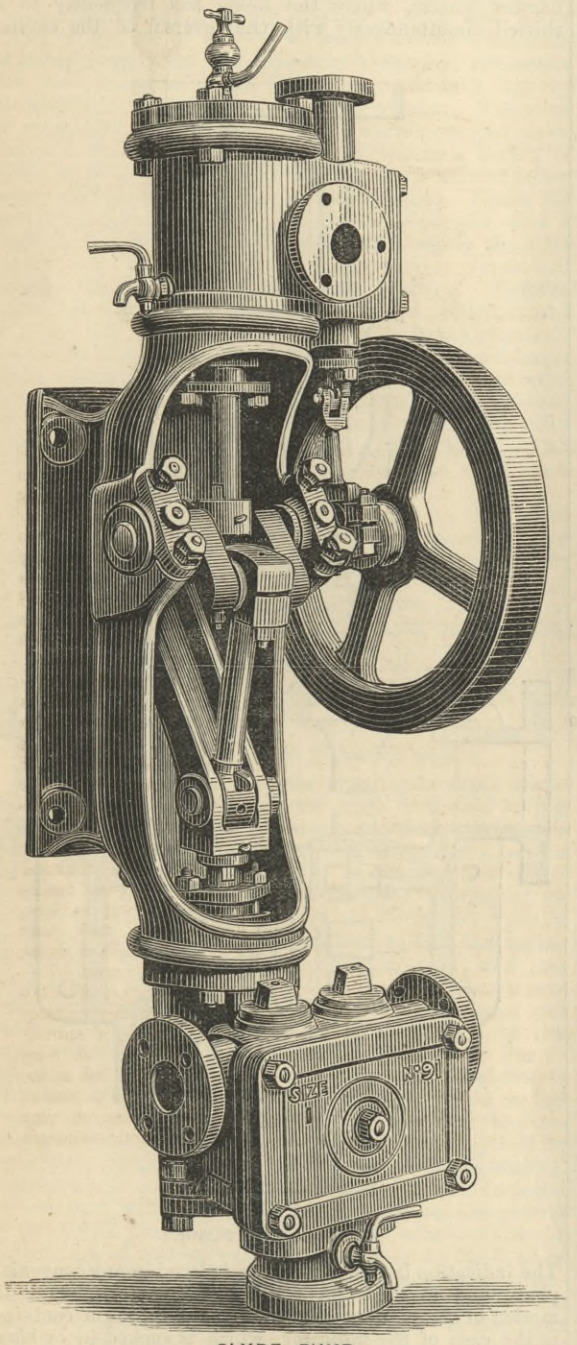
THE CLYDE PUMP.

The indication is made upon a dial placed in any convenient place, and marked "Ahead" and "Astern," and the motion of the pointer is caused by a diaphragm contained in the case of the indicator, which is sucked in or blown out by a slight vacuum or plenum created by an air pump driven by a belt from the engine shaft, and which acts as a pump or exhauster, according to the direction of rotation of the engine. A small leak in the connecting pipe permits the pointer to go back to its mid position the moment the engine stops. Mr. Tower also exhibits his combined rotation indicator, for indicating at any distance, and in any number of places, the actual motion of any revolving mechanism,—*i.e.*, both the actual speed of rotation and the direction of motion. In this instance electricity is used, conveyed by fine wire cable from the place of motion to the place of indication. Asbestos goods are shown by all the principal makers, but as we entered very fully into the nature and use of this interesting material in a recent impression of THE ENGINEER, it will be unnecessary for us to say more here, especially as no new application of importance is exhibited. We will only mention that the stands of Mr. John Bell, and of The Turin Asbestos Co. are well worth a visit, while some amusement may be obtained by a few minutes' talk with the attendant representing the Scottish Asbestos Co., Limited, who, with the assistance of a small chemical laboratory, professes to show to the uninitiated that his company alone produces a pure unadulterated article, his contention being, so far as we could understand, that what is called asbestos by other makers is really nothing of the kind.

Above we illustrate the Clyde connecting-rod pump which is manufactured by Mr. John Cochrane, Grahamstown Foundry and Engine Works, Barrhead. This pump is provided with a stiff cast steel crosshead of swan-neck

shape, the larger sizes having a slide at the bottom to take the wear off the piston-rods and glands. The connecting-rod is made twice the length of the stroke, and a substantial fly-wheel is attached to the crank shaft, causing the pump to work with great regularity and steadiness. The valve-box is so fastened to the pump barrel that its position can at any time be changed and the pump worked horizontally, vertically, or in an inverted position, while the pump barrel itself can be turned round so as to discharge in any required direction. The ports A A^1 in the section communicate with the upper end of the barrel, and B B^1 with the lower end. The ports C D in the valve-box are placed over A B or A^1 B^1, according as it is required to set the pump horizontally or vertically.

Mr. John Redgate, Nottingham, exhibits "The Triplex" furnace bar and fittings, which are claimed to be light and durable, and to promote economy in fuel. They admit air through their entire length, and the air currents are arranged so as to produce a threefold concentration, the effect of this being to prevent the adherence of the clinker. Patent fire bars and smoke-consuming apparatus are also shown by Messrs. Clarke and Co., Nottingham, and by the Venetian Air Valve Furnace Bar Company. In the latter case the bars lie across the furnace instead of lengthwise, being hung in trunnions and connected by a system of levers in such a manner that they can be rocked from side



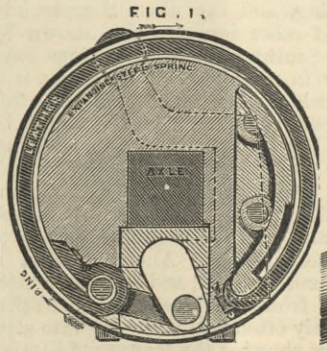
CLYDE PUMP.

to side to break up the clinker. They can also be closed together so as to contract the air spaces between them and prevent the passage of air, and in this position they are intended to be used at night when the coal is banked up, so obviating the closing of the damper, and preventing the nuisance of the smoke escaping through the fire door into the stokehole instead of going up the chimney.

Mr. J. H. Evans, London, exhibits some high class ornamental turning lathes for amateurs, which are of the finest workmanship and finish. We specially noticed a 5in. centre lathe fitted with oval and excentric chucks, universal dome and rectilinear chucks, a very fine ornamental turning slide rest with swivel movement for placing the tools to any angle, and a special arrangement of the spiral apparatus fixed at the back of the lathe head, which enables it to be used in conjunction with the oval chuck. This latter has many important advantages which will readily be appreciated by turners. It enables very beautiful designs to be worked out, it need never be removed from its place, and by means of a new universal joint introduced by Mr. Evans, the slide rest can be set at any angle that is wanted. A feature of attraction, especially to ladies, is a case of specimens of ornamental turnery in ivory and blackwood of Mr. Evans' own work, showing that he is thoroughly proficient in the use of his own tools. Cheaper lathes, termed the "Technical School" lathes, are also shown on the same stand, and though not of the same quality and finish as the 5in. lathe we have noticed, are admirable specimens of their kind.

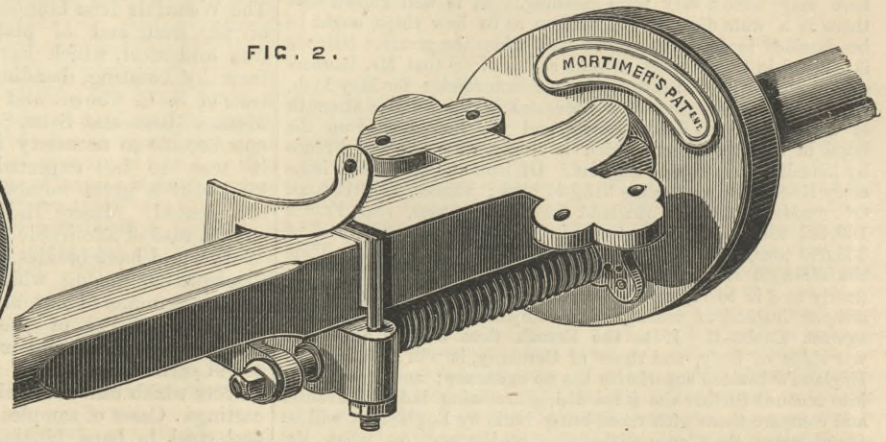
The British Gas Engine and Engineering Company, Queen Victoria-street, E.C., shows four engines of the vertical type, the largest being 1½-horse power, and the smallest one man power. Some of these engines are fitted with pumps fixed to the framing, which makes a very convenient arrangement for a number of purposes, a one-man engine throwing about 400 gallons per hour, which is enough to supply a large mansion, only occupying a space of some 2ft. 3in. by 1ft. 6in. The 1½-horse engine is driving a dynamo, which during the day charges a secondary battery, and during the evening supplies a current direct to fifteen incandescent lamps of twenty-five candle power, used for lighting the company's stand, as well as another in the gallery above. The secondary current from the batteries is conveyed to Messrs. Durham, Churchill and Co's. stand during the evening, and also utilised for electric lighting. These gas engines seem to be strong and well made, and are so free from friction that when the gas is shut off they will run for about eighty revolutions before stopping, and this, coupled with their lowness in first cost and simplicity, should obtain for them a ready sale among users of engines of small power. They can stand on any floor without special foundation, and the direction of motion can be reversed by merely loosening a set screw and shifting the crank disc which actuates the slide. The slide itself works loosely, and without much friction, between two faces, and it controls the admission of gas and air, their ignition, and also the exhaust. The company is engaged in constructing much larger engines on the compression principle, one of which would have been exhibited if it could have been completed in time.

FIG. 1.



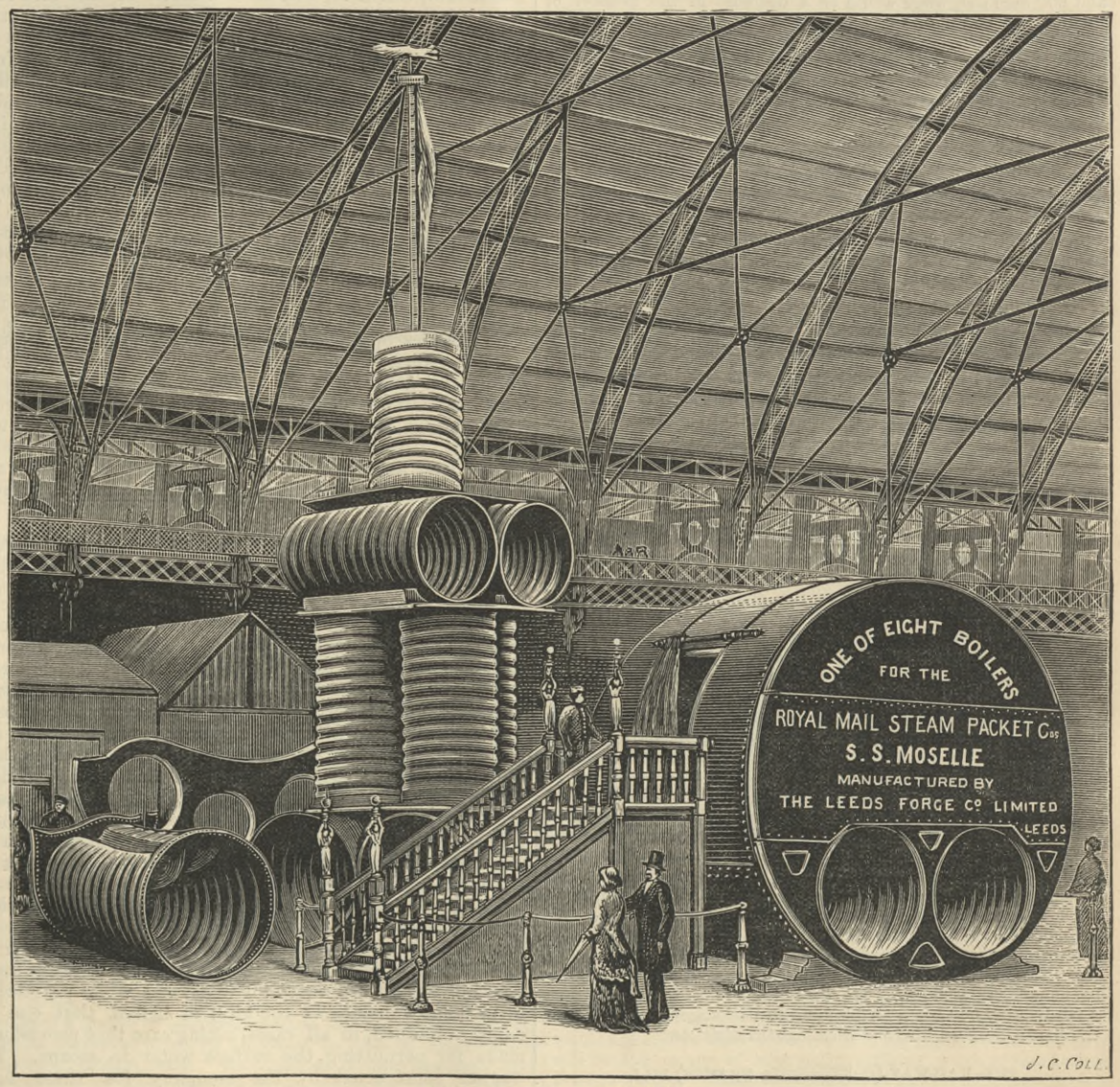
INSIDE VIEW

FIG. 2.



MORTIMER'S BRAKE.]

Messrs. Atkinson and Philipson, Newcastle-on-Tyne, exhibit Mortimer's patent carriage brake, which was awarded a silver medal at the North-East Coast Exhibition, also the American single plate carriage springs and models of the patent india-rubber axle collars. To make the application of the two former inventions intelligible, they have been fitted to one of Atkinson and Philipson's fashionable dogcarts, which in itself will prove attractive to many. The brake is illustrated above, and its action will appear clear to most of our readers. It consists of a coiled spring strap, covered with thick leather, which is brought into contact with the inside of a ring fixed to the nave of the wheel, the movement being effected in a very simple manner by weigh bars and levers. It is entirely concealed, and is noiseless in action. Besides the connection with the brake, the hand lever at the side of the dogcart is attached to the seats in such a manner that when the retarding pressure is applied in descending inclines, the seat slides back and removes the weight from the back of the horse. Such a result is desirable from a humane point of view, but it also increases the safety of the vehicle and its occupants. Much popular prejudice has had to be overcome in the case of the American springs. They consist of a single plate of steel, weighing only a third of the ordinary laminated spring, and vary somewhat in shape, being tapered from the centre to the ends, which are also bent back. The fitting of the dogcart is carried out in the most approved modern fashion, with pulling bar and shafts hung on the adjustable fulcrum principle, by which it is possible to use horses of different sizes while retaining the body of the vehicle in a perfect horizontal position. This exhibit shows the application of several mechanical principles new in carriage building.



BOILER OF S.S MOSELLE

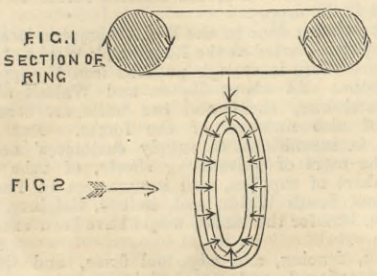
We illustrate above the exhibit of the Leeds Forge Company. On the end of the boiler are painted the particulars of it, some of which are seen in our engraving. The interior has been fitted up as a boudoir, and is lighted up with incandescent lamps. The boiler we may explain is only bolted together for convenience of carriage, and has no tubes in it. The planks making the floor of the boudoir rest on the tops of the corrugated furnaces.

Besides exhibiting the "Compactum" condenser, which we recently described, Messrs. John Kirkaldy and Son, of West India Dock-road, exhibit specimens of the anti-fouling composition for ships, of which they are the makers. It is a smooth exfoliating enamel paint, which effectually protects ships' hulls, dries quickly when applied, and is very highly spoken of for its lasting properties and for its cleanness by very extensive ship-owners who have had vessels coated with it from one to five times.

ON CERTAIN PHENOMENA MANIFESTED BY LIQUID VORTEX RINGS.

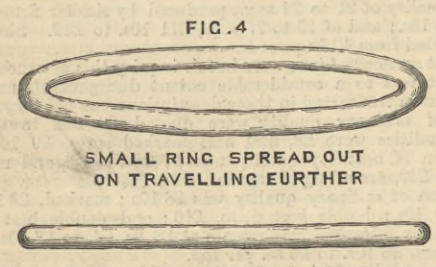
By Mr. T. HART, Assoc. R.S.M.

THE following are a few beautiful, yet very simple, experiments on vortex rings made by the author in conjunction with Mr. L. Reed, F.C.S. Before describing them, a few remarks may be made as to the nature of these rings. These rings enable one mass of fluid to travel through another mass of fluid with the least possible disturbance of the latter. The motion of the rings is general and internal, and the internal motion is shown in Figs. 1 and 2, the directions in which the ring itself is travelling and the directions of its moving particles being indicated by arrows.

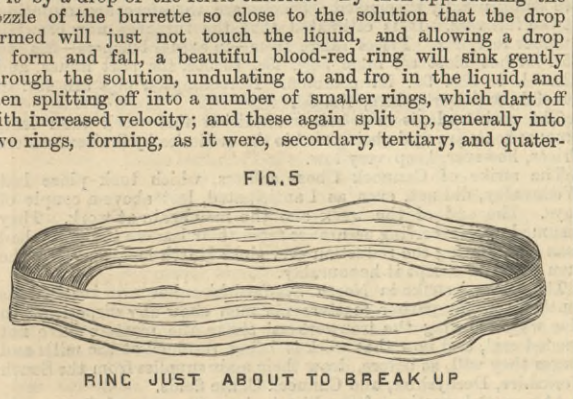


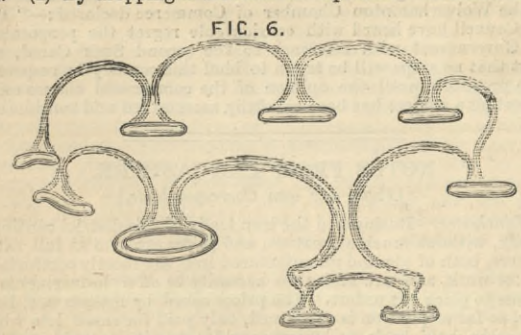
The formation of vortex rings is largely influenced both by the cohesion of the fluid through which they are themselves passing, and also by the cohesive forces exercised between the molecules of the rings themselves. They may be observed escaping from the chimneys of portable steam engines; on igniting bubbles of phosphuretted hydrogen, and issuing from tobacco-pipes, and from the mouths of some smokers. They may also be produced from perforated flexible boxes in a way too well known to need description. Smoke rings have been very fully investigated by Professor Osborn Reynolds, and by some German physicists, who have dealt fully with these phenomena. The author's experiments have taken a somewhat different direction, and he has employed liquids instead of smoke in his investigations, the results of which will be found interesting.

Perfectly formed vortex rings produced by simply dropping one liquid into another.—(1) In order to obtain the most perfect ring we may take a solution of ferric chloride, and place a small portion of it in a burrette, so that a drop can be produced at will by regulating the stop cock. Beneath the burrette place a large beaker containing a dilute solution of potassic sulpho-cyanide

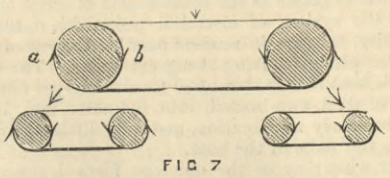


(K C N S), such that a beautiful blood-red colour is developed in it by a drop of the ferric chloride. By then approaching the nozzle of the burrette so close to the solution that the drop formed will just not touch the liquid, and allowing a drop to form and fall, a beautiful blood-red ring will sink gently through the solution, undulating to and fro in the liquid, and then splitting off into a number of smaller rings, which dart off with increased velocity; and these again split up, generally into two rings, forming, as it were, secondary, tertiary, and quaternary rings, as shown in Figs. 3, 4, 5, and 6. On trying the experiment again with other liquids, the author obtained similar and equally beautiful results. (1) By dropping bichromate of potash in weak solution into water, or preferably into ferrous chloride, when the colour disappears, rendering the lower solution green. (2) By dropping a solution of cupramine—obtained by





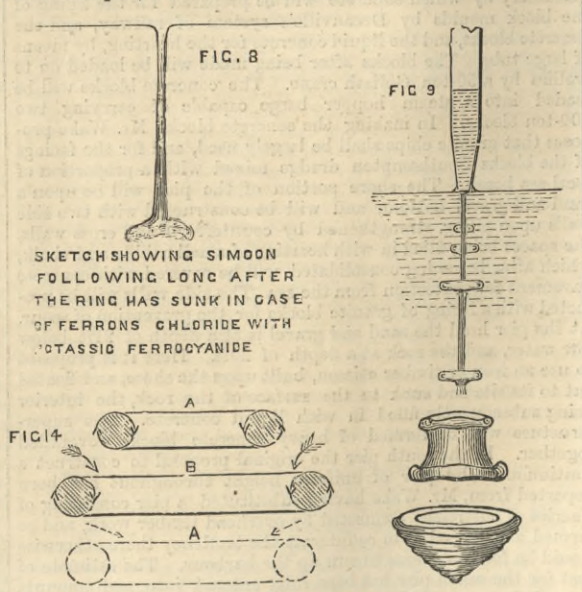
treating sulphate of copper with a large excess of ammonia—into water, when a beautiful deep blue ring, behaving as before, is obtained. (3) Red ink, aniline dye coloured liquids, and other coloured liquids behave similarly. The flatter the surface, the larger the drop; hence, by the use of a bulb, may be obtained very large and very perfect rings in this way. The author attempts to account for the splitting up of the rings in the following way:—Let Fig. 7 represent the section of a large ring, the arrows show the direction of motion of the molecules. When the ring has sunk for some distance, the ring begins gently to undulate, one portion of the ring during its undulation coming lower than the other parts. The motion of the internal molecules of the ring having practically ceased, the liquid matter of the ring being denser than the surrounding liquid, its tendency is to sink per force of gravity, and to do so this lower part assumes the form of a vortex ring, produced by the friction against the sides of the sphere of liquid, and also because this form is the best adapted for travelling; the rings thus made dart aside from the old, destroyed, but main ring, possibly



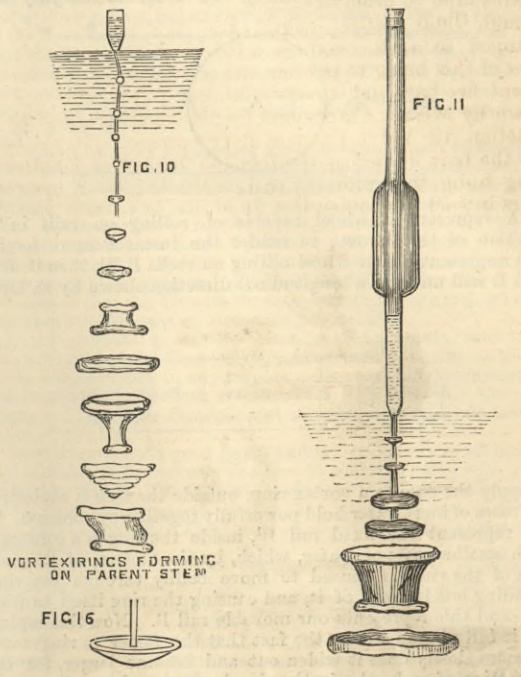
deflected by the cone of downward rushing liquid spoken of elsewhere. For the splitting up of a ring some force, such as gravity, must act on the ring after its several molecules have come to a standstill.

(2) *A series of vortex rings produced by allowing one liquid to diffuse into another in a thin liquid stream.*—By taking similar solutions to the above, but treating them in a different manner, we obtain remarkable results. In one instance the author took a large pipette—one of 50 cc. capacity—and filled it partially with the liquid in question—the deep blue solution of cupramine gave the most perfect results. The upper end of the pipette was then completely closed by a stopper, and the nozzle of the pipette approached so as just to touch the liquid below, which was, when using cupramine, water; and behind which a sheet of note paper rendered observation clearer. The beauty of the phenomenon which then occurred passes far beyond the author's powers of description, and can only be realised by actual experiment. What occurred in the first place was what might be expected, for the higher solution gently diffused in a steady downward stream into the lower, while a stream of the lower colourless solution was seen making its way up the pipette. A series of vortex rings forming were then noticed, as it were, on the parent stem, first appearing as mere knobs or knots on the liquid string, then, by their increased powers of motion, darting off through the liquid, only to gradually diminish in rate of motion until other rings, chasing them, passed through them, giving an appearance somewhat resembling a "top hat," or a sea anemone, by drawing out, as shown in Fig. 10. It would seem that any disturbance of the liquid in the pipette will give rise to an increase in the number and size of these rings, for some precipitate happening to fall into the tube during one of the experiments caused an increase in size and number of the rings. Also the slightest variation in temperature of the enclosed air seems to cause a similar result, thickening the sectional area of the stream if the bulb is very slightly warmed, and increasing the number of rings. So that by keeping a stream of this sort uninfluenced by external forces, the slightest variations in the temperature of the medium surrounding the bulb could be noticed with ease, especially if the bulb be filled with ammonia gas, whose tension varies so readily, as occurs on using cupramine solution. So sensitive is the fluid, that the approach of the warm hand within 6in. of the pipette will modify the results, and we have thus an extremely delicate indicator of very minute changes of temperature. The phenomena may possibly yet be utilised for thermometric purposes.

(3) *Dropping various liquids into one another and observing the effect on the rings.*—Having obtained such perfect rings so simply and so readily, the author extended the idea by dropping all kinds of liquids into one another, obtaining beautiful results. (*a*) He took ferrous chloride and dropped it into a weak solution of potassie ferricyanide. No blue colour was formed at first owing to the excess of ferrous chloride; soon by continued observation he saw, after a short time had elapsed, a "simoon" of blue colour rushing down after the invisible ring, owing no doubt to the potassic ferricyanide being in excess, and showing what a powerful current follows in the wake of a ring. By gently rotating the lower liquid, the simoon or eddy always follows the motion as

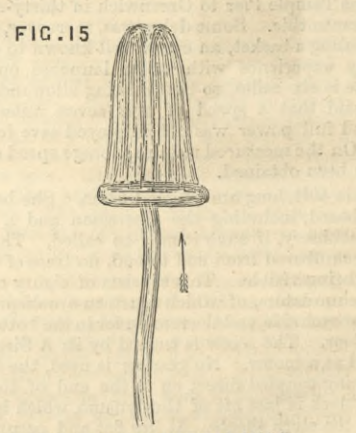


if it were very rigidly part of the liquid—see Fig. 8—and the fact that the latter of two rings which follow one another in very rapid succession is frequently destroyed, is borne out by this experiment. The experiment may be varied, not only by taking solutions of different materials, but the author succeeded in obtaining the phenomena of the passing and repassing vortex rings with greater rapidity by using a denser solution in the case of the upper liquid, as shown by Figs. 9, 10, and 11. No adequate idea can be given of the effect created in the mind by seeing these rings form one sooner than the other, those later formed making up for lost time by rushing after the first-formed rings, sucked into the centre of these no doubt by the vortex action of the first ring, thus hurrying on those nearly spent by force of travelling, and the drawn-out rings becoming rapidly collapsed, when a third and faster ring hastens all into one large ring, which, in its turn, is only to be acted on others following in its wake. The rings when first formed have a mushroom-like shape, and it would require the delicate touch of an experienced artist to note on paper the waving gentle curves by which the opera-hat-like appearances are bounded, when obtained by the passage of one ring through the other. The whole motion when watched for some time reminds one more or less of eddies in a river or pool, especially when the rings follow one another in rapid succession when the solution is dense. Sometimes the rings form a large number of fantastic shapes, and if the solution is strong enough these are bounded by wavy, oily-looking hues, due no doubt to the higher refracting power of the denser liquid and produced in the same way as lines in striæ. These shapes sometimes resemble that of a cup and saucer, and the author had the good fortune to see the rings so rapidly succeed one another that a cup-and-saucer shape has occurred inside the ghost of an opera hat. They resemble sometimes the shapes obtained by the rotation of curved wires in the hollow of the cylindrical projection of a chameleon top. He had at times been able to watch a very small quantity of the solution continue these phenomena for hours, though the action soon becomes less energetic. He believes that good authorities have stated that these rings possess great powers of elasticity when brought into contact, and never actually destroy one another. He thinks that these experiments tend to prove this, for though the rings draw one another out and alter their appearance, they do not lose the circular form. In fact, on analysing their motion he finds, as shown in the annexed sketch, that taking sections of



two rings, one of which is about to pass through the other, the tendency is for the passing ring to destroy the internal motion of the lower of the two rings for a moment at least, and having done so, its own internal motion slightly diminishes, to suck the ring it has just passed through into its own centre; and this is no mere theorising, for he has actually seen it happen. How far down in the liquid this phenomenon may continue to take place he has unfortunately not had the power of judging, for none of the vessels which he has been able to command, though deep, have been sufficiently deep to show when the action ceases.

(*b*) Strong ferric chloride dropped into strong potassic ferrocyanide gives a deep blue solid ring, after having moved as a coloured semi-solid one for some distance—semi-solid owing to the excess of solid particles in the liquid—and occasionally a deep Prussian blue tube will form after the ring has sunk, and grow just as if it were alive, where the simoon in the previous experiment occurred. (*c*) Cupric sulphate in potassic ferrocyanide gives a brown ring. (*d*) By dropping strong hydrochloric acid into a strong solution of sodic carbonate, the ring sinks unchanged as acid to a certain point, when chemical reaction takes place, and the whole appears to rush bodily upwards by the formation of a quantity of escaping bubbles, showing possibly that chemical reaction does not take place while cohesion is acting. (*e*) If we take a liquid made of dense acid below—hydrochloric acid rendered dense by common salt—with less dense sodic hydrate above, then drop a solution of litmus into the liquid, the blue ring sinks through the soda then resting, destroyed, on the denser liquid, giving rise to a series of minute red rings sinking very slowly through the acid. A very similar result was obtained by throwing a drop of red ink in the spheroidal state from a red hot platinum crucible on to water; the fluid as it began to cool sank gently as a series of very beautiful red rings, like stars from a burst rocket, although



while still hot it rested or floated inert on the surface. (*f*) The author was enabled to obtain vortex rings reflected by allowing them to strike the bottom of a basin, when they rose to the surface as new rings. (*g*) Upward rings may be obtained either by dropping a light coloured solution into a denser one, when the liquid first sinks as a ring, then, as it were, changes its mind, reverses its motion, and comes up again as a ring; or (2) the author obtained them by allowing a lighter liquid to escape from the bottom of a denser one from an upturned jet, when a peculiar mushroom-shaped appearance rises to the top, the lower part being the ring, and seen as such on looking down from above—see Fig. 15. (4) These last show the effects of density and cohesion. Mercury dropped into treacle sinks as a sphere; oil allowed to escape beneath the surface of water rises as a flattened sphere. Treacle dropped into water sinks as a bulb, leaving a trail behind it—

mixed with water, he obtained good vortex rings with treacle. Gum in strong solution dropped into water gives an attempt at a ring as in Fig. 16.

The author tried bichromate of potash solutions of different strengths, and found that with three solutions—1 strong, 2 middle, 3 weak—that the middle solution caused a drop to travel further through water than either the weaker or the stronger solution, showing that with every solution of a salt there is probably a point to be obtained in the strength of the solution which will give the most perfect ring, and which might be called "the Vortex ring strength" of that solution, the drop being caused to fall in each case from the same distance above the liquid.

For the present he thinks it would be perhaps as well to summarise the forces which act in producing these fantastic phenomena, and to do so, it may be well to show the motions of the molecules in the surrounding fluid through which a vortex ring is passing. In order to simplify this,

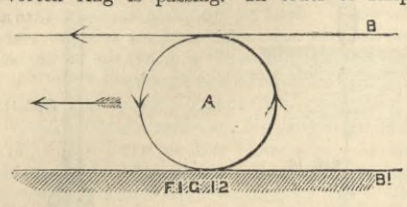


FIG. 12

let A represent a wheel capable of rolling on rails in the direction of the arrow; to render the instance more forcible, let A represent a spur wheel rolling on racks B B^1, then if B^1 be fixed B will move in a longitudinal direction shown by an arrow.

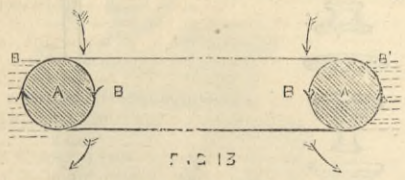


FIG. 13

To apply the case to a vortex ring, outside the ring is a relatively vast mass of inert water held powerfully together by cohesion. Let this represent the fixed rail B^1, inside the ring is a column of much smaller mass of water, which, by the motion of the molecules of the ring, is caused to move bodily through the rings, spreading out in front of it, and causing the ring itself to widen out—and this represents our movable rail B. Now this explanation is fully borne out by the fact that the faster a ring moves the more slowly does it widen out and become larger, for then the motion of molecules in the ring is much quicker, the column moves with much greater rapidity, causing a cone to be formed whose angles are much smaller, and which causes the ring to widen out at first almost inappreciably but when the motion rate decreases, to widen with great rapidity. This explanation will also account for the occurrence of the simoon in a previous experiment. Now to return to the experiment, it seems clear that each ring is produced by the action of the following forces:—(1) By any disturbing action to the gentle flow of the liquid—it is indeed gentle, being that of diffusion—or by any variation of pressure on its surface or on the surface of the exposed lower liquid. (2) By gravity, for the denser the liquid the quicker the flow, and the faster the formation of rings. (3) By the sucking action of the rings which have preceded it and which aid largely in hurrying it off from the main column. Cohesion is not without action—with gum a strong solution will be obtained, no vortexing; but the solution doubles itself up into knots, like a strongly heated stream of molten glass or like falling treacle, showing that cohesion is not without its action.

Why should not this vortex motion be applied to bodies which have to travel rapidly through fluids—such as torpedoes, flying machines, or fireworks?

AN ELECTRICAL LAUNCH.

A LAUNCH propelled by electricity was shown on the Thames on several occasions last year, and attracted a good deal of attention. It was propelled by a screw driven by a Siemens motor and Sellon-Volckmar accumulators. To a certain extent the experiment was successful. Recently Messrs. Yarrow and Co., of the Isle of Dogs, took the matter up, and working with the Electrical Power and Storage Company, a very handsome launch has been fitted up, intended for the Vienna Exhibition, with which many experiments have been made. On Tuesday this little boat made a run from the Temple Pier to Greenwich in thirty-seven minutes, with a moderate tide. Some delay was, moreover, caused by the propeller fouling a basket, an event well known to every one who has had any experience with steam launches on the Thames. The distance is six miles, so that making allowance for the tide, it may be said that a speed of over seven miles an hour was attained, and full power was not employed save for a portion of the time. On the measured mile an average speed of over 8 miles an hour has been obtained.

The boat is 40ft. long and of good beam. She had twenty-one persons on board, including the steersman and a man to look after the machinery, if such it may be called. The boat is completely unincumbered from end to end, no trace of the propelling mechanism being visible. This consists of eighty cells of Sellon-Volkmar accumulators, of which fourteen are disposed under the seats, seven at each side, and the remainder in the bottom of the boat under the floor. The screw is turned by an A Siemens' dynamo commutated as a motor. No gearing is used, the spindle of the armature being coupled direct on to the end of the screw shaft. The thrust block is just aft of the dynamo, which is placed under the floor in the stern sheets. It lies flat and occupies very little space. There are four brushes, two for going ahead, two for going astern, and two small lines going to a becket beside the steersman enable him at a moment's notice, by pulling one or the other, to go ahead or astern; a cylindrical switch beside him enables him to stop or go on at pleasure. This switch is graduated so that the current from forty, sixty, or eighty cells can be used at pleasure. The weight of the whole—batteries and dynamo—is about 2 tons, or as nearly as possible that of engine, boiler with water, and coal for a steam engine competent to propel her at the same speed.

This pretty launch is the very perfection of a pleasure boat; no heat, no smoke, no dust, no steam, no smell of oil, no splashing of pumps. There is no noise of any kind to be heard save the bubbling of the water from the propeller, and the faint hiss caused by the commutator rubbing against the brushes. There is no smell, and no "blacks;" and the boat will run for six hours continuously, or about forty-five miles.

During the trip to which we are referring the current passed through the dynamo was 41·22 ampères from sixty cells, the electro-motive force being 112·5 volts, and $\frac{41{\cdot}22 \times 112{\cdot}5}{746} =$ 6·21-horse power. The loss by friction, &c., must be very small, for 6 indicated horse-power could certainly not have propelled the boat at the speed she readily attained. It has long been known that the screw is an extremely wasteful propeller. It may yet be that further investigations will show that the screw is not so much to blame as the combination of screw and engines. At any rate the system of electrical propulsion opens up a new field of inquiry, because it renders possible the use of screws of extremely fine pitch revolving at a great speed. The dynamo in Mr. Yarrow's boat makes about 680 revolutions per minute. The propeller is of steel, two-bladed, 19in. diameter, and 13in. pitch. There is absolutely no vibration, and very little disturbance of the water in the wake of the boat.

No matter what may be the opinions formed concerning the utility of the electrical propeller for commercial purposes, there can be no doubt that the Electrical Power and Storage Company and their manager, Mr. Collett, and Mr. Yarrow, have together proved that the system is admirably adapted for pleasure purposes. In fact, for such work as that now done by steam launches on the Thames, the electrical system is simply perfection. The expense will be, on the whole, about that of steam; but to those who keep steam launches expense is a secondary consideration, and it must not be forgotten that a 20ft. electrical launch will afford at least as much accommodation as a 30ft. steam launch. Thus in Mr. Yarrow's boat, quite 11ft. of the best part of her would be occupied by engines and boilers. As to the supply of storage cells, that can easily be managed. Many private gentlemen could keep their own engine and dynamo on shore to do the charging, and for the rest it would suffice to establish at certain places on the banks of the river, as at Kingston, Staines, Maidenhead, &c., depôts where, during the summer season, dynamos driven by stationary engines would keep on charging batteries. By calling at any of these stations, enough power for a six hours' run could be obtained either by charging the cells in the boat direct, or by taking the run-down cells out and replacing them with charged cells.

We may add that certain very important improvements have been made in the Sellon-Volckmar accumulator, concerning which we shall have more to say. As now made they have an E.M.F. of 2·3 volts. per cell at starting, and will give five ampère-hours per pound of battery—a very admirable result.

SUNDERLAND HARBOUR.

FOR some time past it has been under contemplation to carry out works at the mouth of the river Wear to convert the port into a harbour of refuge, and, so long ago as the year 1876, the Commissioners sought the advice of Sir John Coode, and received from him a report recommending the construction of two protecting piers. The scheme has lately been revived by the Commissioners, who instructed their engineer, Mr. H. H. Wake, to prepare designs and estimates for the work on the lines laid down by Sir John Coode, and who at a meeting held last month unanimously decided to proceed at once with the improvements. The proposal involves the construction of two large piers at the mouth of the river, that on the north side extending to a distance of 2760ft., when there will be a depth of water of nearly 36ft. at high water, ordinary spring tides. The entrance to the harbour will be 500ft. wide, and the piers will enclose an area of about 55 acres. The tops of the piers it is proposed to carry up to about 10ft. above high water, the width at the coping level being 35ft., and at the base from 38ft. to 65ft. The pier heads are to be circular, and about 50ft. in diameter, and some 20ft. above high water, and it is proposed to build lighthouses on each, and to provide means of access to them in bad weather by subways formed in the hearting, which will also serve for the conveyance of all pipes. Mr. Wake has entered fully into the method of construction of the north pier, and proposes to reclaim land on the beach between the present pier and Roker Groyne by means of a concrete embankment wall. Here will be erected cement store houses, concrete mixing platforms, and machinery by which concrete will be prepared for the filling of the block moulds by Decauville's system of railway, and the concrete blocks, and the liquid concrete for the hearting, by means of large tubs. The blocks after being made will be loaded on to trollies by a 50-ton Goliath crane. The concrete blocks will be loaded into a steam hopper barge capable of carrying two 100-ton blocks. In making the concrete blocks Mr. Wake proposes that granite chips shall be largely used, and for the facings of the blocks Southampton dredge mixed with a proportion of local sea beach. The shore portion of the pier will be upon a sand and gravel bottom, and will be constructed with two side walls upon piling, strengthened by counterforts and cross walls, the spaces being filled in with hearting of small rubble and chalk, which after becoming consolidated will be covered with concrete pavement for protection from the sea. The side walls will be protected with a facing of granite blocks for the prevention of scour. At the pier head the sand and gravel is at a depth of 21ft. below low water, and the rock at a depth of 29ft. Here it is proposed to use an iron or timber caisson, built upon the shore, and floated out to its site and sunk to the surface of the rock, the interior being subsequently filled in with liquid concrete. The superstructure will be formed of heavy concrete blocks dovetailed together. In the south pier the original proposal to construct a continuous solid pier of uniform height throughout has been departed from, Mr. Wake having substituted a pier consisting of a series of buttresses connected by overhead timber work, and so formed and spaced as to counteract the tendency there otherwise would be for heavy seas to run up the harbour. The estimate of cost for the north pier has been fully entered into, and amounts to a little over £167,000. That for the south pier has been approximated, and is taken to be about £125,000. The work will occupy something like ten years in execution, and when complete will raise Sunderland to the position of a first-class port, with an entrance nearly equal in depth to that of the Tyne.

BOILERS FOR THE STEAMSHIP CLAREMONT.

WE published on page 83 of our fifty-fourth volume, engravings of the triple-cylinder engines of the steamship Claremont, constructed by Messrs. Douglass and Grant, Kirkaldy. We now give on page 50 engravings of the type of boiler used with those engines, and carrying a pressure of 150 lb. We are indebted to Mr. Taylor, the designer of the engines and boilers, for the tracings from which our engraving was prepared. It explains itself without description. An interesting letter on the economy of triple expansion engines will be found in our impression for June 1st on page 419.

SOUTH STAFFORDSHIRE MINES DRAINAGE.—The Commissioners are about to erect for the drainage of the Tipton district two of Mr. Davey's patent compound differential engines. They will probably be the most powerful pumping engines in England. One is to have 52in. and 90in. cylinders by 10ft. stroke, and the other 44in. and 76in. cylinders by 10ft. stroke. It is expected this will effect great economy, as the new engines will supersede several old and wasteful engines.

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

(*From our own Correspondent.*)

GREAT loss and much trade hurt is being wrought by the strike of ironworkers. More work than a week ago is now being done at the mills and forges; but the inconvenience which is being suffered by the industries which seek supplies of rolled iron, and which likewise depend upon the ironworks for much of their fuel, almost counterbalances this good. A not very complete effort to obtain by ballot the views of the ironworkers at the several works has resulted in the declaration of a great majority in favour of resuming at the old rate, and the giving of notice to terminate the existing sliding-scale agreement. But the masters refuse to re-open the works except at the drop.

Most work is being done in the Wolverhampton locality. Mills have likewise been started at the Round Oak Works of the Earl of Dudley, where there is enough puddled iron to supply the mills for six months. At about Tipton and Walsall also, and in East Worcestershire, sheet and bar mills are here and there running, and also numbers of the forges. But the aggregate output is insufficient to supply customers' needs. Consequently the users of galvanising sheets, of tube strips, and of bars are short of supplies, and ironmasters in Yorkshire and Lancashire and South Wales, and, indeed, Belgium, are getting orders, which, but for the strike, would have been executed hereabouts.

Engineering, fencing, and edge-tool firms, and the rest are greatly disadvantaged, and are receiving countermands through their inability to execute their orders; for the stopping of the ironworks has cut off the supply of the breezes needed by the smiths. For the breezes which are being made in the few instances in which the works are on there is fierce competition, and prices have run up to an almost unprecedented height.

A portion of the machinery is again in operation at the Monmoor works of Messrs. E. T. Wright and Sons. There on Wednesday morning a criminal attempt was made to bring the whole concern to a sudden stand. A piece of iron had during Tuesday night been thrown amongst the driving machinery outside the engine-house; and if the engineman had not promptly stopped the engine there would have been a smash which would have stopped nearly the whole of the works for some weeks. As it was, however, the result was merely the partial fracture of the driving wheel. Until a new wheel can be got in the engine is worked quietly, the engineman all the time keeping his hand upon the lever.

Happily the strike is mostly over for the present in North Staffordshire, where the bulk of the hands have resumed at the drop.

On 'Change in Wolverhampton yesterday, and in Birmingham this afternoon, there was more business transacted than at the quarterly meetings last week. But makers are still unable to promise deliveries except conditionally. Sheets were in most demand. Messrs. Knight and Co., of the Cookley Ironworks, quoted working-up sheets £11 at works, and stamping sheets £14 per ton. Tin-plates they quoted 20s. to 21s. per box for coke qualities, delivered Liverpool, and 24s. to 25s. for charcoals.

Sheets of 20 w.g., technically known as singles, rolled by the marked iron houses, were priced at—best, £8 10s. to £9; double best, £9 10s. to £10; and treble best, £11 to £11 10s. Sheets of ordinary quality of 21 to 24 w.g., produced by similar firms, were £10 to £10 10s.; and of 25 to 27 w.g., £11 10s. to £12. Sheets of 23 w.g. varied from £17 upwards.

Merchant sections of iron were in fair inquiry this afternoon, but the market was to a considerable extent disorganised, and the actual business transacted in these descriptions was not large.

Hoops of ordinary quality were quoted £6 10s. to £6 15s, marked qualities were £8, and best marked sorts, £9 10s. per ton. T-iron of ordinary quality was £7 10s. to £8, and marked sorts £9 to £10, according to repute.

Rivet iron of ordinary quality was £8 10s.; marked, £8 15s. to £9 and £9 10s.; double best ditto, £10; and double best swarf ditto, £10 10s. Marked bars remain at £8 2s. 6d. to £7 10s.; and common bars, £6 10s. to £6 5s. per ton.

Pigs remain dull. It is next to impossible to effect new sales, whether of native or foreign sorts, and deliveries under old contracts are still generally suspended. Stocks are therefore accumulating at the furnaces. It is estimated that the furnaces now blowing number forty-six. Prices range from—in actual business—60s. to 65s. for hot blast all mine pigs, 45s. to 50s. for part mines, and 42s. 6d. to 38s. 9d. for common. Northampton pigs are 45s. to 46s. 3d., and Derbyshire, 47s. 6d.

The coal trade is in a better condition this week than last, because boats are again being sent to the collieries by the ironmasters Prices, however, keep very low.

The strike of Cannock Chase colliers, which took place last Wednesday, did not, even as I anticipated, last above a couple of days. The end of the week saw the men again at work. They resumed upon receiving assurance from their leaders that they had been anticipating the reduction ever since March last, and that the men ought to accept it honourably.

The colliers' strike in North Staffordshire has now reached its tenth week, yet neither masters nor men show any disposition to give way. During the ironworkers' strike the masters have not needed coal, and now that work is being resumed at the mills and forges they will, as before, draw their main supplies from the South Yorkshire, Derbyshire, and Cannock Chase fields.

At a special meeting of the Birmingham Chamber of Commerce, on Tuesday, it was resolved:—"That in the opinion of this council the desirability of the construction of a second Suez Canal is clearly established; but that the conditions of the provisional agreement recently communicated to the House of Commons are entirely unsatisfactory, and they hope that the sanction of Parliament will not be given to the same." On the same day the Council of the Wolverhampton Chamber of Commerce declared:—"That the Council have heard with considerable regret the proposals of the Government with reference to the second Suez Canal, and trust that no steps will be taken to bind this country in respect of such proposals until the opinion of the commercial classes on so important a subject has been carefully ascertained and considered."

NOTES FROM LANCASHIRE.

(*From our own Correspondents.*)

Manchester.—Business in the iron trade of this district continues steady, without much animation, and prices are firm at full rates. Makers, both of pig and manufactured iron, are mostly comfortably off for work, and are under no necessity to offer inducements to buyers to place out orders. The prices asked by makers are, however, so far as pig iron is concerned, only paid for small lots which cannot be held back, as buyers consider it quite open to question whether present rates can be permanently maintained; whilst as regards finished iron, even the recent strike has not enabled makers, except in the case of sheets, to get up their prices, and that any upward movement in values is not regarded as probable is evidenced by the fact that manufacturers are open to book orders on the basis of the present rates.

There was a fairly good attendance at the Manchester market on Tuesday, and there seemed to be a moderate business stirring; inquiries of any weight were, however, at figures less than makers were asking, and did not find acceptance. For Lancashire pig iron delivered equal to Manchester quotations remain at 45s. for forge and 45s. 6d. for foundry less 2½, and at these figures makers are very firm. A few small sales are made, and there are moderate offers at a trifle below, which, however, are not entertained. In district brands there are still sellers who quote 44s. 10d. to 45s. 10d. less 2½ for forge and foundry Lincolnshire delivered here; there is, however, not much business offered, nor could very much

iron be bought at these figures, as they are considerably below what some makers are asking. The hematite trade continues quiet; prices are without material alteration from the basis at which they have stood for some weeks past, but only a few small orders come forward, and makers apparently are not in a position to come down further to meet buyers.

In the finished iron trade there is a moderate amount of business stirring, but any extra pressure brought into this market as the result of the Staffordshire strike is disappearing. The stoppage of the Staffordshire works has, however, had the effect of putting a moderate weight of orders into the hands of the Lancashire makers, and in most cases they are so full of work at present that they do not care to quote for prompt delivery, except to their regular customers. For sheets a brisk demand is kept up, and higher prices are being obtained, local makes delivered equal to Manchester now averaging £8 per ton; for other descriptions of iron, however, there is no very pressing inquiry, and prices are not more than maintained at £6 5s. for bars and £6 12s. to £6 15s. for hoops, delivered equal to Manchester. Merchants are quite prepared to buy forward at a little under these rates, whilst makers are open to contract on the basis of present prices.

Shipping is only moderate; there are fair orders in hand for India, chiefly in tee and angle iron, but there is still very little American trade coming forward, except in cotton tie hoops. It is, however, thought that a very slight alteration in prices would bring out considerable orders, especially for shipment to the Pacific side.

Sir Joseph Whitworth and Co., of Manchester, are completing a new 9in. 20-ton gun for the Brazilian Government. The gun, which is a breech-loader, and rifled on the Whitworth system, is constructed to fire a 400 lb. armour-piercing shell containing a bursting charge of 20 lb., and it is guaranteed to pierce armour 18in. to 20in. thick. During the past fortnight the gun has undergone a series of trials. With a charge of 160 lb. of prismatic powder a velocity of 2027ft. per second was obtained, and with the charge increased to 170 lb. a velocity of 2074ft. was obtained. This, I believe, is a higher velocity than has previously been obtained with guns of this description under similar conditions. One new feature in the gun if that the usual trunnions are dispensed with, and the gun is held in position on the carriage by means of grooves in the same manner as an ordinary shaft.

In the coal trade business continues to drag on slowly through the summer months, without any material change to record in the condition of the market. Except that for special sales concessions are in some cases made, prices are steady at late rates, with a continued very firm tone as regards business for forward delivery.

Shipping is moderately active at low prices, but freights are advancing, which is tending to check operations.

The annual meeting of the Iron Trades Employers' Association was held last week, and Mr. H. Shield, of Messrs. Fawcett, Preston, and Co., general engineers, Liverpool, was elected president for the ensuing year. The annual report which was presented gives a review of the condition and prospects of trade, which forms a suggestive contrast of the position of the employers compared with the position of the men, as set forth in their trade society reports On the one hand there are the men in full employment, at advanced wages. The other side of the picture, as it concerns the employers, is briefly set forth in the Association's report in the following paragraph:—"No question," says the report, "of unusual importance has arisen during the past year to interfere with the relationships existing between employers and their workmen. The wages question has disturbed no district where the Association has members. In 1882 the General Committee reported that, consequent upon increased activity in the engineering and iron trades of the country, there was scarcely any district in the kingdom where wages had not been advanced by employers at the request of their workmen, and that, so far as the members of the Association were concerned, the upward movement in wages had not been brought about by agitation, or strikes, or anything to produce ill-feeling between employers and workmen. The same remark may be again repeated in 1883. In districts where the engineering trade is known to be bad, and without signs of revival, wages have remained stationary. In other districts, where special branches of industry are fully active, wages have continued to advance without any disturbing influences. At the present time, except in special industries, there are signs that the engineering trades are not as flourishing as they were a year since. The margin of profit is continually growing less, and the fact is incontestable that the increased production of the last three years has not been proportionately profitable to the employer Competition is now keener than ever, and capital is of less value in industrial enterprises, because high wages have increased the cost of production to a point where profit grows less, and seems likely to fall still lower." The report was adopted, and Halifax selected as the town in which to hold the annual meeting of the society next year.

Barrow.—Little business has been done during the week in the hematite pig iron trade, and few orders have come into makers' hands. Industrially speaking, there is no diminution in activity in any of the branches of trade, and the output still remains larger than the demand, notwithstanding the fact that prices remain very low. I think this shows that makers have no desire to reduce the output, but rather to accumulate large stocks in the hope of an increase of the prices, which it is expected will soon be manifested. I hear of no variation in the prices, mixed Bessemer being still sold at 50s. per ton at mills, and No. 3 forge at 49s. per ton net at works. A steady and brisk business is being done in the steel trade, and there is no scarcity of work at either the merchant or the rail mills. The output by the works has been very much increased of late, and there is no doubt that before the end of the season there will be a still greater increase. Prices show no alteration. Ordinary heavy parcels of rails are quoted at from £4 15s. to £5 per ton at mills. Mild steel and other qualities for cutlery and general purposes are in great demand in inland towns. A very considerable business is being done in the wire trade, and as the works in this district are undergoing extensive alterations, will soon be able to largely increase the output. I can hear of very little change in the shipbuilding trade; there, however, appears to be no scarcity of orders. The new contracts which have been booked are already showing themselves, with the erection of frames and the laying of keels in the yards of the district. I believe that before long we shall have steel plates for shipbuilding purposes manufactured here, as the means whereby this article can be produced at a price making it commercially usable have been attained. A comparatively large business is being done by engineers, ironfounders, boiler-makers, and others employed in mining industries. The demand for iron ore is quiet, and the prices remain at from £9 per ton at works. Coal and coke remain steady. The shipping trade is brisk, especially in exports to foreign countries.

The fine block of buildings until recently used as a rolling stock and steel works by Mr. S. J. Claye, are, it is reported, to be opened for the manufacture of ships' plates, angles, steel tires, &c. Messrs. Caird and Massicks is the style of the new firm. They have taken over the whole concern, and will utilise the greater portion of the standing machinery, and with the addition of some new plant they will be able to compete with any firm in the trade. The services of Mr. Wolfenden, for some time in the employ of Messrs. Cammell and Co., Sheffield and Workington, have been secured as manager, and the work of laying machinery will commence at once. Barrow being a shipbuilding town, these works will prove a great boon, and no doubt as soon as they are opened will be well patronised.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

A BRISK business was done in Cleveland pig iron last week, and consumers appear more eager to buy than for some time past. The slightly advanced prices previously reported are fully maintained, and all sales made during the last few days have been on the basis of 39s. 4½d. per ton for No. 3 g.m.b. At the iron market held at Middlesbrough on Tuesday, the general quotation for No. 3 by merchants was 39s. 6d. per ton, and only very small and exceptional lots could be had at less than that figure. Most of the makers were firm at 40s. per ton, and as the shipments continue good and stocks are declining, there is no little probability that they will shortly realise that price.

Holders of warrants have become less eager to sell, and now ask from 39s. 3d. to 39s. 6d. per ton f.o.b. prompt cash.

The stock of Cleveland iron in Messrs. Connals' Middlesbrough store on Monday last was 74,776 tons, being a decrease of 34 tons for the week.

The shipments of pig iron from the Tees continue very good, the monthly total up to Monday night being nearly as high as for the previous month. The iron is for the most part going to Scotland and to Germany. The quantity shipped during July up to Monday night was 50,575 tons, against 54,902 tons sent away in the corresponding period of June, and 37,919 tons in a similar period of July, 1882. The quantity of manufactured iron and steel exported to Monday night was 10,865 tons.

A slightly increased business has recently been done in finished iron, but the new orders have only been for small quantities and for prompt delivery. Prices are the same as before, viz.:—Ship plates, £6 to £6 5s. per ton; shipbuilding angles, £5 12s. 6d. to £5 15s.; and common bars, £5 15s. to £6, all free on trucks at makers' works, cash 10th, less 2½ per cent. discount. The steel rail trade is very dull, and prices continue low.

The wages of the blast furnacemen employed by Messrs. Jones, Dunning, and Co., of Cargo Fleet, near Middlesbrough, are to be reduced 5 per cent. The men work under a sliding scale based on the selling price of pig iron.

The Whitby, Redcar, and Middlesbrough Union Railway is now complete and ready for traffic. General Hutchinson, the Board of Trade inspector, has made his final examination, and a certificate authorising the opening of the lines for both passenger and mineral traffic is expected daily. It is thought that regular traffic will commence in about a month. The railway in question was commenced in 1871, but owing to various difficulties the original company abandoned their undertaking, and nothing further was done for four or five years. The North-Eastern Railway Company then undertook to complete the work. The line runs close to the sea coast, through a district consisting of a series of hills and valleys. There are a number of tunnels, the longest being 1651 yards long, and several viaducts, the most important being 264 yards long and 150ft. high.

The Hartlepool Port and Harbour Commission have received Mr. A. M. Rendel's report as to the possibility of constructing a harbour of refuge at Hartlepool. Mr. Rendel is of opinion that the scheme is impracticable, as the ground outside that port would not afford good anchorage. He says, however, that the Tees Bay, south of the mouth of the river, is admirably suited for such a harbour, and is in every respect superior to Filey. Mr. Rendel's plan is to enclose eighty acres with an outer breakwater 11,000ft. long, and an inner pier 7500ft. long, having an entrance from the south2800ft. wide, and another from the north 1200ft. wide. He estimates the cost of the work at £1,600,000.

It is authoritatively announced that another large finished iron manufacturing company has decided to suspend operations, and lay in their works within the next three months. This step is necessitated by the present unremunerative price of ship plates, and the impossibility of avoiding loss.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE Glasgow iron market was closed from Thursday morning till Tuesday, on account of the annual fair holidays, and the amount of business done has therefore been smaller than usual. On the whole, however, the tone of the market has been favourable, and prices of warrants and of makers' iron are, so far, pretty well maintained. Since last report a furnace has been put in blast at Kinneil Ironworks, making 114 in operation, as compared with 108 at the same date last year. The past week's shipments of Scotch pig iron have amounted to 12,441 tons, as compared with 12,398 in the preceding week, and 13,136 tons in the corresponding week of 1882. In the course of the past few weeks the previous falling off in the total shipments has been made up, and the figures are now rather ahead of those at the same date last year.

Business was done in the warrant market on Tuesday forenoon at 47s. 7½d., 47s. 7d., and 47s. 8d. cash, and 47s. 9d. to 47s. 10½d. one month, the afternoon quotations being 47s. 7½d. to 47s. 6½d. cash. Business was done on Wednesday at 47s. 6d. to 47s. 5½d. cash and 47s. 7½d. one month. To-day—Thursday—business took place at 47s. 5d. to 47s. 6½d. cash and 47s. 8½d. one month.

There is not much alteration in the values of makers' iron, which are as follows:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 57s. 6d.; No. 3, 53s. 3d.; Coltness, 61s. and 53s. 6d.; Langloan, 60s. 6d. and 53s. 6d.; Summerlee, 57s. 6d. and 51s. 3d.; Chapelhall, 57s. and 54s.; Calder, 58s. and 50s. 6d.; Carnbroe, 55s. and 49s.; Clyde, 51s. and 48s. 9d.; Monkland, 49s. and 47s.; Quarter, 48s. 3d. and 46s. 3d.; Govan, at Broomielaw, 49s. and 47s.; Shotts, at Leith, 59s. 6d. and 55s.; Carron, at Grangemouth, 48s. 6d. (specially selected, 54s. 6d.) and 47s.; Kinneil, at Bo'ness, 49s. 6d. and 48s.; Glengarnock, at Ardrossan, 55s. and 48s.; Eglinton, 49s. and 46s.; and Dalmellington, 50s. and 49s.

Very little has been done this week in the malleable works or foundries, and in Glasgow and the neighbouring towns the engineering works have been closed during the entire week. The holiday has been well earned, for at most of the works the quantity of manufactured goods turned out during the past twelve months is by far the largest on record.

The coal trade continues in a satisfactory state, although like other departments, it has been affected by the holidays. In the colliery districts prices are becoming rather firmer at the pits, but it is unlikely that any material change will be experienced for the next month or six weeks. There has, of course, been less doing this week in the shipment of coals at Glasgow Harbour. Trade is very brisk in Fifeshire, and a good deal of interest has been awakened there, and indeed all through the mining districts, by a rumour that a company has been formed to purchase the Great Eastern, and employ her in the carriage of coals from the Frith of Forth to London. It is alleged that by this means the inhabitants of the metropolis could have excellent coals set down at their doors for 15s. per ton, the conductors of the enterprise at the same time realising a handsome profit. Definite information regarding the proposal will be awaited with interest. The coals despatched in the past week from Leith amounted to about 6000 tons. At Grangemouth and Bo'ness a good shipping business was likewise done.

WALES AND ADJOINING COUNTIES

(From our own Correspondent.)

THIS week the two-feet nine seam was struck at Cwmpennar, and the rejoicings are great, especially as this gives fullest assurance of the celebrated four-feet being close at hand, and the six and nine in the rear-guard. Twenty feet more or so will prove this.

There has been a ferment in the coal world since my last, Mr. Burt, M.P., having visited the Rhondda, but not accompanied, as was expected, either by Sir H. Vivian or Mr. Bradlaugh. His ovation was a warm one. It pleased the colliers to think that one of themselves, familiar with the heaving of coal, had won a position in the House of Commons, and the cheering was immense. The meeting took place at the Ton, and was attended by a great concourse—estimates at numbers varying from 15,000 to 20,000. Halliday, Abraham, Royal—house coal—Lewis, tin-plate representative, Bishop, and others, spoke at great length preceding Mr. Burt, whose rejoinder was a long and able one. The chief features of his speech were advocacy of a common union between English and Welsh collieries, and support of unionism generally. In referring to coal, Mr. Burt admitted the superiority of Welsh steam coal to that of Northumberland, a reference taken as sufficient to show that Wales had nothing to lose by connecting itself with Northumberland, as its coals would command a market. But the best points of his address were those referring to education generally, and to home education in particular. It is in the latter respect that the workmen of Wales are backward, and if Mr. Burt's views are followed out his visit to the Rhondda will not be a vain one. With reference to a union between North and South, I have no faith in the usefulness of such combinations. There can be no interest common to both but that of bringing a pressure to bear on the employer, and this past experience has shown to be injurious to all persons concerned.

The coal trade is fairly maintained, considering that we are entering upon the season when shippers and coalowners are able to take a brief holiday. Exports, like outputs, show a lessened total, and will for a time, unless foreign combinations lead to a mustering of the fleet, and a re-supply of coal stores at Mediterranean depôts. Last week's trade, however, showed that the flatness of the steam coal trade was partial, Swansea and Cardiff suffering, while Newport retained its general briskness. Best steam coal can be obtained at present for 11s.; seconds about 10s. 6d.; small steam, 4s. 6d. to 4s. 9d.

The iron industry is plodding along without much of special note to record. At Victoria a new blast furnace has been blown in with the usual pleasing ceremonies. The two furnaces are now in good working order, and will in all probability be well used; height 60ft. Blast supplied by seven tuyeres, six Cowper stoves. The blast engines, vertical, are made by Kitson and Co., Leeds; boilers of Adamson's make, Dukinfield Works, Manchester, and the steel tubes are the fast growing popular ones of Galloway and Co. The estimate is that the Victoria furnaces, which are of excellent design, will turn out 700 tons of Bessemer per week.

Rapid progress is also being made at Cyfarthfa, and the old characteristic of the Crawshays', perseverance, is being well shown, there being no limit in any respect. The cost of transformation of old ironworks to modern steelworks is well shown by the case at Victoria. The two furnaces and connections there will cost little short of £70,000.

Dowlais presents a good front, and is busy in nearly all branches, and marked improvements are also in contemplation with respect to its coke makes. The tin-plate trade is in tolerably good condition, prices firm and prospects better than they have been in the early part of last quarter. The result of the last quarter's meeting was satisfactory.

Patent fuel continues in demand, and pitwood is advancing. Bilbao ore continues a drug, and some degree of alarm has been aroused amongst holders of large stock by a remark made by Mr. Edward Williams, of Middlesbrough, at the installation of Mr. Crawshay as High Sheriff for Glamorgan. Mr. Williams was reported to say that with our new processes we were independent of foreign ore, even did a continental war break out. With the long slackness of the foreign ore trade in view, there is yet remarkable vigour in imports of this commodity. Nearly 30,000 tons a week come into the ports of Newport and Cardiff.

The Barry Dock promoters have figured in a published list, and include many inhabitants of Cardiff. The diversion of two million tons of coal per annum from Cardiff, with all the contingent benefit attending shipping agencies, &c. &c., would, one would have thought, presented a subject of gloom instead of investment to successful tradesmen and solicitors.

The "doctor's dispute" at Mountain Ash is still raging, and the colliers' agent has been dismissed by the men.

A strike exists at Gwernal Colliery, Malsycwmmer.

THE SANITARY INSTITUTE OF GREAT BRITAIN.—At the anniversary meeting of the Sanitary Institute of Great Britain, held at the Royal Institution on Thursday, July 12th, an address was delivered by W. Rassie, C.E., entitled, "The Relationship between Geology and Sanitation," and the medals and certificates were presented to the successful exhibitors at the Exhibition held at Newcastle in September, 1882.

THE SALT TRADE.—The Cheshire salt trade returns for the half-year terminating midsummer show an increase of 20,000 tons on the exports of white salt to the end of June this year, as compared with the same period last year. The exports during the first quarter of this year were 61,000 tons less than in the corresponding period last year; consequently the revival of trade has been extraordinary during April, May, and June. During last June, 121,720 tons of salt were exported from the Mersey, against 115,372 tons during June, 1882. Among our largest customers in June were the United States, which purchased 13,095 tons, British North America 13,350, and East India 23,314. The demand for salt in the States is constantly growing. The exports, regarded as a whole, have only been exceeded thrice during the last ten years.

FILTERING DISTILLED WATER.—Herr Eiselt recommends in the *Neuste Erfahrungen* the use of sponge for filtering distilled water. The filtration goes on with great rapidity, and the product is clear as crystal. When filtered through paper, distilled water soon exhibits a *felty* sediment, which is never formed when filtered through sponge, so that the bottles scarcely need cleaning after several months' use. The apparatus that he employs consists of a bottle with an opening near the bottom from which descends a bent glass tube. This tube is about 6in. long and 1in. or 1½in. in diameter; at each end is a perforated rubber stopper bearing a narrower glass tube. The wide tube contains one or two long strips of fine sponge that has been cleaned with dilute hydrochloric acid and then dried. The bottle to which this filter is attached must not be larger than the one placed beneath to catch the filtrate. The sponge, of course, must be cleaned every few months.

AGRICULTURE IN CANADA.—The report of the Minister of Agriculture of Canada for the year 1882 has been presented to the Dominion Parliament. There was a large increase in the number of pure-bred cattle imported as compared with previous years, the number being—cattle, 1215; sheep, 1124; swine, 1122. The exports of stock in 1882 were 62,106 cattle, 311,659 sheep, 20,920 horses. The figures in 1881 were 62,277 cattle, 354,155 sheep, 21,993 horses. It may be mentioned that 16,145 cattle went to the United States, and the remainder came principally to Great Britain. The value of the sheep exported represents about 1,400,000 dols. The export of phosphate of lime has largely increased; the quantity in 1878 was 7301 tons, and in 1882 17,181 tons. The cost of mining and transportation is stated to be 8 dols. a ton, and the mineral sells readily in Montreal at from 17 dols. to 20 dols. a ton. It principally comes from the Ottawa district, which is attracting the attention of capitalists at the present time. The patents granted in 1882 were 2137, as against 1732 in 1881. Of these 1633 were granted for five years, 26 for ten years, and 187 for fifteen years. The total arrivals in Canada for the year are stated to have been 193,150, of whom 112,458 were *bonâ fide* settlers for Canada. These figures include 12,862 representing the emigration to British Columbia. The total emigration to Manitoba and the North-West for the year is stated to have been from all parts 70,532, of whom 13,325 were from the United States. It is stated that the emigrants in 1882 had money and property with them exceeding 3,000,000 dols., besides a large amount unascertained taken to Manitoba, which it is impossible to approximate. The number of men arriving in Canada *viâ* United States ports is returned at 12,793. The agents of the Government report that they had no difficulty in placing all the emigrants that arrived.

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.

10th July, 1883.

3398. GAS GENERATORS, H. P. Holt, Manchester.
3399. DOOR FASTENINGS, F. Newman, Ryde.
3400. OILING HEMP, &c., A. V. Newton.—(*J. Good, B ooklyn, U.S.*)
3401. LOCK NUTS, A. M. Clark.—(*B. S. Crocker and W. H. Hill, Topeka, and A. Monroe, Lawrence, U.S.*)
3402. STEAM BOILERS, A. H. B. Sharps, Lincoln.
3403. REFINING SUGAR, C. E. V. Haesendonck, Brussels.
3404. LOADING VESSELS from LIGHTERS, T. E. Heath, Northlands.
3405. TRICYCLES, J. M. M. Viney, Birmingham.
3406. TREATING GAS, J. E. Dowson, London.
3407. GRINDING GLASS TUMBLERS, W. R. Lake.—(*O. W. Minard, Johnsville, Pennsylvania, U.S.*)
3408. PORTABLE OVENS, J. H. Johnson.—(*L. Dathis, Paris.*)
3409 KNEADING DOUGH, J. H. Johnson.—(*L. Dathis, Paris*)
3410. INDIA-RUBBER SPRINGS, G. Spencer, London.
3411. BREECH-LOADING REPEATING FIRE-ARMS, G. Baron de Overbeck. London.
3412. MAKING REEDS, W. R. Lake.—(*M. Bray, Newton, Massachusetts, U.S.*)

11th July, 1883.

3413. ELECTRIC INSULATION, W. V. Wilson, London.
3414. COUPLING DEVICE for REINS, &c., J. Nicholls, Penzance.
3415. HOOPS for CANNONS, &c., W. Brierley.—(*La Société Anonyme des Aciéres et Forges de Firminy, Paris.*)
3416. POINTS for TRAMWAYS, P. U. Askham, Sheffield.
3417. STEAM BOILER TUBES, T. Riley, London.
3418. SCHOOL DESKS, T. Laurie, London.
3419. CARPETS, T. Tempest-Radford, Kidderminster.
3420. ARTIST'S COMBINED EASEL and SEAT, H. F. H. Newington, Ticehurst.
3421. ALLOYS of TUNGSTEN, F. W. Martino, Sheffield.
3422. FIXING COLOURS on FABRICS, A. Kirk, Halifax.
3423. APPLYING ELECTRICITY, J. N. Aronson, London.

12th July, 1883.

3424. GALVANIC BATTERIES, J. Gray, Gateshead.
3425. CIGARETTES, F. Hipgrave, London
3426. COMBING WOOL, &c, J. H. Whitehead.—(*A. Prouvost, France.*)
3427. DRYING, &c., GRAIN, E Keighley, Scarborough.
3428. STEAM BOILERS, J. Burlinson, Sunderland.
3429. STOPPERING BOTTLES, J. Sceats, Norbiton.
3430. DETACHING GEAR for SHIPS' BOATS, R. Hudson, Blyth.
3431. CONTROLLING the SPEED of CARRIAGES, L. J. de Mesmacker, Brussels.
3432. VELOCIPEDES, F. W. Jones, Exeter.
3433. WORKING RAILWAY POINTS, W. Buck, London.
3434. ATTACHING LABELS to ENDS of ROLLS of DRAWINGS, H. N. Maynard and H. G. Cooke.
3435. BLEACHING OZOKERIT, J. Imray.—(*J. C. O. Chemin, Paris.*)
3436. VENT PEGS, W. E. T. Dawson, London.
3437. MALTOSE, J. Imray.—(*L. Cuisinier, Paris.*)
3438. PLASTER of PARIS, J. Thomlinson, Carlisle.
3439. LOOMS for WEAVING, T. Hanson, Bradford.
3440. COATING METAL PLATES with TIN, &c., T. James, Morriston.
3441. MATCH-BOXES, P. Jensen.—(*F. Lundgreen, Stockholm.*)
3442. LOOMS for WEAVING, J. S. Park, Stockport, and J. Park, Manchester.
3443. MOVABLE GUIDE WHEEL, A. J. Boult.—(*J. M. Terras, France.*)

13th July, 1883.

3444. ELECTRIC LIGHTING APPARATUS, J. Clerc, London.
3445. PLANTING POTATOES, W. Dewar, Dundee.
3446. MARQUETRY PARQUET, G. Howard, London.
3447. VACUUM BOXES, H. Marsden and H. Schofield, Sheffield.
3448. PICKERS, J. Holding, Lancaster.
3449. COUPLING, &c., RAILWAY CARRIAGES, J. Darling, Glasgow.
3450. FLOWER-HOLDING BROOCHES, &c., D. MacGregor, Perth, N.B.
3451. ELECTRIC BATTERIES, P. de Villiers and E. F. Rey, London.
3452. SECONDARY BATTERIES, F. M. Lyte, London.
3453. BOTTLES, J. H. Lindsey, London.
3454. SOAP, B. Seeman, Bromley.
3455. TIN CANS, &c., J. Maconochie, Lowestoft.
3456. SEWING, &c., MACHINES, W. E. Gedge.—(*E. Cornely, Paris.*)
3457. ELECTRIC MACHINES, W. S. Frost, London.
3458. PORTABLE PLATFORM for SHEEP, J. Hornby, Watton.
3459. VOLTAIC BATTERIES, A. Clark, Glasgow.
3460. STEAM GENERATORS, C. C. S. Knap, London.
3461. GLOVE FASTENINGS, &c., F. Baker, Birmingham.
3462. CYLINDERS for PICKING MACHINES, W. R. Lake.—(*F. G. and A. C. Sargent, Granitville, U.S.*)
3463. BAKERS' OVENS, R. A. Gilson and W. J. Booer, London.
3464. ELECTRIC CURRENT SWITCHES, H. J. Haddan.—(*C. G. Perkins, New York, U.S.*)
3465. ELECTRIC INCANDESCENT LAMPS, H. J. Haddan.—(*C. G. Perkins, New York, U.S.*)
3466. TREATING CARBON FILAMENTS, H. J. Haddan.—(*C. G. Perkins, New York, U.S.*)
3467. GRATES, H. J. Haddan.—(*E. Breslauer, Berlin.*)
3468. SPANNERS, H. J. Haddan.—(*G. Gontier, France.*)
3469. CORD FASTENER for WINDOW BLINDS, H. J. Haddan.—(*D. W. Ernsting, Germany*)
3470. STORE SERVICE APPARATUS, H. J. Haddan.—(*H. H. Hayden, New York, U.S.*)
3471. FASTENINGS for the HAMES of HORSES, F. B. Goodman.—(*F. O. Minor, New Orleans, U.S.*)
3472. BOOTS and SHOES, H. and E. Lulham, Brighton
3473. DYEING SEAMS of GLOVES, A. M. Clark.—(*E. F. Peyre, Paris.*)
3474. SAFETY VALVES, J. H. Johnson.—(*Messieurs Lethuillier and Pinel, France.*)
3475. RECORDING a SUPPLY of ELECTRICITY, J. Hopkinson, London.

14th July, 1883.

3476. PRODUCING DESIGNS upon PAPER, &c., R. Brown, R. W. Barnes, and J. Bell, Liverpool.
3477. FASTENINGS for PURSES, &c., A. M. Clark.—(*Alexandre and Company, Paris.*)
3478. CONNECTING, &c., CONDUCTORS of ELECTRIC CURRENTS, C. A. C. Wilson, London.
3479. SUBAQUEOUS STRUCTURES, W. J. Bentley, Leeds.
3480. RECEPTION, &c., of HOUSE REFUSE, W. K. Sidgwick.—(*G. A. Sidgwick, Colorado, U.S.*)
3481. GOVERNING the FLOW of GASES from GASHOLDERS, J. Lewis, Brockley.
3482. BICYCLE ALARMS, W. A. Rudling and J. F. Coffin, Southsea.
3483. SCREENING COAL, R. D. Thomson, Motherwell.

16th July, 1883.

3484. NOISELESS TIRES for CARRIAGE WHEELS, W. H. Carmont, Manchester.
3485. SOAP TABLETS, G. H. Ellis, London.
3486. VALVES, J. Krogg, Halle-on-the-Saale.
3487. SOLDERING JOINTS of WIRE, &c., J. T. Neighbour, London,
3488. WATER-CLOSETS, &c., J. Fairbairn, Edinburgh.
3489. SHEARS, J. Seligman.—(*G. Josephs, Philadelphia, U.S.*)
3490. INDICATING LEVEL for ARTIFICERS, A. J. Boult.—(*H. W. Knieper, Berlin.*)
3491. BLUE COLOURING MATTERS, H. J. Haddan.—(*Lembach and Schleicher, Germany.*)
3492. RAISING SUNKEN VESSELS, H. J. Haddan.—(*G. A. Kessel, Berlin.*)
493. BATTERY GUNS, H. S. Maxim, London.
3494. BEARINGS for AXLE JOURNALS, H. H. Lake.—(*G. W. Stewart, Atalanta, U.S.*)
3495. CHEMICAL DEPOSIT CURRENT METERS, Sir D Salomone, Broomhill.
3496. REGISTERING APPARATUS, H. H. Lake.—(*G. Marzari, Italy.*)
3497. LAND-ROLL, E. Otto, G. Peisker, and A. Rittner, Prussia.
3498. COLOURING MATTER, F. Wirth.—(*H. Baum, Germany.*)

Inventions Protected for Six Months on Deposit of Complete Specifications.

3391. CARBURETTERS, H. J. Haddan, Kensington, London.—A communication from W. M. Jackson, Providence, U.S.—*9th July*, 1883.
3397. DEFECATING or CLARIFYING SACCHARINE LIQUORS, H. H. Lake, London.—A communication from Henry A. Hughes, Camden, New Jersey, U.S.—*9th July*, 1883.
3401. LOCK NUTS and SCREW BOLTS, A. M. Clark, London.—A communication from B. S. Crocker and W. H. Hill, Topeka, and A. Monroe, Lawrence, U.S. —*10th July*, 1883.
3412. REED and REED PLATES, W. R. Lake, London.—A communication from M. Bray, Newton, Massachusetts, U.S —*10th July*, 1883.
3446. MARQUETERY PARQUET, G. Howard, London.—*13th July*, 1883.
473. DYEING SEAMS of GLOVES. A. M. Clark, London. —A communication from E. F. Peyre, Paris.—*13th July*, 1883.

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

2818. ARTIFICIAL HATCHING of CHICKENS, H. Tomlinson, Warwick.—*9th July*, 1880.
2821. DISPLAYING CLOTHING in SHOP WINDOWS, F. McIlvenna, Liverpool.—*9th July*, 1880.
2986. RING FRAME BOBBINS, H. Southwell, Rochdale. —*20th July*, 1880.
2848. PLANING WOOD, S. S. Hazeland, Cornwall.—*10th July*, 1880.
2875. PULVERULENT PREPARATIONS of PHOSPHORIC ACID, J. H. Johnson, London.—*12th July*, 1880.
2902. REFINING SUGAR, B. H. Remmers and J. Williamson, Glasgow.—*14th July*, 1880.
2870. WHEELED VEHICLES, J. Wood, Burnley.—*12th July*, 1880.
2899. TREATING and UTILISING FUEL, W. Gorman, Glasgow.—*14th July*, 1880.
2911. MATCH-BOXES, M. Wiberg, Stockholm.—*14th July*, 1880.
2913. FRAMES of DOUBLE SKEPS or BUCKETS, G. Allix, Isle of Dogs —*14th July*, 1880.
3010. KNITTED FABRICS, J. Cresswell, Leicester.—*22nd July*, 1880.
3140. GAS ENGINES, H. H. Lake, London.—*30th July*, 1880.
3259. CONTINUOUS AUTOMATIC BRAKES, W. L. Wise, London.—*9th August*, 1880.
2872. WINDOW FRAMES, W. Wilson, Liverpool.—*12th July*, 1880.
2907. WATER GAUGES for BOILERS, J. Ellis, London.— *14th July*, 1880.
2916. GOVERNING APPARATUS, J. Coutts and H. Adamson, Liverpool —*15th July*, 1880.
2905. SPRINGS for RAILWAY CARRIAGE SEATS, G. D. Peters, London.—*14th July*, 1880.
2914. CHEMICALS for PURIFYING VITIATED AIR, R. Neale, London.—*15th July*, 1880.
2996. SEWING MACHINES, J. H. Johnson, London.— *21st July*, 1880.
2923. ORDNANCE and FIRE-ARMS, W. Hope and R. S. Ripley, London.—*15th July*, 1880.
2975. OXIDISED OIL, F. Walton, Twickenham.—*19th July*. 1880.
2976. HOLLOW ARTICLES, F. Walton, Twickenham.— *19th July*, 1880.

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

2849. TOBACCO-CUTTING MACHINES, R. Legg, London.— *12th July*, 1876.
2823. REAPING and MOWING MACHINES, W. J. and C. T. Burgess, Brentwood.—*11th July*, 1876.
2825. MALTING, H. B. Barlow, Manchester.—*11th July*, 1876.
2813. LAMPS, &c., E. A. Rippingille, London.—*11th July*, 1876.
2901. PREVENTING the FORMATION of ICE in HOT-WATER APPARATUS DURING FROST when not in USE, W. Stainton, London.—*15th July*, 1876.
2874. DECORATIVE, &c., PRINTING, J. E. Jefferies, Bristol.—*13th July*, 1876.

Notices of Intention to Proceed with Applications.

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

1178. BOXES for TEA, &c., C. Cheswright, London.—*5th March*, 1883.
1220. INGOT MOULDS, S. Rideal, Manchester. —*7th March*, 1883.
1223. DYEING LOOSE COTTON BLACK, G. W. von Nawrocki, Berlin.—A communication from G. Jagenburg.—*7th March*, 1883.
1227. STEAM GENERATORS, R. G. Rodham, London.— *7th March*, 1883.
1228. SCREW GILL BOXES, G. W. Douglas, Bradford.— *7th March*, 1883.
1232. TRAMWAYS, E. F. Roberts, London.—*7th March*, 1883.
1241. MULTITUBULAR STEAM BOILERS, E. Edwards, London.—A com. from J. J. Godot.—*7th March*, 1883.
1242. PREVENTING the DEPOSIT of SAND, &c., in RIVERS, W. R. Lake, London.—A communication from H. E. Hargreaves.—*7th March*, 1883.
1247. SHARPENING PENCILS, J. Darling, Glasgow.—*8th March*, 1883.
1258. ELECTRIC SIGNALLING APPARATUS, W. J. Brewer, London.—*8th March*, 1883.
1251. STEEL OPEN HEARTH SHOVELS, T. Sidaway, Brierley Hill.—*8th March*, 1883.
1263. UMBRELLAS, H. Hughes, Liverpool.—A communication from R. Williams.—*9th March*, 1883.
1274. SLEEPERS, &c., A. J. Boult, London. —A communication from P. Dietrich.—*9th March*, 1883.
1283. ADJUSTABLE SPANNERS, C. Niel, Sheffield.—*10th March*, 1883.
1284. BLOCKS for FUEL, L. Blackburn and J. G. Elliott, London.—*10th March*, 1883.
1286 BOOKS for ADVERTISING, R. Ripley, Liverpool.— *10th March*, 1883.
1287. KALEIDOSCOPIC TOPS, A. A. King, London.—*10th March*, 1883.
1290. TELEPHONIC APPARATUS, G. H. Bassano, A. E Slater, and F. T. Hollins, Derby.—*10th March*, 1883.
1300. HACKLING MACHINES, J. C. Mewburn, London.— A communication from J. Cardon.—*12th March*, 1883.
1301. FORMING CAST METAL SOCKETS, R. Clayton, Deepfields, near Bilston.—*12th March*, 1883.
1307. LOOMS for WEAVING, T. Hollingworth, Blackburn. —*12th March*, 1883.
1311. STEAM and AIR ENGINES, H. H. Lake, London.— A com. from F. McMellon.—*12th March*, 1883.
1325. HYDRAULIC LIFTS, W. H. Johnson, London.—*13th March*, 1883.
1341. LUBRICATORS, W. R. Lake, London.—A com. from H. R. Randall and C. G Till.—*13th March*, 1883.
1412. LATHE CHUCKS, W. R. Lake, London.—A com. from A. B. Wadsworth.—*16th March*, 1883.
1430. GALVANIC BATTERIES, J. B. Hannay, Glasgow.— *19th March*, 1883.
1515 BREECH-LOADING SMALL-ARMS, H. Tolley, Birmingham.—*22nd March*, 1883.
1595. FEED-WATER HEATERS, J. Withinshaw, Birmingham —*29th March*, 1883.
1620. VOLTAIC ARC LAMPS, B. J. B. Mills, London —A communication from O. A. Moses.—*31st March*, 1883.
1702. STARTING TRAM-CARS, B. J. B. Mills, London.—A communication from P. B Shaw.—*4th April*, 1883.
1753. ELECTRIC ARC LAMPS, J. T. King, London.—A communication from J. R. Finney.—*7th April*, 1883.
1770. BOTTLE STOPPERS, W. R. Lake, London.—A communication from C. G. Hutchinson.—*7th April*, 1883.
1829. ELECTRICAL SIGNALLING APPARATUS, B. J. B. Mills, London.—A communication from J. U. Mackenzie.—*11th April*, 1883.
1947. HAND-WEAVING DEVICES, E. Wernicke, Berlin.— *17th April*, 1883.
2107. FLEECE DIVIDERS, C. Pieper, Berlin.—A communication from G. Josephy's Erben.—*26th April*, 1883.
2333. EVAPORATING SALT BRINE, W. T. Whiteman, London.—A com. from H. Frasch.—*8th May*, 1883.
2492. GAS MOTOR ENGINES, G. G. Picking and W. Hopkins, London.—*18th May*, 1883.
2573. POROUS, &c., PLATES, F. T. Williams and J. C. Howell, Llanelly.—*23rd May*, 1883.
2600. TRAMWAYS, A. H. Rowan, London.—*24th May*, 1883.
2752 STEAM ENGINES, W. Watson, Leeds.—*2nd June*, 1883.
2756. GLASS SYRINGES, E. C. Williams, London.—*2nd June*, 1883.
2818. MOULDING CORSETS, A. Grant, Landport. —*6th June*, 1883.
2921. ROOFING TILES, C. Major, Bridgwater.—*12th June*, 1883.
2925. OBTAINING MOTIVE POWER, A. W. L. Reddie, London.—A communication from T. McM. Wilson. —*12th June*, 1883.
2939. COLOUR BOXES, C. Davis, London.—*13th June*, 1883.
2992. PLATE ROLLING MILLS, C. Davy, Sheffield.—*15th June*, 1883.

(*Last day for filing opposition*, *7th August*, 1883.)

1297. BRAIDING MACHINES, W. Ashton, Manchester.— *12th March*, 1883.
1298. CARRYING, &c., WIRES, R. Longdon and F. B. Welch, Manchester.—*12th March*, 1883.
1299. CIGAR CASES, F. McD. Robertson and J. E. Cousté, London.—*12th March*, 1883
1302. FASTENINGS for DOORS, R. Whiston, Wolverhampton.—*12th March*, 1883.
1306. SPINNING FIBRES, E. Morley, Halifax. —*12th March*, 1883.
1317. HANDLES for VALVES of CLOSETS, J. Harsant, Wandsworth. —*13th March*, 1883.
1318. CONDENSING WOOL, J. Wilkinson, Yeadon.—*13th March*, 1883.
1329. RAILWAY FROGS, H. J. Haddan, London.—A communication from W. J. Morden.—*13th March*, 1883.
1335. CENTRIFUGAL SEPARATING MACHINES, F. H. F. Engel, Hamburg.—A communication from H. Petersen and W. Ritter.—*13th March*, 1883.
1343. CUTTING PAPER, W. R. Lake, London.—A communication from O. Lelm —*13th March*, 1883.
1346. AIR PUMPS, T. Wirth, Frankfort-on-the-Maine.— Com. from H. and J. F. Beins.—*13th March*, 1883.
1354. FACILITATING TRAM-CARS passing POINTS, J. Rettie, London.—*13th March*, 1883.
1359. POLE END FITTINGS for VEHICLES, R. Hill and W. Pollitt, Heywood.—*14th March*, 1883.
1362. COLOURING MATTERS, C. D. Abel, London —A communication from Actien Gesellschaft für Anilin-Fabrikation.—*14th March*, 1883.
1365. SEATS and BACKS of CHAIRS, H. J. Haddan, London.—A com. from R. Schimmel.—*14th March*, 1883.
1372. GLAZED STRUCTURES, J. E. and F. B. Rendle, London.—*14th March*, 1883.
1376. WOOD-WORKING MACHINERY, E. Cory, Barnes.— *15th March*, 1883.
1379. EMERY WHEEL, T. West, Bromley-by-Bow.—*15th March*, 1883.
1386. HOLDING BRACES to TROUSERS, N. P. Davison, London.—*15th March*, 1883.
1387. PERAMBULATORS, W. H. Brassington, Manchester. —*15th March*, 1883.
1392. SACK LIFTERS, T. and A. Lewis, Kettering.—*15th March*, 1883.
1393. LOOPED FABRICS, H. H. Lake, London.—A com. from La Société Couturat and Cie.—*15th March*, 1883.
1400. STUD or BUTTON for FASTENING the ENDS of BALE BANDS, R. Benwell, Alexandria.—*16th March*, 1883.
1409. LOADING SHIPS with PATENT FUEL, S. Butler, Cardiff.—*16th March*, 1883.
1410. CARRIAGES, R. Spence, jun., Richmond.—*16th March*, 1883.
1417. VENTILATING APPARATUS, R. H. Brandon, Paris. —A com. from Prince J. d'Aragon.—*17th March*,1883.
1418. FINISHING LACE, L. Lindley, Nottingham.—*17th March*, 1883.
1441. MUSICAL INSTRUMENT, P. M. Justice, London.—A communication from J. Albert.—*19th March*, 1883.
1478. LAWN TENNIS BOOTS, W. H. Stevens, Leicester.— *21st March*, 1683.
1507. CLEANING TOBACCO PIPES, S. Grafton, Birmingham.—*22nd March*, 1883.
1520. STEAM BOILER FURNACES, S. Schuman, Glasgow. —*22nd March*, 1883.
1559. AUTOMATICALLY OPENING, &c., DOORS, J. Stones, Ulverstone, and T. Kirby, Barrow-in-Furness.—*27th March*, 1883.
1594. OIL LAMPS, A. Chamberlain and G. Hookham, Birmingham.—*29th March*, 1883.
1736. DYNAMO-ELECTRIC MACHINES, M. Deprez, Paris.— *6th April*, 1883.
1737. TRANSFORMING ELECTRIC CURRENTS, M. Deprez, Paris.—*6th April*, 1883.
1822. HOSE PIPES, J. C. Merryweather, Greenwich.— *10th April*, 1883.
1900. TEMPERING NEEDLES, V. Milward, Redditch.— *14th April*, 1883.
2332. SHEDS for PROTECTING RICKS, T. Colby, Pantyderi Blaenffos.—*8th May*, 1883.
2491. EXPANSION VALVE GEAR, W. E. Rich, London.— *18th May*, 1883.
2582. REFINING FULLER'S EARTH, C. R. Dames, Bath.— *23rd May*, 1883.
2638. WOOD SCREWS, H. J. G. Halström, Köping, Sweden.—*28th May*, 1883.
2819. FASTENERS for BUTTONS, W. R. Lake, London.—A communication from S. L. Pratt.—*6th June*, 1883.
2991. PROTECTING IRON and STEEL SURFACES, A. S. Bower, St. Neots.—*15th June*. 1883.
3053. ANTISEPTIC FLUIDS, B. Nickels, London.—*20th June*, 1883.
3063. IMPROVED FLY-WHEEL, H. Blank, Berlin.—*20th June*. 1883.
3066. GAS MOTOR ENGINES, C. H. Andrew, Stockport. —*20th June*, 1883.
3068. HEATING, &c., FEED-WATER, W. Baragwanath, Chicago, U.S.—*20th June*, 1883.
3299. PRESERVING ENSILAGE, W. R. Lake, London.—A communication from S. M. Colcord.—*3rd July*, 1883.
3302. TELEPHONIC APPARATUS, W. R. Lake, London.— A communication from H. Clay.—*3rd July*, 1883.
3401. LOCK-NUTS, A. M. Clark, London.—A com. from B. Crocker, W. Hill, and A. Monroe.—*10th July*, 1883.
3446. MARQUETRY PARQUET, G. Howard, London.— *13th July*, 1883.

Patents Sealed.

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

20. BOOTS and SHOES, H. H. Lake, London.—*1st January*, 1883.
245. ANTI-FOULING and PRESERVING COMPOSITION, J. H. Barry, London.—*16th January*, 1883.
258. STRAIN GOVERNOR, J. Munro, West Croydon.— *16th January*, 1883.
268. MAKING CHAINS, W. Ralston, Manchester.—*17th January*, 1883.
270. STAMPING LETTERS, A. Hoster, London.—*17th January*, 1883.
280. BRICKS, &c., J. H. Starling, Erith, and E. A. May, Belvedere.—*17th January*, 1883.
283. FITTING SCREW PROPELLERS, A. Morris, London. —*17th January*, 1883.
291. CORSETS, H. C. Leprince, Paris.—*18th January*, 1883.
295. TREATING YARNS, W. T. Glover and G. F. James, Manchester.—*18th January*, 1883.
376. MAKING FLAGS, FLATTENING STONES, &c., W. D. Herman, St. Helens.—*23rd January*, 1883.
395. RAILWAYS, P. Jensen, London.—*24th January*, 1883.
396. PULPING COFFEE BERRIES, W. Walker, London.— *24th January*, 1883.
447. SCREW SWAGING MACHINES, F. J. Cheesbrough, Liverpool.—*27th January*, 1883.
448. SCREW SWEDGING MACHINES, F. J. Cheesbrough, Liverpool.—*27th January*, 1883.
459. SELF-ACTING COUPLINGS, W. Stableford, Oldbury. —*27th January*, 1883.
565. METALLIC BEDSTEADS, H. Ferrer, Balsall Heath.— *1st February*, 1883.
700. RAILWAY CHAIRS, J. Lindley, Walkley.—*8th February*, 1883.
1155. IMITATION "GUIPURE D'ART" LACE, A. Mosley, Nottingham.—*3rd March*, 1883.
1163. TREATMENT of PULMONARY AFFECTIONS, J. T. Dann.—*5th March*, 1883.
1231. AUTOMATIC MUSICAL INSTRUMENT, M. A. Wier, London.—*7th March*, 1883.
16 3. ELECTRIC ARC LAMPS, F. M. Newton, Belfast.— *31st March*, 1883.
1687. COUPLINGS, S. Roberts, Tunbridge Wells.—*4th April*, 1883.
1806. COMBING MACHINES, J. C. Walker, Shipley.—*10th April*, 1883.
1924. ELECTRICAL HEATING, J S. Sellon, London, and R. P. Sellon, Surbiton.—*16th April*, 1883.
2080. CLEANING the FILTERING MEDIA of FILTERS, J. E. Hodgkin and E Perrett, London.—*24th April*, 1883.
2545. DENTISTRY, S. Pitt, Sutton.—*22nd May*, 1883.
2561. OPERATING GAS ENGINES, L. H. Nash, Brooklyn, U.S.—*22nd May*, 1883.

(*List of Letters Patent which passed the Great Seal on the 17th July*, 1883.)

212. SUBSTITUTES for GUTTA-PERCHA, M. Zingler, London.—*15th January*, 1883.
320. STEAM BOILER FURNACES, B. Harlow, Macclesfield. —*19th January*, 1883.
321. SWITCH for INCREASING the STRENGTH of ELECTRIC CURRENTS, F. Mori, Leeds —*19th January*, 1883.
322. ELECTRIC ARC LAMPS, F. Mori, Leeds.—*19th January*, 1883.
324. SECURING CORKS in BOTTLES, R. L. Howard, Luton.—*19th January*, 1883.
326. GAS ENGINES, C. T. Linford and W. E. Cooke, Birmingham.—*19th January*, 1883.
329. STEAM BOILERS, J. W. Boulton, Ashton-under-Lyne.—*20th January*, 1883.
331. COUPLING RAILWAY CARRIAGES, J. Darling, Glasgow.—*20th January*, 1883.
333 FOOT MATS, E. P. Alexander, London.—*20th January*, 1883.
335. DISTILLING COAL SHALE, B. P. Walker, Birmingham, and J. A. B. Bennett, King's Heath.—*20th January*, 1883.
342 COUPLINGS of RAILWAY WAGONS, F. Attock, Newton Heath.—*20th January*, 1883.
347. APPLIANCES for the GAME of CRICKET, G. G. Bussey, Peckham.—*20th January*, 1883.
359. FASTENINGS for STAY BUSKS, F. R. Baker, Birmingham.—*22nd January*, 1883.
387. VENTILATING SEWERS, G. F. Harrington, Ryde.— *24th January*, 1883.
399. COATING for WATERPROOFING, L. A. Groth, London.—*24th January*, 1883.
419. BARRELS or CASKS, F. Myers, London.—*25th January*, 1883.
430. STRINGING PIANOFORTES, C. F. Southack, London. —*26th January*, 1883.
433. AIR EXTRACTING APPARATUS, T. Rowan, London. —*26th January*, 1883.
471. REVOLVING FLAT CARDING ENGINES, J. M. Hetherington, Manchester.—*29th January*, 1883.
505. ATTACHMENTS for BRACKETS, &c., J. H. Norrington, Harlesden —*30th January*, 1883.
522. DESICCATED EGG, H. J. Allison, London.—*31st January*, 1883.
523. FOLDING BEDSTEADS, A. Hodgson, London.—*31st January*, 1883.
558. MARINE BOILERS, C. H. Ziese, Elbing.—*1st February*, 1883.
598. GALVANIC BATTERIES, H. Thame, Battersea.—*3rd February*, 1883.
753. SAWING, &c., STONE, J. H. Johnson, London.— *10th February*, 1883.
756. GUN CARRIAGES, A. Noble, Newcastle-upon-Tyne. —*10th February*, 1883.
824. EXTENSIBLE FIRE-ESCAPE LADDERS, A. M. Clark, London.—*14th February*, 1883.
867. GENERATING ELECTRICITY, F. M. Newton, Belfast. —*16th February*, 1883.
1089. MAKING-UP the LEGS of TROUSERS, C. Wills, Bristol.—*28th February*, 1883.
1239. FRESH AIR INJECTORS, S. Low, London.—*7th March*, 1883.
1296. CRUSHING SUGAR CANES, A. S. Brindley, New Radford, & J. Worsnop, London.—*12th March*, 1883.
1422. CURE of FOOT-AND-MOUTH DISEASE, G. Jeanes, Clapham.—*17th March*, 1883.
2077. VEHICLES, E. Newman, Burnham.—*24th April*, 1883.
2088. CARPETS, &c., H. Fawcett, Kidderminster.—*24th April*, 1883.
2166. LUBRICATORS, C. H. Andrew, Stockport.—*28th April*, 1883.
2194. RAILROAD BRAKE APPARATUS, B. J. B. Mills, London.—*1st May*, 1883.
2202. UMBRELLA FRAMES, J. Willis, Bournemouth.— *1st May*, 1883.

List of Specifications published during the week ending July 14th, 1883.

5449, 2d.; 5513, 2d.; 5523, 2d.; 5534, 2d.; 5544, 2d.; 5552, 2d.; 5553, 2d ; 5560, 2d.; 5568, 4d.; 5573, 6d.; 5574, 2d.; 5576, 2d.; 5577, 2d.; 5578, 4d.; 5579, 2d.; 5584, 6d.; 5586, 2d ; 5588, 2d.; 5589, 2d.; 5590, 2d.; 5591, 6d ; 5592, 6d.; 5593, 6d.; 5594, 6d.; 5595, 6d.; 5596, 4d.; 5597, 2d.; 5598, 6d.; 5600, 2d.; 5602, 2d.; 5603, 8d.; 5604, 4d ; 5606, 8d.; 5607, 6d.; 5608, 6d.; 5609, 6d.; 5612, 2d.; 5613, 2d.; 5614, 2d.; 5615, 8d.; 5616, 6d.; 5620, 2d.; 5621, 6d.; 5622, 6d.; 5626, 6d.; 5627, 4d.; 5628, 6d.; 5629, 2d.; 5630, 6d.; 5631, 6d.; 5632, 2d.; 5633, 8d.; 5634, 6d.; 5635, 4d.; 5636, 2d.; 5637, 6d.; 5638, 6d.; 5639, 8d.; 5640, 2d.; 5641, 6d.; 5643, 6d.; 5644, 2d.; 5645, 8d.; 5646, 2d.; 5648, 10d.; 5649, 8d.; 5650, 2d.; 5651, 2d.; 5652, 2d ; 5653, 6d.; 5657, 6d.; 5658, 10d.; 5659, 6d.; 5660, 2d.; 5661, 6d ; 5662, 4d.; 5663, 4d.; 5666, 2d.; 5667, 6d ; 5668, 2d.; 5670, 6d.; 5675, 2d.; 5677, 2d.; 5678, 2d.; 5680, 4d.; 5684, 2d.; 5687, 6d.; 5689, 6d.; 5692, 2d ; 5696, 2d.; 5697, 6d.; 5699, 4d.; 5701, 2d.; 5702, 6d.; 5707, 6d.; 5709, 6d.; 5717. 4d.; 5734, 4d.; 5743, 1s. 2d.; 5754, 6d.; 5768, 6d.; 5795, 6d.; 5805, 4d.; 5815, 6d.; 5831, 6d.; 5928, 6d.; 6145. 4d.; 297, 6d.; 664, 6d.; 811, 4d.; 1304, 6d.; 1564, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

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

5381. WASHING, BREAKING, AND BEATING ENGINES OR MACHINERY FOR MANUFACTURE OF PAPER PULP, *C. Aitchison, Lounhead, N.B.*—11*th November*, 1882. 6*d*.

This has special reference to the construction and arrangement of the cutting rolls and fixed knives or bed-plates of such machines, the object of which is to secure more even or regular action of the knives on the pulp.

5378. SECURING OR FASTENING THE SLIDING SASHES OF WINDOWS, *R. Plush, Brixton.*—11*th November*, 1882.—(*Not proceeded with*). 2*d*.

A box is formed in the window case, and its door closed by a lock and key. Through the side of the box towards the window a screw bolt works so as to engage with one of a series of recesses formed in the edges of the sliding sashes, whereby the window can be secured in any desired position.

5439. SPINDLE MOUNTINGS OF SPINNING MACHINERY, *R. N. Cottrill, Bolton-le-Moors.*—15*th November*, 1882.—(*Not proceeded with.*) 2*d*.

This invention is particularly applicable to the "Rabbeth spindle" and other arrangements wherein appliances are used to prevent the lifting of the spindle during the doffing operation. To prevent such lifting a bridle is fitted to turn upon centres below the whirl or sleeve, and when turned up a cross-bar comes into position above the whirl or above a collar on the sleeve.

5462. CHUCKS FOR LATHES, &c., *W. R. Lake, London.*—16*th November*, 1882.—(*A communication from J. A. Wiedersheim, Philadelphia.*) 6*d*.

This relates to the combination of a slotted block or body and its sleeve, pivotted levers, and pivotted jaws.

5463. ENVELOPES, *E. Edwards, London.*—16*th November*, 1882.—(*A communication from J. Marzari, A. Manucci, and A. D. Noce, Florence.*) 6*d*.

This relates to means for preventing the fraudulent opening of envelopes by the employment of ink, which when the envelope is moistened dissolves and makes a stain.

5464. MACHINES FOR SPINNING, DOUBLING, AND TWISTING FIBROUS MATERIALS, *J. B. and T. H. Dewhurst, and R. Cornthwaite, Skipton.*—16*th November*, 1882. 6*d*.

This relates partly in cog or ring spinning, twisting, and doubling frames, to the combination of a special bearing formed in one with the oil cup and fastened to the collar rail or lifter plate.

5465. UTILISATION OF RESIDUES OBTAINED IN THE REFINING OF COTTON SEED OIL, &c., *J. Longmore, Liverpool.*—16*th November*, 1882. 4*d*.

This consists essentially of forming a solution of the mucilage by melting; adding water or soda lye, caustic or carbonate, and thereby, or by means of common salt or other known separant, effecting the separation of the soap; the colouring matter is dissolved and remains in the excess of liquor, which can then be removed by means of a filter or drawn or pumped off.

5466. MAKING SOAP AND SEPARATING THE COMPONENT PARTS OF FATS AND OILS AND OBTAINING FROM THEM GLYCERINE, STEARINE, AND OLEINE, *W. P. Thompson, Liverpool.*—16*th November*, 1882.—(*A communication from W. West, Denver, U.S.*) 6*d*.

This relates in a soap-making apparatus to the combination of the following elements:—A superheating furnace, a superheater, a retort or still with its connections, and a condenser.

5468. WHEELS OF CARRIAGES, VELOCIPEDES, &c., *W. J. Fraser, London.*—17*th November*, 1882. 6*d*.

This consists in a mode of fastening metal tires on to wheels having compound or composite tires or rims by means of an expanding inner rim.

5469. ACTIONS FOR PIANOFORTES, *W. H. Squire, London.*—17*th November*, 1882. 4*d*.

The object is to obtain a very quick return of the hopper or jack, and also to otherwise improve the construction of the parts known as the action.

5470. METALLIC BEDSTEADS AND BEDSTEAD BOTTOMS AND CASTORS FOR SAME, *S. B. and S. I. Whitfield, Birmingham.*—17*th November*, 1882. 6*d*.

The First part refers to an improvement in the method of brass mounting bedstead pillars; the Second part refers to improvements in spring bottoms of bedsteads; the Third part relates to improvements in the construction of the castors.

5471. BLEACHING, MORDANTING, AND DYEING COTTON, *J. C. Mewburn, London.*—17*th November*, 1882.—(*A communication from A. Bozzi, Paris.*)—(*Not proceeded with.*) 2*d*.

This consists in the employment of a cold solution of sal-ammoniac for the purpose of bleaching cotton, and in effecting the bleaching when the cotton is in the fleece, that is to say before it is carded.

5472. MANUFACTURE OF PAVEMENTS OR SURFACE COVERINGS, FLOOR CLOTHS, WALL COVERINGS, &c., *S. Hawksworth, Scarborough.*—17*th November*, 1882. 4*d*.

This consists chiefly of a mode and means whereby a marbled appearance is given to the fabrics, this marbling being not a mere surface colouring but extending through the thickness of the solid paint or compound of the fabric.

5473. SELF-RECORDING LEVER WEIGHING MACHINES, *T. Williams, jun., London.*—17*th November*, 1882.—(*Not proceeded with.*) 2*d*.

The sliding weight being properly adjusted to register the exact weight, a system of levers is so acted upon as to cause the weight to be printed on a slip of paper.

5474. PRINTING MACHINES, *W. W. Taylor, Ripon.*—17*th November*, 1882. 10*d*.

This relates to that class of printing machines described in patent No. 1127, A.D. 1875, the object being to afford a more perfect means for carrying the web of paper over the guiding or turning surfaces or rollers, by which the paper is turned or twisted in the required direction. An additional web or webs or tape or tapes are arranged as a carrier or support for the tape or tapes, which carry the paper round the guiding surfaces or rollers, and they may be carried over additional rollers, so that guides may be arranged for each tape clear of the paper, and guides may also be arranged beneath for the same purpose. Skew pulleys are used to arrange the tapes, so as to give them the same motion as if they were in contact with the turning cylinders. The turners may be divided into longitudinal sections, having internal rollers, so that the parts can slide lengthwise upon one another, and such turners are rotated in connection with cams, so that the roller surface partakes of the suction of the tapes, web, or paper, with which it is in contact. The invention further relates to the framework of the machine, the ink distributing surface, and to means for giving the necessary motion to the printing formes by a rack driven by pinions.

5475. LOOMS FOR WEAVING, &c, *G. R. Snowdon and O. Ball, Bradford.*—17*th November*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to fitting an apparatus on the hand trees or rails and going parts of looms, to prevent the shuttles when working flying out of the race and flying across to other weavers attending other looms.

5476. SHIPS' HATCHES, *R. T. Pawley, Cardiff*—17*th November*, 1882. 6*d*.

A top set of hatches is secured to the coamings with beam and rebate in the usual way, and underneath them is a second set secured at top by a longitudinal beam, and at bottom in a rebate in the top edge of the inside coamings. A space is left from the bottom of the second hatches to the coaming to form a water-course to carry off water from the second hatches, and which passes off through outlets in the coaming. Under the water-course to the deck a double coaming is fixed forming an air space, connected at one end to an air chamber having a ventilator.

5477. MOTOR ENGINES OR MACHINES, *C. Cizzio, Switzerland.*—17*th November*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the use of wheels provided with arms carrying weights, so adjusted as to swing as required and cause the wheel to revolve.

5478. MULES FOR SPINNING AND TWISTING WOOLLEN AND OTHER FIBRES, *J. E Heppenstall, near Huddersfield.*—17*th November*, 1882. 6*d*.

The inventor claims, First, the employment in a spinning mule of a parallel barrel or scroll. Secondly, the method whereby the delivery rollers are allowed to revolve continuously until the carriage reaches its furthest point backward; Thirdly, the employment of mechanism for giving rotary motion to the feed rollers about the time the carriage returns thereto.

5479. PREPARATION OF TOBACCO, *J. Howard, Erith.*—17*th November*, 1882.—(*A communication from E. Howard, Gosport, U.S.*) 2*d*.

The object is to decompose and destroy nicotine in tobacco without destroying its fragrant or aromatic properties, and so render the tobacco harmless when smoked.

5480. APPARATUS FOR FACILITATING THE TIPPING OF COAL, &c., FROM RAILWAY TRUCKS, *P. G. B. Westmacott, Newcastle-upon-Tyne.*—17*th November*, 1882. 6*d*.

The inventor claims, First, a suspended platform or cradle so constructed that when lowered upon a line of railway it adjusts itself thereon, and wagons may then be run from the railway on to the platform or cradle to be lifted with the platform or cradle and swung to a position from whence the wagon may be discharged; Secondly, the combination with such a platform or cradle of a turnable swivel admitting of the wagon when suspended being turned from the position in which it stood upon the railway to that best suited for its discharge; Thirdly, the combination with such a platform or cradle of tackle, by which when suspended with a wagon upon it the platform or cradle may be inclined and the wagon emptied.

5481. POTASH AND SODA, *A. M. Clark, London.*—17*th November*, 1882.—(*A communication from J. B. M. P. Closson, Paris.*)—(*Not proceeded with.*) 2*d*.

This relates to the caustification of alkaline sulphates by dissolving in hot water and treating with a milk of lime and of lead oxide.

5482. MILLS FOR GRINDING GRAIN, *R. Young, Glasgow.*—18*th November*, 1882. 6*d*.

This relates to the arranging or combining together of the parts of mills for grinding grain, the grinding or dividing action being effected by annular metal surfaces rotating in the same direction, but at different speeds.

5483. PIANOFORTES, *W. Fischer, Leipzig.*—18*th November*, 1882. 6*d*.

This relates to improvements on patent No. 1603, A.D. 1882, in which the notes are produced by sounding forks, and consists in preventing the forks having a prejudicial effect on each other by fixing them to a bar instead of to the sounding board, and establishing a separate connection between each fork and the sounding board at the moment that such fork is struck.

5484. ANTI-FOULING AND PRESERVATIVE COMPOSITION FOR SHIPS' BOTTOMS, &c., *J. and T. Kirkaldy, London.*—18*th November*, 1882. 4*d*.

The composition consists of the combination of shellac, grease, and metallic oxides.

5485. TRANSIT INSTRUMENTS, *J. L. Clark, Westminster.*—18*th November*, 1882. 6*d*.

This relates, First, to a plan by which the spirit level on the declination circle may be dispensed with, and consists in the use of an adjustable arm attached to the vernier circle or index, which arm of a transit instrument rests against a fixed stop on some part of the frame of the instrument, and serves to make the zero point; Secondly, in connecting a transit instrument to its pin by a spring under the base, allowing free play to levelling screws and avoiding distortion of the frame by undue strain; Thirdly, the method of adjusting for collination by supporting the tube of the telescope in a loose collar with adjusting screws for varying its position; Fourthly, supporting and adjusting the cross wires of a transit instrument by means of a screwed diaphragm; Fifthly, the use of a perforated hinged diaphragm with a central aperture for illuminating the cross wires; and Sixthly, to a jointed lamp support for carrying a lamp.

5487. APPARATUS FOR "STAYING WARPS," *R. L. Hattersley and W. Greenwood, Keighley.*—18*th November*, 1882. 2*d*.

This relates to apparatus for drawing threads or ends through the reed before placing them in a loom, and consists of a frame to support the warp and the reed, the latter being nearly horizontal, so that the ends of the warp rest thereon. Under the reed is a shaft carrying three hooks for pulling the ends through the dents of the reed, the boss to which the hooks are attached sliding on a feather on the shaft, which is caused to revolve by a ratchet wheel and pawl operated by lever and treadle. By means of a triangular tappit on its end this shaft communicates an intermittent motion to a screw shaft below on which is a boss terminating in a fork or clutch. At each motion of the treadle the upper shaft moves one-third of a revolution, and as the hooks project above the reed an end is placed in contact therewith and drawn through on the next movement, and another needle rises in the next dent, the lateral traverse being given by the fork on the screw shaft.

5488. ADMINISTERING INJECTION OR DOUCHES, *T. G. F. Dolby, Dulwich.*—18*th November*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in connecting the force pipe of an enema with a vessel containing the liquid to be injected, and which has an outlet pipe communicating with the lower part, so that air is pumped into the vessel and forces the liquid in a continuous stream through the outlet pipe.

5489. SCREW BOLTS AND NUTS, &c., *T. Hancock, Wolverhampton.*—18*th November*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to prevent the single nut on the end of a screw bolt from working loose, and it consists in forming a conical recess in the under side of the nut, and providing a split washer with one edge inclined upwards.

5490. PACKING OR CAULKING FOR PIPE JOINTS, &c., *C. Wheeler, Newbury, Berks.*—18*th November*, 1882.—(*Not proceeded with.*) 2*d*.

A piece of soft wire, such as lead, is wound spirally round the spigot end of a pipe, with spaces between the coils to receive hemp, cord, or the like, with as much red lead as required. A special caulking tool is also described.

5491. APPARATUS FOR THE MANUFACTURE OF BOOTS, *J. Wetter, New Wandsworth.*—18*th November*, 1882.—(*A communication from M. Ronchin, France.*) 4*d*.

This relates to apparatus for frilling the uppers of boots, and consists essentially of two stands, to which is attached a cross beam curved on its upper side to suit the shape of the boot, and on which the piece of leather is placed. A wheel is mounted between the two stands, and has on its face various forms arranged radially. The wheel can be turned by toothed wheels, a fly-wheel, and a crank. A small hand-wheel causes the wheel with the forms and the cross beam to come more or less together.

5493. BULKING OR MIXING TEA, *B. Tydeman, Erith.*—18*th November*, 1882. 6*d*.

A circular drum is caused to revolve so as to mix the tea placed therein, rods being arranged spirally and alternately left and right in the drum to assist the mixing. The tea then falls into chests, which are acted upon by beaters, scales being provided to weigh the tea delivered thereto, and a press provided to press the tea into the same space as it originally occupied.

5494. INDICATING AND RECORDING THE AMOUNTS OF MONIES RECEIVED OR PAID IN SHOPS, &c., *S. H. and J. C. Boswell, Norwich.*—18*th November*, 1882.—(*Void.*) 2*d*.

A series of keys act on levers carrying types, which are caused to bear upon a travelling band or web, and so register amounts received, while an indicating card is exposed to the view of the purchaser.

5497. SAGGERS, *J. H. Johnson, London.*—18*th November*, 1882.—(*A communication from J. F. Bapterosses, France.*) 6*d*.

This relates to means for arranging pottery ware in the saggers in which they are baked, and consists in providing temporary points of support, which enable the articles to be arranged in position at the proper distances apart with facility and precision. These supports consist essentially of a frame carrying sliding bars for temporarily supporting the plates or other articles at their upper edges and swivelling racks for spacing or adjusting the same at their lower edges.

5498 TREATMENT OF DUFF COAL, *J. Jameson, Newcastle-upon-Tyne.*—18*th November*, 1882. 4*d*.

This consists in passing through the duff coal or other material highly heated and burned air and products of combustion. The air is passed through the fuel of a close furnace, and the gases generated in or passing through such furnace are forced through the material to be operated upon, and also contained in a close receptacle, or it may be caused to pass through it by suction, whereby the volatile and condensible matters of the material operated upon are extracted from it, and may be recovered by condensation.

5499. RAILWAY SLEEPERS, *W. E. Pedley, Old Bromley.*—18*th November*, 1882. 6*d*.

This relates to the special form of iron or steel sleepers.

5502. PROPORTIONAL REDUCING VALVES, *A. W. Quinlan, Glasgow.*—20*th November*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to render such valves suitable for very high as well as moderate pressures. In one form two pistons, the areas of which are in the required ratio to each other, are connected and work in cylinders, to one end of the smaller of which the fluid is admitted, while the outlet for the fluid of reduced pressure is at the opposite end of the larger cylinder. There is a passage between the cylinders, and it communicates with the smaller cylinder by small holes which the small piston uncovers in succession.

5503. OBTAINING MOTIVE POWER, *L. L'Hollier and G. Asher, Birmingham.*—20*th November*, 1882. 4*d*.

This consists essentially of a spherical piece with a worm formed round it and engaging with a wheel to be driven, such piece being mounted freely on a shaft driven by a suitable handle, and on which it has a slight vertical movement, so as to bring it in contact with rollers connected to the shaft both above and below such spherical piece.

5511. MANUFACTURE OF APPLIANCES FOR SAVING LIFE AT SEA, &c., *F. Wolff, Copenhagen.*—20*th November*, 1882.—(*A communication from S. A. L. Klixbüll, Copenhagen.*) 4*d*.

This consists in combining with the article to be rendered buoyant inflated gut, previously cleansed, disinfected, and rendered waterproof, the same being protected by an enclosing case or cases secured within the article to which it is applied.

5512. BARBED WIRE, *O. W. Malet, London.*—20*th November*, 1882.—(*A communication from F. B. W. Malet, New Zealand.*) 4*d*.

Stars or spurs are secured to a single wire by flattening the wire upon each side of same.

5513. PROCESS OF DYEING COTTON-WOOL, &c., *W. E. Gedge, London.*—20*th November*, 1882.—(*A communication from P. T. Richard, Paris.*)—(*Not proceeded with.*) 2*d*.

This consists in the application to the dyeing of raw cotton in indigo or vat blue of a process of biting or fixing the colour by furnishing the whole mass of material with an oxidising substance, which immediately causes the deposit of the indigo blue without preliminary aeration.

5514. CAST TUBES OF GOLD, SILVER, COPPER, ZINC, BRONZE, &c., *T. Morgan, London.*—20*th November*, 1882.—(*A communication from E. I. Levasseur, Paris.*) 6*d*.

This relates to the production of tubes for jewellery by casting, and consists essentially in the use of a travelling mould with a longitudinal slot or casting gate, and enclosing a fixed or rigid core or mandril which determines the inner dimensions of the tube.

5515. ERASING PENCIL, INK, OR OTHER MARKS, *L. Wolff, Battersea.*—20*th November*, 1882. 6*d*.

This consists in the construction of a case or holder for the erasing material, so that when not in use the latter may be folded within the case and thereby kept clean.

5521. SEWING MACHINES, *W. H. Beck, London.*—21*st November*, 1882.—(*A communication from A. L. J. Loubinoux, Paris.*)—(*Not proceeded with.*) 2*d*.

This consists in a modification of the thread-drawing lever, whereby the uniform regulation of the traction and distribution of the thread is effected, and the thread prevented from breaking whatever work the machine may be operating upon.

5523. TREATMENT OF SOLUTIONS OF METALLIC SALTS FOR THE REMOVAL OF IRON IMPURITIES THEREFROM, *C. D. Abel, London.*—21*st November*, 1882.—(*A communication from F. C. Glaser, Berlin.*)—(*Not proceeded with.*) 2*d*.

This consists in adding to solutions of metallic salts certain antimony compounds or stannic acid, the latter being regained by regeneration, and thus rendered available for repeated operations.

5525. APPARATUS FOR THE MANUFACTURE OF SUGAR IN LUMPS, PIECES, OR BLOCKS, *H. H. Lake, London.*—21*st November*, 1882.—(*A communication from La Société Lebaudy Frères, Paris.*) 6*d*.

This relates to improvements on patent No. 1055, A.D. 1882, and consists, First, in fitting the tables described in said patent with movable partitions, independent of the bottom plates, and capable of being fixed at different distances apart, according to the thickness of sugar desired; Secondly, in the use of border or edge plates combined with plates of trapezoidal section, to allow of the loosening of the mass and extraction of the plates, and of the pieces of sugar with facility; Thirdly, in the evacuation of syrup draining from the pieces of sugar by apertures formed transversely in each frame below the wire gauze or perforated metal in the lower part of the apparatus, the juxtaposition of such aperture when the frames are placed together forming draining gutters open on two opposite sides and communicating with a vacuum apparatus.

5527. GAS ENGINES EMPLOYED IN CONNECTION WITH TRAMCARS, &c., *E. Dyson, near Huddersfield.*—21*st November*, 1882.—(*Not proceeded with.*) 2*d*.

A bag is employed for supplying the gas to the engine, which is fitted with a suitable clutch for connecting and disconnecting it with the driving wheels of the carriage.

5530. TENTS, &c., FOR MILITARY AND OTHER PURPOSES, *H. E. Newton, London.*—21*st November*, 1882.—(*A communication from J. G. C. van Döcker, Copenhagen.*) 6*d*.

This consists in the use of wooden or iron frames connected together in pairs by hinges and any number of pairs being used together to make a tent of the required size, when covered with felt or similar substance firmly nailed to the frame.

5531. MATERIAL IMITATING LEATHER FABRICS, &c., *H. Loewenberg, Germany.*—21*st November*, 1882. 4*d*.

This consists, First, in the use of drying oils thickened by the action of chlorine in admixture with other substances to form a facing material; Secondly the use of vaseline in combination with gelatine and other ingredients to form a facing material; Thirdly, applying a waterproof backing to the fabric; and Fourthly, in preparing a mould or negative by applying to the original surface a composition consisting of 1 or 2 parts of strong solution of a salt of copper, 1 or 2 parts of a chromate or bichromate in a weak solution of about 1 part of salt to 50 parts water, and 1 to 1½ parts of glycerine added to from 5 to 7 parts liquid glue.

5534. DISTRIBUTING STEAM OR OTHER FLUID UNDER PRESSURE IN MOTOR ENGINES, *J. W. Jordan and J. T. Brockliss, Norwich.*—21*st November*, 1882.—(*Not proceeded with.*) 2*d*.

As applied to an oscillating engine, each end of the cylinder communicates by a passage with a port in a surface working in contact with a distributing valve, preferably of the "face-valve" type, and carried concentrically with the trunnions by a stem at the back. It is preferably in the form of two segments of a disc radiating from opposite sides of a central trunk. Each segment presents a surface which alternately covers and uncovers the port of the cylinder passage. Each segment also has a passage communicating with the exhaust outlet.

5536. METHOD AND APPARATUS FOR PURIFYING, &c., TOWN SEWAGE, *P. Jensen, London.*—21*st November*, 1882.—(*A communication from H. Betche, Magdeburg, and Zeppernick and Hartz, Berlin.*) 6*d*.

Relates to the construction of a centrifugal machine, for the purpose of separating liquid from solid parts, while the latter are continuously removed.

5537. APPARATUS FOR DRYING GRAIN, &c., *W. R. Lake, London.*—21*st November*, 1882.—(*A communication from F. W. Wiesebrock, New York.*) 6*d*.

This comprises the combination of a housing or casing, a series of inclined rotary drying cylinders having their ends extended outside the housing or casing, each cylinder having a spout cap provided with a dampered ventilating flue or pipe, blast pipes, and mechanism for rotating the cylinders, located outside the housing or casing.

5538. WHEELS FOR VEHICLES, *W. R. Lake, London.*—21*st November*, 1882.—(*A communication from U. A. Chanveau and P. C. A. Laglenne, Paris*) 6*d*.

This consists of a wheel having the body suspended within the ring or rim by means of springs, which act in a circular direction, and are connected to the body of the wheel and to the said ring or rim by hinges.

5539. APPARATUS FOR MEASURING LIQUIDS, &c., *H. H. Lake, London.*—21*st November*, 1882.—(*A communication from P. J. Carmien, Paris*) 10*d*.

The apparatus consists of a paddle receiving an alternating movement in a closed cylindrical casing by the introduction into the said casing of a liquid under pressure through the lower part of a distributing cock, whilst the liquid in the cylinder is expelled by the movement of the paddle, and escapes from the anterior part of the said cock or other distributing device, the reversing of the distributing cock or the like being effected by toothed sectors with lever and counterpoise and a pointer with stops.

5540. PROPELLING VEHICLES BY HYDRAULIC POWER, *E. Edwards, London.*—21*st November*, 1882.—(*A communication from C. Laburthe, St. Pierre, Landes, France.*)—(*Not proceeded with.*) 2*d*.

This relates to wheeled carriages or locomotives running upon ordinary roads or upon railroads, and it has for its object a novel method of constructing such carriages and of propelling them by means of hydraulic power.

5542. COMBINED URINAL AND WASHSTAND, *F. Wirth, Frankfort.*—21*st November*, 1882.—(*A communication from F. Müller, Stuttgart.*)—(*Not proceeded with.*) 2*d*.

This relates to the construction of a combined self-closing urinal and washstand.

5544. TRAVELLING GRATES FOR FURNACES, *G. and E. Ashworth, Manchester.*—22*nd November*, 1882.—(*Not proceeded with*) 2*d*.

This relates to improvements on patent No. 1470, A.D. 1882, in which a travelling grate was supported by two bearers formed with side gratings, and it consists in forming the latter separate from the bearers, so as to be capable of being readily replaced. The invention also relates to the means for actuating the travelling grate.

5545. UTILISING BYE PRODUCTS OF THE SODA AND POTASH MANUFACTURES, &c., *J. Mactear, Glasgow.*—22*nd November*, 1882. 6*d*.

This relates to the combination of processes for utilising alkali waste, consisting in first treating the waste mixed with water with carbonic acid aided by heat and pressure, and in afterwards treating the resulting sulphuretted hydrogen with sulphurous acid in the presence of water or a solution of chloride of calcium, in order to separate the sulphur.

5547. MOVABLE PARALLELOGRAMIC SUPPORT WITH STOPPING SPRING CATCH FOR TAPER STANDS, CONSOLS, &c., *A. Zwierzchowski, Paris.*—22*nd November*, 1882. 6*d*.

The movable support, bracket or branch, with toothed sector or rack, consists of a parallelogram, jointed at one end to a pivotting axis, and at the other to a guide or slide on the said support, bracket, or branch. A spring click arrangement engages in the teeth of the rack or sector, and fixes the support or bracket in any desired position.

5548 IMPROVING THE APPEARANCE OF INFERIOR QUALITIES OF DIAMONDS, RUBIES, AND OTHER PRECIOUS STONES, *J. C. Mewburn, London.*—22*nd November*, 1882.—(*A communication from G. H. Durkée, Paris.*) 4*d*.

As applied to diamonds, for example, the invention consists in adding to this stone the necessary complementary colour to produce the white colour, the complementary colour being in the form of an enamel glaze.

5549. HANDLE FOR SAUCEPANS, &c., *E. Baldwin, Stourport.*—22*nd November*, 1882. 4*d*.

The handle is provided with a bead at the end.

5553. GOVERNORS FOR STEAM ENGINES, *W. M. Musgrave, Bolton.*—22*nd November*, 1882.—(*Not proceeded with.*) 2*d*.

On the governor spindle below the ordinary governor an auxiliary governor is fitted, and has friction plates, which actuate a pulley when the speed is too high or too low, such pulley being fixed on a screw passing through one end of a vibrating lever connected to the balance weight on the ordinary governor, so as to move such weight nearer to or further from the fulcrum of the balance lever.

5554. MANUFACTURE OF COLOURING MATTERS FROM COAL TAR PRODUCTS, *C. Lowe, Reddish.*—22*nd November*, 1882. 4*d*.

The object is to manufacture by new and improved processes basic and conjugated acid red colouring matters designated under the names of roso-phenoline and roso-phenoline-sulphonic acid from the product generally known under the names of aurin or yellow corraline.

5555. CONSTRUCTION AND MANUFACTURE OF BOILER FLUES AND BOILER SHELLS, &c., *G. W. Dyson, Bolton.*—22*nd November*, 1882. 6*d*.

This consists partly of a boiler flue or boiler shell constructed of a spiral or helical coil of plain plate or bar iron or steel, &c., united by a corresponding spiral or helical expansion joint plate, the said joint plate having an external curved projection or an internal curved projection, or both an external and an internal curved projection, or united by a joint plate of similar or equivalent construction. Other improvements are described.

5557. MACHINERY FOR TRIMMING AND BURNISHING THE SOLES AND HEELS OF BOOTS AND SHOES, &c., *J. Keats, Bagnal.*—22*nd November*, 1882. 8*d*.

Mounted in suitable bearings on a bed-plate are two

horizontal parallel shafts, one of which is fitted at its opposite ends with detachable rotary cutters, and the other with burnishing tool-holders. To the cutter shaft is given a rotary motion by a band and pulley, and to the burnisher shaft a reciprocating axial motion, which motion is imparted thereto from an excentric or its equivalent on the cutter shaft.

5559. ORDNANCE, *J. Vavasseur, Southwark.*—22*nd November*, 1882. 6*d.*

This consists partly in cutting a coarse screw groove on the exterior of the inner piece or tube at the part where it is desired to couple it to the outer piece, and to cut an exactly corresponding groove in the bore of the outer piece, so that when the two pieces are shrunk or fitted together there will remain a spirally-formed recess, by preference square or rectangular in section, into which is passed a spirally-formed bar of steel or other metal of corresponding section to fit as closely as possible into the space thus left for it.

5560. CUTTING PAPER, *W. C. Kritch and J. Garland, Leeds.*—22*nd November*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to machines in which a knife is caused to descend both diagonally and horizontally upon the paper, and consists in improved means of actuating the knife, verifying the position of the paper previously to being cut, and actuating a presser beam for holding the paper during cutting.

5561. COUPLING APPARATUS FOR RAILWAY WAGONS, &c., *A. S. Mildred, Middlesbrough-on-Tees.*—22*nd November*, 1882. 6*d.*

In conjunction with a device called a loop for raising, supporting, and guiding the coupling link, is provided an arrangement of apparatus whereby the said loop can be moved radially upward or downward, and also laterally, these movements being effected by operating a single lever or handle at either side of the vehicle. The loop and its operating gear are carried by links capable of radial movement in vertical planes, to enable the said loop and gear to be moved towards an adjoining vehicle.

5562. LAMPS AND THEIR BURNERS, *H. Salsbury, London.*—22*nd November*, 1882. 6*d.*

This relates, First, to the oil well and its burner or wick-holder; Secondly, to the means of holding the star wheels; Thirdly, to the means of fitting the reflector.

5563. APPLIANCES FOR THE PROPULSION OF ROW BOATS, *W. J. Sage, Walworth.*—22*nd November*, 1882. 6*d.*

This relates to a method and appliances to be fitted to the gunwales of row boats to enable them to be propelled either forward or backward, or to hold the boat at any given position at the desire of the person or persons occupying the boat.

5565. PREPARATION OF EXTRACTS OF MEAT, *F. S. Barff, Kilburn, and A. P. Wire, Leytonstone.*—22*nd November*, 1882. 4*d.*

This consists in mincing or dividing the meat, and adding thereto water and agitating the mass or magma at a temperature of about 140 deg. Fah, and afterwards straining and pressing for separating the solid from the fluid part, and subsequently removing the fibrine and other solid matter in suspension therefrom by raising the temperature and thus obtaining a solution of flesh or meat albumen free from fat and fibrine.

5567. HARVESTING MACHINERY, *A. C. Bamlett, Thirsk.*—22*nd November*, 1882. 8*d.*

The First part relates to mowing and reaping machines. The draft pole is hinged by a bracket and bolt to the frame; to the same bolt is hinged a bracket for carrying the steerage pole and castor wheel, it also carries the lifting and regulating levers, and is so arranged that the castor wheel can run closer to the uncut crop when mowing and farther from the uncut crop when reaping, and the two brackets may be connected when it is desired to dispense with the steerage pole and castor wheel. The Second part relates to that class of reaper in which the sheaf is delivered automatically in the rear of the machine. The Third part relates to that class of reaper wherein the sheaf is delivered automatically at the side of the machine. Other improvements are described.

5568. APPLYING MOTIVE POWER TO TRAM-CARS, &c., *W. H. Hindle, Blackburn.*—22*nd November*, 1882.—(*Not proceeded with.*) 4*d.*

This relates to apparatus for applying the power of a gas engine to propel tram-cars of the class in which the body can be turned on a central pivot when at the end of its journey and before commencing the return journey.

5569. MANUFACTURE OF RIBBED PILE FABRICS, *J. R. Hutchinson, Bury.*—23*rd November*, 1882. 6*d.*

This relates to a system of weaving cotton cords or fustians.

5570. CONSTRUCTION OF CHAINS AND BUCKETS FOR DREDGERS, *W. R. Kinipple, Greenock.*—23*rd November*, 1882. 8*d.*

This relates to the construction of the links of the chains, and also to the construction of the buckets with a cellular back.

5571. APPARATUS FOR PROTECTING SHIPS FROM THE EFFECTS OF COLLISION, &c., *W. Beverley, Aberdeen, and G. A. MacLaverty, Glasgow.*—23*rd November*, 1882. 8*d.*

The apparatus to the employment of an iron or steel framing.

5572. ANTISEPTICS, DISINFECTANTS, AND DEODORANTS, *C. T. Kingzett, Tottenham, and M. Zingler, London.*—23*rd November*, 1882. 4*d.*

The inventors claim, First, the triple fluid mixture or composition consisting of a liquid volatile hydrocarbon spirit containing a terpene, of the non-volatile resin, and of resin oil, the product of the destructive distillation of resin; Secondly, the combination of the said triple mixture or composition with camphor; Thirdly, the said triple mixture or composition, either with or without camphor, oxidised by treatment with air.

5573. DRAIN PLOUGHS, &c., *S. Pitt, Sutton.*—23*rd November*, 1882.—(*A communication from J. C. White, Pennsylvania.*) 6*d.*

The drain plough is composed of a beam with a vertical longitudinal slot through it, two cheeks extending down from the two sides of this slot to the bottom of the ditchcut. The forward end of the beam carries a right and left-hand plough to throw the earth to both sides, and the rear end is suspended from a pair of wheels. The beam or the two side plates carry other ploughs, one behind the other, cutting to different depths. An endless chain forms an incline, down which drain pipes may be conveyed and laid in the ditch.

5574. PURSES, &c., *G. Macaulay-Cruikshank, Glasgow.*—23*rd November*, 1882.—(*A communication from F. W. Schwarz, Germany.*)—(*Not proceeded with.*) 2*d.*

The object is to form purses from one piece of leather or other material and without a seam, the purse being also furnished with a lock.

5575. APPARATUS FOR EXTRACTION AND FUSION OF TALLOW, *C. D. Abel, London.*—23*rd November*, 1882.—(*A communication from H. Lissagaray and H. Leplay, Paris.*) 4*d.*

This relates to an apparatus for dividing the animal fat, and to the process for treating the same.

5577. COMBINED PRINTING OR ENDORSING STAMP AND INKING PAD, &c., *G. H. Cooke, Paris.*—23*rd November*, 1882.—(*Not proceeded with.*) 2*d.*

This relates to a printing or endorsing stamp and inking pad combined with a pencil-case or match-box, so as to be capable of being carried in the pocket.

5576. BREECH-LOADING ORDNANCE, &c., *S. H. Berry, Hackney.*—23*rd November*, 1882.—(*Not proceeded with.*) 2*d.*

To the breech end of the gun is adapted a chamber of larger diameter than the gun, and which contains a cylindrical breech-block, and is cut away to allow the latter to pass through the side of the chamber. This chamber holds the block in position while discharging by a screwed plug working in the breech end of the chamber. The block has to contain the shot and cartridge, and is brought to the loading position by a rack and pinion.

5578. BOBBINS AND SPOOLS, *L. Heppenstall, jun., near Huddersfield.*—23*rd November*, 1882. 4*d.*

This consists in making bobbins and spools of cast metal with pegs instead of the usual staples, for preventing them running round upon the spindle when yarn is being wound thereon.

5579. CARTS OR WAGONS FOR HOLDING AND DISCHARGING MUD, &c., *A. Bettger, Kilburn.*—23*rd November*, 1882.—(*Not proceeded with.*) 2*d.*

To the rear axle of a four-wheeled carriage the back ends of two parallel bars are fixed, the front ends being supported on the fore carriage of the cart. Between the axles holes are formed in the bars to receive pivots at the end of a transverse bar, upon which a number of springs are arranged to receive a rectangular vessel to hold the mud.

5581. WOOD BLOCK OR OTHER PAVEMENTS, &c., *E. Hughes, Liverpool.*—23*rd November*, 1882. 6*d.*

This consists in the form of wood or other blocks, and a method of securing the same on concrete, brick, or stone floors, by simply bedding the same in mortar, pitch, or cement, without any other fastening.

5582. NAVES OF WHEELS FOR CARRIAGES, &c., *S. Andrews, Cardiff.*—23*rd November*, 1882. 6*d.*

This relates to the method of attaching the naves of wheels to their axles.

5587. CONSTRUCTION OF RAILWAY SWITCHES, *E. N. Molesworth-Hepworth, Manchester.*—24*th November*, 1882. 6*d.*

This consists in making the rails with butt joints, and fixing the switch rails and the frog point, each in or on a separate traversing carriage running on slides, rollers, wheels, or balls, and so that the said carriage can be caused to traverse a sufficient distance to put either of the diverging lines in exact opposition to the main line.

5588. KEYS FOR FIXING THE RAILS OF RAILWAYS, *E. W. Swan, Middlesbrough, and T. G. Massicks, Broughton-in-Furness.*—24*th November*, 1882.—(*Not proceeded with.*) 2*d.*

The keys are iron or steel and are hollow, and shaped to fit the rail and chair.

5589. SEWING SILK AND OTHER THREAD, &c., *W. Trafford, Stafford.*—24*th November*, 1882.—(*Not proceeded with.*) 2*d.*

This relates, First, to a mode of measuring, weighing, putting the strands together, and doubling; and, Secondly, to a mode of stretching the yarn to regulate the twist, measure, and reel it into skeins.

5590. METALLIC BEDSTEADS, MATTRESSES, BED BOTTOMS AND BOLSTERS, *T. Kendrick, Birmingham.*—24*th November*, 1882.—(*Not proceeded with.*) 2*d.*

In bedsteads capable of being converted from a French bedstead into a half canopy, so that the canopy and drapery may be easily removed or attached, the uprights of the canopy are attached to the head pillars by detaching the base and passing over the screw fixing at an eye connected to the uprights, after which the base is replaced. The upright is continued down and its lower end turned in, and forms a clip to steady the upright. The mattresses and bed bottoms are formed of woven wire attached to the frames by coiled springs, and the bolsters are also of woven wire of drum form.

5591. TREATING MATERIAL COMPOSED OF VEGETABLE AND ANIMAL MATTER, &c., *G. and J. E. Tolson, Dewsbury.*—24*th November*, 1882. 6*d.*

This relates to a method of disintegrating or effecting the separation of vegetable matter from animal matter in materials composed of a mixture thereof. The material is placed in a revolving tank heated by a fire beneath, and in connection with which is a retort for generating hydrochloric or sulphurous acid in a gaseous state, which is admitted to the tank, and when the process is complete alkaline gas is admitted to neutralise the acid gas.

5592. CRICKET BAT HANDLES, *H. J. Haddan, Kensington.*—24*th November*, 1882.—(*A communication from J. Chalmers Brodie, South Australia.*) 6*d.*

The handle is in one piece, and is made hollow and filled with cork or other light springy material. A hollow may also be formed in the blade and filled in with cork or other light springy material.

5593. MAKING AND STRIKING STAMPED, IMPRESSED, AND EMBOSSED PLATES AND DISCS, &c., *J. F. Smyth, Belfast.*—24*th November*, 1882. 2*d.*

The object is to dispense with manual aid in the process of striking stamped, impressed, or embossed metallic and other plates, and it consists in the use of a revolving table or endless apron with cells, into which the blanks are placed, and from which they are removed by an arm or lifter, magnetised or formed with a sucker to hold up the plate. A horizontal plunger bears the matrix and forces the flank into a conical chamber containing the die.

5595. CANDLE-MOULDING MACHINES, *E. Cowles, Hounslow.*—24*th November*, 1882. 6*d.*

This relates to machines in which the candles are moulded in tubes contained in a box through which cold water flows, and it consists in preventing waste of water by confining the moulds in small inner tanks or vessels within the box, so that water passing through the confined spaces of the inner tank is all brought into intimate contact with the moulds and is thus all usefully employed in cooling them.

5596. FACILITATING AND REGULATING THE RAISING AND LOWERING OF THE HEADS OF LANDAUS, &c., *S. C. L. Fuller, Bath.*—24*th November*, 1882.—(*Not proceeded with.*) 4*d.*

A spring is usually employed to assist the raising of the head, and in the present invention the spring is arranged so that it assists in raising the head by acting thereon with a pulling force by means of a lever connection, instead of with a pushing force.

5597. STEEL AND IRON TUBES, *S. Walker, Birmingham.*—24*th November*, 1882.—(*Not proceeded with.*) 2*d.*

As applied to the manufacture of a weldless steel tube, the invention consists in taking a circular steel disc, and after heating, bringing it to the form of a short hollow cylinder closed at one end by means of a mandril and a raising or drawing through die. The hollow cylinder is then pierced at its closed end, and the piercing expanded by a conical tool, or the end may be cut off. The short open tube is then elongated by drawing or rolling.

5598. STOVES, &c., *F. Greatrex, Uxbridge.*—24*th November*, 1882. 6*d.*

The objects are to prevent smoke, economise fuel, and produce greater heat in open fireplaces, and it consists in producing a double draught in and through the fuel, one being horizontal and the other vertical. In addition to the vertical flue, a short back vertical flue is formed parallel to and behind the ordinary flue, such flue commencing on a level with the lower bars and extending upward to about the height of the chimney breast, where it enters the ordinary flue. At the back behind the fuel there is an opening into the back flue

5621. APPARATUS FOR PREVENTION OF INJURIES, ACCIDENTS, OR DESTRUCTION OF STEAM BOILERS FROM EXCESSIVE PRESSURE OR DEFICIENCY OF WATER, *A. J. Smith, Westminster.*—27*th November*, 1882. 6*d.*

The object is to provide a high-pressure sentinel, with a low water alarm valve, for steam boilers, and placed under lock and key to prevent tampering with same. The casing A, which is provided with an alarm whistle Z, covers the working parts, and is secured to the valve casing, having a transverse diaphragm X, on which the high-pressure valve B is seated, such valve being loaded by a screw plug C acting on spring D, preferably enclosed by casing E. In the centre of the under face of valve B is the seating of the low-water alarm valve F, the former operating by opening outwards by excessive pressure in the boiler, and the latter in the opposite direction by the action of weight G, brought into play when the water sinks below the

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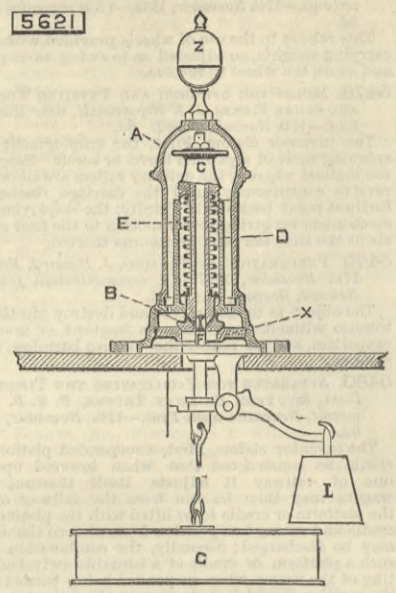

desired level, such weight being as nearly the specifi gravity of the water it displaces as possible; but as it is not practicable to employ a substance of the exact specific gravity of water, the difference is compensated for by a weight I.

5628. STEAM AND MOTIVE POWER ENGINES, *W. Hornsby and R. Edwards, Grantham.*—27*th November*, 1882. 6*d.*

A sliding block in a vibrating link, actuated by a crank and excentric on the crank shaft, is usually employed to actuate the valves for admitting gases or fluid to the motor, and the admission is often regulated by a governor, which shifts the block along the link. An excentric is introduced in the connections between the governor and the sliding block, so that the tendency to shift the slide, arising from angular action of the link, may be more effectually controlled. The slide valve is worked by an oscillating link, and its travel controlled by the raising and lowering of the block in it, which is effected by the governor acting through the medium of an excentric. The slide valve

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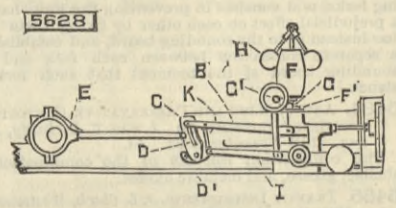

rod is connected by a coupling rod B with block C capable of being slidden by the action of the governor along the slotted link D. D^1 is the fulcrum of the link, and E the excentric actuating the link. F is the governor, and F^1 its slider, which operates upon lever G, and so partly rotates an axis G^1 mounted in stationary bearings. On this axis is an excentric H, the strap of which is connected with the counterpoised lever I, and this is connected by coupling K with the rod B and block C. The movement of the governor is thus transmitted to block C, the travel of the valve accordingly varied, while any tendency of the block to shift along the link independently of the governor action is controlled by the friction of the excentric, and so has but little disturbing influence on the governor.

5768. STEAM ENGINES, *C. Ridealgh, Sunderland.*—4*th December*, 1882. 6*d.*

This relates to multiple cylinder single-acting engines. The cylinders are fixed with their cylinders in the same plane and their bases in a plane at right angles to their axes. At one end are attached to a plate formed with ports and passages communicating with the several cylinders arranged either to act independently as ordinary non-compound engines, or the exhaust port of one is made to communicate with the slide jacket of another, thus forming a compound engine. Two ports are formed in the plate opposed to the end of each cylinder, one being an inlet and the other an exhaust port. When all the cylinders exhaust directly into the air or into a condenser, one slide jacket or steam chest contains all the slide valves; but where

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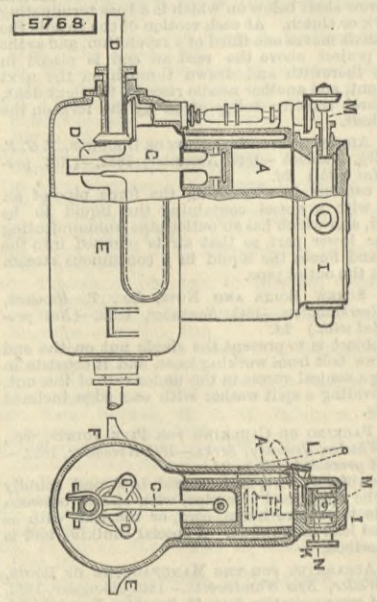

the engines are compounded, partitions divide the steam chest according to the number of cylinders. Each slide face is fitted with a distributing valve worked by an excentric on a common shaft actuated by the crank shaft, which is enclosed in a casing formed in one with the cylinders. A is one cylinder, the piston of which is connected by rod C with crank shaft D enclosed in casing E. I is the slide jacket, K the steam inlet, and L the exhaust port. M is the shaft actuated by gearing from the crank shaft, and formed with excentrics N, which actuate the slide valves by working between parallel faces formed at right angles to the reverse of the slides. The reversing is effected by altering the angular position of the shaft M with relation to the crank shaft. The distribution valves may be rotary if desired.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

279,273. TELEMETER, *William D. Patterson, San Francisco, Cal.*—*Filed March 6th*, 1883.

Claim.—(1) In a telemeter, the tube A, having an object glass at each end, and a small telescope *a*, whose collimated line is at right angles with the collimated line of said tube, and adapted to permit observation in a direct line through one of the object glasses, in combination with a swinging mirror or reflector within the tube A in line with the other object glass, a means for moving and reading the inclination of said mirror, and a system of reflectors in the other end of the tube to reflect the ray of light from the swinging mirror to coincide with the direct ray, substantially as herein described. (2) In a telemeter, the tube A, having an object glass at each end, and a small telescope whose line of collimation is at right angles with the collimated line of tube A and in line with the object glass at one end, in combination with the reflectors B^1 and B^2 and the half-silvered reflector or glass B^3, arranged, as shown, to

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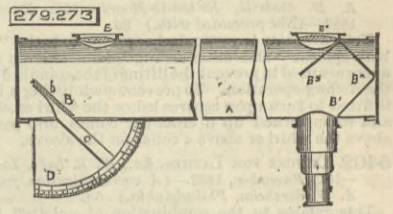

transmit the direct ray to the eye at the small telescope, the swinging mirror or reflector B at the other end of the tube A, adapted to receive a ray through the object glass at that end, a means for moving or changing the inclination of said reflector to cause its ray to coincide with the direct ray at the other end, and a means for reading the inclination of mirror B, substantially as herein described. (3) A telemeter consisting of the tube A, having object glass E E^1, the small telescope *a*, the reflectors B^1 B^2, the half-silvered glass B^3, the mirror or reflector B, mounted on pivots *b* in the other end of the tube A, and the means for inclining and reading the inclination of said mirror, consisting of the arm C, the vernier *c*, and the graduated arc D, all arranged and operating substantially as herein described.

279,573. MANDRIL FOR BENDING TUBES, *Edwin S. Leaycraft, Jersey City, N.J.*—*Filed January 11th*, 1883.

Claim.—A mandril for forming or bending metallic tubes, composed of pulleys, cut into sections radially and strung together on wires passing through the

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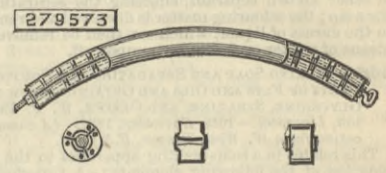

respective sections, and placed upon a central rod or wire of such diameter that the pulleys, when placed thereon, will occupy the same diameter that they would before being cut into sections.

CONTENTS.

THE ENGINEER, July 20th, 1883. PAGE

CONSUMPTION OF GAS IN BERLIN.—In the year 1881-82 the four gas works of that city produced 3,360,000,000 cubic feet of gas, of which 14½ per cent. was consumed in public illumination. The loss amounted to 8·2 per cent. Schlesian coal is almost exclusively employed and yields on an average ten thousand cubic feet of gas per ton.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending July 14th, 1883:—On Monday, Tuesday, and Saturday, free from 10 a.m. to 10 p.m., Museum, 11,257; mercantile marine, Indian section, and other collections, 5548. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 6 p.m., Museum, 3086; mercantile marine, Indian section, and other collections, 1499. Total, 21,390. Average of corresponding week in former years, 18,882. Total from the opening of the Museum, 22,185,272.