#### THE ROYAL AGRICULTURAL SOCIETY'S SHOW AT SHREWSBURY.

THE Royal Agricultural Society's Show opened under very favourable auspices at Shrewsbury on Saturday, July 12th. We have already given full particulars of the entries, prizes, competitions, &c. &c., and we need not reproduce them here. Great preparations had been made in the extremely picturesque town of Shrewsbury, and the triumphal arches across the principal streets are by far the best we have ever seen. They are painted on stout canvas stretched on a light timber framework, and have been done with a good ave to scenic effect. The town and been done with a good eye to scenic effect. The town and the neighbourhood present many objects of interest. Manufactures it has practically none, being in the centre of an almost purely agricultural district. It is impossible within the limits of available space to say this week all that we have to say concerning the show, and we shall confine our attention for the present to the steam and other engines, the thrashing machinery, and to some of the miscellaneous machinery exhibited. The former we have dealt with fully elsewhere. Here we shall speak only of the very various machines and implements which must be taken together as miscellaneous.

On Wednesday-the second half-crown day-as many on wednesday—the second half-crown day—as many as 13,574 persons were found to be willing to pay for ad-mission at the turnstiles, compared with 21,817 at York, 13,461 at Reading, 18,130 at Derby, and 13,164 at Carlisle. According to the testimony of many exhibitors, the Shrewsbury Show has up to the present time seldom been rivalled in regard to the amount of business done. In a single day one Yorkshire firm sold over four hundred chaff cutters, and large numbers of others have been busily engaged in booking orders. Shropshire exhibitors are extremely pleased with the unexpectedly large results from their exhibits.

There is rather a large number of sheaf-binding reaping machines in the yard, all of which bind by means of string, and nearly all of which are fitted with the Appleby form of binding apparatus, or modifications of it. Most of the machines have a high level binding table, but two makers have produced a "low down" machine, namely, one in which the binding takes place on a platform but a few inches above the ground, and some makers of the machines with high elevator webs have reduced the height of this elevating part. It is particularly noticeable that the wire binding apparatus is already completely dead, and at the competitive trials to be held by the Royal Agricultural Society in a few weeks, none but string binders will be admitted. As we shall have to deal at some length with these machines on the occasion of the trials, it is unnecessary to refer at length to them here. Messrs. Samuel-son and Co., of Banbury, exhibit one of the two very low son and Co., of Banbury, exhibit one of the two very low level machines just referred to, the binding platform being on one side of the cutting platform, an arrangement which makes the machine very wide. This, however, for tra-velling purposes is overcome by putting on a pair of travelling wheels on a detached axle, and by fixing the pole in the direction of the length of the machine, for which provision is made. The binder is of the Appleby form, modified to suit the position. The revolving packers are used. The machine has, we are informed, been exten-sively and successfully tested in South Australia and New Zealand. The second low-level machine is by Mr. Kearsley. Zealand. The second low-level machine is by Mr. Kearsley, of Ripon. It is not so low as that just mentioned, an elevator being used to raise the corn to the binding platform. This, however, is placed at an angle with the finger bar, and by this means the width of the machine is kept down to that of a wide gateway. Though the binding platform is a little higher than that of Messrs. Samuelson and Co., it is much lower than the machines

exhibited by the other makers. Messrs. J. and F. Howard have made some material Messrs. J. and F. Howard nave mate some material improvements in their sheaf binder, amongst which is a simpler means of actuating the retainer, an arrangement by which the packing arm itself releases the binding gear, and thus determines the size of the sheaf. Messrs. and thus determines the size of the sheaf. Messrs, Howard have made machines with binding platforms, like

Messrs. Samuelson's, on the level of the cutting platform; but these were not ready for exhibition at the Show. Messrs. Hornsby and Sons, H. J. H. King, and Bamlett, are also exhibitors of string binders entered for the coming trials. Messrs. Hornsby and Sons have already done good work with their machine, and gained high award with it. Messrs. King and Evans have been at work hard for years in the endeavour to get a good binder, and this year, like the rest of the makers, have come out with a modified Appleby binder. The arrangement of the machine is, however, such that it will readily pass an ordinary gateway when ready for work. The Wood and the McCormick and the Johnstone machines are all orbiblication of the second se exhibited, and a large number have been entered for trial. Even when allowance is made for the number of machines entered, but which will not be quite ready when the time comes, there is still a larger number for trial than has yet been put into competition by the Royal Agricultural Society.

Attached to Messrs. Howard's machine is a very simple means of preventing the continuous tieing up of small sheaves. h not described without drawings, which we shall postpone. On their stand is an automatic sheaf-delivery reaper with controllable rakes arranged within a steel and wrought iron frame, the result being a light, strong, and cheap machine, weighing only 6.5 cwt.

With regard to the trials of sheaf-binding machinery, which as already announced, will take place at harvest time, in the neighbourhood of Shrewsbury, it may be stated that the stewards have given to the competing exhibitors permission to remove their machines after the conclusion of the Show, provided they deposit with the secretary the sum of £25 for each machine so removed, as security for its appearance on the trial ground at the appointed time. This deposit will be refunded after the trials have taken place, but will be forfeited to the Society if the machine is not due worked. if the machine is not duly produced. The advantage of this arrangement is that it will afford the competitors the desired opportunity of improving their binders in the adjustment is very easy.

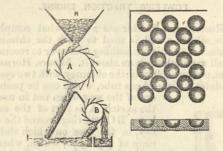
meantime, and also of practically trying them on crops in the field before the trial organised by the Society. A new form of brick, pipe, and tile machine is exhibited by Messrs. E. Page and Co., of Bedford. The novelty consists in the use of a horizozontal rectangular clay box fitted with a close fitting plunger worked by two connecting-rods actuated by their attachment to two slotted links, which receive their motion from the sliding blocks working on crank pins in two disc wheels, one on each side of the machine, and driven by strong gearing. By the use of two connecting-rods a parallel movement of the plunger is ensured, and the risk of breakage from unequal distribution of clay in the box is minimised. By the employment of the slotted links the connecting-rods are never more than 12 in. out of the centre line of pressure on the plunger. Another the centre line of pressure on the plunger. Attornet advantage is that a slow pushing stroke and quick return, as in some forms of shaping machines, is secured. This gives ample time for refilling the box after each stroke, and the power is greatest on the working stroke. The machine is also fitted with a screen which can be cleaned while in motion. The machine makes about three strokes per minute delivering of the learch of don't house ht dois and minute, delivering a 6ft. length of clay through the die; and it will make from 18,000 to 20,000 tiles per working day.

It will make from 18,000 to 20,000 tiles per working day. Messrs. Samuelson exhibit a new machine in the form of a turnip cutter, with two of Gardner's barrels working towards each other. There is a knife blade separation between the barrels, and as both barrels cut in the same direction, *i.e.*, downwards, but on opposite sides of the turnips, the latter are kept from revolving; the last piece is cut, and the machine will perform a very large quantity of work of work.

Messrs. E. H. Bentall and Co. show a new litter cutter, with a modification of the old cylinder or spiral knife. The old machines of this kind were never satisfactory, chiefly because the knife or knives could only with diffi culty be adjusted. By giving the knife more the form of a part of a cylinder, and giving it extra width, supported by a wide arm, giving room for a number of set screws, Messrs. Bentall have got over this, and produced a good machine which will cut litter and, with very slight changes, long or short chaff. They also show an oat kibbler, in which steel barrel and steel back are used, and the spindle easily withdrawn from the barrel when repair is necessary.

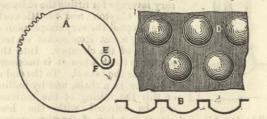
A clip pulley of a cheap form is exhibited by Messrs. R. J. and H. Wilder, of Wallingford. In this pulley clip pieces are held in place between two beaded wheel rims by projections on the back of the clip segments, which fit loosely on the internal heads of the flanges or rims of the Between the two rims are packing pieces, which may be varied in thickness to suit the diameter of the

may be varied in thickness to suit the diameter of the rope employed. These pulleys are chiefly used by the makers for well ropes and such purposes. A new form of cockle, round seed, and broken grain separator is exhibited by Messrs. Guy and Stevens, of Kingston-on-Thames, in which the separation is effected by the use of metal plates punctured with holes not quite through the plate. An idea of the construction of the machine can be gathered from the annexed diagram. Here H is a hopper, in which is a feeding roller, and below it a H is a hopper, in which is a feeding roller, and below it a barrel of some length fitted with paddles not radially set. These paddles are made of the punctured metal strips; B



GUY AND STEVENS' GRAIN AND SEED SEPARATOR.

is a similar barrel. The grain from the hopper passes on to B, turning in the direction of the arrow. The whole grain is carried down far enough to fall down into the box C. The cockles, &c., fitting into the punctures are carried farther and drop to B, where the process is repeated, the



GATWARD'S GRAIN AND SEED SEPARATOR.

cockles passing into box D. The same idea was some time since worked out in a different way, as shown at York by Messrs. Gatward and Son, of Hitchin. This was illustrated in THE ENGINEER of the 20th July, 1883, p. 44, and for convenience we reproduce the accompanying engraving, as it seems to us to be the better form of the two.

In their straw elevator Messrs. R. Hornsby and Sons have made an improvement in the folding joint in the centre of the trough. This consists in making the joint with a short link, thus forming a double joint, so that it accommodates itself to the length of the elevator chain, which has not to be slacked out to allow for the folding. Time and trouble are thus saved.

Messrs. Picksley, Sims, and Co. have appeared as makers of engines and thrashing machines. The latter is of a well-known type, and calls for no special remark.

Messrs, Ransomes, Sims, and Jeffries show a new form of lawn edge cutter, the roller of which is of truncated ogival form, making it work with much facility in trimming the borders of any angle, or of scalloped or any ornamental form. The revolving and the fixed knives are, moreover, attached at right angles to each other by screws, so that

A number of other kinds of machines we must leave for our next impression, but as we generally mention the fact when a show or exhibition catalogue is bad, we ought here to mention that the Royal Agricultural Society's catalogue is very complete, and well supplied with name and subject indexes, and is not rendered a nuisance with intrusive advertisements.

The judges of implements have awarded one out of the ten silver medals at their disposal for new or improved inventions. This is given to Messrs. Richard Hornsby and price  $\pounds 3$  15s.—fitted as a gripping plough with steel breasts. In addition to these ten silver medals, the judges breasts. In addition to these ten silver medals, the huges were also empowered to make special awards of medals for efficient modes of guarding or shielding machinery from contact with persons immediately engaged in attending to such machinery while at work Taking advantage of this authorisation, they have awarded a silver medal to Messrs. Burlingham, Innes, and Paternoster, for their new patent of the tracked to their aembined portable self-feeding motion attached to their combined portable self-feeding motion attached to their combined portable chaff and ensilage cutter, as an efficient safety guard to the feeder of the machine. It was confidently anticipated that other novelties in the Shrewsbury Showyard would receive distinction at the hands of the judges; but it is understood that further awards may possibly be made before the closing of the exhibition.

#### ENGINES AT THE SHREWSBURY SHOW.

THERE is little variety in the steam engines shown this THERE is little variety in the steam engines shown this year at the Shrewsbury Show of the Royal Agricultural Society. We find there the same types that have been repeated year after year by the same firms with the smallest possible changes even in details. Novelties in the construction of such engines we have long given up the hope of finding. It would seem indeed as though finality had been reached; and for any important alterations we must wait until the Royal Agricultural Society thinks fit must wait until the Royal Agricultural Society thinks fit to yield to wise counsels, and give prizes once more for the best steam engines. The last steam competition was held at Cardiff, and in the years which have elapsed since then, the portable and semi-portable engine have alike undergone important modifications, and it is certain that what was deemed exceptionally economical at Cardiff would not be so considered, let us say at Preston, next year. The great mass of engines shown at Shrewsbury call for no particular comment, and we shall therefore confine our attention to the comparatively few which present some points worthy of special notice.

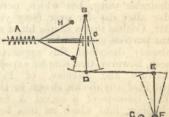
The only compound stationary engine in the yard is shown by Messrs. Whitmore and Binyon, of Wickham Market. It is a tandem engine, intended for the use of millers, and is at work driving flour-dressing machinery, &c. The cylinders are steam-jacketted, 6½m. and 10m. diameter and 12m. stroke. The frame is of the Corliss type. The automatic expansion gear consists of a semi-rotary valve somewhat like Rider's at the back of the main slide of the high-pressure cylinder. It is actuated horizontal cam plates rotating with the governor by horizontal cam plates rotating with the governor spindle. One of these opens the valve while the other closes it. This last is cast on a sleeve with two screw slots cut in it, and as the governor rises and falls a pin in these slots causes the cam plate to go ahead of or fall behind the governor through a portion of a revolution, thus accelerating or retarding the moment of cut-off. The engine is well-finished and well-designed, but the exhaust pipe from the high-pressure to the lowpressure valve chest is unlagged and of considerable length,



which is distinctly a mistake. Compound engines are shown by several firms. The most noteworthy is a great portable shown by Messrs. Richard Garrett and Sons, which will work up to 100 indicated horsepower. It is of the "D" size, and is fitted with Boutard's reversing gear, illustrated and fully described in our impression for the 16th of May. The fire-box crown has a single cor-rugation — thus. This is a fine engine, well made and well de-signed. A smaller compound, of signed. A smaller compound, of the "Alpha" class, to indicate about 18-horse power, is also shown by the firm.

Messrs. John Fowler and Co., of Leeds, have more than one compound engine in the yard. Generally speaking, they are of the "Yorkshire" type, first brought out by the firm at the Kilburn show. These engines are all of ample proportions, and excellent material; but the workmanship does not appear to us to be as good as it used to be, and does not compare favourably in the matter of finish with At Stand 254 will be found one, driving brick machinery by Messrs. Bradley and Craven, of Wakefield. This engine is fitted with a valve gear recently patented by Mr. Wilson Hartnell, which does not compare favourably with the chargent degree for favourably with the elegant devices for effecting the same ends which he has already produced. On the back of the main slide are two V pieces, which, travelling at right angles to the course of the main valve, serve to open and shut the steam admission ports in a way which is well understood by all engineers, the device being a very old one. The V pieces are moved by the partial rotation of the rod driven by the cut-off excentric, and this rotation is brought about by the governor in a way which will be readily understood

from the following diagram. Here H is the governor, located horizontally under the forward end of the boiler, so that the balls just clear the smoke-box; A is a spiral spring, loading the governor; B D is a pendulum lever, acted



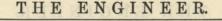
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on by a sleeve C; E F is an arm keyed on the V valve spindle;

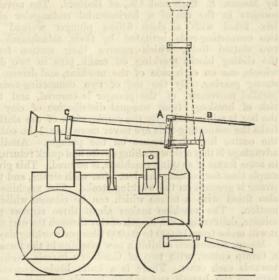
G is the main slide valve rod. As the governor balls open and close, the rods BD and EF describe arcs, as shown by the dotted lines, and thus the rod F is caused to make a partial rotation. As, however, F is moving endways backwards and forwards at the same time, the end E of the rod D E also describes an arc in a plane at right angles to the two other arcs, and this renders it necessary that the joints at D and E shall be universal. Universal or not, however, no matter what the position assumed by the governor sleeve C, the arm E F would have a motion imparted to it equal to the versed sine of the horizontal arc described by F, and this mould effect the point of out off. described by E; and this would affect the point of cut-off if the governor were very sensitive and the joints D E were tight. The difficulty is got over by making them slack, so that there is a good deal of play. The workmanship of the governor is not the best possible, and the action is not very good. It is sufficiently accurate, however, for brick machinery. The idea involved is somewhat ingenious, but, as we have said, it does not compare favourably with other specimens of Mr. Hartnell's skill.

other specimens of Mr. Hartnell's skill. Messrs. Charles Burrell and Sons, of Thetford, show a portable engine of the "Lady Jane" type, which has already been fully described in our columns. The steel springs on the governor have been replaced by flat chains, which is, we think, an improvement. Close by this stand is a portable engine by Messrs. Gibbons and Robinson. This engine will repay examina-tion although at first eight it presents pathing remarkable

tion, although at first sight it presents nothing remarkable. The guides are of the trunk type, bored out with the cylinder, and the crosshead is made adjustable in one direction—that in which wear takes place—by a very neat and simple modification of the wedge. The governors are



lower the chimney in a few seconds. The lever serves as an ordinary crowbar. It will be seen that there is a truss rod on the chimney. Mr. Barford maintains that this is

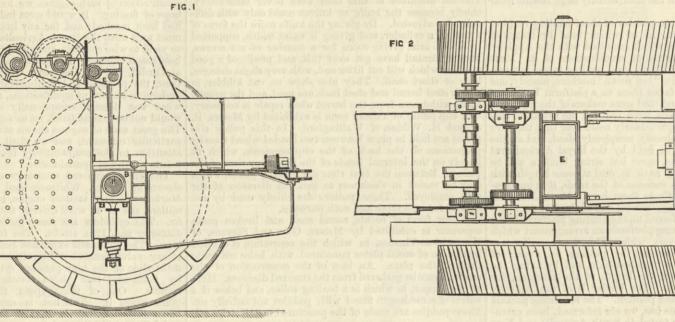


#### BARFORD'S CHIMNEY\_RAISER.

essential, because when chimneys get old they are often nearly burned through at the base, and too weak to stand the strain. Other makers have not been idle, however. 1883, for further information. Mr. Foden uses two cylinders, and for this we commend him. His practice is opposed to that of most other makers of traction engines, but the double cylinders save the gearing from shocks and snatches. In one word, they are mechanically right. Whether they are commercially right or not is quite another question; but those who have driven double-cylinder traction engines know they are greatly superior to those with single cylinders in steadiness and ease of movement.

cylinders in steadiness and ease of movement. The Durham and North Yorkshire Engine Company shows a traction engine which is carried on helical springs on the foot-plate. The whole arrangement of this engine is good and ingenious. The framing of the engine is the now usual wrought iron box on top of the fire-box. The whole fire-box drops into and is fitted in a kind of cage of wrought iron plates which support the bearings for the gearing. The crank shaft being supported by the engine and fire-box, can play up and down in the cage through the extent of the array of the array of the support extent of the range of the springs. An extremely neat arrangement is used for changing the speeds, the pinion being moved by a small cross handle, which, being turned, winds the sliding clutch bar right or left as may be desired.

The third engine of this type is shown by Messrs. Fowler, of Leeds; the diagram on the next page shows the spring gear. Hitherto, in order to keep the crank pins and front motion wheel in gear, they have been coupled by arms, one at each end of the shafts. In the sketch A and B are the crank shaft and third motion wheel respectively. E is one of the links of which we speak, while C may be taken to represent the thrust rod, and D the road spring. It will be seen that E plays up and down with B, but that the positions of the pitch circles remain unaltered. Now



very small, run at a high speed, and control the engine by a peculiar rotary throttle valve, which is very simple and perfectly balanced. We do not feel ourselves at liberty to make the details public. In all governors the force available for working the throttle valve is only the difference between the pull of gravity or a spring and the centrifugal force of the rotating element in the generatory and the more delicate the generatory is the in the governor, and the more delicate the governor is the less is this force. In astatic governors it is very small indeed. In the case of the engine of which we speak the valve is in such perfect equilibrium that it offers no resistance worth naming to the governor, and this renders the use of an extremely small one practicable. The stop valve, too, is simple, ingenious, and so far as we are aware, new. It has the curious property that when open the whole of the seat is covered; at such time the rush of steam from the boiler is most likely to carry up mud and grit to be deposited on the rubbing surfaces. These are, grit to be deposited on the rubbing surfaces. These are, however, as we have said, quite protected at that time, and only exposed when the valve is shut, at which time grit is not likely to find its way to them. The engine is a new departure by the firm, and reflects much credit on Mr. Robinson, by whom we believe it was designed. It is unnecessary to say more of the engines of Messrs. Marshall and Sons, Clayton and Shuttleworth, Robey and Co. Barsomes Head and Inférrice F. B. and F. Turmor

Co., Ransomes, Head, and Jefferies, E. R. and F. Turner, Ruston and Proctor, the Reading Ironworks Company, Brown and May, Barrows and Stewart, &c., than that they in all respects maintain the reputation of their makers, Higher praise than this we cannot give them, and they

present no features of novelty calling for special remark. It may be taken as illustrating the difficulty which now exists in producing a novelty in portable engines, that nothing in the showyard has caused more excitement than appliances for raising chimneys. The chimneys of all portable engines are made with a hinge at the base; a crutch or fork is fitted at the opposite end of the boiler, and when the engine is not at work the chimney is laid down horizontally, one end supported by the hinge, the other by the fork. When the chimney has to be raised a man must get up and stand on the engine, which is not a desired by the third but is hort a the state of desirable thing, but which, nevertheless, has been done day after day for over forty years. Last year it struck Mr. Coultas that a simple bit of mechanism would answer the purpose, and he adopted a screw and chain. We have already described this apparatus fully. It was soon seen, however, that simpler expedients would do. Messrs. Barford and Perkins, of Peterborough, accordingly patented the device shown in the accompanying sketch. This consists of a socket A fixed on the front of the chimney, into which an iron lever B fits. By inserting chimney, into which an iron lever B fits. By inserting the lever into the socket, one man can most easily raise or

FOWLER'S TRACTION ENGINE.

device, in which a rod is used to push the chimney up from behind. As this has nothing whatever to recommend it, we shall say nothing more about it. Messrs. Hornsby, of Grantham, put two collars on the chimney, with two eyes, and in these slides a piece of gas tube, which can be pushed up out of the way when not in use. In the sketch, A is part of the smoke-

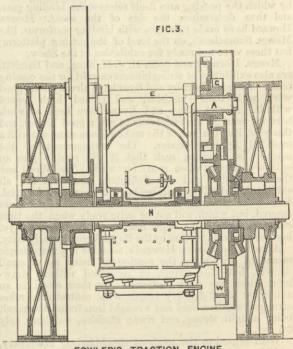
box ; BC two rings round the chimney, in the eyes on which slide the piece of piping D, which, when the engine is at work, are pushed up out of the way, as shown, the bent end resting on the smoke-box; E is a collar which prevents the pipe being taken out and mislaid by coming in contact with B, when D is drawn out through the eyes to give the neces-sary leverage for lifting the chimney. Messrs, Clayton and Shuttleworth have adopted the very simple plan of rivetting a cast iron socket on near the base of the chimney. Into this a lever is stuck when it is necessary to elevate the funnel. To the end of the lever is a chain, and by pulling on this the raising of the chimney can be effected with the least A large number of traction engines

possible trouble. is exhibited by all the principal makers. They call for no special mention, and we shall speak now only of those in which springs, in some form or other, are used. For twenty years or thereabouts this journal has per-sistently advocated the adoption of springs for traction engines and our views have as steadily been onposed by

A

engines, and our views have as steadily been opposed by some makers, while the rest stood aloof, or from time to time made attempts to mount their engines on springs, and then reverted to the old system. Time has, however, shown that we were right, and all the principal makers of this class of engine are now adopting springs in some form or other. Those who make only a few engines for the road have not altered their plans yet. Two methods of obtain-ing elasticity are in use—in one the engine is mounted on springs interposed between it and the axle of the driving wheels; on the other, the springs are put into the wheels. We shall deal with this system last. Mr. Foden, of Sandbach, in Cheshire, shows a very good engine indeed. It has driving wheels 7ft. high, and is carried on helical springs put into boxes above the countershaft. In this way the whole of the gearing rises and falls, while the pitch lines keep their proper places. We have already illustrated this engine, and we must refer our readers to our impression for July 20th, I the action of the springs. By the use of the equalising

Messrs. Ruston and Proctor use a somewhat complicated | it has been found in practice that considerable difficulties interfere and prevent this being made a good job. In the engine under notice, the link E is not centred on the engine under notice, the link E is not centred on the crank pin shaft, but on a short pin put parallel with it across the fire-box as shown. In the sketch on the next page H is the centre pin to which we have referred. In this case the link E takes the form of a broad casting, the top of which makes a tray for the driver's cans, &c. The accompanying engraving shows the arrangement as actually worked out in practice. It will be seen that to keep the gearing in proper

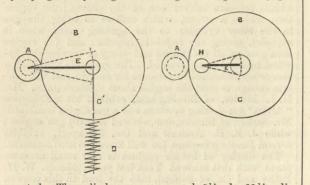


#### FOWLER'S TRACTION ENGINE.

working position, the third motion shaft A is coupled by the two vertical links L to the axle-boxes B; the axle H revolving in these axle-boxes, and the weight of the engine being thus transmitted through the springs, the vertical levers  $\mathbf{L}$  keep the road spur wheel W and the road spur pinion G always equally distant from each other. The third motion shaft A is carried by the equalising lever E, which is free to move on its centre F, thus allowing the third motion wheel and pinion to rise or fall according to

#### JULY 18, 1884.

lever and by coupling both axle-boxes to it by the levers L, a parallel motion is obtained, and at the same time the third motion wheel is free to vibrate on the pitch line of the pinion, into which it gears according to the amount of play of the springs. One of the great advantages claimed for this engine is that the tractive power does not pass through the springs, as in the case of engines with spring wheels and from prostical experiment does not pass the spring wheels, and from practical experience Messrs. Fowler state they find the gear most efficient, the springs only working in proportion to the unevenness of the road, and the usual jumping and jarring of the engine being entirely pre-



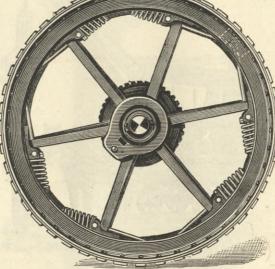
vented. The cylinders are compound, 6½ in. by 11½ in. dia-meter, and the boiler constructed for a working pressure of 140 lb. per square inch. The spur gearing is of steel, and fitted with compensating wheels and pinions. The driving wheels are 7ft. diameter, and driven through the axle. The drag bar is fitted with a spring, and the engine throughout is designed to withstand the heavy wear and tear of continuous road haulage. We come now to spring wheels. Three types are shown at Shrewsbury, namely, Mc Laren's, Aveling's, and Burrell's. We have already fully illustrated MacLaren's wheel, and it is enough to say here that the spokes are broad plates of steel bent to a gentle curve, and secured by

broad plates of steel bent to a gentle curve, and secured by nuts and bolts at their inner ends to the boss of the wheel while the outer ends bear against the inside of the vineer, Messrs. McLaren, of Leeds, show two fine traction engines fitted with these wheels, and a wagon; they also show one of almost the first pair of spring wheels they made; it is the property of Messrs. W. Lund and Son, of Chapeltown, near Leeds, and having run over 6000 miles, is as good now as when it began work. These wheels have worn out two sets of cross-pieces on the tires. We have already expressed a highly favourable opinion of this wheel, and we are glad to find that the results obtained have answered our expectations; over 60 pairs are now at work.

The spring wheel shown by Messrs. Burrell, of Thetford, is applied to a very fine traction engine indeed, built in the substantial style for which the firm has acquired a well-deserved reputation. The construction of the wheel will be understood in a moment from the annexed cut. The spokes are of steel, bent as shown; each is secured to the angle iron of the rim by two rivets, put in by hydraulic

great satisfaction, but like Burrell's it is too short a time in use to permit a confident opinion to be expressed concern-ing its future. Turning now to what may be termed miscellaneous

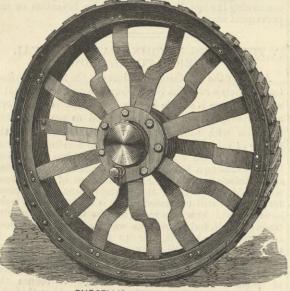
we would direct attention to a new crane exhibited by Messrs. Aveling and Porter, of Rochester.



AVELING AND PORTER'S SPRING WHEEL.

We shall publish drawings of this machine in an early impression; without them it would be impossible to make its construction clear. It must suffice to say that while it some respects resembles the locomotive crane made hitherto by the same firm, and now perfectly well known to almost all engineers, it differs from that in the fact that the jib can be swung round at right angles to the engine at either side. The crane is worked from the foot plate. Fitted with a grab bucket-Priestman's patent-the plate. Fitted with a grab bucket—Fitestman's patent—the engine may be made to run on the towing path of a canal and dredge the banks. For ordinary crane work it is, of course, more useful than anything of the kind yet brought out. The clutch gear in this crane is, so far as we are aware, entirely new, and the whole machine reflects much credit on its designer.

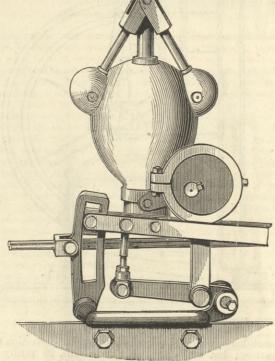
Messrs. Hornsby, of Grantham, exhibit a fine semi-fixed ompound engine, the valve gear of which deserves notice. When a link rocking on one end is used to determine the point of cut-off, the inclination of the link at each end of the stroke tends to cause the governor to dance. Various attempts have been made to get over this difficulty. The plan usually adopted is to use a dash-pot to steady the governor. This, of course, has its objections, one being that it renders the governor sluggish in its action. Messrs. Hornsby attempt, with considerable success, to get over the difficulty



BURBELL'S SPRING WHEEL.

pressure. The boss is in two parts, bolted together, and the spoke ends are fitted into cells in the boss, but are not fixed. This permits a certain amount of play to take place. The wheel can, of course, be made stiff or rigid, as may be needed, by employing spokes of any suitable thick-ness or curvature. The wheel has not yet been sufficiently long in use to let us speak positively concerning its future; but the results obtained up to the present have been, we understand, all that can be desired, and the simplicity of the wheel is immensely in its favour.

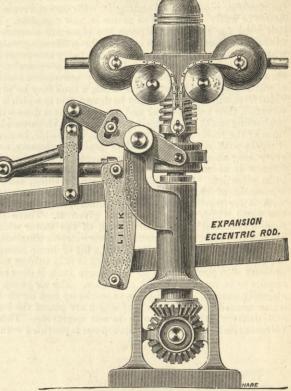
The third wheel shown is that of Messrs. Aveling and Porter, and is extremely ingenious, and far more elastic than either McLaren's or Burrell's. Whether this is or is not an advantage we shall not pretend to determine. Much will depend, we imagine, on the roads. The accom-panying engraving illustrates the wheel. The outer rim or tire is made up in trough section by two angle irons. The spider, or centre of the wheel, consists of the arms and two wrought iron rings. These rings are geared at a suitable distance apart by castings, which are secured to them by putting the rings in the mould and making the castings on them. Each casting is the point of abutment of one of Timmis' helical springs, as shown. The rods passing through the springs are secured by pins, as shown by the dotted lines, to the outer rim or tire. Thus it will be understood that the tire and the spokes are only connected through the medium of the springs. In the position of the wheel shown, the whole weight of the engine would hang on the two vertical springs at each side of the wheel. We understand that this wheel is giving very



HORNSBY'S VALVE GEAR.

in the way shown by the accompanying engraving. It is well known that, while an excentric makes a good driver, it is very hard to drive it. Bearing this in mind, the action of Messrs. Hornsby's gear will be readily under-stood. The governor is heavily loaded, as shown. The lower end of the spindle carries a collar, in which is a ring ; this ring is connected to the arm of a short rocking shaft, on the other end of which is keyed an excentric This excentric is fitted with a hoop and rod, by which it shifts the die in the link, in a way that will be understood in a moment. Now the excentric acts very power fully to shift the die, but the die can do very little to shift the excentric, and set the governor dancing. We have not seen the governor at work, but we are told that it performs very well, and we see no reason to doubt this. Messrs. Charles Burrell and Sons show a semi-fixed

engine, of most substantial design and excellent work-manship. This is fitted with a valve gear shown by the accompanying engraving. A parallel motion is used to carry the outer end of the cut-off valve rod. The link is of the box type. Here the attempt is made to obtain steadiness by employing a governor of very considerable



action, but solely on centrifugal force, controlled by a spring. This gear has been very well thought out. The workmanship is really admirable, and in the matter of

solidity of construction and dimensions of parts nothing

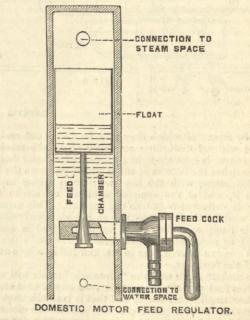
is left to be desired. An unusually large range of expan-

BURRELL'S VALVE GEAR.

sion has also been secured. We have not seen the gear at work, but we are told that dancing is practically pre-vented. The problems presented by the construction of valve gear of this type are so interesting that we propose to discuss them fully at another time.

Among the smaller engines exhibited, we can speak very favourably of those shown by Mr. E. S. Hindley, of Bourton, Dorset. The little engines made by this firm have enjoyed a well-deserved reputation for years, and in design and workmanship Mr. Hindley appears to improve year by year. Messrs. Farmer, Robey, Brown and Co., Gainsborough, show some small engines of good quality. The little 2-horse power portable engine has a cylinder The little 2-horse power portable engine has a cylinder 5in. diameter and 8in. stroke, which is considerably more than is usually allowed for a 2-horse engine. It has a trunk guide bored true with the cylinder at one operation, and steel is freely used. Mr. Mather shows an example of his curious little portable engines, which travel on their own fly-wheels, which have already been described in this journal. Many other makers exhibit excellent small engines, which, however, present no features worthy of special comment.

Perhaps the most interesting new exhibit is the Domestic Motor invented by Mr. Henry Davey, and exhibit is the Domestic Messrs. Hathorn, Davey, and Co., of Leeds. Many attempts have been made from time to time to produce a cheap, safe, and economical small motor for the "hundredand-one" purposes requiring small power. Small steam and-one purposes requiring sman power. Sman sceam engines, gas engines, hot-air engines, and water-pressure engines have been employed, but, as we have before pointed out, there is a want of something simpler in its mechanism for a variety of purposes to which the above-named motors are not so well adapted. The Domestic Motor is an honest and most successful attempt to produce an engine which possesses all the advantages of a steam engine without the com-



plication, danger, and need of attention incidental to the steam engine. The motor is a vacuum engine, or as it may be termed, a steam engine which works with negative pressures. It has a cast iron generator resembling a greenhouse boiler, in which water is evapo-rated below the atmospheric pressure and therefore worked rated below the atmospheric pressure, and therefore worked at very low temperatures. Referring to our illustrations, it will be seen that the motor consists of a vertical cast iron shell of symmetrical and convenient form, in which is power, which does not depend at all on gravity for its contained a removable fire-box and a bronze working

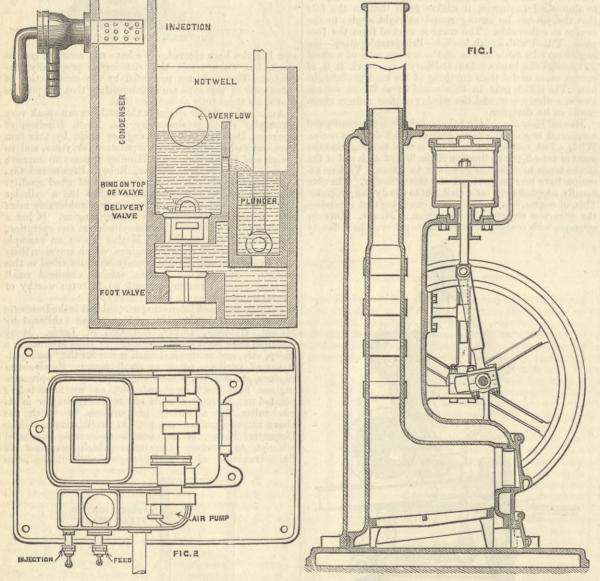
cylinder resembling the cylinder of a double-acting steam engine. The said cylinder is situated in the upper part of the generator. The crank, excentric, slide valve and connecting-rod are all of the ordinary side valve and connecting-rod are all of the ordinary engine construction. At the side of the generator is a casting forming the condenser, automatic fuel chamber, and air pump. To this casting are connected two small india-rubber pipes for connecting it with any convenient source of water supply. The motor is now complete. If it is used for pumping purposes the pipes are connected to the water pump, and one supplies the condensing water whilst the other supplies the feed both being automatic whilst the other supplies the feed, both being automatic in action. When the motor is used for driving purposes only, action. When the motor is used for driving purposes only, then the pipes are connected with any convenient source of water supply, or if none such exists, a tank may be pro-vided from which the water may be drawn, and to which it is returned, thus using it over and over again, as is done with the cooling tanks of gas engines. The great recommenda-tions of the motor are that explosion is impossible, because it works with negative instead of positive pressures, and it works with negative instead of positive pressures, and It works with negative instead of positive pressures, and everything about it is automatic except the fire; but the furnace is so constructed that even that requires but little attention. So simple is the whole thing, that a housemaid of ordinary intelligence might be entrusted with it for working domestic machinery, thus justifying the name which the makers have given it. There are some mechanical points in the design of the motor which are specially interacting because of their arts are simplicity. some mechanical points in the design of the motor which are specially interesting because of their extreme simplicity. There is no packing about it, except a bit of hemp around the piston and valve rods; and as that is only subject to a pressure of a pound or so to the square inch, it does not require to be screwed up with a spanner. The air pump is absurdly simple. A solid plunger works up and down in a gun-metal barrel, at the side of which are placed the foot and delivery values as shown in our correspond. These and delivery valves, as shown in our engraving. These valves are linked together, and the top one is provided with a

loading manure, straw, &c. We cannot help thinking that a machine of this kind, with certain modifica-tions in the carriage on which it is mounted, might



#### PRIESTMAN'S DREDGER.

be found extremely useful in certain military operations. It could easily be made to go wherever a heavy field gun can be taken, and in a very few minutes in moderate ground it would sink a trench and raise an



DAVEY'S DOMESTIC MOTOR.

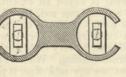
ring, by means of which they may be lifted out and re-The placed without disturbing anything about the machine. The plunger is kept air-tight by means of a water seal; as it approaches the bottom of the stroke it uncovers the hole communicating with the hot well; water rushes in and covers it, and at the completion of the up stroke that water is delivered back into the hot well. This arrange-ment enables the motor to run at a high speed without the air pump splashing. The automatic feed is accom-plished by means of a copper float in the feed chamber, which engages a tangent of the speed without the surgest at a part of the speed without the speed which causes a tapered plug to rise and fall in a hole at the end of the feed pipe.

The makers claim that the "Domestic" motor will work with less fuel per effective power than any hot air engine or other small motor made, and that it is the lightest and smallest motor for a given effective power. Its efficiency is certainly very great; we saw it running with a difference in pressure between that of the cylinder and generator of 5in. of mercury, and as its full effective pressure is 25in., its loss by friction, &c., in this case was clearly 20 per cent.

Messrs. Priestman Brothers, of Hull, produced a novelty in the shape of a small portable dredger, the first of the kind, we believe, ever made. It is illustrated by the accompanying engraving. It is fitted, as will be seen, with a pair of shafts, and can be drawn by one or two horses. It has been specially designed for cleaning out dykes and small streams, but it can also be used for

earth-bank, which would afford admirable protection to a battery; but apart altogether from this, its utility for loading and unloading stores of all kinds would be

loading and unloading stores of all kinds would be immense. It would come into use, in fact, as a highly improved steam crane, and the utility of steam portable cranes has already been recognised by the War-office. Messrs. Thomas Robinson and Sons, of Rochdale, show a semi-fixed double-cylinder non-compound engine of excellent design. The guides are of the cast iron trunk type placed back to back in one piece, somewhat in cross comparison with the source of th



section like the accompanying sketch. The side frames are of rolled beam iron. There is a centre bearing for the crank shaft carried on a similar beam. The feed pump is inside the frames near the firebox end, and driven by a back

rod from one of the excentric hoops. This engine has a great deal about it to recommend it, and it would be worth while to run it on a brake in competition with an ordinary commercial compound semi-fixed engine, in order to ascertain the difference in economy, if any, secured by compounding alone, the conditions of cut-off and expansion being, of course, the same in both engines.

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their new double-cylinder Otto engines of 6-horse power nominal; giving an impulse every revolution, and capable of giving out 28-horse power indicated. The double cylinder is self-starting; the self-starting arrangement is very simple. A strong cylindrical reservoir is provided, and at any time, say the end of a day's work, the exhaust from the engine is made to communicate with this by a suitable pipe and valve. The products of combustion—in other words, the exhaust air and gas from the engine—can then be accumulated to a very good pressure in this reservoir. When the engine is to be started a valve is opened which admits pressure behind one of the pistons; the engine then makes a stroke, which suffices to bring the gas in the other cylinder to the igniting point, when it explodes, giving the requisite impulse; and the engine then goes on, all the fatigue and worry of turning the fly-wheel by hand being avoided. The reservoir will hold a charge undiminished in pressure for months, and will con-tain enough to start the engine about eighteen times. Mr. very simple. A strong cylindrical reservoir is provided, and tain enough to start the engine about eighteen times. Mr. H. L. Müller, of Birmingham, exhibits his well-known "Alpha" gas-making machine and a gas engine combined. Mr. Barker, of Birmingham, showed a small gas engine to while J. E. H. Andrew and Co., Stockport, exhibits several Bisschop engines, too well known to need comment. The display of hot-air engines is very small as com-pared with that made at York last year. Messrs. W. H. Beilow and Co. of Salford take the load in this response

Bailey and Co., of Salford, take the lead in this respect, showing three, namely, a  $\frac{1}{2}$ -horse power horizontal engine which requires a little brickwork and almost no attenwhich requires a fittle brickwork and almost ho atten-tion. A vertical hot-air engine with pump attached; this is self-contained and needs no brickwork; it is specially intended for pumping water to supply dwelling houses in the country; and, lastly, a hot-air pumping engine similar to the preceding, but using ordinary coal gas as fuel. It is claimed for this latter engine that it is really a gas pumping engine but uplike other engine has no

It is claimed for this latter engine that it is really a gas pumping engine, but, unlike other gas engines, has no wearing parts and is safe while in motion. The Buckett engine is shown by Messrs. Gilbert Gilkes and Co., of Kendal. A single example only is exhibited, but this presents a marked contrast to those shown last year at York, in that it works almost in silence. Improvements in details have been effected, and it appears to be a your satisfactory machine.

to be a very satisfactory machine. We have endeavoured to give our readers a good idea of the most noteworthy engines exhibited at Shrewsbury. We have omitted to mention even the names of a great many firms who send more or less excellent engines. We cannot see, however, that anything could be gained by pursuing a different plan. Excellence alone does not con-stitute a claim on us to describe an engine or other machine. If it did we should have to treble the number of our pages; and we believe that we serve the best interests of all parties by confining our attention as strictly as possible to the things which are new and good exhibited under the auspices of the Royal Agricultural Society. If we have overlooked any noteworthy engine, or unwittingly done any exhibitor an injustice by omitting to make due mention of his improvements, we shall be very happy to make all the amends in our power on due cause being shown. The estimates, however, which may be formed concerning the novelty or utility of an invention or improvement may differ.

# THRASHING MACHINES AT THE ROYAL AGRICULTURAL SHOW.

AMONGST the thrashing machinery in the Royal Agricultural Society's Show at Shrewsbury, there is a little that is new, and there is a little improvement that is of importance, although it can hardly be classed as novelty. Conversation with manufacturers indicates that while the feeling of most is strongly in favour of leaving things as they are in these machines, that which has been done lately is causing a little uneasiness, or at least is shaking the satisfaction with which the feelings of conservancy were held. The belief that improvement cannot much further go is still expressed, but it is evident that it is not so as a creed. Few care much for the thrashing machine trade of itself, but for reasons which are well understood none want to lose it, nor to go to any expense in making changes until they are more or less forced upon them. This in a gentle way is being done by making changes until they dive way is being done by upon them. This in a gentle way is being done by those who are attempting to reduce the number of parts in a machine, and thereby to reduce the cost. Machines exhibited at Shrewsbury show that this may be done, and as it is known that one of the firms of the highest repute has taken up with the most radical of the highest repute has taken up with the most radical of the recent improvements, other firms are more inclined to think that there is something in it, and that probably it will be as well to consider whether finality in thrashing machines has been reached after all. It has occurred to one well-known maker, for instance, that it is curious that when corn is thrashed by ox treading, as in Spain, or better, as thrashed by a small machine having little more in it when corn is thrashed by ox treading, as in spain, or better, as thrashed by a small machine having little more in it than a drum, that the product of the thrashing is very well prepared for market by a winnowing or dressing machine of no great size and costing but a few pounds; and yet as soon as this dressing has to be done by a finite store there there are the product of the product of the store there is a store the sto finishing steam thrashing machine, something ponderous and costly is immediately required. The finishing thrashing machine will perhaps produce a slightly better sample than is obtained by the common small dressing machine, but all who have made and used either of these can see that a very little addition in the cost of dressing machines would make them produce an excellent sample, and but a few pounds sterling extra would make a machine which would dress as fast as a 54in. drum would thrash.

Some rather bold strokes in the alteration of thrashing machine practice have been made in the past two years, and more are yet to be made. In one case shakers have been'reduced to what is simply a big sieve, which is hung so that it may be horizontal, or with an upward inclination, so that the straw may have to rise a little before it reaches the outer end, as for instance, when dry short straw is being thrashed, or with a downward inclination, so that damp Of engines other than steam, the most noteworthy ex-hibit was that of Messrs. Crossley, who showed one of straw may be helped a little. In the machines of three

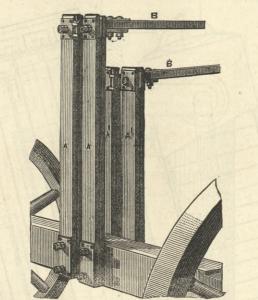
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different makers the whole of the reciprocating parts are driven by one crank only; one does away with the rotary screen, another dispenses with dressing shoes, and effects the separation by means of an exhaust fan, and the same the separation by means of an exhaust ran, and the same maker is now trying to do without reciprocating the usual heavy caving riddles by using a travelling band with splines which pass the smaller of the shaker products through the riddles. A move is thus being made in the reform of this class of machine, and it is time that some-thing tangible was effected towards removing thrashing machines from the category of those which give off the smallest mechanical duty.

It should be possible to do without caving riddles, and we are not sure that the time is far distant when shakers, we are not sure that the time is far distant when shakers, as we know them now, will be dispensed with. With a somewhat larger drum, and but a slightly lower number of revolutions, it ought to be possible to make use of the work put into the straw to effect the shaking. That work is now mostly thrown away upon the apron in front of the drum. The methods generally in use for making the separations are crude, and the difference in the size, form, and density of grains seed dust and dirt ought to make separations are crude, and the difference in the size, form, and density of grains, seed, dust, and dirt, ought to make it possible to do more than has yet been done by blast separation. It will be said in reply to this, that blast separation was tried years ago and did not succeed, and that exhaust draught was also tried, and its use continued by but one firm. To this it may be answered that it was never fully tried. There is even yet room for improve-ment in thrashers, though they are things to try the best ment in thrashers, though they are things to try the best

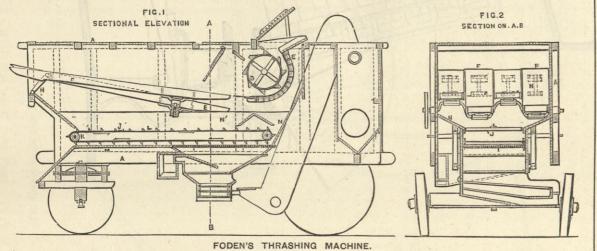
of tempers. The thrashing machine exhibited last year at York by Mr. Foden, of Sandbach, in which an exhaust fan performs all the dressing, appears again at Shrewsbury, and by its side a similar machine in which the riddles are fixed, instead of having the usual reciprocating movement. The usual jog-board under the shakers is also dispensed with, and a travelling band fitted with cross splines takes its place. This emperator is chosen in the comparation place. This arrangement is shown in the accompanying engravings. In these Fig. 1 is a longitudinal section and Fig. 2 a transverse section of a machine made according to

spring blades attached to them. In the larger machine two of these spring blades are led to the upper shoe, and three to the bottom shoe. The rockers usually used at the end of the shaker boxes are thus dispensed with, the weight of shoes and riddles being carried in the usual way by wood hangers The crank used in this machine is



GIBBONS AND ROBINSON'S THRASHER SPRING.

large, the diameter of the crank dip journals being 2in. and the width 6in., the total width of bearing to work the lower shoe being thus 18in. The momentum springs, as the makers call them, are attached to the hind axle bed of the machine, as shown in the annexed engraving. By this arrangement eight wood springs A A' are worked by the two joints of connecting rods B B', attached to the reciprothis invention. a a is the outer casing of the machine, c c is the driving shaft, d d the drum or beater, and e c the cating parts, and as the one set of parts moves in one



concave; ff are the shakers, and gg the crank shaft. At the outer end of the shaker ff are arms h h, so that this end of the shaker has a rising and falling as well as a to-and-fro motion imparted to it. In the riddling apparatus the fixed caving riddle is seen at ii. Mr. Foden dispenses altogether with the tray and the movable caving riddle, with its spring and hangers, and the invasite caving rule, with its spring and hangers, and in place of the tray employs an endless travelling band jj passing round two rollers kk', and fitted with splines ll, which as the band jj travels along carry the short straws, corn, &c., towards the back end, and deliver it upon the fixed caving riddle ii, and the band ii in its actualing moment draws all the about end, and deliver it upon the fixed caving riddle ii, and the band jj in its returning movement drags all the short straws, &c., over the riddle ii along the board mm, and ejects the cavings from the machine, at the same time causing or allowing the corn to fall through the holes of the caving riddle ii, which is fixed just beneath it. The sloping boards  $nn^1$  from the drum and the sides are carried down to meet the riddle ii and the band jj respec-tively, so that all that falls down passes over or through the riddle. The machine exhibited with this arrangement has a 5ft. drum. It will be seen that fixing the riddle and dispensing with the tray or jog-board makes a good has a bit, drum. It will be seen that fixing the fiddle and dispensing with the tray or jog-board makes a good deal of difference in the weight to be reciprocated at a rather high speed. The travelling band has, however, we believe, only been tried a short time, and it may be premature to pronounce an opinion on its probable behaviour, and it must not be forgotten that the travelling band does not move itself, so that the alteration in this matter is not wholly gain, although, if successful, the gain will be great. Another machine, or rather two machines, with im-

portant improvement is exhibited by Messrs. Gibbons and Robinson, Wantage. These are also single-crank machines, but they have some further merit. The shoes, caving riddles, and shakers are not only arranged so as to be worked by one crank, but the spring connecting rods by which the shakers are worked carry them as spring cantilevers, so that beside the vertical reciprocation due to the crank, there is a vertical vibration of very small range imparted to the shaker, which increases the shaking given to the straw. An equally important feature is a device by which the momentum of all these reciprocating parts, or rather their inertia of motion, is taken up, so that not only is the crank relieved of the work of overcoming that inertia at either end of the stroke, but the power required to operate these reciprocating parts is materially reduced. The two machines exhibited are a 54in. and a 42in. The arrangement of the parts just referred to is as follows:-Five shaker boxes in the larger and three in the smaller machines are supported on brackets, worked by the crank as usual, but the brackets are extended towards that end of the shaker boxes which must be supported, and wood

direction while the other set moves in the opposite direction, the tendency to shaking the machine is reduced to a minimum. Four springs are attached on each side of the axle-bed, and the pull or push on each being at any time in opposite directions, no stress is put on the axle-bed. The spring connecting-rods BB<sup>1</sup> act as guides for the shoes; they throw no stress on the machine frame, as the springs  $A A^1$  do not carry any weight, and by their use a single crank may be safely used in very wide machines. These springs may of course be made to give any desired elastic resistance to flexure, and to form a cushion of any required power for the reciprocating parts. Assuming that it is impossible to mount these reciprocating parts by means of some equivalent of a pendulum whose period is the same as the necessary number of strokes, the employment of cushioning springs as above described is the best arrangement that can be adopted, and the way in which this and the other improvements by Messrs. Gibbons and Robinson have been carried out, reflects great credit upon that firm.

Messrs. Farmer, Robey, Brown and Co., of Gainsborough, exhibit a machine to which we have not previously referred, but which deserves attention. The frame is a combination of oak sill and top, with angle iron inter-mediate framing. This combination would not a few years are have been considered advirable but often error the ago have been considered advisable, but after over two years' experience the makers express themselves well satis-fied with it. The shakers in this machine are worked with two cranks, and have five boxes, the central box being much wider than the two on either side. The crank dips are set 120 deg. apart, and the action, is we are toldbut have not seen the machine at work-such that the side boxes deliver to the central box, so that better action and central delivery is secured. The cranks have a 4in. stroke. The machine is fitted with a blast elevator.

Messrs. Marshall, Sons, and Co., exhibit a machine fitted with Howard's straw trussing machine in front of the shakers.

There is, it need hardly be said, a large show of thrashing machines in the yard, but except those referred to, we believe none are represented as containing any novelty calling for remark.

#### STOLLWERCK'S FEED-WATER PURIFIER.

As bearing on the interesting discussion on water-tube boilers now going on in our correspondence columns, we illustrate on page 42 a Root boiler fitted with Stollwerck's feed-water purifier. The boiler in question is working at Messrs. Shoobridge and Co.'s Cement Works, Grays, Essex. It is fired by Knapp's mechanical stoker as shown, but it is not fitted with Stollwerck's current which we have added in our program to show the apparatus, which we have added in our engraving to show the

mode of applying it to an actual boiler. The Root boiler and the Knapp stoker are so well known that we need not stop to add any information to that supplied by our drawings. Stollwerck's apparatus is extremely simple, and depends for

its action on the fact that certain salts of lime and magnesia are insoluble in hot water. The feed-water is therefore mixed with hot water in vessels not exposed to the direct action of the fire, and in these the lime is deposited instead of being thrown down

and in these the lime is deposited instead of being thrown down in the tubes. The apparatus and its action are thus described by the inventor:—"The first object to be attained is that the water contained in the boiler, to which the apparatus is to be directly applied, shall circulate from the boiler through the apparatus and back again to the boiler. The circulation being esta-blished, the feed-water is introduced into the uprising current of water and steam directly this current enters the apparatus. Being thus diluted, the feed-water is imme-diately heated to the temperature of the boiler, depositing its impurities, which are then collected in the apparatus. This pro-cess of dilution and heating can be repeated any number of times, by again diluting the first mixture of feed-water and cir-culating water with a fresh current of water and steam from the boiler. Each subsequent dilution will develope such im-purities as may have remained undeveloped after the previous dilution, and which are collected in the apparatus as before. The water thus purified during its circulation through the apparatus, passes then into the boiler. The steam generated in the boiler separates from the water on entering the apparatus, which acts as steam room for the boiler. The process as here described is entirely self-acting and thoroughly reliable; it is described is entirely self-acting and thoroughly reliable; it is found in practice that two or three dilutions will efficiently deposit all sulphate and carbonate of lime, and other impurities contained in the very worst description of water, and insures absence of incrustation in the boiler. "The apparatus consists of one or more cylindrical vessels or

"The apparatus consists of one or more cylindrical vessels or receivers, of sufficiently large diameter to cause a slow flow of the circulation water through them, and of sufficient cubical capacity to leave room for the efficient collection and settle-ment of the developed impurities. To have sufficient sur-face at the water level for the steam to escape freely, and also sufficient cubical contents of the steam space, are further matters to be considered in the construction. The mixture of feed-water and circulation water deposits in its passage towards the back of the receivers the developed impuripassage towards the back of the receivers the developed impuripassage towards the back of the receivers the developed impuri-ties. Trays or other appliances are placed therein to assist in this object. When the process of dilution is to be repeated, the water, after passing through the whole extent of the first receiver, is by means of a pipe carried to the front end of the second receiver, there to be diluted by the water and steam fresh from the boiler. After passing through this second receiver, it is generally taken direct to the boiler, except in cases where the water is exceptionally bad, or the quantity to be purified very great, and then a third dilution may be advisable. The advantages resulting from absence of incrustation and sedi-ment in steam boilers are so well known that they need not be enumerated here; but it is claimed for this patent that it is cheaper, simpler, and more effective than any other, being entirely self-acting, thoroughly reliable, cannot get out of order, entirely self-acting, thoroughly reliable, cannot get out of order, easily cleaned, and without cost for maintenance. "It is further of the greatest importance to note that the water-

"It is further of the greatest importance to note that the water-heating surface of boilers with this apparatus is increased 25 per cent. and upwards, owing to the raising of the water level. The cost of the apparatus can thus be considered paid for by the enlargement of the boiler alone. It is found in practice that nearly all the deposit is precipitated in a loose crystallised state." The following data have been supplied to us by Mr. Conrad Knapp, of 11, Queen Victoria-street, the agent for the Stollwerck apparatus in this country. The apparatus was fitted to two boilers, of 80 and 100-H.P. respectively :--

		apparatus.						
11 11	" "	5th August, 1883 353 lb. "	Not worked very hard during this period.					
00-H.P.	"	17th June 1882 82/10. ,,	Forced fir- ing by blast					
33 33	33 33	4th November, 1883 1133 lb. ",	part of the time.					
bout 75	per cent. of	above was found loose . the remaining						

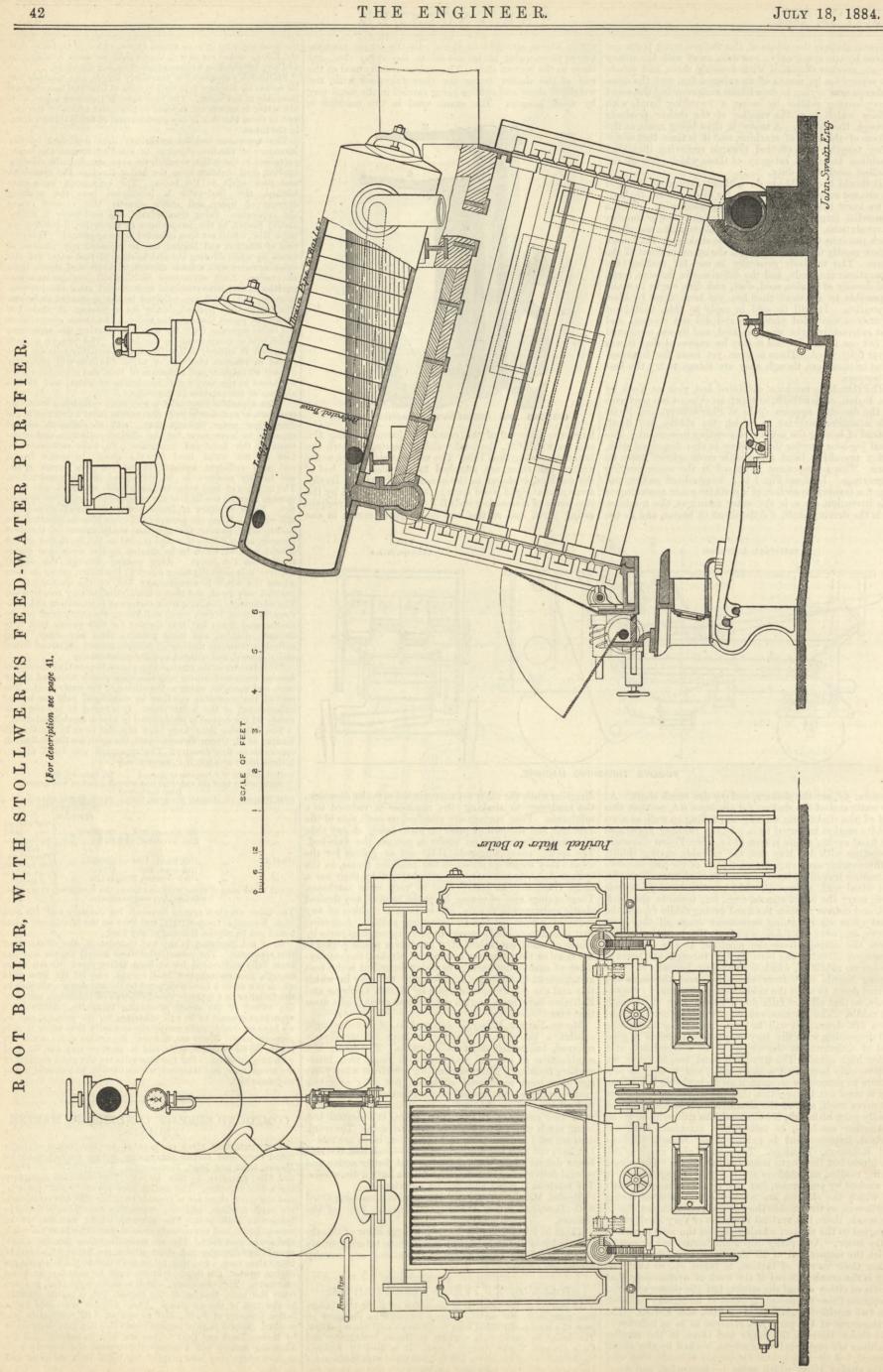
attached, but easy to remove.

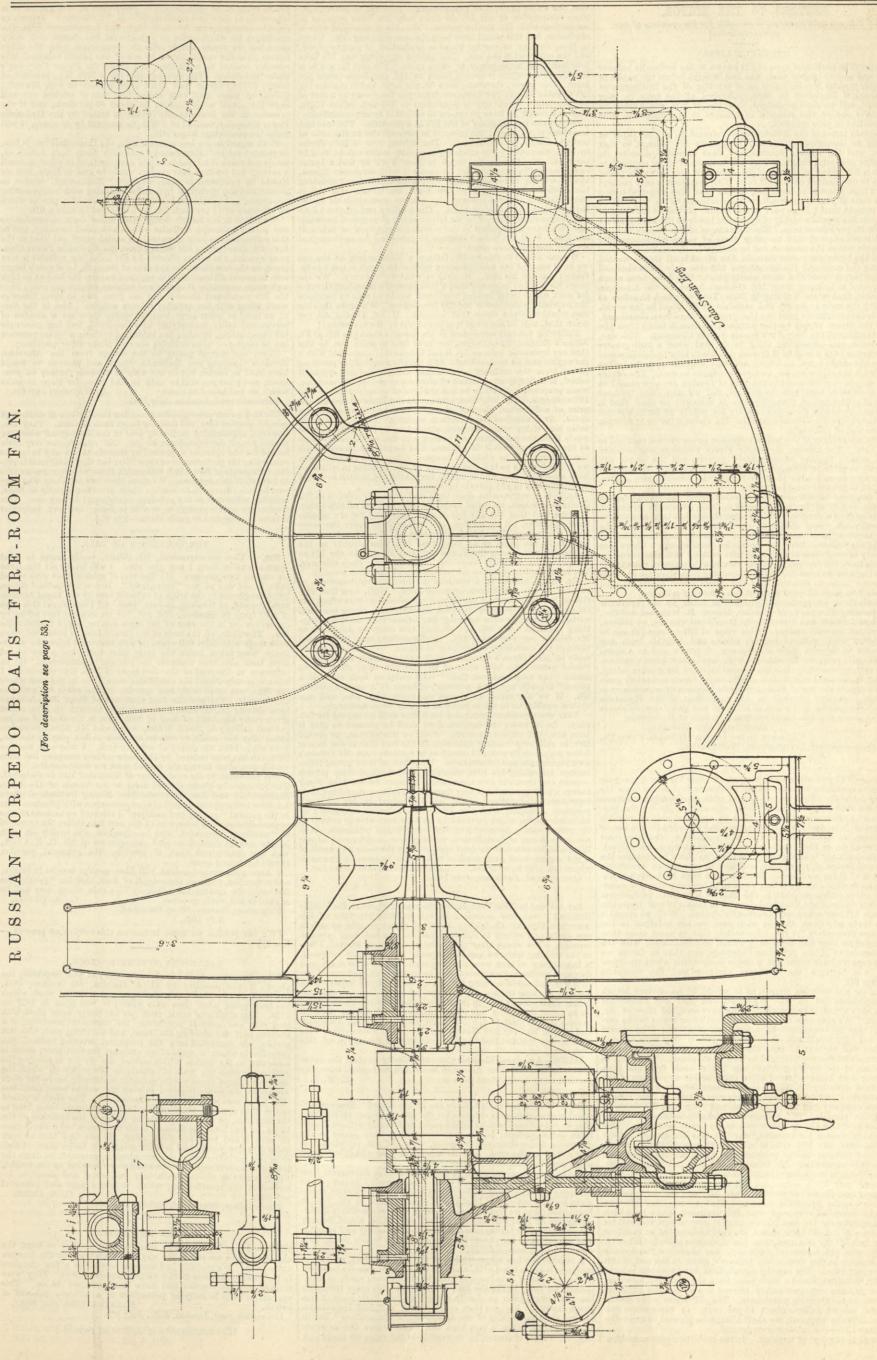
The tubes were not opened between 1st January and 4th and 25th November, respectively, and were on the last-named dates found not to require cleaning of any kind.

It is not necessary in any way to insist on the efficiency of this apparatus. The principle involved is well known, and has been fully understood for at least thirty years. Given space enough, time enough, and heat enough, and all the lime salts which can make a hard scale must be thrown down—whether in the beilt en in a superstant of the salts. Which can make a hard scale must be thrown down—whether in the boiler or in a separate vessel depends on the action taken by the owner of the steam generating apparatus. Stollwerck's apparatus appears to be well contrived for its purpose, and is, we have no doubt, quite competent to purify feed-water if it is properly used. There are, however, impurities which it will not touch, as, for example, acids, and it may, or may not, do good with muddy water. But the lime salts are the great enemies of the steam user, and these can, without doubt, be removed in the way described. way described.

#### COMPOUND SURFACE CONDENSING MARINE ENGINES.

THE engravings given on page 46 are illustrative of high-speed compound surface condensing marine engines, made by Messrs. Ruck and Burt, Portsmouth. The cylinders are 16<sup>4</sup>/<sub>2</sub>in. and 31in. diameter, by 20in. stroke. They are cast separately and bolted together. The motion bars are of "open" pattern and the guide shows are adjustable on either side the grosshead and bolted together. The motion bars are of open patient and the guide shoes are adjustable on either side, the crosshead are solid forgings, and the connecting rods have adjustable brasses at both ends. The columns, six in number, are of brasses at both ends. The columns, six in number, are of wrought iron, and are securely cross-stayed. The links are solid, and are of cast steel. The air and circulating pumps, which are of large diameter and short stroke, are fitted with nests of four valves each. Starting valves are fitted to the low-pressure engine, so that the larger cylinder may be called upon when necessary. The condenser, which is of wrought iron, is apart from the main framing of the engine, but is bolted directly to the foot of the air pump. These engines are made for a to the foot of the air pump. These engines are made for a boiler pressure of 80 lb., and to run at 140 revolutions per minute. Several pairs of engines about this size have been made by Messrs. Ruck and Burt. They are light, but strong, and are what the makers call a commercial type of the torpedo boat engines which they have adapted for light draft steamers and vachts. vachts.





#### LETTERS TO THE EDITOR.

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

#### HYDRAULIC LIFTS.

SIR,—The particular type of lift known as the hydraulic balance lift, and now so largely used, was first brought before the public in a paper read by Mr. Ellington at a meeting of the Institution of Mechanical Engineers in 1882, published at the time in your journal, and we shall be obliged, therefore, if you would allow us to make one or two remarks in relation to the discussion now proceeding in your columns.

to make one or two remarks in relation to the discussion how proceeding in your columns. Certain forms of the balance were referred to in that paper as acting as economisers. Messrs, Waygood's lift belongs to that class, and the name "economiser" does correctly describe its peculiar property, viz., to reduce the amount of water required to work a lift below what would be needed if the hydraulic power were to act directly on the lift ram. This condition is only realised when high pressure is employed, but we have been surprised to find that none of your correspondents have referred to the fact that at the present time a large part of the busiest portion of the City of London has a public supply of hydraulic power can successfully compete where the pressure can be obtained. A small service pipe from the hydraulic power main in the street is all that is wanted to give the consumer the advantages hitherto only to be obtained by the laying down of a most costly plant. We have been much interested in learning from Mr. Gibson's letter on the American elevator, that in the building in New York to which he refers as having the most complete and satisfactory lift plant in the world, the boilers originally used on the premises have been abandoned, and the steam supply to the pumping engines is taken from the and the steam supply to the pumping engines is taken from the street mains of the New York Steam Supply Company. This was, no doubt, the economical thing to do, but what a still greater improvement it would be if it were possible to take hydraulic power from the street main, and thus not only dispense with the boilers but with the steam engine, pumps, and tanks as well. The owners and occupiers of premises in the City of London are now placed in the position of being able to do this, and we may claim, without fear of contradiction, that this fact is sufficient to show that in matters hydraulic we in this country are nearly as far in advance of the rest of the world

of America as Mr. Gibson considers his elevator to be in advance of the rest of the world. The advantages of the public hydraulic power are not confined to the City. The London Hydraulic Power Company has obtained this session further parliamentary powers, and the supply will shortly be given in Westminster, while in Kensington the company is putting down a large plant to supply the estate known as Ken-sington Court and neighbourhood.

sington Court and neighbourhood. A company has also been incorporated during the present session for the supply of hydraulic power on this system in Liverpool, while in Hull a company with similar objects has been at work for several years. Any discussion on hydraulic lifts ought to take into account these facts, and more especially any discussion on hydraulic balance lifts or hydraulic economisers. There are already several cases of hydraulic lifts working with these arrange-ments from the Hydraulic Dourser Company's meins it the Citre of

already several cashince rules of nydraulic lifts working with these arrange-ments from the Hydraulic Power Company's mains in the City of London, and we have found that the saving from their use amounts in some cases to two-thirds of the power which would be used if ram lifts were adopted without compensating cylinders. With these arrangements, whether as made by the Hydraulic Engineering Company, of Chester, Messrs. R. Waygood and Co., or Messrs. Smith and Stevens—the three firms who are, we believe, at present the only makers of this class of lift—a ram lift can be made to work without balance chains and weights from any pressure of supply, with an economy of power and at a speed which will compare favourably with any other known system. The system, moreover, has the special merit of far greater safety, owing to the total suppression of all chains, ropes, and safety gear. We regard the use of these hydraulic balances or economisers as a most important element in the operations of the Hydraulic Power Companies, and we shall welcome and give every assistance in our power towards improvements in details of the system. <u>ELLINGTON AND WOODALL, Engineers to the London Hydraulic</u> Power Co. Palace-chambers, Bridge-street, Westminster. July Sth.

July 8th.

SIR,—Will you allow us to trespass a little farther upon your space to enable us to reply to Mr. Gibson's last letter upon the above subject? Your correspondent with considerable frankness explains that he made use of your columns simply for the pur-poses of a trade advertisement, that he appealed only to possible buyers of lifts, and that his letter was not intended for the use, or criticism, of those members of the profession who are most interested in, or likely to be most able to speak upon, the subject. We can only say that if such is his view, we think he mistakes the interested in, or likely to be most able to speak upon, the subject. We can only say that if such is his view, we think he mistakes the uses and design of your paper, and that he selected an unsuitable portion of it for his letter. To those who read that communica-tion, no farther defence of our position in the controversy is neces-sary. Our statement that in the case of nine lifts, professional advisers declined the Standard elevator in favour of our hydraulic balance lift is attacked, and practically denied. Well, we repeat it with these additions, that in each case we are indebted to the advisers themselves for the information, that in most cases they informed us they had been in personal communication with the representative of the American Company, and that so far as we are aware we have never lost a single competition where the ques-tion was between the Standard elevator and the hydraulic tion was between the Standard elevator and the hydraulic balance lift.

We do not mention names, as it would be an obvious breach of confidence to do so. We must ask that our statements upon such a matter be accepted, as we have accepted those of Mr. Gibson. We may note here that that gentleman seems rather sur-prised that his statements have not been attacked. Why should they be? He would not send them to you if they were untrue. We are well content to take them as they stand. But with his inferences we reserve the right to deal as we please. Referring to the case of the building where one lift of each type has been erected, ours being selected after considerable experience of the Standard elevator, Mr. Gibson received complimentary letters from the architect, but did not receive the order. Quite so. Mr. Gibson and his company had to be dropped, and they were let down as gently as possible. Mr. Gibson is eminently satisfied with the manner in which the operation was carried out—so are we. One influential reason for selecting our lift was its greater safety; We do not mention names, as it would be an obvious breach manner in which the operation was carried out—so are we. One influential reason for selecting our lift was its greater safety; another was, as Mr. Gibson admits, the unsuitability of the Standard elevator to the position, and there are many positions where it is unsuitable. Mr. Gibson declined to put in a ram lift. No other course was open to him. The same reason which prohibited overhead gear for a suspended lift also prohibited the heavier overhead gear for an overhead balance lift, and the only ram lift possible was the hydraulic balance. Had a suspended lift been thought desirable, the roof over the staircase could have been raised sufficiently for less money than it cost to bore the well for our ram. We could have raised the roof and erected an excellent suspended lift for less cost than the American price for lift only. Safety, and not structural difficulty, was therefore the decisive Safety, and not structural difficulty, was therefore the decisive consideration in this case. Mr. Gibson's guess at the cost of this lift is very wide. We readily admit that our hydraulic balance ram lift will always cost a little more than the Standard Elevator, but we find the superior safety offered is a more than sufficient inducement to intending purchasers. The difference in the case in question was we believe about 15 per cent. In cases where sus-pended lifts are required, we shall always be pleased to meet the American Company on their own ground. Now as to the cost of working. In the huilding under considera-

tion, the water-power is all pumped on the premises by gas engines. Since the crection of our lift no extra help has been required in connection with the motive power. The lift is provided with a conductor, but this would have been the case with any lift. There is, then, nothing to pay for wages in production of motive power, and the only cost is the gas. The pumps supplying our lift take four indicated horse-power to drive them. The cost for gas in a Crossley-Otto engine is usually taken at 14d, per horse-power per hour. Our power, therefore, costs 6d, per hour, and it enables the lift to make twenty-two complete trips per hour—say at a cost of 4d, per trip. Each trip is equivalent to 15½ owt. raised 734ft. That is a result we have no reason to withhold from publication. Next, as to the efficiency of the lift as a machine. The load and travel are given above; the pressure in accumulator at the time of test was 693 lb. per square inch. The driving ram is 10ft, stroke by 55m, diameter. The efficiency therefore works out at over 70 per cent. Mr. Gibson has to go to New York to find a better example, and having found it, he quotes it with erroneous figures, the error being to his advantage. We hope that before publishing the farther information from New York, Mr. Gibson will call in the assistance of some one who has a more commendable know-ledge of the multivalication table.

the assistance of some one who has a more commendable know-ledge of the multiplication table. The wealthy and eminent Lon-don Corporation referred to we have not the pleasure of knowing, and they have not applied to us for either description or prices of our lifts. Will Mr. Gibson venture to introduce us to them that we may state our own case? We can afford to forgive Mr. Gibson a little spleen at the use

we have made of the multiplication table—the result is not a satis-factory one for his case. He asks us what we disprove. We dis-prove his implied inference that a purchaser of a Standard elevator prove his implied inference that a purchaser of a Standard elevator for work under usual London conditions would be able to purchase the requisite water-power for £20 per annum. We prove that the cost would be seven times that amount. If Mr. Gibson did not mean that, will he say what was the object of the statement? Following your correspondent in his remarks upon the lift at St. James's Residential-chambers, we have first to point out to him that our hydraulic balance lift is not inseparably connected with a cas engine and an accumulator. It is equally adapted for receiving

that our hydraulic balance lift is not inseparably connected with a gas engine and an accumulator. It is equally adapted for receiving power from the ordinary town mains. When the gas engine is added, it is simply an accident of circumstances, as, for instance, when proprietors decide to be independent of water companies and their charges. The lift, then, alone costs but little more than the price of a Standard elevator of same size, and it occupies less space. It is noiseless and smooth in working. The annoyance of noise and extra space occupied, alluded to by Mr. Gibson, arise solely from the gas engine and pumps, and this would be the same at the Alliance offices if Mr. Gibson had to provide power within the premises. If he wishes to compare notes upon this question, we will refer him to the engine-room of the building in which we have succeeded him, and in which his machinery is such as would be insufferable in any private building.

have succeeded him, and in which his machinery is such as would be insufferable in any private building. As it is many months since we heard from our friends at St. James's-chambers, we called to-day for the purposes of this letter. We are told that the lift has worked every day for six months from eight a.m. till eleven p.m., and within those hours has never been stopped. The skilled attendant of Mr. Gibson's letter appears in the guise of an intelligent lad, who attends to the engine, pumps, accumulator, and lift, and also works the lift as conductor, for a weekly wage less than we pay a shop labourer. The management object to the publication of the exact amount. Mr. Gibson alludes to a contract in the City which came to us

engine, pumps, accumulator, and hirt, and also works the hirt as conductor, for a weekly wage less than we pay a shop labourer. The management object to the publication of the exact amount. Mr. Gibson alludes to a contract in the City which came to us because he was not known or understood. Well, now that Mr. Gibson has made himself known and understood at that office, our friends there have again specified our lift for a larger contract, without apparently even advising Mr. Gibson that there was anything required. We will not prolong this letter by describing to Mr. Gibson our suspended lift. A description may be obtained through the customary advertising mediums. We will only say in reply to Mr. Gibson's questions, that we use neither a piston nor "solid water" on both sides of it. By the way, allow us to assure your correspondent that "solid water on both sides of a piston " is really not yet a necessary element in a good hydraulic lift. If we use ropes, we always use more than one, and our system enables us to use as many as we may deem necessary. Your correspondent concludes his letter with an appeal for fair play. As far as we are concerned we shall be pleased to give it him, and shall expect a return. While on this subject, we should like to call your readers' attention to the fact that in our former letter we carefully confined ourselves to remarks upon Mr. Gibson's position. Compare with our letter Mr. Gibson's outpouring of backstair gossip, which fortunately we have been able to exhibit at its proper value; his confident, working, and maintenance of our lift; and his attempt to foist upon our lift the noise and smell of a gas engine—and your readers will be able to form an idea as to where fair play is, or is not. ARCHD. SMITH AND STEVENS.

SIR,—I was in New York during the year 1882, when the "Mills Building" was first opened. In this building are four of the American Elevator Company's standard elevators side by side in one shaft, and others in different parts of the building. On one occasion, a few weeks after the elevators had been started, I was A large group of men were standing round the elevator shaft, and A large group of men were standing round the elevator shaft, and damaged portions of cagework were being removed, and one of the lifts was not again working for several days. Upon inquiry from the men working the elevators, I was informed that the cage had fallen when nobody was in it—whilst being handled by an official on an upper floor, who was either cleaning or repairing. Several persons on the staff of the Northern Pacific Railroad Company and Oregon Railway and Navigation Company, whose offices were then in the "Mills Building" can testify to the truth of this statement statement.

Will the American Elevator Company kindly explain the cause of this accident, if their American house has ever given them any particulars to enable them to do so. F. M. E. July 15th.

SIR,-We did not reply fully to the letters signed "Economiser" which appeared in your columns for the reason already stated, viz., that we did not care to enter upon a paper controversy with an anony mous correspondent; but as well-known firms have joined in the discussion under their proper names, we would ask permission to give a brief explanation, lest the readers of your widely-esteemed paper should think we had none to offer.

paper should think we had none to offer. In the first place, we would beg to point out for the second time that we have never applied the term "Economiser" to our patent balancing cylinder, that name having been applied by your repre-sentative in a notice you kindly gave of our exhibit at the Health Exhibition; but we claim that, compared with the ordinary direct-acting lift of medium height, the loss by friction would be very nearly equal, and taking into consideration the safety and smooth-ness of motion of the patent lift, the small gain or loss would be a very secondary consideration

ness of motion of the patent lift, the small gain or loss would be a very secondary consideration. A regards the loss by protrusion of the ram, this fact, of course, everyone is acquainted with, and also the efficient manner in which in the old type of low-pressure lifts the chains were made to com-pensate for this; but in the high-pressure lifts this exact balancing has not always been so rigidly adhered to, as a little more or less power expended has not been considered of sufficient importance to alter the construction of the apparatus. "Economiser" has in his illustration taken a very high lift, which shows the extreme loss. It would, of course, be impossible in the snace we could ask loss, It would, of course, be impossible in the space we could ask

154 3 445 . 1 154 1 you to grant us to give details of every class of lift, just as it is impossible to show in a small model—as "Economiser" appears to expect—arrangements for both high and low-pressure lifts, the machinery for which varies in a greater or less degree with every case; but we would simply offer for comparison with the other figures given the results shown by one of our patent balanced lifts recently erected to work from the Hydraulic Power Company's mains in London. The travel of this lift is 39ft. 9in., pressure of water, 750 lb.; actual load lifted from bottom to top, 17½ cwt.; gallons of water used each stroke, 5°6; this, if worked out, will show the actual work done to be about 80 per cent., and if the pressure in the mains is only 700 lb., as stated by the Hydraulic Power Company, instead of 750 lb. as assumed by us above, it will make the percentage larger still.

Power Company, instead of 750 lb, as assumed by us above, it will make the percentage larger still. With regard to our low-pressure lifts, the theoretical loss is less, as pointed out by "Economiser," and with these facts before us, we do not think it advisable to add complications to effect so small a saving; but perhaps your readers would be glad to know, and we should be interested to hear, whether "Economiser" wishes to recommend any system of hydraulic balancing with compensating apparatus, as he states he has received a report of a case in which

recommend any system of hydraulic balancing with compensating apparatus, as he states he has received a report of a case in which an efficiency of 71 per cent. has been obtained by such a lift. We stated in our former letter that under some circumstances our patent balancing cylinder effects a decided economy, and as this statement has been disputed, we would point out that in the case of a direct-acting lift worked from the Hydraulic Power Com-pany's mains, the saving effected by the balancing cylinder is very great, as the ram must, for the sake of strength, be of much larger area in nearly all cases than is required to raise the load at so high a pressure, especially if chains and balance weights are used; thus the lift mentioned above would use from two to three times as a pressure, especially if chains and balance weights are used; thus the lift mentioned above would use from two to three times as much water with the ordinary balance weights. Also in the case of an hotel or other large building where there are a number of service and other multiplying lifts employed, and one passenger lift direct-acting, by using the balancing cylinder a higher pressure can be employed, thus reducing the cost of the other machinery. There are several points in the letters from the American Elevator Company and Messrs. A. Smith and Stevens we would have liked to notice, but do not wish to trespass further on your space, and trust you will be able to find room for these remarks which we feel bound to make. Falmouth-road, London, July 16th.

[So long as our correspondents confine their letters to matters of [So long as our correspondents confine their letters to matters of general interest they will find our pages open to them. They are, however, approaching perilously near to the line beyond which we cannot permit correspondence to go. Our readers care very little indeed for the opinions expressed by manufacturers and inventors concerning the performance of their lifts; but they do appreciate pre-cise statements of fact which will enable those who may require lifts to form their own opinions. We must therefore ask those who take part in this discussion to confine their attention strictly to facts, omitting references to the opinions entertained by any one. Our readers are astute enough to be able to form their own judgment if facts are supplied to guide them.—ED. E.]

#### THE EFFICIENCY OF FANS.

THE EFFICIENCY OF FANS. Sign — Now correspondent, Mr. Aland, really seems to wark for a ditention than I can give him. I will briefly set him right of the engineers in the trials of exhaust fans by the Royal Agricul-tof trial open to question, and not fair on exhaust fans acting by expansion — as in the case of my open fan, or, say, a Guibal mine of trial open to question, and not fair on exhaust fans acting by expansion — as in the case of my open fan, or, say, a Guibal mine is more active main the trials of exhaust fans of late, as published, have be and e with inlet full open, or with restricted inlet, the water-gauge being taken inside the large inlet tube; and a few closed tests have also been made for the purpose of comparison. (3) In fave expressly stated the conditions were alike in the case where my 30in, was tried with two cupolas on, the other fan with one yeola only. Perhaps the fact that one of these 30in. fans on cupolas, II, have expressly stated the conditions were alike in the case where my 30in, was tried with two cupolas on, the other fan with one yeona only. Perhaps the fact that one of these 30in. fans that have never of the reading in the case of the second or the trial of the two types of 30in. fans to the fan, the devine both are empty of coke or iror. I may add, another out, fan has been ordered by the same colliery company for min-thereforeme he quotes did not refer to my friends of the South why two ordinary cupolas are mere child's play to the fan, the general "pelting and scolding" I received on account of the parametry eccentric behaviour of the new fan, before the princip. The powner correspondent will blow gentler breezes in future, when bote are end to the subject of fans, that the "gentler the devine to the envine. The subject of fans, that the "gentler the devine to the devine care. The performant of the subject of fans, that the "gentler the devine to the devine care. The meremeter while on the subject of fans, that the "gentler the devine

Passenham Rectory, Stony Stratford, July 10th.

[We can publish no more letters on this subject at present.----ED. E.]

#### DARDENNE'S AUTOMATIC CLOCK.

DARDENNE'S AUTOMATIC CLOCK. SIR,—Some time back I made an enquiry of you respecting the above; it was patented by H. J. Haddan, 8th August, 1881, No. 3425. I now send you a description of a similar clock which has been going more than fifty years; it was fixed in 1827 or 1828. This clock was made from an old thirty hour clock with long case and seconds pendulum, the movement consisting of a working part for showing the time, and a striking part; this last portion was converted into the perpetual winding motion, the propeller to which is made of an ordinary tin ventilator, which is connected to the pinion which carried the fly for regulating the striking through the train of wheels to the pulley on which the endless Huygens' chain works, so that it continually keeps the clock wound up, the power required to wind the weight being much less than is the case with Dardenne's movement. The clock is placed in the shop opposite the door, the back of the clock being fixed to the partition, on the other side of which is the staircase of the house, so that from the draught of air it requires but a small force house, so that from the draught of air it requires but a small force house, so that from the draught of air it requires but a small force to work it and keep the clock going. It has now been at work quite fifty-five years, and is still going, and keeps time. I con-sider this far better than the one recently patented, as from the train of wheels it requires but a small power to wind up the weight, which cannot be the case with only one wheel and pinion, as de-scribed in the specification, which require a large and powerful propeller. G. E. CHILD. propeller.

Market-place, Southwold, Suffolk, July 14th.

#### RUSSIAN PROTECTION.

SIR,—It may be of value to some of your readers to learn the obstacles which are put in the way of foreign trade by the Russian authorities. We recently had occasion to address a few circulars to the local authorities in the various Russian towns. They were stopped on the frontier and have been returned to us. This authority to us to be carrying protection to a billowing the second appears to us to be carrying protection to a hitherto unheard of length. MERRYWEATHER AND SONS, Greenwich-road, London, S.E., July 8th.

(For continuation of Letters see page 51.)

#### RAILWAY MATTERS.

THE Hull and Barnsley Railway works, which were started under such splendidly successful auspices, are practically at a standstill, and the company does not seem to see its way through its financial difficulties.

THE Times of India states that large quantities of light steel The Times of India states that large quantities of light siden rails, on the portable narrow-gauge system, are being forwarded to Quetta, where they will be stored in readiness for any emergency, and also that a number of small locomotives suited to the re-quirements of a military transport line have been ordered.

IT is believed that the Indian Railway Committee will, to a large extent, adopt the recommendations of the Indian Government, and propose that the interest on the capital expended in the construc-tion of certain lines shall be guaranteed, under special restrictions, however, against any increase of taxation to cover such guarantee

An American contemporary says :-- "An English engine driver An American contemporary says:— "An English engine driver was lately looking at his engine, when the very spot his eyes rested on blew off. This was at the joint of the top plate and the left-hand side plate of the fire-box shell, and at a point about 18in. from the back of the box." This man will do well to keep his eyes off engines in future.

AMSTERDAM news states that the subscriptions to the Transvaal Railway Lean of 15,000,000 florins only amount to about 2,000,000 florins, whereas not less than 5,000,000 are required to enable the works to be commenced. The Loan Committee have requested the present subscribers to remain pledged to the amount of their liability until November 15th, in order to allow time for raising the rest of the money.

THE official inspection of the South Staffordshire Tramways has The official inspection of the South Stationdanie Tramways has been made this week by Major Marindin, R.E., on behalf of the Board of Trade. The total length of the tramways is 6½ miles, and the work has been carried out by Mr. F. C. Winby. Steam is the propulsive power used. The inspector first inspected the line from Bloxwich to Walsall, and afterwards proceeded to Wednesbury. He expressed his approval of the construction of the line.

WEST AUSTRALIA, with but 30,766 inhabitants-but an area of WEST ADSTRALLA, with but 50,766 innabitants—but an area of 1,009,000 square miles, which is more than that of the whole United States east of the Mississippi—has  $92\frac{1}{2}$  miles of railroad, or one mile to 333 people. But it does not support its railroads. There are two roads—one 24 and one 12 miles long—owned by companies and engaged in carrying timber to the coast, which may be presumed to earn some profit, else they would not be worked; but neither of the two roads owned by the Government earned its working expenses working expenses.

SOUTH AUSTRALIA extends entirely across the continent from the SOUTH AUSTRALIA extends entirely across the continent from the south to the north coast, with the enormous area of 935,000 square miles, most of which has scarcely ever been trod by the foot of man. Its population was 310,650 at the close of 1883, which was 311 per mile of railroad. The expenditure on railroads per inhabitant was only £20 12s., the average cost per mile of the 9454 miles at the end of 1882 having been but £6520. Small as it was, however, the net earnings were but 2.56 per cent. on this capital, and the balance had to be made up by taxation. Several of the roads did not earn their working expenses.

THERE are altogether on French railways 6893 locomotives, of THERE are altogether on French railways 6893 locomotives, of which the *Railway News* says 2826 are passenger and 4067 goods engines. There are also 15,432 carriages, of which 3208 are first-class, 5315 second-class, and 6909 third-class, together with 182,089 wagons. As regards the principal companies, the following are the figures:—Northern: 1138 locomotives, 2021 carriages, and 33,971 wagons. Eastern: 922 locomotives, 2039 carriages, and 22,401 wagons. Western: 1045 locomotives, 2881 carriages, and 17,465 wagons. Orleans: 970 locomotives, 2100 carriages, and 20,433 wagons. Paris-Lyons.Mediterraneau: 1960 locomotives 3489 carri wagons. Paris-Lyons-Mediterranean: 1960 locomotives, 3489 carri-ages, and 62,200 wagons.

THE majority of the members of the Wolverhampton Town Council, our Birmingham correspondent writes, are manufacturers, and they feel very strongly upon the railway rates question. On Monday a proposition was made that the seal of the corporation should be affixed to a petition in favour of the Manchester Ship Canal Bill. In the discussion which followed, Alderman Edwards, Canal Bill. In the discussion which followed, Alderman Edwards, a large edge-tool manufacturer, recalled with regret the time when goods were carried on the canals to Liverpool and London for 2s. 6d. to 5s. per ton less than at the present time; while another member hoped that the next scheme the Council would be asked to assent to would be one for the opening of a good waterway from Manchester to Gloucester. Believing, therefore, that anything which would facilitate cheap locomotion must be of service, the Council decided, with only one dissentient, to affix their seal to the petition. petition.

petition. THE extension of railway communication in the Neapolitan pro-vinces of Italy continues unabated, and last year 143 kilos, were opened to traffic. A concession has also been granted for a rail-way from Naples to Puzzuoli and Cuma, and the works are now in progress. The length of the line will be eighteen kilos., and its cost, including railway plant, is estimated at 3,800,000 lire. The State will subsidise this line for thirty-nine years at the rate of 1000 lire per kilo. Another concession has been given for a line from Castellamare to Cancello—on the main line from Rome to Naples—a distance of thirty-seven kilos., with various branch lines, and one for a line from Naples to Bajano by Somma and Nola. This network of railways goes by the name of "Circum-Vesuvian," and it will be of great advantage to the agricultural population of the vast and rich plains which extend from the foot of Mount Vesuvius to Naples, Castellamare, Scafati, and Caserta. An American paper says :—"Some experiments have been made

We vast and hen plans when extend from the foot of normal Vesuvius to Naples, Castellamare, Scafati, and Caserta. An American paper says :—"Some experiments have been made lately upon the Bound Brook Railway to ascertain the difference in the consumption of coal between an express train running on schedule time, and the same train run at a very low speed, but otherwise on the same conditions, the same five cars and precisely similar engine being used. The trains ran in each case from Phila-delphia to Bound Brook and back, a distance of 119 miles. The slow trip was made in 9 hours and 23 minutes, 4420 lb. of coal being consumed. The train stopped at the same places as the regular express trains, the only unusual feature of the trip being the funeral pace, averaging a little over 12½ miles an hour. When running on schedule time the consumption was 6725 lb., agreeing closely with the usual consumption on this route with the regular five-car express trains. The saving effected in coal by running the train at a very slow pace was 2305 lb. The percentage of saving may be expressed in two ways; as compared with the consumption at the normal express speed, the slow speed shows a saving of 34:2 per cent., while the consumption at the high speed shows an increase over that at the low speed of 52:1 per cent." increase over that at the low speed of 52'1 per cent."

A TERRIBLE accident happened of 52'1 per cent." A TERRIBLE accident happened on the Manchester, Sheffield, and Lincolnshire Railway to the express train leaving Manchester at 12.30 p.m. on Wednesday, and due at King's-cross at 5.20. The train proceeded safely on its journey as far as Bullhouse Colliery, where the line is carried by a stone bridge across the Thurlstone-road, about two miles from Penistone. As it passed the signal-box something happened, and the nine carriages leaving the rails were hurled over the embankment close to the bridge, where they were overturned and completely wrecked. The engine, tender, and horse-box kept the road, and went on for some 400 yards, ploughing up the line and breaking the chairs as they passed. At the time the accident occurred the train was, it is said, going at the rate of fifty-four miles an hour. It was soon discovered that there were mineteen persons killed and at least thirty injured. Those who were killed were nine women, six men, and four children. The driver and stoker escaped without a scratch. We have here one of those cases in which the value of a good automatic brake is negathose cases in which the value of a good automatic brake is nega-tively demonstrated. If this train had been fitted with a brake which would have held the wheels to the last, the probability is that not a life would have been lost.

#### NOTES AND MEMORANDA.

HIGH-PRESSURE steam is used by Dr. Tatham, of Salford, for the

IT is stated that M. Michel Perret, of the Compagnie de Saint-Gobain, has succeeded in bringing the percentage of sulphur in burnt pyrites down to a maximum of 1.5 per cent. by roasting these pyrites in thin layers in shelf-furnaces.

According to the last census, the amount of power used in manufacturing in the United States was 3,410,837-horse power, of which 1,225,379 was water-power, and 2,185,458 was steam-power. The portion used in grist and saw mills was 1,593,129-horse power. Pennsylvania stands in the lead, with 354,774-horse power.

The deaths registered in twenty-eight great towns of England and Wales for the week ending 28th June, corresponded to an annual rate of 19<sup>-2</sup> per 1000 of their aggregate population, which is estimated at 8,762,354 persons in the middle of this year. In London 2691—sixteen per hour—births, and 1471 deaths—87 per hour—were registered. The annual death rate rose to 19<sup>-1</sup>.

hour-were registered. The annual death rate rose to 19'1. A LETTER on the mean reciprocal distances of the planets in the primordial state of the solar system, addressed to M. Hermite by M. Hugo Gyldén, was recently read before the Paris Academy of Sciences. The respective mean distances, supposed to be far less absolutely than at present, are determined as under:-Mercury, 0'443; Venus, 0'519; Earth, 0'562; Mars, 0'625; Jupiter, 0'850; Saturn, 0'988; Uranus, 1'177; Neptune, 1'322.

PLASTER of Paris, an American contemporary says, makes a very efficient and safe tamping, its peculiar advantage being the abolition of the tamping bar and the consequent danger of explosions resulting from its use. The plaster is used in the usual way, but with a little sand. It is found that in many crease the plasting of an elestic subling of some compressible usual way, but with a little sand. It is found that in many cases the placing of an elastic cushion of some compressible substance just above the cartridge produces good effects. All danger of cutting the fuse in tamping is removed by the use of plaster.

DURING the week ending May 31st, 1884, in thirty cities of the DURING the week ending May 31st, 1834, in thirty cities of the United States, having an aggregate population of 6,562,700, there died 2542 persons, which is equivalent to an annual death-rate of 20°1 per 1000, a decrease of 1°4 from that of the previous week. In the North Atlantic cities the rate was 18°1; in the Eastern, 21°9; in the Lake, 19°5; in the River, 13°6; and in the Southern cities, for the whites, 21°4, and for the coloured, 37°9 per 1000. Of the deaths, 30°5 per cent., as given by the American Sanitary Engineer, were under five years of age, and the proportion of this class of deaths was highest in the Lake cities, viz., 48°5 per cent.

ALMOST all the Sicilian sulphur ore is carried to the surface on A LMOST all the Sichah support of is carried to the surface on boys' backs, consequently it does not pay to work below about 400ft., as it then becomes necessary to employ hauling machinery. Hence the deposits lying below that level are hardly touched, and as many of the beds are nearly vertical, and do not diminish in yield as they descend, the still untouched resources must be very great. Various estimates have been made as to the period for which the supply will lest at the present rate of consumption. which the supply will last at the present rate of consumption; these range from 50 to 200 years. There are said to be about 250 mines in the island, and no less than 4367 calcaroni were reported in operation fifteen years ago. The average yield is stated not to exceed 14 per cent.

exceed 14 per cent. IN an article on water analysis in the School of Mines Quarterly, Professor H. B. Cornwall says experiments are now in pro-gress, at Columbia College laboratory to determine whether any opinion as to the probably more or less nitrogenous nature of organic matter in water can be formed from a comparison of the observed amounts of "albuminoid ammonia" and "oxygen consumed by organic matter." Tests made on such characteristic liquids as beef tea and infusion of soft and fresh wood chips gave decisive results, but the investigation has not yet been carried far enough to show whether the approximate proportion of organic carbon and nitrogen can be determined in this way, or whether any clue to the source of the organic matter in ordinary waters can be so obtained. Attention is also called to the recent article by Darton, giving some very interesting results of experiments made by him on the volatile nitrogenous organic matter which Remsen, and later, Marsh have shown to exist in many waters. Darton, the Scientific American says concentrated the distillate from various well waters, and tested the residue by injecting it under the skin of rabbits, producing in most cases either death or very serious disturbances in the approximate. These marked force ware obtained of rabbits, producing in most cases either death or very serious disturbances in the animals. These marked effects were obtained from waters which had been shown to contain much volatile nitrogenous matter.

nitrogenous matter. THE theory of the strength and stiffness of the ordinary cylindric spiral spring of small angle was given for the first time in 1848 by Professor James Thomson, and Messrs. Perry and Ayrton have followed his method in investigating the laws governing the behaviour of spiral springs generally. They find that if the centres of all cross-sections of the wire, or strip, forming the spring lie on a right circular cylinder of radius r; if the spiral have everywhere an inclination  $\alpha$  to the plane perpen-dicular to the axis of the cylinder, and if a force F act at one end of the spring along the axis, the other end of the spring being fixed; if B is the flexural rigidity of the wire in the osculating plane, and if A is the torsional rigidity about the spiral line at any place; if the angular motion, in a horizontal plane, of the free end place; if the angular motion, in a horizontal plane, of the free end of the spring relatively to the fixed end be called  $\phi$ , and if the axial increase of length be called d, and the whole length of the spring along the spiral l, then—

$$\phi = l \operatorname{F} r \operatorname{sig.} \alpha \cos. \alpha \left( \frac{1}{A} - \frac{1}{B} \right) \quad . \quad . \quad . \quad (1)$$
  
and—

Assuming for the general investigation that the cross-section of the wire is elliptic, it is found that the rotation of the free end of a spring of thin flat elliptic section, is greater the greater the inequality in the principal diameters of the elliptic sections.

An apparatus for determining the latent heat of vaporisation was recently exhibited before the Dublin University Experimental Science Association by Mr. F. Trouton. The chief gain in the use of the apparatus is, that to effect a determination by its means it is not requisite to know either the boiling point of the liquid or the specific heat of the body in either the liquid or gaseous condition. In the vessel in which the liquid is placed there is a spiral of platinum or other substance unattacked by the liquid. On passing a current of electricity—the difference in potential being insuffi-cient to decompose the body if a compound—through the spiral, heat is generated, and the liquid vaporised if at the boiling point. heat is generated, and the liquid vaporised if at the boiling point. According as the body is vaporised it is conducted away to a con-denser, collected and weighed. All sensible loss of heat is pre-vented by surrounding the vessel by a larger one full of vapour obtained by boiling some of the liquid itself in the bottom of the outside vessel under the same pressure as in the inner one; so that, if in any experiment the weight is determined of the liquid vaporised while a known quantity of electricity passes, the heat required to vaporise a unit weight of the body can be deduced, the resistance of the spiral being also known. As the electrical mea-surements are difficult to make sufficiently accurately, it is simpler to compare the latent heat of the body with that of a liquid of which the latent heat is known. This may be easily effected by employing a second apparatus similar to the first, in which the liquid taken as the standard—say water—is put. The same current is passed through both spirals, so that the ratio of the latent heats may be deduced on weighing the quantities vaporised, if the ratio Is passed through both spirals, so that the ratio of the latent heats may be deduced on weighing the quantities vaporised, if the ratio of the resistances of the spirals is known. This, says *Nature*, if both liquids boil at nearly the same temperature, may be obtained by a previous experiment where one of the bodies is put into both apparatuses, the ratio of the resistances being that of the weights of the substance to be vaporised.

#### MISCELLANEA.

THE London Hydraulic Power Company has in contemplation the extension of its system of mains from the City to Westminster, but before commencing the works the attempt is being made by circular to ascertain what amount of power is likely to be used.

THE Master, Wardens, and Court of Power is inkely to be deed. THE Master, Wardens, and Court of Assistants of the Company of Turners, according to their custom, propose to give this year their silver medal, the freedom of the company to, and will also obtain the freedom of the City of London for, any workman, whether master, journeyman or apprentice in the trade, in the United Kingdom, who may send in the best specimen of hand turning in wood, pottery, and precious stones.

ONE of Messrs. Fowler's traction engines has lately accomplished a journey of 250 miles in 151 hours 43 minutes from Sydney, Australia, to Mary Vale. The road was not of the smoothest, and gradients of from 1 in 20 to 1 in 8 were taken as things that could not be helped in a new country. The engine and load weighed 175 tons and the cost of transport was 2s, per ton instead of 5s., which it would have been by rail, a difference which allows for wear of traction engine.

AT a meeting of the Mining Institute of Scotland at Hamilton At a meeting of the Mining Institute of Scotiand at Haniton a few days ago, Mr. James M'Creath in the chair, Mr. James Walker, of Glasgow, read a paper on "Blasting Explosions," in which he showed the superiority of compressed over loose powder. It was stated that Mr. Watson, of Garnock, was prepared to sub-scribe liberally towards the introduction of the Fleuss life-saving apparatus into the mines. The Institute agreed to appoint a com-mittee at a future meeting to deal with the matter.

ON the 9th inst. a large steel mail lighter was launched from Mr. G. Skelton's yard at Millwall. This craft is intended solely for the loading and unloading of the mails at Suez. Its dimensions are as follows:--Length, 62ft. 6in.; breadth, 14ft.; depth of hold, 6ft. 6in. Large air-tight chambers are built at each end to ensure the safety of the mails. The lighter has sufficient stowage room for 80 tons of mails, and will be towed to and from the steamers. It has been constructed for the Orient Steam Navigation Company, and is the second one built by Mr. Skelton for the same purpose.

A NEW screw-steamer of 500 tons, built and engined by Messrs. M. Simons and Co., was on Saturday launched for the Liverpool Corporation, complete, from their works at Renfrew. This steamer is intended to convey 400 tons of the city refuse twenty miles off to sea, where it is deposited through the vessel's bottom in sixty fathoms of water. The bottom doors are simultaneously opened and closed by steam appliances, and the vessel is fitted so that sixty tons of water ballast take the place of the discharged cargo. It is fitted with compound engines and steel boilers, there being over 150.000 tons per annum to be got rid of. over 150,000 tons per annum to be got rid of.

over 150,000 tons per annum to be got rid of. A LARGE party of visitors assembled at the Thames Ironworks, Blackwall, on the 9th inst., to witness the launch of the Alphonso d'Albuquerque, an iron wood-sheathed cruiser, built by the Thames Ironworks Company for the service of the King of Portugal. The vessel is 205ft. long, 33ft. beam, and has a dis-placement of 1100 tons, and will be fitted with single-screw com-pound engines by Messrs. Humphrys, Tennant, and Co., the boilers being arranged to work under forced draught, so as to develope additional power if necessary. The Alphonso d'Albuquerque is the first of a class of cruisers specially adapted for service on the west coast of Africa. coast of Africa.

coast of Africa. AN American paper says :--"There is a lively fight in Detroit over the proposition to light the city by electricity. The Board of Aldermen has voted to contract with the Brush Company to light the city by means of the lights from seventy-two towers, for the sum of 95,000 dols. When the matter came before the Board of Councilmen, there were delegations representing the Detroit Gas Light Company and Excelsior Electric Light Company. The latter offered to furnish as good a light for 80,000 dols., while the gas men argued that so large a sum should not be voted for a mere experiment. The Council Committee, after submitting a favour-able report on the proposition, voted to lay the matter on the table." THE Union Engineering Company. Adelaide, recently successfully

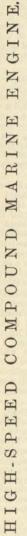
able report on the proposition, voted to lay the matter on the table." THE Union Engineering Company, Adelaide, recently successfully cast a large hydraulic press cylinder, to be used at Messrs. W. Cameron and Co.'s tobacco factory, Grenfell-street. The casting is the largest loam casting which has been undertaken in the colony. The casting weighs over four tons, and is 4ft. in length, 2ft. 6in. in diameter, the thickness of the casting being Sin. The cylinder has four heavy bosses for holding the pillars which support the head press. At the bottom of the casting, two strong wrought iron reinforce bands have been shrunk on to the cylinder. The Union Company has to guarantee that the cylinder will stand a pressure of 2½ tons to the square inch, making a total pressure on the ram of 385 tons.

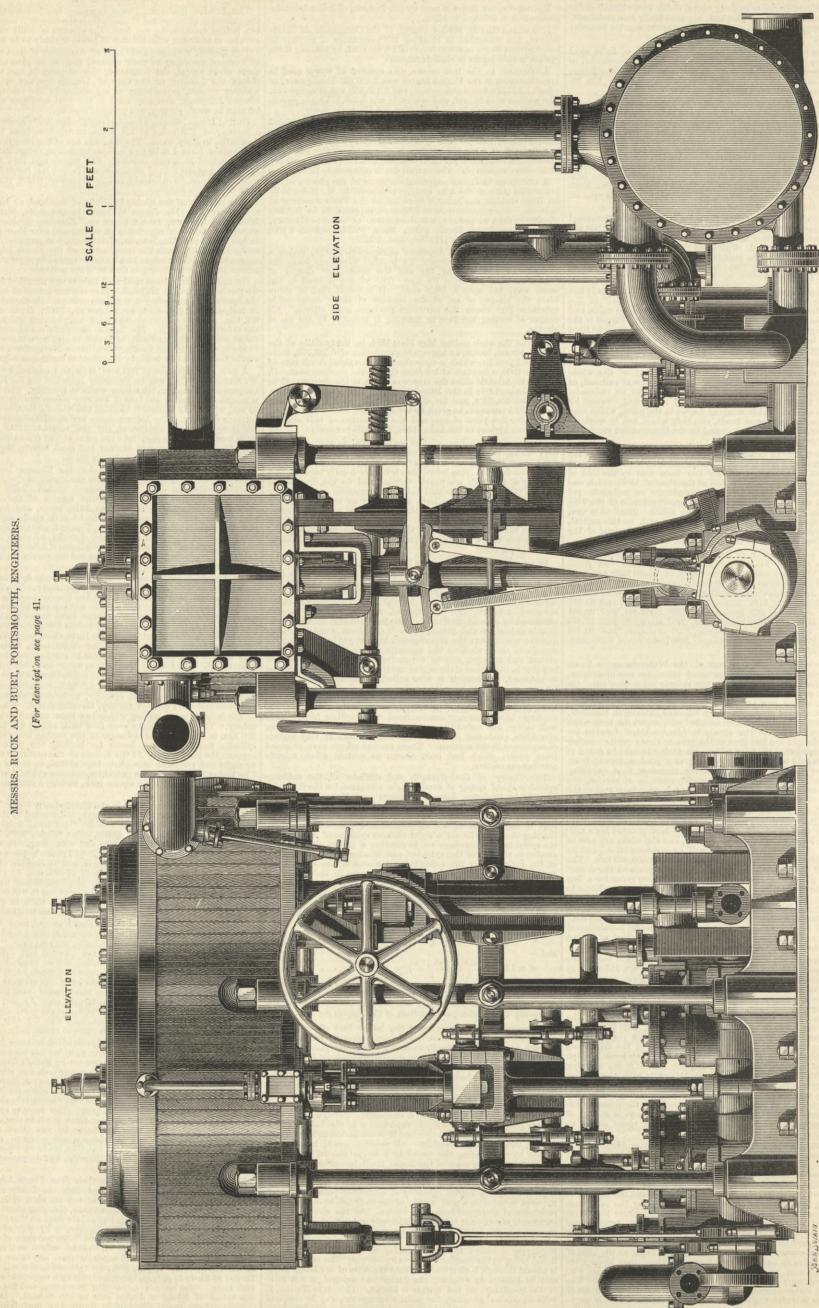
the ram of 385 tons. A LARGE planing machine in the Charlestown Navy Yard, at Boston, built in 1866-69 by S. Wilmarth, is described by the Boston Globe as the largest one in the world. "Its total weight is 300 tons; extreme length, 55ft; width, 31ft; height, 29ft. It will plane a piece of metal 18ft. square and 45ft. long. It will also plane at right angles or vertically. It will plane a piece weighing 200 tons if required at any given angle, and is capable of boring, turning, slotting, or splining to a depth of 4ft. and at any taper indicated. The lightest class of work is accomplished with great rapidity and accuracy. Among other specialities it will bore, turn, and cut gear wheels of any required size up to 40ft. in diameter. It will bore and spline propellers of any size and weight." AT the annual meeting of the Parkes Museum, held July 9th.

It will bore and spline propellers of any size and weight." AT the annual meeting of the Parkes Museum, held July 9th, a report was read by the chairman of council showing the work that had been carried out by the Museum during the past year. "Twenty-one lectures have been arranged by the Council and delivered in the Museum by some of the best authorities on hygiene and sani-tary science. These lectures have contained much valuable infor-mation, and have dealt with a majority of the subjects included in the scope of the Museum in a most useful and interesting manner." The Museum has been largely used by lecturers on public health, and other skilled teachers, for practical demonstra-tions, to various classes of students, &c., who for this purpose have been admitted to the Museum without entrance fee. ON Tuesday, the Harwich, a finely-modelled steamer belonging

ON Tuesday, the Harwich, a finely-modelled steamer belonging to the Great Eastern Railway Company, which has been converted from a paddle steamer into a twin-screw by Earle's Shipbuilding and Engineering Company, of Hull, was taken on her official trial trip. She is intended for the carrying trade between Harwich and Bottardem on Antworn and is nowided with accommedication for and Engineering comparing the carrying trade between Harwich and Rotterdam or Antwerp, and is provided with accommodation for cattle, the transportation of which is very extensively carried on by the Great Eastern Railway Company. Her engines are of the compound diagonal direct-acting twin-screw type, having cylinders compound diagonal direct-acting twin-screw type, having cylinders compound diagonal direct-acting twin-screw type, having cylinders 22in, and 42in, by 27in, stroke. The vessel was taken over the measured mile outside the Humber, where a mean speed of 13<sup>‡</sup> knots was attained, and a run was then made to Flamborough and back to Hull. A distance of 120 miles by the patent log was accomplished in nine hours.

MESSRS. BOLLING AND LOWE, in their Iron Trade Report, say: "In February last we pointed out that the heavy duties in Russia were much against us—£5 per ton on steel rails. Spain practically treats us in the same manner, charging about £3 10s. per ton on English rails, a much higher rate than on those imported from other countries. This, we suppose, is by way of 'special thanks' to Englishmen for holding a large amount of Spanish bonds, freely investing capital in Spanish mines and importing more Spanish wines, fruit and minerals than any other country. In our report of 1st March, 1882, we referred to the St. Gothard Tunnel as likely to play an important *rôle* with respect to our trade with Italy. The traffic is continually increasing, and the question now arises of laying a double line in the tunnel. Italy and Germany have practically broken down the mountain barrier previously existing between them, and in consequence much of the North Italian Iron trade will be diverted from this country,"





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\*\* Next week a Double Number of THE ENGINEER will be pub-lished containing the Index to the Fifty-seventh Volume. The Index will include a List of Abstracts of Specifications published during the same period. Price of the Double Number, 1s.

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- \*\* In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a 1d. postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions.
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- communications.
- W. S. M.—The engines of the Oregon are about 10,000-horse power. This is probably the greatest power regularly developed at sea. D. J. M.—Zeuner's treatise "On Valve Geer," if you are a good mathe-matician; Welsh's Treatise if you are not. Messrs, E. and F. N. Spon are the multividers.

- D. J. M.-Zeumer's treatise "On Valve Gear," of you are a good mathematican; Welsh's Treatise if you are not. Messrs, E. and F. N. Spon are the publishers.
  MILANO.-There is very little choice exhibited, as some engine builders pass the steam through the tubes and some the water. Sending the water through the tubes is perhaps the more general practice.
  G. R.-You can obtain any specification in print by applying at the Great Seal Patent-office, Chancery-lane. At most of the public libraries a complete set of Patent-office publications is kept, and by consulting the indexes you can find the date and number of the specification you require.
  J. P. (Putney Bridge).-It is not necessary to publish your letter, as the facts are not as you give them. The springing level of the arches is a little dove Trinity high-varier, and at this level of vacet there will be a clear headway of 13/t. at the centre of the arches. See the drawings in THE ENGINEER of the 6th October, 1882.

#### CHIMNEY CONSTRUCTION.

(To the Editor of The Engineer.) SIR,—Will you kindly allow me to ask if any of your readers can oblige me with the names of works where the following tall shafts are erected? Manchester, 410ft. high; Wigan, 420ft. high; Warrington, 440ft. high. Church-end, Finchley, N., July 14th. R. M. B.

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#### DEATHS.

On the 28th May last, at Burgersdrop, South Africa, of fever, WILLIAM HONT, C.E., formerly of Cappawhite, County Tipperary, and latterly of Ballinasloe, County Galway, Ireland. On the 30th June, at South-place, Kennington Park, HENRY CHAPMAN, C.E. acod 68.

C.E., aged 68. On the 14th July, at the residence of W. M. Gibson, Devon House, Kingsdown-parade, CHARLES FOURACRES, C.E., late of Seebpore College, Cal-utta, aged 58 years.

# THE ENGINEER.

#### JULY 18, 1884.

#### THE THAMES VALLEY SEWERAGE.

THE THAMES VALLEY SEWERAGE. CONSIDERABLE surprise, not unmingled with conster-nation, has been created by the rejection of the scheme for the drainage of the district known as the Lower Thames Valley. The project had been carefully elaborated by the Joint Board brought into existence seven years ago for the purpose of wholly diverting or purifying the concerne. The Theorem concerned of the the sewage. The Thames Conservators approved of the plan. Mr. J. Thornhill Harrison conducted an inquiry into its merits on behalf of the Local Government Board, and after a careful investigation, costing  $\pounds4000$ , reported unreservedly in its favour. Sir Charles Dilke's depart-ment endorsed that conclusion by granting a Provisional Order to serve the server of the serve Order for carrying out the undertaking. Another Pro-visional Order renewed the powers of the Lower Thames Valley Main Sewerage Board, and granted that body further time for the execution of the scheme, during which period the district would be exempt from penalties on account of polluting the river. The project when about to come before Parliament attracted considerable notice on account of its probable effect on the Thames in the vicinity of London. All the sewage of the district, com-

prising twenty-one parishes, with a population of 150,000, was to be brought by a system of main sewerage to a station on the banks of the river at Mortlake, there to be treated by a chemical process and the effluent dis-charged into the Thames; while the sludge was to be sold or given away as manure, or else barged away to a piece of land down below London. The scheme was estimated to cost more than a quarter of a million of money, with an annual charge of  $\pounds 25,000$ . The provisional orders connected with the project were referred by the House of Commons to a hybrid committee. As the inquiry proceeded, the prospects of the scheme seemed to promise fair, and it was even thought at last that its success was secure. Supporters and opponents were all alike astonished when the Committee suddenly cut the proceedings short by declaring their decision that the Provisional Orders Bill should not be approved. Sir Charles Dilke, on being questioned upon the subject in the House of Commons, remarked that the Committee had incurred "a grave responsibility," and "the difficulties which would result would be of a most serious character."

Since Sir Charles Dilke spoke, the report of the Com-mittee has appeared, being published on Wednesday. One of the most puzzling circumstances connected with the decision of the Committee was that it refused to sanction the unopposed Order by which the existence of the Lower Thames Valley Main Sewerage Board was to be prolonged. The reason for extinguishing that Board now appears. The Committee consider it desirable to break up the combined district, and to substitute four or five districts for the one. This appears like going back to the original condition of things, and entirely subverts the policy which established the Joint Board. For this retrogression—if so it may be called—the Committee plead the improvement which has taken place in chemical methods for the treatment of sewage. The Committee have great faith in chemical processes, and consider that no longer necessary to treat the sewage of all the localities at one spot. According to their view of the case, the combination of districts, so as to create one large area under a Joint Board, was a concession to the defects which then existed in the science of sewage treatment. We presume that in the opinion of the Committee combination was necessary, in order that sewage irrigation, or the absolute diversion of the sewage, might be effected. They say that the Joint Board have sought, but failed to obtain, power for various schemes designed for the total diversion of the sewage, or for its treatment by irrigation at one particular place. Now at hat particular place. Now at last came a plan for chemical treatment; this also to be carried out at one spot. The Thames Valley Board seem to have been a little too successful in the present instance. They have brought such a weight of professional evidence in favour of their scheme, and to prove the perfection with which the sewage can be treated by a chemical method, that the Committee turn round and say:—"Your chemical process is so exceedingly good that any little Board can adopt it successfully, and there is no longer any need for your existence." The Thames Valley Board, after suffering many reverses, have now "fallen on the other side," and have triumphantly extinguished their own corporate existence. Heston and Isleworth may now form one district. and treat their own sewage. Richmond urban and rural may unite, like Heston and Isleworth; and out of the twenty-one parishes there are to be four or five districts, each independently treating its own sewage.

This, at least, is the mental conception of the Committee. It is one more scheme added to the many that have gone Another Committee, with another batch of Probefore. visional Orders before it, may see matters in a different light. There are members of Parliament who refuse to put their trust in tanks, and who are doubtful as to the qualities possessed by precipitating agents, whether they be sulphate of alumina, lime, and a little yellow clay, or anything else. Moreover, there is a very decided notion among people in general, that whatever liquid comes from sewage-works is itself sewage, let its appearance be what it may. There has been a tremendous outcry against the Mortlake outfall, as an invention for utterly spoiling the river above London, and probably doing consider-able mischief within the area of the metropolis itself. The public are not yet fully converted to a faith in precipitation. The Mortlake effluent has been denounced by anticipation as something inevitably foul and polluting. "The House of Commons Committee," and polluting. "The House of Commons Commutee, says one of the dwellers at Chiswick, "acted like sensible men in throwing out this audacious scheme." "Take the sewage away to the sea," says this gentleman, "or else let it be pumped up and taken inland to some waste piece of ground, far distant from human habitation, where the chemists can deal with it safely." But who is to pay for all this? The ways and means are ample, for this generous adviser proposes that the State should come to the rescue, instead of spending money "in the purchase of enamelled vases and pictures by the old masters." We have a great variety of ways for solving the sewage question, but none of them give much satisfaction. London has tried "abso-lute diversion," and everybody seems to be horrified at the result. At all events, it is sufficiently plain that the metropolis has not yet seen the finish of its main drainage works.

The Committee on the Thames Valley scheme consider that by having several outlets instead of one there will be a more perfect dilution of the effluent. This looks as though the Committee were not quite sure that the effluent would behave itself properly. But the Committee are said to be satisfied that each of the four or five districts would be able to treat its sewage with greater efficiency and economy than the Joint Board. Possibly each district may think so, and may like to have the honour of possess ing sewage-works of its own. There has been a considering sewage-works of its own. There has been a consider-able amount of disagreement over the present scheme, the Thames Valley Board having failed to secure the firm adherence of all the subsidiary authorities. But we are not yet assured as to the economy of having four or five establishments instead of one. The dilution of the effluent may be a fair expectation, but the multiplicity of sewage-

carried off to some distant and lonely spot for disposal by irrigation, it would be a happy issue. If chemical treatment could be relied upon, it would be a happier thing treatment could be relied upon, it would be a happlet uning still. There is need for something to be done, and that soon. An important and beautiful suburban district, of great extent and rapidly increasing population, is con-demned to a sanitary blockade of a most dangerous and intolerable character. Of dire necessity a hundred sewers and drains between Sunbury and Putney are discharging their context, the law lu and drains between Sunbury and Turney at the law. In their contents into the Thames, contrary to the law. In addition there are countless cesspools. The Conservators addition there are countless cesspools. The Conservators of the Thames will shortly have power to sue the offenders for enormous penalties; but nothing will stop the sewage. For enormous penalties; but nothing will stop the sewage. Parliament must again suspend the law, and some scheme or other must be adopted. The Thames Valley Board have been toiling at the problem for seven years. Fifty thousand pounds have been expended, with the result that things are not only as they were, but considerably worse. The state of affairs threatens to get so bad that almost any scheme might be welcomed as a change for the better.

#### OUR ARTILLERY INVENTORS.

It is said that when a German official in high position was asked whether he did not consider that we needed more science in our English Government Departments, he replied, "You have something much better than that, you have perfect honesty; no one else has perfect honesty. We have not, Russia has not, no nation except yourselves has it; you keep it, you can buy science as you want it." This was in some respects a pleasing reply; still let us read it correctly. He did not say "you have perfect honesty, so you can buy science if you want it without paying for it." We should all be shocked at such an idea of honesty. Probably there could not be found an individual who would contemplate such a thing. Nevertheless, system may be more unjust than individuals, and it may be well to consider whether custom and system may not be doing what we should all repudiate as individuals.

Is our system of treating inventions for the service fair and liberal? We all know that such a question will meet with a chorus of replies that it is the very opposite. This must, however, in the nature of things be felt by disappointed inventors generally. Suppose then we throw them all out and choose a reasonable number of suc-cessful inventors, what answer should we then get? Very much the same, we apprehend. Take, for instance, Colonel Moncrieff, who is, on the whole, a very successful inventor. He recently read a paper at the United Service Institution, in which he described his treatment somewhat as follows: He succeeded in getting a committee appointed to consider his hydro-pneumatic system, and after over-coming some opposition, he eventually so convinced the committee of the soundness of his proposals that they reported in his favour. On this they were at once broken up, and a new committee appointed, only to come to an end in the same way. Seven committees in succession did Colonel Moncrieff convince, and they each eventually recommended his system, each being in turn, at this stage, immediately abolished. Colonel Moncrieff is an obstinate Scotchman; doubtless, also, he benefitted by the example of Bruce and the spider; but his official connection with Government was abolished on the seventh favourable report. His case, indeed, then was becoming a heinous one, requiring decided action. We remember a young officer, in a cold-blooded way, many years ago endeavour-ing to dissuade Sir William Palliser from the course of invention, in which he was then comparatively fresh. "You may find one successful man," he said. "Sir Wm. Armstrong may have made it answer, but try some others who have become celebrated. Has Whitworth made it pay? Can you, on the whole, expect to do better?" This officer regarded an inventor as an unhappy man who lit a fire that could not be quenched, one that went about in the character of a sort of public nuisance, if not a public enemy, always wanting something that he could not get. Is this a proper view to take of the matter? It un-doubtedly contains a measure of truth. If, however, the view taken by officials of inventors is hardly a healthy one, the opposite side of the case is worse. Inventors, as a rule, consider that they have not only been hardly and grudgingly treated, but in many cases they speak out so strongly of the unfair or fraudulent action from which they have suffered, that it becomes difficult for any responsible officer to converse with them. Supposing it were necessary for the English Government to obtain a character in order to get an invention placed in their hands, could a man be readily found who would testify that he had received full consideration and justice, and would guarantee that others coming should meet with the same?

Let us look at the matter from another point of view. Suppose a scientific referee could be taken over one of our ships; he would find innumerable designs well carried out, each one representing, not only ingenuity and wear and tear of the human mind, but successful ingenuity, each design being presumably the best of several alternative schemes. Suppose he was then to ask what money the country had paid for each design, would the answer bear out the commendation of our German authority? Suppose he asked after the man who was the author of each construction, and whether he had any complaints to make, not reckless complaints of course, but such as he was prepared to substantiate, what answers would he get ? Most men are hard to please; inventors probably overrate their own inventions. A complaint to carry weight must be supported and proved. What should we hear then from our constructors of ships, guns, projectiles, carriages, and the like? Supposing that the Elswick firm, Sir W. Armstrong, Messrs. Noble, Rendel, and Barnaby to be satisfied men, what about Sir E. J. Reed, Palliser, General Boxer, Colonel Moncrieff, Vavasseur, General Clerk, and Admiral Scott, or others? Our new General Clerk, and Admiral Scott, or others : guns are built up of steel tubes, but this was not done until the system had been brought to such a pitch of the before superior to wrought iron. This was done for us by Whitworth and Vavasseur. Has the country in any way shown its appreciation of their labours? works seems to be objectionable. If the sewage could be We are trying wire guns. Are we even paying Longridge

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the compliment of consulting him? Observe, we are making the supposition that our Government have adopted all the best designs, and we are only considering the case of the presumably happy and successful men whose designs have been taken up. If our relations with them are unsatisfactory, where does the fault lie? Very pro-bably the professional advisers of Government will be blamed by most people. Yet it can be easily shown that they are very little interested in behaving badly. The system which turns them out at the end of five years, or in the case of a committee member in three years, makes in the case of a committee member in three years, makes their official employment worth but little. It could not pay them to steal and get credit for inventions, for no money has been given to our knowledge by our Government to any officer for an invention for many years. We believe that the fault lies in the spirit and system which has shaped all our national operations in a greater or less degree of late our national operations in a greater of ress degreative by years, the spirit of bidding for immediate popularity by cheese-paring or flint-skinning in every department. The popularity of a Government depends much on keeping down expenses, and the competition between opposite political parties is keen enough to make every department a subject for the shears of parsimony. Party interests are admirably secured by a penny-wise-pound-foolish policy if one party gets credit for saving the penny and their opponents come in for losing the pound. The habit of driving hard bargains when long continued leads to standards being established by custom which ought never to have been tolerated. We may cite two instances of lines of conduct recommended by our responsible advisers, which are unworthy of England. It has been urged that the Government should have a right to use any patent without paying a royalty, and this is applied to war stores. Consider what this amounts to. A store is invented with the requirements and demands of our own Government principally in view. Any benefit arising is likely to be enjoyed chiefly by England. England would grant the inventor a patent and pocket the inventor's money in doing so, and then legally use the invention for nothing— that is she could seize his invention and can also take his money for a nearly valueless document. What would be neid of one encourage to each other work of each other work other work of each other work other work of each other work o said of any approach to such action on the part of an individual. Again, to take the case of Mr. Lynall Thomas. Without attempting to discuss his claim, we note the bare fact that in 1877, after a lengthened trial in which he, a private individual, contested with Government at a great disadvantage, he obtained a verdict and a large award for services rendered in 1861, sixteen years before. On this, advantage is taken by our legal advisers of a technical or legal plea to carry the case on further in a way that would involve enormous expense and waste of years and something very like ruin to him. Can we con-ceive a private individual of unlimited wealth being allowed to deal in this way with any small bill sent in to him? Can we wish our country then to take such a line

We may on our present time-honoured system keep down the immediate annual charge, but we may depend upon it that in the long run we suffer, for every other aspect of the question is miserable. England on this system cannot be encouraging inventive effort, and her designs must suffer accordingly. Yet if we inspect those we have, we cannot feel that we have come by all of them rightly. If we think of the private inventors whose brains we are using, one man after another rises up before us trying to struggle on and keep up appearance and heart under cruel discouragement, and with capital and life wasted. Then again our Government officers are men put in charge of departments to manufacture and invent, if they can and care to do so, as it were, by order, for five years, at the end of which time they must take up military duty and carry off their special knowledge to distant parts of the globe. India and Bermuda were the destinations of the last manufacturing officers that we remember being ordered away. About the age when they ought to be most valuable they are likely to be compelled to retire to give promotion. They have little encouragement to show their powers, though we have some who have done so. We know one young artillery officer, of very remarkable inventive capacity, who, after successfully getting some designs adopted, has relapsed into the ordinary condition of disgust. In the face of the admitted bad state into which our national armaments, especially our navy, are falling, we can hardly armaments, especially our navy, are failing, we can hardly expect that public attention can be drawn to this question. Nevertheless, it is certainly not being dealt with as the character or the interests of the nation demands. It is not easy to suggest what should be done. In these days it is difficult to obtain money for what is not popularly understood. A Royal Commission might not effect much, but it might be interesting to try one.

#### METROPOLITAN WATER SUPPLY.

THE water supply of London has been occupying a large share of public attention lately. The subject deserves it. Public health, public cleanliness, insurance of a speedy and efficient means of extinguishing fires, and last, but hardly least, a supply of cheap power are all embraced by the question. Nor must the price paid for water be for a moment overlooked. If the committee asked for by Mr. W. H. Smith had been appointed it would have been able to lay before the House of Commons and the country a mass of valuable information. Of course the ultimate object of inquiry is to ascertain how best to give the inhabitants of Inquiry is to ascertain how best to give the inhabitants of London the largest supply of the purest water at the least possible cost. In any changes that might be suggested by the results of future inquiry the vested interests of the share-holders of the water companies must be duly considered and respected. The water rates of London, and their alleged disproportion to the actual value of the water interface the state of the state of the state of the state interface the state of the state of the state of the state interface of the state of the state of the state of the state interface of the state of the sta given, is the point of most general interest, therefore it is the one chiefly debated. This is perfectly natural; the other points in connection with the subject enumerated the one chiefly debated. This is perfectly natural; the other points in connection with the subject enumerated above are either medically or otherwise technical in their nature, but a question of money payment addresses itself forcibly to all parties. It will need skilful financing ability to secure a cheap and constant water supply at a low yearly rate without injuring the water companies. If

it is found on a searching examination of their accounts that these corporations do realise 7 or 8 per cent dividends, what then? They hold certain legal powers of rating consumers, and any attempt on the part of Parliament to fix the interest which water companies may charge on their in-vested capital will border somewhat closely on paternal legislation. If upon inquiry it is found that an interest of 8 per cent., say, is realised on waterworks, and that Parliament in the public behalf desire to lower that to, say, one-half, then in justice to the shareholders, they must receive due compensation in a sum of money paid downfor the reduction forced upon them. A very important point in relation to water rating is the alleged inequality of its scale. The rating powers of the different water companies of London and of the provinces vary in an almost incredible degree, and are levied under no less than 767 Acts of Parliamentthat was the number at the end of 1880-and it is therefore nearly certain that at present there must be some inequality in the proportion of value given for money paid, and one of the first requisites is to see how this injustice can be removed. The operations of water companies are, as a rule, free from the influences of competition; a monopoly is enjoyed by each company, and the commodity sold may fairly be called the first necessary of life It is therefore expedient that control by law must to some extent operate on their charges. The method of regulating the price paid for water by charging according to the rateable value of each house appears, at least to outside observers, to be loose and ill-defined. It is a tax, yet not for imperial purposes; it is one to all intents levied in behalf of a set of private companies. Whether a man and hisfamily use a gallon of water a day or a thousand gallonshe has to pay the same; and even the phrase "a thousand gallons" must be taken with reserve, because though the consumer gain nothing by limiting his use of water, the company take various precautions to limit the quantity supplied, practically only filling a moderately sized cistern so many times a week for him, and if he proposes to use a hose to water his garden, he is charged in some cases  $\pounds 5$  a year for it.

THE ENGINEER.

In order to come at some idea of the proportion between the price charged for water by house rating and by the the price charged for water by house rating and by the gallon, the following figures may be taken. A house cistern may measure 7ft. square and 2ft. deep, equalling, say, 600 gallons capacity. Theoretically 600 gallons a day of water are supplied to it, but save in certain weeks of summer, not the whole, probably not more than half this quantity is actually used, say, 300 gallons a day, or  $365 \times 300 = 109,500$  gallons per annum, which at  $7\frac{1}{2}d$ . per 1000, equals 43 as 9d a year. Instances are to be found equals £3 8s. 9d. a year. Instances are to be found, however, where the water rate for this supply is £4 10s. or more, being what is paid according to the rating value of the house; and the fact furnishes an illustration of the inequality of the incidence of water rates, because in another house having identically equal cistern capacity and water supply, if of greater rateable value, the tenant has to pay a higher price for the same thing. According to Mr. Parry's report for a number of towns, the selling price of water varies from 2s. at Manchester and Bury, to 4d. at Glasgow; but of course the relative cost of obtaining the water, borne by the respective companies, also varies. How far the cost of obtaining and distributing the water is equally proportionate to the charges levied in the respective cases can only be exactly arrived at by careful investigation. According to Sir Joseph Bazalgette, in his address as president to the Institution of Civil Engineers, on the 8th of January this year, the rateable value of London, within the area of the districts of the eight great water companies, is £28,000,000. The total amount received in the year 1883 by these companies for water rates and sales was  $\pounds 1,561,811$ , of which upwards of  $\pounds 300,000$  was received for the sale of water by meter for trade purposes, at prices ranging from 6d. to 9d. per 1000 gallons. The balance of  $\pounds 1,260,000$  equals  $4\frac{1}{2}$  per cent. on the rateable value of the property The companies are only entitled to make a charge of 5.53 per cent. on the nominal rental-a sufficiently vague definition for basis, and this vagueness is one of the chief points now being contested. In all business transactions, whatever their nature, it is of great importance that the relations between any two parties should be clearly defined. A householder requires both coals and water; he goes to his coal agent and orders the quantity and quality he wants; they are delivered and paid for. Both seller and buyer understand each other. The water is obtained on altogether another footing. Periodically the householder gets a notice that so much is due for water rate; if not paid in due time the water is cut off, or he is summoned. It matters nothing, as we before observed, whether much or little water has been used, and this is a grievance to the business mind.

Turning now from the directly financial to the engineering aspect of water supply, we may invite attention to the daily waste of water power where domestic motors are so much needed. In a large proportion of houses water is served into the cisterns under pressure, and a very high pressure indeed in some manufacturing and country towns, yet up to the present it apparently has not occurred to any one to utilise or store it. Let us see what it is. First water, say 22 cubic feet, is run into the cistern at a pressure in the service pipe of, shall we say, 201b. per square inch. This, if passed through the cylinder of a water engine having a diameter of 6 in. or area of 28 in., and having a stroke of 12 in., gives  $28 \times 12 = 336$  cubic inches, or about  $\frac{1}{5}$  of a cubic foot; the piston would, therefore, make  $5 \times 22 = 110$  single strokes while the tank was filling, it would realise 2200 foot-pounds of power, and for a week's supply a foot-poundage of 13,200 is obtained, the piston and cylinder operating at the same time as a water meter. It has been suggested that this power might be stored up in various ways, such as storage electrical batteries, compressing air in a receiver, or by the more primitive method of winding

induce the companies to give a constant supply, because the meter would not only register the water used but the power also. The quantity of power to be had in this way would no doubt be very small, yet if it only sufficed to drive a sewing machine it would be valued. It is not very easy, however, to see how the storage is to be affected. The scheme could only be possible at all by the general adoption of meters working under high or comparatively high pressures, the operation of the mechanism of which would be the same whether it did work or not. There are, however, many cases where the consumption of water under pressure is large, and the power required small, in which the scheme might be turned to account.

#### THE WESTINGHOUSE BRAKE ON THE NORTH-EASTERN RAILWAY.

MR. T. E. HARRISON, the well-known chief engineer of the North-Eastern Railway, has been good enough to send us a report on the working and maintenance of the Westinghouse brake on that line. If the Board of Trade required support, they should be grateful indeed to be backed up by such power-ful aid, for this document, as will be seen, breathes the greatest confidence and satisfaction in the brake, which experience has proved to be the only one which really complies with the Board of Trade conditions in a satisfactory way, and which can now be proved to do so at a trifling cost for maintenance. Mr. Harrison's report is the more valuable since it bears evidence that the opinions expressed are the result, not only of practical experi-ence, but of careful, methodical, systematic arrangements. We are told about the methods adopted to keep the brake in good order, and of the system of training the drivers in a model van fitted up with apparatus for a whole train, and through which each map must press satisfactavily before he is acted as fit to each man must pass satisfactorily before he is entered as fit to take charge of a train. The knowledge of the principles thus gained will prove of value in many ways, and not the least in making drivers cautious as to setting up impossible theories to account for some mishap, for which, perhaps, their own want of caution is alone to blame; and it might not be amiss if guards were also instructed in some of the main features of the brake for the same reason. A detailed statement of the cost of maintaining the Westinghouse brake on 2666 vehicles for two years is given, and this is particularly instructive. From it we find that, including the cost of replacing the whole of this stock with new hose pipes, for reasons explained in the report, the total expenditure for maintaining both the brake proper and the brake rigging, exclusive of brake blocks, is under 9s. 6d. per vehicle rigging, exclusive of brake blocks, is under 9s. 6d. per vehicle per annum. As Mr. Harrison points out, however, the cost for hose pipes should be reduced by one-half to get an average, which brings the sum to only 7s. per vehicle. This amount includes everything but brake blocks, which are common to all brakes, and is made up as follows:—Maintaining and repairing parts of brake and rigging, 8d. per vehicle per annum; hose renewals, 2s. 4d. per vehicle per annum; men's wages, testing and overhauling, and inspector's salaries, 4s.; total, 7s. This sum is equal to about 14 per cent. for the first cost of the brake proper and the brake rigging—a truly surprising result, which, as the report says, "shows conclusively that there is great economy in the maintenance of the Westinghouse brake." Mr. Harrison has been, with ourselves, a believer in the triple valve from the first, and takes the opportunity of the triple valve from the first, and takes the opportunity of stating, as his experience of some 3000 in use on the North-Eastern Railway, that only 1 per cent. per annum require repairs, and that during the year 1883 there were only five triple valves which caused delay. The importance of the tell-tale quality, the utter insignificance of the delays, the advantages of the Westinghouse brake on their heavy inclines, of its powers for either emergency or station stops—are not all these things written in brief but forcible terms in the report of our eminent engineer? and we commend it to our readers' attention. It must be very gratifying to one who has for some years taken a quiet but confident lead in the brake question, and whose ability and sagacity in both civil and mechanical engineering during half a century has constituted him one of our leading during half a century has constituted nim one of our leading engineers, and perhaps our highest authority in all that relates to railway matters, that his opinions should have received such confirmation from practical experience, and that he should be able to report that "There does not appear to be any one point in the principle and arrangement of the Westinghouse brake, as now in use, requiring alteration, and it entirely complies with all the requirements of the Board of Trade." Mr. Harrison all the requirements of the Board of Trade." Mr. Harrison concludes by giving a table of the number of Westinghouse automatic brakes in use and actually ordered up to the 30th April, 1884, all over the world, amounting to 11,553 sets for engines and 63,065 for carriages and wagons. It is further shown that an increase of 8276 sets for engines and 49,563 for carriages and wagons has taken place in three years and nine months. Mr. Harrison is clearly not alone in his good opinion of this invaluable appliance.

#### OUR EXPORT COAL TRADE.

ALMOST alone amongst the mineral industries, the export coal trade continues to show growth even in the present period of depression. In the first six months of the present year we depression. In the first six months of the present year we exported of coals and coke—and the latter is only a driblet— 11,098,062 tons, an increase of nearly half a million tons on the quantity for the corresponding half of the past year, and a still larger increase on that of its predecessor. The increase, it is still more satisfactory to note, is one that is spread over an area that is wide. We sent in the past half year more coals to Russia, Sweden and Norway, Denmark, Spain, Italy, Egypt, Brazil, Gibraltar, Malta, the British East Indies, and the "other countries" that are not specifically named in the official lists. Germany, Holland, and France are the only countries that show any decrease, and the decline is very slight. It had show any decrease, and the decline is very slight. It had been anticipated that the numbers of the idle steamers would have lessened the quantity of the coals shipped for the use of steamers engaged in the foreign trade; but, on the contrary, there is for the half year an increase to 3,108,705 tons. It appears then that in the half year we have added over half a million tons to the quantity of the coals exported and to the quantity used by the vessels engaged in the foreign trade; and though the tonnage so used is small compared to that raised, yet it is satisfactory to notice that it is growing and that in the last for satisfactory to notice that it is growing, and that in the last few years there has been a very considerable enlargement of the rate of growth. It will not prove sufficient to make up for the undoubted decline in the quantity of coal consumed in the home manufactures; and the latter is believed to be so large, that in spite of the continuance of the normal growth in the worst, it still shows signs of being unlikely to improve very rapidly. For the next few months there is unlikely to be much change for the better, and thus it would seem that for the present year we must look to one of the decreases in the total production of coal that so rarely occur in this kingdom.

#### THE WATER SUPPLY OF VENICE.

THOSE who have stayed in Venice have learned what it means to be dependent for water upon an army of men, who with barges fetch a daily, or rather nightly, supply of liquid, rarely fit to drink, across the lagoons from a stream emptying near a place called, if we remember correctly, Servola. These old a place called, if we remember correctly, Servola. These old travellers, and those who have yet to visit that much-visited city, will be glad to learn that the inauguration of the Venice Waterworks, by which a real piped-water supply is carried into the romantic city, took place on the 23rd of June last, and fully realised the expectations of all concerned in this piece of hydraulic engineering, which is internationally interesting. The contract for the works has been carried out by the Public Works' Company of Italy—Messrs. Breda and Co.—including the con-struction of the reservoir and filter beds at Moranzano on the mainland, and the laving of the pipes under the Laguna to the mainland, and the laying of the pipes under the Laguna to the city of Venice of a total length of 6460 metres, of a diameter of 80 centimetres—31 5in.—and the laying of the total length of mains in the thoroughfares and canals of 25,706 metres of a diameter of 30 centimetres—11 8in. In the course of laying these mains they were taken at eighty-five places across canals, and twice across the Grand Canal, work which involved con-siderable difficulties. The work also included the construction of an engine house and reservoir at St. Andrea, the erection of a pair of 50 nominal horse-power engines, together with laying on the water to all the principal buildings and hotels in the city. the water to all the principal buildings and hotels in the city. The work was commenced early in January, 1881, and was consigned to the entire satisfaction of the concessionaires on the 23rd June, 1884. The concession was originally granted to Mr. D. C. Dalgairns, C.E., of Palermo and Penge, in 1876, upon provisional plans and studies then deposited, and the works have been carried out on the defini-tive plans presented by him on the 23rd June, 1877. The com-pany to which the property now belongs is the Société des Eaux pour les Etrangers, of Paris, which was formed for the purpose of carrying out this scheme in January, 1879. Probably no city in the world had more urgent reason to obtain and maintain an excellent water supply than Venice. Venice lives upon the pleasures of all the nations of the world, and she could not afford that the fearfully bad supply upon which she has depended from pleasures of all the nations of the world, and she could not afford that the fearfully bad supply upon which she has depended from time immemorial should drive away even a few hundreds of the many thousands of her visitors. She has therefore gone to the Brenta for water, and now her visitors may at any time, instead of occasionally, have a glass of water to drink, or may even have a bath. Count Dante Serego degli Allighieri, the Sindaco of Venice—a descendant of Dante—through the medium of G. G. Maranzoni, of Venice, has expressed his deep sense of gratitude to Mr. Dalgairns on the successful inauguration, and adds. "The to Mr. Dalgairns on the successful inauguration, and adds, "The city of Venice is truly alive as to its indebtedness."

#### THE INSTITUTION OF CIVIL ENGINEERS.

THE Council have awarded the following premiums in respect of the original communications submitted during the session 1883-84:-

FOR PAPERS READ AT THE ORDINARY MEETINGS.

1-A Watt Medal and a Telford Premium to Sydney Walker Barnaby, Assoc. M. Inst. C.E., for his paper on "Hydraulic Pro-vulsion". pulsion.

2-A Telford Medal and a Telford Premium to Samuel Bagster Boulton, Assoc. Inst. C.E., for his paper on "The Antiseptic Treatment of Timber."

3-A Telford Medal and a Telford Premium to William Foster,
M.A., F.C.S., for his account of "Experiments on the Composition and Destructive Distillation of Coal."
4-A Telford Premium to William Tregarthen Douglass, Assoc.
M. Inst. C.E., for his description of "The New Eddystone Lighthouse"

M. Inst. C.E., for his description of the house." 5-A Telford Premium to James Atkinson Longridge,\* M. Inst. C.E., for his paper on "Wire Gun Construction." 6-A Telford Premium to William Hackney,† B.Sc., Assoc. M. Inst. C.E., for his paper on "The adoption of Standard Forms of Test-pieces for Bars and Plates." 7-The Manby Premium to George Henry Stayton, Assoc. M. Inst. C.E., for his paper on "Wood Pavement in the Metro-polis."

FOR PAPERS PRINTED IN THE PROCEEDINGS WITHOUT BEING DISCUSSED.

DISCUSSED. 1—A Telford Medal and a Telford Premium to Thomas Andrews, Assoc. M. Inst. C.E., F.R.S.E., for his paper on "Galvanic Action between Wrought Iron, Cast Metals, and Various Steels, during Long Exposure in Sea-water." 2—A Telford Medal and a Telford Premium to Francis Colling-wood, M. Inst. C.E., for his paper "On Repairing the Cables of the Allegheny Suspension Bridge at Pittsburgh, Pa., U.S.A." 3—A Telford Premium to James Henry Apjohn, M.A., M. Inst. C.E., for his note an "The Area of Sluice-opening necessary for the Supply Sluice of a Tidal Canal." 4—A Telford Premium to Thomas Gillott, M. Inst. C.E., for his paper "On the Basic, Open-hearth, Steel Process." 5—A Telford Premium to James William Wyatt, Assoc. M. Inst. C.E., for his communication "On the Art of Paper-making by the Machine, as Exemplified in the Manufacture of High-class Writings and Printings."

and Printings." 6-A Telford Premium to William Santo Crimp, Assoc. M. Inst. C.E., for his account of "The Wandle Valley Main Drainage." FOR PAPERS READ AT THE SUPPLEMENTAL MEETINGS OF STUDENTS,

FOR PAPERS READ AT THE SUPPLEMENTAL MEETINGS OF STUDENTS.
1—The Miller Scholarship to Alfred Richard Sennett,<sup>‡</sup> Stud. Inst. C.E., for his paper "On the Electric Light."
2—A Miller Prize to Peter Chalmers Cowan, Stud. Inst. C.E., for his notes on "The New York, West Shore, and Buffalo Rail-way, and the Methods used in its Construction."
3—A Miller Prize to Walter Osmond Rooper, Stud. Inst. C.E., for his account of "Emery Wheels, and Emery-wheel Machinery."
4—A Miller Prize to Richard Moreland (*tertius*), Stud. Inst. C.E., for his paper on "Constructional Ironwork for Buildings."
5—A Miller Prize to Edward Woodrowe Cowan, Stud. Inst. C.E., and a Miller Prize to James Fawcus, Stud. Inst. C.E., for their joint paper descriptive of "A Light-draught Launch."

SOUTH KENSINGTON MUSEUM .- Visitors during the week ending SOUTH KENSINGTON MUSEUM. — Visitors during the week ending July 12th, 1884: — On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 9799; mercantile marine, Indian section, and other collections, 3342. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 6 p.m., Museum, 1782; mercantile marine, Indian section, and other collections, 219. Total, 15,142. Average of corresponding week in former years 19,103. Total from the opening of the Museum, 21,186,027.

\* Has previously received a Telford Medal and also a Watt Medal, + Has previously received a Telford Medal, + Has since been elected an Assoc, M. Inst. C.E.

NOTES ON THE WESTINGHOUSE BRAKE, AN ON SOME REGULATIONS IN WORKING IT.

WE have received from Mr. T. E. Harrison, M.I.C.E., the following memorandum on the Westinghouse brake, which may be interesting to some of our readers. It is simply a statement of facts coming within Mr. Harrison's own prodocument of the North-Eastern Railway Company:-

A van has been specially fitted up for instructing the engine-men and firemen in the use of the Westinghouse brake under all circumstances. The van contains all the apparatus necessary for a train of eleven carriages, and pressure indicators are attached to show the varying pressure in the reservoirs, cylinders, and pipes. An intelligent engine-driver takes the van to the different stations, where men are located, and they are instructed in the use of the brake, the men taking a great interest in it; and when fully understanding its working they are passed, and their names entered in a book. A great improvement in the working of the trains was observed after the men had been instructed

instructed. Hose couplings bursting.—The number of failures of the hose coupling is chiefly to be attributed to their position on the carriages having been changed, necessitating the hose being removed from the iron ends by the following process:—The hose is soaked for from fifteen to thirty minutes in nearly boiling water, and then each end of the hose is put into a machine with movable heads, worked by levers, and forcibly pulled off the iron nipples, and invariably more or less damaged. The hose couplings so damaged have now been nearly all removed, and couplings so damaged have now been nearly all removed, and replaced by new ones.

Triple values.—All triple valves are examined and cleaned every three months, and it is probable that this examination will turn out to be more frequent than is necessary—the time occupied for the examination and cleansing of each triple valve is seven minutes. A little water is sometimes, but not often, found in engine triple valves, and in those on vehicles worked next to the engine. So far triple valves requiring repairs amount to about 1 per cent. per annum. Brake cylinders.—Brake cylinders on engines and carriages

Brake cylinders.—Brake cylinders on engines and carriages are at present examined every three months; a little paraffin oil is put in, and the pistons are turned round, so that the leather washers may be lubricated, and wear evenly. This process takes twenty minutes. The leather washers in the cylinders seldom require renewing, except in some cases on engines where they come in contact with heat. *Main reservoirs on engines.*—Water accumulates in these reservoirs, at the rate of from one to two gallons per week, depending on the state of the atmosphere. The time occupied in clearing off this water by a plug is five minutes. If these main reservoirs be kept moderately free from water, there is very little accumulation of water in the reservoirs on the carriages or bottom caps of triple valves. The larger the main reservoirs the better, and they ought not to be less than 9 to 10 reservoirs the better, and they ought not to be less than 9 to 10

cubic feet capacity. Dirt.—It is most desirable that dirt should be kept out of the working parts of the brake as much as possible, and this depends chiefly on the lubricant used in the air pump, and if a little pure paraffin oil is used once in two days, very little accumulation of dirt, and consequent clogging of the different parts of the brake, will take place will take place.

will take place. Governors.—The automatic governors now in use on all the engines on the North-Eastern Railway, though little used on other lines, have been proved to be of great importance in keep-ing up a uniform pressure; they require cleaning every two or three months, time occupied being about one hour. Donkey pumps.—The lower or air part of these pumps and the air valves and case require cleaning every three months, the time occupied being about half an hour. The pump itself requires a complete examination and cleaning once every nine months, taking two men's time one and a-half days. taking two men's time one and a-half days.

Divers' valves.-These valves require cleaning every two or three months, and take about an hour. All the cost of labour in connection with the examinations and clearing above referred to is included in the following table:—

Repairing and Maintenance of Westinghouse Brakes and Machinery for the Two Years 1882 and 1883, the Number of Vehicles being 2029 Carriages, 637 Guards' Vans, Horse-boxes, d.c.-in all 2666.

Description of parts,	Quantity.	Cost of materials, less old materials.		Labour in fitting and repairs.		Total cost of repairs for two years.				cost per ele for One year,				
Cylinder & parts: Cylinder Pistons Covers Springs Washers Air gauge	4 1 9 7 65 2		s. 0 0 12 2 10 0	d. 000000000000000000000000000000000000	30	s. 0	d. 8	£	s.	d.	S.	. d.	.5	3. d.
Los Incores Loss (	sie	32	4	0	6	0	8	38	4	8	0	3.44	0	1.72
Reservoir and union Triple valve Release valves Crosshead Miscellaneous parts: Truss rods, piping, &c Oil (lubricating).	1 86 14 51 1		15 0 6 10 2 3 6	0 0 0 6 11 4	10	3 3 7 12 0 10	00093	$     \begin{array}{c}       1 \\       82 \\       6 \\       14 \\       0 \\       23 \\       9     \end{array} $	18 3 13 2 2 13 6	0 0 9 9 9 11	000000000000000000000000000000000000000	·17 7·39 ·60 1·27 ·01 2·13 ·83	000000000000000000000000000000000000000	·085 3·695 ·3 ·635 ·005
						-	-				-		-	•415
Total brake parts Hose pipes and	241	162	7	9	13	16	8	176	4	5	1	3.84	0	7.92
mountings* Reversing the	5332	1199	14	0	66	13	0	1266	7	0	9	6	4	9
Wages, men testing Salaries inspectors, &c.	111				279 200 596	12 0 4	00000	279 200 596	12 0 4	00000	2 1 4	1·15 6 5·67	0	0.575 9 2.835
		1362	1	9	1156	5	8	2518	7	5	18	10.7	9	5.35

\* As it was thought desirable to change all the hose pipes that had been damaged when altering their position, the number here charged is above the average, to the extent of from one-third to one-half.

The above figures show conclusively that there is great economy in the maintenance of the Westinghouse brake.

Brake Blocks .- The wear of brake blocks is common to all brake Blocks.—Ine wear of brake blocks is common to an continuous brakes, and depends on the number of stoppages made by the brake. In the year 1883 the stoppages at stations on the North-Eastern Railway were 2,863,756; and on the Brighton Railway it has been found that the additional stoppages from signals and other causes amount to 50 per cent. The cost of brake blocks for one year is-

315

£874 m6g. 61d, par vehicle.

4 3.44

5 158=3.04

Attention is directed to the few cases of delay from the triple valve being out of order. It may here be remarked that the above delays are not attended with danger; though called "failures," they are in most cases the best proof of the reliability of the automatic brake, acting as a tell-tale to call attention to any slight derangement, and they will certainly be gradually of the automatic brake, acting as a tell-tale to call attention to any slight derangement, and they will certainly be gradually and greatly diminished in number, particularly in the bursting of the hose pipes. The whole result is a delay to one train every other week day, of three to five minutes, out of all the trains working on the North-Eastern system; not as great a delay as occurs every hour under the working of the block system. The returns of failures made by different companies for the half-year ending 31st December, 1883, vary a great deal, in one case being relatively more than six failures to one on the North-Eastern. North-Eastern.

Efficiency of the Westinghouse brake.—It must not be forgotten that the great object of the introduction of continuous brakes that the great object of the introduction of continuous brakes was not for the mere stopping of trains at stations, but that it might be used as an emergency brake to prevent accidents; and every day's experience shows more clearly the efficiency of this brake for this purpose, and in diminishing the extent of damage when accidents do occur; and it is generally liked by all engine drivers who have used it. It has been found especially useful for working steep inclines, of which there are many on the North-Eastern system, in some the gradients being as steep as 1 in 37. The incline on the main line to Whitby, five miles long, with curves of 15 chains radius, and the gradient less than 1 in 50, was formerly worked with a train of carriages fitted with Fay's brake. The Westinghouse brake now works the trains over this incline, at a speed of from 20 to 25 miles an hour, under complete control, the brake being applied throughout the running in descending the incline at a uniform pressure. The running in descending the incline at a uniform pressure. The "leak off" brake would be useless on such an incline. There does not appear to be any one point in the principle and arrange-ment of the Westinghouse brake as now in use requiring altera-tion, and it entirely complies with all the requirements of the Board of Trade.

Board of Trade. *Automatic brakes.*—The automatic brakes of all kinds in England 30th December, 1883, exceeds the number of non-automatic brakes by more than 50 per cent; and of the auto-matic brakes of all kinds in use, more than 60 per cent, are Westinghouse brakes. A comparison is given below of the number of Westinghouse brakes in use and actually ordered on the 30th April, 1884, and on the 20th July, 1880, the increase being remarkable: being remarkable :---

Westinghouse Automatic Brakes,	30th April,	
	Engines.	Carriages and wagon
		13,129
Continental railways and the Colonies	1,219	10,642 5,571
United States	4,386 7,167	29,342 33,723*
Return 20th April, 1880	C Children	
		49,563
	England France Continental railways and the Colonies United States Return 20th April, 1880	England       1,647         France       1,520         Continental railways and the Colonies       1,219         United States       7,167         Return 20th April, 1880       3,277

There was not at the date of the last Board of Trade return a single vacuum brake in use on any of the Scotch lines of railway. The Westinghouse brake is becoming generally the adopted brake for the continental railways.

# THE ASSOCIATION OF MUNICIPAL AND SANI-TARY ENGINEERS.

THE annual meeting of the Association of Municipal and Sanitary Engineers and Surveyors was held at Newcastle-on-Tyne, on Thursday, Friday, and Saturday last week, in the Council Chamber at the Town Hall. Mr. W. H. White, borough engineer, of Oxford, the retiring president of the Association, occupied the chair at the opening of the proceedings, and about forty members attended, largely from towns in the northern district.

The Mayor of Newcastle-Dr. W. H. Newton-accompanied by Alderman Wilson, the chairman of the Health and Sanitary Committee, and other members of the Town Council, attended by the town clerk, Mr. Hill Motum, first welcomed the Associa-tion to the borough. His worship briefly referred to the great importance of sanitary matters, not only as affecting the health and happiness of the people, but also as intimately connected with the commercial prosperity of the country. He expressed gratification that the borough engineer, Mr. W. G. Laws, had been elected president of the Association for the ensuing year, and observed that whilst it was a compliment to the corporation and to the city, he was sure it was a selection which would also prove advantageous to the Association. Alderman Wilson also welcomed the Association as the representative of the Health Committee. He said the Corporation were determined to get the town into the best sanitary state possible and such confer-ences were calculated to further the satisfactory solution of sanitary difficulties. The President expressed his thanks for the cordial welcome given

to the Association, and said it would be impossible for its mem-bers to visit a place of such commercial activity as Newcastle

without going away wiser than they came. Mr. Thomas Cole, the Secretary, read the annual report of the Council, which congratulated the members on the continued bounds, which congratulated the members on the continued success of the Association. During the year fourteen new members had been admitted, making the number now 217; and the receipts had been  $\pm 354$  17s.; and the expenditure,  $\pm 234$  15s., so that there was a surplus of  $\pm 119$  8s. 10d. The Council had watched Sir John Kennaway's Bill and other measures in Par-liamentaffecting the profession, and Messrs. L. Angell and C. Jones had been appointed to during the procession to be recented to the Paris had been appointed to draft a memorial, to be presented to the President of the Local Government Board, urging the importance of certain amendments being made in the Public Health Act. The 50

The rules were then discussed, and the scope of the Association was enlarged by making civil engineers and surveyors holding chief appointments under municipal or sanitary authorities in Scotland and Ireland, in the colonies or foreign countries, also eligible as members, subject to the approval of the Council. There were several propositions relating to the election of the Council, with a view of making it more popular. Last year at Oxford itwas decided thatforty, instead of only twenty-two candidates should be nominated, and in the discussion Mr. Meade, Hornsey, referred to the Institution of Civil Engineers, which had 3103 members, only nominating twentynine candidates for the council, four vice-presidents, and president. That gave only one candidate to 106 members, whereas their forty was equal to five to every forty members. Mr. Spencer, Newcastle, characterised this as a most unfortunate reference, because the Civil Engineers' mode of election caused general dissatisfaction, but unfortunately it was so provided for in the charter, and, it was considered, could not be altered. After some discussion, the whole of the propositions were withdrawn, and it was decided that the Council, with the addition of Messrs. Jerram, Walthamstow, Newman, Ryde, and de Courcy Meade, Hornsey, shall revise the rules and bye-laws, and then print and circulate them amongst the members, preparatory to their being considered at the next annual meeting of the Association. The Eastern district of the Association was revived, and Mr. Buckham, Ipswich, was appointed secretary, and Mr. Hall, Torquay, and Mr. Horsley, Batley, were requested to act temporarily for the Western and the Yorkshire districts, owing to no meetings having been held in either for nearly two years.

to no meetings having been held in either for nearly two years. The retiring President then introduced the President-elect, Mr. W. B. Lawes, Newcastle, who was received with hearty applause, and delivered the inaugural address. He said that though their Association had prospered, they must eventually incorporate into it the whole of the other eight hundred engineers and surveyors eligible to become members. They wanted every one who could aid or further the interests of the Associa-tion, or whom it could benefit. No time could be more opportune than the present for establishing the Association on a basis. Sanitary reform had never been more active, and there is every sign of the activity continuing, and the public interest in all saintary matters affecting the health of towns is constantly increasing. Every surveyor, however large his district, could learn something of his fellows, whilst none were so insignificant but they had something useful to communicate. If they were thus united, and each member contributed his knowledge to the common stock, there was no reason why the Transactions should common stock, there was no reason why the Transactions should not become as valuable as those of the two larger institutions, the Civil and Mechanical Engineers. The sanitary problems of the day are many, varied, and of great moment to thousands. Some had been problems since history began, and were still waiting solution—such as the "removal of refuse," which taxed the skill of Moses. On this had been grafted many minor ques-tions such as savere forming and the utility of the still of moses that tions, such as sewage farming and the utilisation of refuse; the main question was "how best to remove the refuse beyond our boundaries." The important question of procuring pure and wholesome water for domestic use had been solved by towns, and the highest engineering skill had been applied to it; but it had not been got rid of, and as population increases and thickens in large centres, and as the value of cleanliness of person and dwelling as vital conditions of health are more widely known, the supplies that were ample twenty years ago become wholly inadequate now, and the problem has to be solved again. Science, experience, and skill were constantly at work seeking to devise healthy dwellings, in which hygienic laws shall not be set at defiance; and healthy dwellings for the artisan and labouring classes is a much more pressing question, which is taxing and will tax the utmost effort of both local and imperial legislation. After pointing out that the crowding of populations into circumscribed areas is the result of civilisation, and the facilities it has afforded for drawing ample food supplies from distant sources, the President observed that a population of four millions means a daily consumption of 5000 tons of food stuffs, and the daily removal of 70,000 tons of solid and liquid refuse through the sewers. A month's stoppage of the food supplies would mean starvation to thousands; whilst a week's stoppage of the sewers would be equally fatal from the diseases that would be engendered. The housing of the labouring classes in London and large towns, where space was too valuable to live upon, was a problem which demanded for its satisfactory solution both wisdom in deliberation and skill in administration. In all these problems municipal and sanitary engineers had to take no small part, as advisers and executive officers. This it was which made the value of such associations and such meetings as theirs, where they could discuss the sanitary pro-blems of the day and compare and exchange their experience. Sanitary progress was aided by their discussions, methods that had proved successful and made generally known; and, what was equally important, failures were published, their causes investigated, and similar mistakes guarded against in other places.

A vote of thanks was accorded to the ex-president, Mr. W. H. White, of Oxford, for his valuable services during the past year, on the proposition of Mr. Jones, Ealing, seconded by Mr. Gordon, Leicester. A like compliment was paid to the President for his address on the motion of Mr. Allison, Manchester, seconded by Mr. Parry, Reading, and supported by Mr. McRie, Carlisle, and Mr. Vawser, Manchester. They all endorsed the President's views as to the importance of the large number of engineers and surveyors not connected with the Association being induced to become members, and Mr. Vawser said if there was anything in the constitution of the Association which needed to be rectified, or any change that would bring in a larger number of members, it certainly ought to be made

it certainly ought to be made. Mr. White and Mr. Lawes both responded to the vote of thanks, accorded in each case by acclamation. The President said he earnestly desired to see the Association become a mighty power and influence with the country, both educationally and for the benefit of its members.

Mr. J. P. Spencer, Newcastle, read a paper on the "Inspection of and Testing of the Sanitary Arrangements of Houses." He agreed with doubts expressed, that the officer of a sanitary authority, with the staff and assistance usually afforded, cannot find time properly to inspect and test the drains and sanitary appliances of all houses should be examined and tested not less than once a year, and that one inspector, giving his whole time to the duty, cannot inspect and test more than an average of

400 houses per annum. Thus, hardly any sanitary authority would keep the requisite staff, even if they had the power to make inspection compulsory. Many of the more complicated cases would, however, be taken out of the hands of the inspectors by the Sanitary Inspection Associations, and the owners of better class houses would prefer their being dealt with by a private engineer. The powers possessed and the facilities afforded by law for inspectors making a thorough inspection of dwellings were far too restricted to result in thorough investigation, much less remedy. He suggested there should be a manhole at each house where the drainage joins the sewer, and held this to be a primary step for preventing the spread of infection by means of drains. The manhole, or disconnecting shaft, should be ventilated, trapped against the sewer, and the connection of the house-drain into the shaft should be left open, so that a current of fresh air might pass up the drain from the house to the sewer, especially wherever it passed wholly or in part under a house, Mr. Spencer urged that any pipes laid under houses should always be of metal, with strong spigot and faucet, and lead joints. He then spoke of the means of testing drains by water, paraffine, peppermint, and smoke—the latter of which he considered the best of all—and laid stress upon all direct connection between the house and the sewers being cut off, the proper ventilation of the soil pipe, and the water supply to the closet being obtained from a separate cistern. He submitted, finally, that the objects should be :—(1) To isolate the drainage system of each house from its neighbour and from the main sewer ; (2) to construct or alter the drainage of each house, so that wherever possible a current of fresh air shall pass up and through the pipes ; (3) to have all houses, old or comparatively new, inspected and tested at least once a year ; (4) in the cases of new houses, to see that the first two objects are attained and carried out during the construction ; (5)

exist, and of preventing those likely to arise. Mr. Jerrom, Walthamstow, characterised the paper as more suited for the consideration of sanitary inspectors than surveyors. As to pipes inside houses, earthenware ones covered with 6ft. of concrete, as in the South of England, would effectually prevent the escape of any sewer gas. He agreed, however, that houses should be inspected annually, that its con-dition should be recorded by the local authority, which record should be open to the inspection of the owner on payment of a An inspector could, in his opinion, deal with 1200. small fee. small fee. An inspector could, in this opinion, due to a least 1000 houses, in a year; but he regretted that the present powers for compelling owners to alter unsanitary arrangements in old houses as too restricted. Mr. Gordon, Leicester, in old houses as too restricted. Mr. Gordon, Leicester spoke also of the difficulties of dealing with the unsanitary arrangements of old houses, even where it was known that there were several direct connections between the house and the sewers, unless actual complaint was made of the existence of a nuisance. He agreed that additional legal powers to compel nuisance. He agreed that additional legal powers to compel necessary improvements to be executed were required, in order to deal effectually with such cases. Mr. McKie held it was im-possible to make an earthenware pipe permanently gas tight. The other day, in testing, the water did not leak at the joints, but through the pipe. He held every house should be properly self-cleansing. There should be for this purpose a self-acting flushing chamber at the head of the cistern. If only the drains were effectually flushed and cleansed there would be no diffi-culty. The water from a lavatory or bath-room might be utilised for self-flushing tanks, which might thus be done with utilised for self-flushing tanks, which might thus be done with by meter. Mr. Newman, Ryde, exhibited and explained a syphon trap which he had designed, to facilitate the inspection of the condition of house drains. Mr. Hall, Stockton, dissented entirely from the suggestion that the inspection of old premises was beyond the province of a borough surveyor. He held that it was as much his duty to direct what should be done to remedy defects in old premises, as to see that the drainage of new houses was constructed in a satisfactory manner. Mr. Platt, Rochdale, explained that, under bye-laws there, the drain from the sewer to the house could not be interfered with unless notice was given to the Corporation before it was touched. was secured by having an authorised list of contractors the same as plumbers. Then the alteration made was inspected by the borough surveyor, and in this way they ensured the work being efficiently done. Mr. Parry, Reading, held that though the inspector of nuisances might visit and inspect premises, he should report to the borough engineer, and the latter alone should direct what structural alterations should be made. Mr. Jones, Ealing, held they should strongly protest against its the opinion of the Association that it was the being taken as province of the inspector of nuisances to deal with these matters He held that they should be entirely, absolutely, and completely under the control of the engineer or surveyor of the sanitary authority. They should not give up to a subordinate one of the most important duties entrusted to them as surveyors. Mr Alison spoke of Mr. Spencer's paper as only containing what every competent surveyor fully knew. At this stage the discussion was adjourned, and after visiting

At this stage the discussion was adjourned, and after visiting the Castle, the American Steam Laundry, Messrs. R. and W. Hawthorne's locomotive workshop, and driving round the new park, the members of the Association dined together in the evening at the Grand Turk's Head in Grey-street, under the presidency of Mr. Laws.

The discussion on Mr. Iaws. The discussion on Mr. Spencer's paper on the Testing and Inspecting the Sanitary Arrangements of Houses, was continued at the meeting on Friday night, when the President expressed himself strongly in favour of earthenware pipes. In taking up defective drainage, he had almost invariably found any fracture in the pipes was owing to imperfect bedding. It was impossible to get an ordinary labourer to scoop a hole large enough for the flange of a clay pipe, and whenever a pipe thus rested on the flanges it would break. In order to obviate this he had been in the habit of having them laid half their depth in concrete. There was thus less liability to break, and they could be inspected before being filled up. He thought Mr. McKie's idea of a self-acting tank a capital idea for keeping house drains clean, but was afraid it would increase the consumption of water, and that the ordinary 40 gallons per head would no longer be sufficient. The water which passed from the house was amply sufficient to flush the drains, if put in at once, instead of only in driblets. He agreed that it would be an advantage for the public authorities to construct the drain from the sewer to the boundary of the house. Frequently a jerry builder only put in drains which lasted until he had built and sold his houses, when they soon had to be reconstructed at the public cost. It would be better and more satisfactory if these drains were first put in by the local authority, even if the

owner were only charged 70 or 75 per cent. of the actual cost. It would also be cheaper for the ratepayers, because the cost of reconstruction would then be obviated. Mr. Gordon, of Leicester, and others, also spoke on the subject, and Mr. Davis, Stratford-on-Avon, asked whose duty it was to take action when a complaint was made of a nuisance existing on old premises? The ex-President said he thought he should be expressing the opinion of the Association when he said that the Inspector of Nuisances should make an inspection and report to the surveyor, who should then recommend any structural alterations he deemed necessary. Mr. Escott, Halifax; Mr. Meade, Hornsey; Mr. Fowler, Manchester; and Mr. Lobley, Hanley. Mr. Spencer replied to the criticisms on his paper, for which he was then cordially thanked, on the suggestion of the President.

Lieutenant-Colonel Jones, of the Sewage Farm, Wrexham, then read a paper on the best practicable and available means of rendering sewage harmless. He urged that there should be a certain elasticity in the law's requirements, as if a low standard were fixed there would be no improvement, and a high standard is in certain cases unattainable, and to enact it would simply bring the law into contempt, whereas popular feeling will always support a practicable and available measure. It is now gener-ally admitted that the contest between the various systems of dealing with sewage had only been a drawn battle, because differing local conditions, rather than the intrinsic merits of those systems, should in each case determine their selection or rejection. Where suitable land could be obtained at reasonable cost, and its irrigation can be properly conducted, there could be no doubt as to the policy of adopting that mode of dealing with sewage, both on sanitary and financial grounds. Such favourable conditions for irrigation, however, were often want-ing, when some measure of clarification by precipitation or simple deposition may, in some such cases, constitute the "best practical and available means for rendering sewage harmless." Or the sewage, or its partly clarified effluent, might, in some cases, be safely and cheaply discharged into the sea, or volume of fresh water relatively large enough and sufficiently charged with oxygen to render such sewage harmless. The point on which he desired to elicit an opinion was as to the diency of adopting the elastic standard as opposed to any hard and fast one; but he thought at the same time that it would be well for the Local Government Board to put forth some practical advice for the guidance of the sanitary authorities, with whom the choice of remedies for existing evils must ultimately rest. He did not for a moment contemplate surrender-ing any part of local self-government, but still thought the central authority ought to give advice and protection to subordinate bodies, which could seldom obtain the wide experience required to ascertain what are the best practicable and available means without going through greater tribulation and expense than can be expected to be incurred by ratepayers or their representatives. Mr. Hanson, Wakefield, exhibited his auto-matic water machine for raising sewage sludge from depositing matic water machine for raising sewage sludge from depositing tanks, and explained his system of treating sewage with black ash—a waste product of soda manufacture. He said that black ash, by exposure to the air, absorbed such an amount of oxygen, that when mixed with sewage it purified it. He stated that, if made into solution, and put into sewage manholes, there would absolutely be no sewage gas generated. His system, in 1876, was tried in competition with some forty others by the Leeds Corporation, and was pronounced to be the best and also the cheapest. Mr. Vawser, Man-chester, spoke of the contradictory views entertained on chester, spoke of the contradictory views entertained on sewage disposal by Local Government Board inspectors, and instanced a case where one dissented from what another had cordially approved. He strongly urged that they should have free-trade in sewage, and that the Local Government Board should sanction any reasonable and feasible scheme proposed by a local authority. Mr Britchard Birmingtone dithe case of a local authority. Mr. Pritchard, Birmingham, cited the case of the Lower Thames drainage scheme. It was sanctioned by the Local Government Board after a strong opposition and fifteen days' hard fighting; but Parliament had refused its sanction, and thus a fruitless expenditure of  $\pounds 50,000$  had been entailed. He held that the system of dealing with sewage adopted must depend upon the local circumstances, and cordially endorsed the opinion that there should be free-trade in sewage. Mr. Fowler, Manchester, said the standard in the Local Government Board book of 1876 was unattainable; endorsed what Mr. Hanson had said about his system at the Leeds experiments, and described the nuisance at Blackpool and other seaside places, where the raw sewage was poured into the sea, from its being carried back again by the sea and strewn along the shore. Mr. Spencer, Newcastle, expressed a hope that discharging raw sewage into any river, or into the sea, will soon be absolutely prohibited. Mr. Gordon, Leicester, referred to some startling evidence given before the Parliamentary Committee on the Lower Thames Valley drainage scheme, to the effect that the best modes of treating sewage still left 20 per cent. of the polluting matter in the effluent water, which was considered pure enough to be poured into rivers. Hence he argued that where there was a sufficient volume of water, raw sewage might be poured into it, and it would not be so bad as the effluent water. The President pointed out that the alteration in the character of the ewage left in the water was held by all to be an important part of chemical treatment, so that the 20 per cent. which remained was less noxious than 1 per cent. only of the original. He heartily agreed with Mr. Vawser as to the necessity of there being free trade in sewage. Lieutenant-Colonel Jones briefly replied, and was thanked for his very interesting paper, which he said had elicited exactly the opinion which he desired the Association should express Association should express. Mr. James B. Hall, borough surveyor of Stockton, read a

Mr. James B. Hail, borough surveyor of Stockton, read a paper on steam tramways, a portion of which, relating to the expense of running Merryweather's engines on the Stockton and Darlington steam tramway, has already appeared in these columns—June 29th, 1883. He expressed regret that steam power was not more generally used on tramways, and summarised the essential conditions as being:—(1) There must be no visible smoke or steam; (2) no visible fire; (3) the working machinery must be out of view, and not cause noise calculated to frighten horses or annoy the public; (4) the engine must be so constructed that the driver is always stationed in front, and he must have absolute control over the engine and brake; (5) the brake must be of the most powerful description, so that an instant stoppage can be effected; (6) the engines as well as cars should be short-coupled to facilitate the turning of sharp curves with safety; (7) all wheels should be properly grooved, and automatic regulators should be provided. No accident had occurred in Stockton, and he considered steam both cheaper and more economical than horse-power. The gradients generally did not exceed 1 in 50, with the exception of 1 in 18 for a short distance outside the town, which, from its wide level streets, was peculiarly well adapted for tramways. Mr. Pritchard characterised the working expenses quoted by Mr. Hall, 3'12d. per engine per mile, as exceptionally low, and gave some details of working Kitson engines, where the cost was 5'13d, and that

include renewals, which in his own estimate figured for 1'43d. per mile. He expressed regrét that, on the score of humanity as well as of utility and economy, steam power was not generally substituted for horse power. The objection to steam, he said, was not on the part of tramway companies or the Board of Trade, whose general conditions were very fair, but on the part of local authorities. Mr. Spencer, Newcastle, spoke of the unsatisfactory character of existing governors. He urged that they should not release the brake when they had come into operation until manual power had been applied to do so, otherwise in the absence of the driver, when the governor should be of practical use, it would entail the risk of a series of collisions or sudden stoppages. There was this objection, too, that whereas in ascending steep gradients the engine wheels might be going at the rate of more than ten miles not the engine and ensemitted the second to do so, than ten miles, yet the engine and cars might be only ascending very slowly, yet the governor would, because the wheels were revolving at the rate of ten miles an hour, come voluntarily into action, and arrest even the slow progress that was being made. Mr. Platt, Rochdale, approved of a suggestion made by Mr. Hall, that trancars should only stop at fixed stations, to be indicated at night by coloured lights, to take up and set down passengers; but one or two speakers dissented, and held that varent in perplement distingted there are been used to be except in populous districts, and where people must travel, the chief convenience of a tramway, and what conduced greatly to its success, was the facility afforded for getting on the tram and alighting from it just where a passenger desired. The discussion was not closed when the meeting rose on Friday night, and was continued on Saturday morning by Mr. Vawser, Manchester, who gave some of the results of his experience in connection with the Manchester and Rochdale line. Other speakers followed, and having replied, Mr. Hall was thanked for his paper.

On Friday evening the members visited Sir Wm. Armstrong's ordnance factory at Elswick, the Elswick Collieries, and the Swan and Edison electric light companies' works. the Swan and Edison electric light companies' works. After the formal sitting on Saturday morning, the mem-bers of the Association spent the day on the river Tyne, visiting the various points of interest, including the new docks to be opened next month by the Prince of Wales. On reaching Tynemouth, an exhibition of the mode of rendering assistance to associate in the solution of the mode of rendering assistance to vessels in distress, by the rocket apparatus, was given by the crew of the Tynemouth lifeboat, who went through the whole operation of rescuing those supposed to be on board a shipwrecked vessel, who were brought across the mouth of the river in a cradle attached to the line thrown from a rocket.

#### THE ROYAL INSTITUTION.

#### MONSIEUR E. MASCART, ON COLOURS.

SHORTLY before the close of the Royal Institution session. Monsieur E. Mascart, Professor at the College of France, delivered a Friday evening lecture in French, on colours. Mr. Warren De La Rue, F.R.S., manager and vice-president of the Royal Insti-tution, occupied the chair.

Professor Mascart began by saying that it was a bold undertaking to address, in a foreign language, listeners well versed in the subject of the lecture, and in a theatre in which they were accustomed to hear the greatest scientific minds of the day expounding their discoveries. Light, he said, is distinguished by two qualities, intensity and colour; the intensities may be compared by means of physical apparatus, but colours cannot be dealt with without calling into play the physiological impression. He then briefly explained the nature of the solar spectrum, and added that if a portion of the rays of the spectrum be re-united at one point, either one of the primitive colours more or less pure is produced, or a new tint. If the spectrum be divided arbitrarily into two parts, and the rays of those parts be united by themselves, two distinct colours are produced, and when these two colours are united, white light is the result. In the phenomena of rotary polarisation white light is the result. In the phenomena of rotary polarisation white light is also separated into the most brilliant colours, the re-union of which produces white once more. Whatever the rays which build up a colour, the sensation of but one colour is given through the organs of vision the arc unlike the arc but one through the organs of the sensation of but one colour is given through the organs of vision; the eye, unlike the ear, has not the power of distin-guishing all the notes which build up a harmony, to use an analogical way of expressing the fact. The eye cannot tell whether an apparently pure colour is simple or compound, except in the cases of purple and rose, and then only because those two colours are known not to exist in the spectrum. It is the same with the colours of nature and those used in industry: an object returns to the case a partien those used in industry; an object returns to the eye a portion only of the light it receives from the general supply. The separation may be effected by transmission, as in the case of coloured glasses; by reflection, as from the surface of metals; by diffraction, as in the wings of certain butterflies and in the diffraction, as in the wings of certain butterflies and in the coronas seen sometimes around the moon. That portion which does not reach the eye is either absorbed or sent off in a different direction. Putting on one side the effects of fluorescence, it will be seen that an object has no colour of itself, it can but borrow from the general light the rays proper to itself, and it presents different aspects in accordance with variations in its mode of illumination. A red ribbon for some locad in yearing particles illumination. A red ribbon, for example, placed in various parts of the spectrum appears black, except in the red rays, where it gives back an almost homogeneous light. A rose-coloured ribbon

gives back an almost homogeneous light. A rose-coloured ribbon appears luminous in an unequal manner in different parts of the spectrum; the light it reflects is therefore very complex. They might ask how nature would appear in homogeneous light. Objects would appear more or less brilliantly lighted, but of one colour, and if no other colour existed to give a term of comparison, the sensation would be that of the presence only of white, black, and intermediate shades of grey. The volatilisa-tion of a salt of soda in the flame of a Bunsen's burner gives a homogeneous yellow light; under this light the art of the painter exists no longer. He would ask them to look upon a superb painting by Edward W. Cooke, lent him by Sir William Bowman, representing Venice under the setting sun. In that light it appeared to be but an engraving. Again, he would light it appeared to be but an engraving. Again, he would present another picture, this one painted by an artist placed in monochromatic light, and who thought that he was using only black and grey colours; this picture, as they would see by white light, was painted in the most brilliant colours. In the pure yellow light which he produced once more, a bouquet of flowers he said, appeared but a collection of white and grey spots on black foliage. The human figure took on a cadaverous look; the effect was monotonous, strange, and sepulchral, and it would be a strange punishment to be condemned to live in Persons so situated would feel joy indescribable if such a light. the wand of a fairy brought out the objects around in their ordinary colours, as he would then do by lighting a strip of magand he was sure that they must all have a feeling of relief at coming to the end of such a lugubrious experiment.

Thus the impression of colour depends upon the effect produced on the retina, and it follows that the human eye cannot always equally well exercise this function. Different parts of the retina give a different impression of the same colours;

those rays which enter the eye in a lateral direction give enfeebled effects as regards colour, and none at all towards the limits of the field of view.

A more important fact is that the eyes of different people cannot distinguish colours with equal facility, and sometimes confound together colours which to other persons are the most discordant, such as green and red. The discovery of this particular infirmity is due to Dalton, who was afflicted with it him this self to a high degree, and who analysed the errors of his judgment with the greatest care. That which the English call "colour blind ness" is in France called "Daltonism," which is rather abusing the name of a philosopher who has other and superior titles to have his name handed down to posterity. This defective vision, so long unrecognised, is in reality very common. Ten persons out of every hundred are more or less colour-blind, and sufficiently so to be put in evidence for careful examination. Ordinarily the imperfection is not inconveniently great, and is unconsciously corrected by habit, by the recollection of objects, and by the judgment of others; but he cases are extreme when men cannot distinguish red from green, a cherry or a ripe strawberry from its surrounding foliage, a red light or a green light in the signals used on shipboard and on railways. Artists have sometimes a marked predilection for certain colours. Lesueur used a profusion of blue in his paintings; Turner, a profusion of red. It is a fair matter for inquiry whether this was absolutely inten-tional or the consequence of physiological condition. Some persons are colour-blind from birth, others but temporarily so from illusor or as the rought of an accident i in certain nervous from illness, or as the result of an accident ; in certain nervous affections colour-blindness appears in a most bizarre manner.

The sight, more than the other senses, is the victim of number-less errors and illusions. Limiting these errors to those con-nected with colour, it is but necessary to refer to those due to the effect of two adjacent colours, to those also which follow the impression of an image, or to the subjective colours seen with closed eyes as the result of mechanical action upon the eye. He would, in this respect, turn to the apparent relief of colours. In an ordinary spectrum upon the screen, the colours thrown-in this instance by a direct vision prism—appear to be all in one plane, but if either the prism or the diaphragm in front of the plane, but it ether the prism of the diaphragm in Front of the electric lamp be rotated slowly, the colours assume the form of a wave in relief, with the red in advance. The effect is more decided with a V-shaped diaphragm, causing, as they saw, the spectrum to appear like a veritable snake. Replacing the dia-phragm with another having the word "Davy" cut in it, they saw the letters standing out in relief, like those above certain shop windows shop windows.

In addition to the colours ordinarily seen, the spectrum throws other radiations, some more refrangible than the red, and warmer, others more refrangible than the violet, and distin-guished by their photographic and fluorescent qualities. The ultra-violet spectrum occupies a space nearly equal to that of the luminous spectrum, and Professor Stokes has proved that this invisible end of the spectrum as thrown by the electric light is five or six times longer. It is surprising that the eye sees so small a portion of the radiations from a luminous source. It is the same with the other senses; the touch gives but a limited idea of temperature; the ear perceives neither very grave nor very acute sounds, and the higher sounds produce a painful impression. At the infra-red end of the spectrum, the visible spectrum is arrested somewhat sharply, and the efforts of Brewster extended the limits of their action but a little; Captain Abney's experiments have successfully given a complete history of the region beyond the red. At the other end of the spectrum the visibility persists in a remarkable manner. Helmholtz has shown that with care all this end of the spec-The amount of refraction of these rays varies with the substance employed in the optical apparatus, but if the length of this invisible end of the spectrum be defined by the length of the waves of the radiations, it may be said to include one octave more than that of the visible spectrum. In studying the light emitted by the vapours of certain metals, he—the lecturer— found that when a prism of Iceland spar was used, ordinary vision could distinguish a spectrum three or four times longer than the ordinary visible spectrum see, indeed, all those rays which it is possible to photograph.

Sir William Thomson has expressed surprise that Nature has forgotten to give us a sense to perceive those magnetic phenomena in the middle of which we live. Here, on the contrary, we are in the midst of radiations, some of which are absorbed energetically by the humours of the eye, others strike the retina, yet we know nothing about them in ordinary life. Does it not appear from this that there is a want of harmony in the organic structure ? Is man susceptible of more organic perfection, and is it possible to follow this revealed thread of progress in improvement in the structure of the eye? An eminent Englishman has not disdained to occupy himself with this question. Mr. Gladstone has made a complete examination of the words for colour used by Homer, and shows that they are applied in an uncertain manner; that the great poet appears to confound green with yellow, and blue with black. But the interval which separates Homer from us is a short one in the history of humanity. The Greeks, but a short time after Homer, showed good knowledge of colour, as exemplified by their works still in evistance. In the middle of the correctanth conworks still in existence. In the middle of the seventeenth cen-tury, in the time in which Lesueur made such great use of blue in painting, is it not singular that a poet exceptionally naturalistic, La Fontaine, never once employed the word "blue" to describe a coloured object or the colour of the sky ? The smallest romance of to-day gives a more perfect record of colours. In early times literature had but to recount the facts of history or the passions of man, to produce the desired impression on the mind of the reader; the painter was concerned only with design and colour. For some time, at least in France, it seems as if the  $r\delta les$  have been changed; literature is becoming picturesque and painting becoming impressional. Without recourse to the hypolesis ( a modifi n in our organs, e change the desire for novelty serve to explain the coloured language of modern literary men. Otherwise, if man is capable of such rapid organic improvement, it is necessary to admit that those savages who are still in the stone age, as at Cape Horn, do not share in the general progress. The French expedition to Terra del Fuego discovered that the natives had names for two tints only-one name for red and another for blue, green, and analogous tints. This was simply because colours did not play an important part in their existence; with a little practice they could distinguish and classify various colours and different shades thereof as well as any European.

Is the sight of animals the same as that of man? Have they the faculty of perceiving radiations to which we are insensible To reply to this question he would repeat Monsieur Paul Bert' curious experiment. In a glass vessel he placed some water containing a great number of the little fresh water crustace belonging to the family of *Daphniada*. When he lighted up a part of the vessel, but not too brilliantly, the water-fleas for the most part entered the luminous portion. When a spectrum was projected through the vessel, the water-fleas again entered

the luminous part; the smaller of them swam about in the whole length of the spectrum, a few of them in the red, many in the yellow and green, more still in the blue and violet, and there were some in the ultra-violet. The larger water-fleas, on the contrary, collected almost exclusively in a straight line between the green and the blue. These animals, then, see by the same rays as ourselves, despite the distance which separates man from the crustacæ in the zoological scale; they seem even to partake of our infirmities, for some of them behave as if they were colour-blind. Sir John Lubbock had made in the labora-tory of the Royal Institution an excellent series of researches on the sight of ants, bees, and wasps. One result especially was very curious; he discovered that to ants the ultra-violet rays were brighter than those of the ordinary luminous spectrum. The natural history of animals studied from this point of view would be of high interest.

Colours have a psychical influence, and this moral impression is but the translation of a physiological action. In certain establishments for the treatment of the insane, a light in which yellow rays preponderated was found to promote cheerfulness and quietude among the patients; he did not mean such a pure yellow as that obtained by means of salts of soda. Luminous and thermal rays influence the growth of plants. A plant grows more healthily in light than in darkness, but its general nutrition and transversal development is retarded. Here the different colours have a marked influence. The retarding action is insensible under the obscure rays, but it reaches a first maximum in the red, a minimum in the yellow or the most illuminated part of the spectrum, and a great maximum in the violet. Light of short wave-length is therefore most active. Plants turn towards the light because of this retarding action; the parts near the light grow more slowly than those in shadow, and under the unequal tension the plant bends its head. This and under one unequal tension for plants being the head marked in the red, and has its maximum in the blue and violet. Plants have two kinds of respiration. One goes on regularly by day and night, and results in the evolution of carbonic acid. The other takes place only in the light, and results in giving off oxygen, carbon being taken from the carbonic acid in the air, to build up sugar and wood. Chlorophyll, the green colouring matter of plants, plays the principal part in this nutritive respiration, and the various colours have an unequal influence on the process. The formation of cholrophyll under light of average intensity takes place in all the rays of the spectrum, feebly in the infra-red, with a maximum in the brightest yellow, and a regular diminution into the ultra-violet region. The curve resembles that given by Fraunhofer for the luminous intensity of the spectrum, but is more extended in the more refrangible part. There is a certain intensity of light best for the formation of chlorophyll, upon which the full light of the sun has a destructive effect. Oxygen is formed by plants in the presence of chlorophyll only; chlorophyll gives an energetic absorption band in the red, and two others in the blue and violet, and these are precisely the rays which enable the green substance to decompose carbonic acid, as proved in an ingenious way by M. Engelmann. There are two kinds of bacteria—one kind breathes and flourishes in the presence of oxygen, the other kind breathes and nou-rishes in the presence of oxygen, the other kind is killed by oxygen. The former may be seen under a microscope settling upon air bubbles to get oxygen. When the water is without air, and a piece of weed is put in it, in a feeble light, the bacteria swim about indifferently; but if a bright white light be thrown upon the weed the bacteria precipitate themselves upon it at once to serve the traces of oxygen disengreed. When a small once to seize the traces of oxygen disengaged. When a small spectrum is thrown upon a cut section of the weed, the bacteria ccumulate upon the plant in the red at the point of maximum absorption by chlorophyll, then in the blue, and the density of the population nearly reproduces the absorption curve of the colo uring matter.

The colour of seaweeds is influenced by light. They are blue usually at the water level, greener lower down, and brown and red at greater depths. This is not the effect of depth of water, for they are brown and red in shaded places, and in crevices in rocks near the high-water mark.

To conclude, in the words of Lavoisier :-- " Organisation, feeling, spontaneous movement, life itself, do not exist except upon the surface of the earth, and in places exposed to light. Possibly, the fable of the torch of Prometheus was the ex-pression of a veritable philosophy which had not escaped the ancients. Without light nature is without life; she is dead and inanimate; a good God in giving light has covered the surface of the earth with organisation, feeling, and thought."

#### LETTERS TO THE EDITOR. (Continued from page 44.)

### WATER-TUBE BOILERS.

WATER-TUBE BOILERS. SIR,—Referring to your leader in issue of 13th June, and suc-ceeding letters under same heading as this, I am pleased that a subject in regard to which we appear to be considerably in arrears is opened for discussion, and gladly contribute a few remarks, rough and disjointed, as need only be expected from a bred boiler fireman, although for a very long time a boilermaker and mender, also a manager and inspector, and what is perhaps as much to the present point, a breaker up into scraps of types of the multifarious forms of boilers in use, including water-tube ones, in respect of all which I may be entitled to a small share of your space on the sub-ject in hand. A very striking indication of the state of our knowledge and our

ject in hand. A very striking indication of the state of our knowledge and our position in regard to steam boilers is gathered by reference to explosion records, and by contemplation of the destruction and death rate which they tabulate; but nowhere perhaps is the sub-ject brought out more impressively than is done in Sir William Armstrong's address to the British Association at York in 1881, which, as touching steam generation, may here be profitably quoted:—"Dividing," says Sir William, "the whole heat energy into ten equal parts, two escape by the chimney, one is lost by radiation and friction, six remain unused when the steam is dis-charged, and one only is realised in useful work. It may be fully Into teh equal parts, two escape by the chimney, one is lost by radiation and friction, six remain unused when the steam is dis-charged, and one only is realised in useful work. It may be fully admitted that the greater part of the aggregate loss is inevitable; but are we to suppose that the resources of science, ingenuity, and skill have been exhausted in the attainment of so iniserable a result? Nothing but radical changes can be expected to produce any great mitigation of the present monstrous waste. . . Why is it that we have to throw away at the very outset of our operations twice as much heat as we succeed in utilising in the engine?" I may say at once I have a decided opinion that, if we are to get from under the burden of these well-deserved reproaches, we must hope for a considerable portion of the easement coming from water tubes, abused as they are in some quarters. Of course princely incomes will be very seriously impaired, and thousands of occupa-tions altogether gone, with the introduction of an acceptable sub-stitute for the Lancashire, Cornish, or tubular types of boilers, and it is not in the nature of things to expect that those to be affected should refrain from having their kick at any disturber of things as they exist. they exist.

No doubt we can find water tubes in the hands of George Stephen-son and other pioneer engineers, down to and including the days of the Howard boiler—a structure in no sense favourable to the pro-gress of water tubes—which by shorter or longer stretches of imagination, in different cases, may be likened to things of the same name lately claiming attention. But early water tubes, like early sewing machines, or items of the breech-loader of last century, are not now comparable any more than these water tubes are with productions of the present day, as exemplified in boilers of the shape and make of Root's, Babcocks and Willcox, Belleville boilers, or some fine specimens of such boilers to be seen in use in the industries of Germany, or of such varieties, for example, as were exhibited at Dusseldorf in 1880, the exhaustive testing of which was witnessed by the writer, all such boilers as indicated are absolutely free from such pestering things as cast-on sockets, brazed-on cups, quickly perishing soft joints, wedged ferrules, and a whole lot of other crude accessories en-ployed in connection with early water tubes, the reminiscences of which are anything but agreeable to those who had to do with them. Why twenty years ago I do not think the roller tube expander was so much as invented, and the drifting ones then used were often innocent of the lathe, and as fmatter of course, often produced incipient rents in the sockets, ending after a few months' use in splits of unseemly leakages; but more than this, half-a-dozen tubes of the kinds demanded in modern structures could scarcely have been got out of a lot of two score which would fit to one gauge with olerable accuracy, whilst a large percentage had bad welds at one part or other.

The second secon

There is not even yet competition of any consequence in the production of its chimney. There is not even yet competition of any consequence in the production of water-tube boilers in this country, and some splendid specimens I have seen have not even emerged from the isolated corners of their devisement, and are not yet known to the pages or advertising leaves of our scientific journals. The fact is, the water-tube boiler in its developed state is as yet young, very young indeed, as compared with the Lancashire, Cornish, or tubular forms. Besides, the abused thing has had a more delicate and precarious infancy than any of them, though perhaps, now is the hardiest of the lot; and were a very small fraction of the tools, plant, or energy employed in its production which is presently employed in any one of the other, we should probably be wakened up with a vengeance to realisations of, "How much cheaper ! How much safer ! How much more economical!" water-tube boilers are than the others.

much safer ! How much more economical!" water-tube bollers are than the others. I should like to have been more specific on the heads just named, but presently have exhausted my time, and possibly your space; so I here leave off, but with permission may return to the subject in a week or two. Airdrie Engine Works, Airdrie, N.B., 8th July.

#### THE PROSPECTS OF YOUNG ENGINEERS.

SIR,—Will you allow me to join in the grumble on this, to us who have got no work to do, very interesting subject? I think I am entitled to do so, having spent some thousands on my educa-tion, first at one of the universities and afterwards at an engineer-ing schools and on works, only to find myself at near thirty years of arg in damgar of heirs reduced the school the spectrum of the school the school to be all the school of age in danger of being reduced to absolute want through not being able to get employment. All the letters you have hitherto received on the subject have only I think tended to confirm all that Mr. Audain said in opening the correspondence, as to the large number of young engineers who can get nothing to do; but I have waited in vain for anyone to supplement his practical and valuable suggestion for remedying the evil, viz., that of having a sort of head registration agency for engineers out of work, which should form a trustworthy medium of communication between employers and would-be-employed in our profession. In the present state of things, it seems to me that this means of communication is very often the chief thing wanted. There is, I believe, plenty of work for engineers of all sorts, if not at home, in other parts of the world; but the difficulty to the individual is to gain information about the place that will suit him. Few will deny that a man with

a large connection, however moderate his abilities, seldom remains long without having enough to do, at any rate to find himself in bread and cheese. But there are many who when out of their articles, or later, when a temporary job is finished, leave their masters, as Mr. Audain says, with his best wishes and perhaps an introduction to two or three engineers, who again may pass him on to one or two others; and failing their being able to help him, what is he to do? He will soon find that people don't like young men, of whom they know nothing, walking into their office to ask for a job. He advertises till he is tired. He will perhaps go, as I did, to one of our Colonies, only to find that everything is given to local men whether qualified or not, and to be told that he should have brought his appointment with him. I think this is not an exaggerated statement of many a man's case, and any amount of hard work and self-improvement will not remedy it. The remarks of some of your correspondents on this latter subject are excellent, but they seem to forget that many spend most of their apprenticeship in works in out-of-the-way parts of the country, where evening classes, &c., are not available. I cannot accept Mr. Severn's suggestion either that a man who has gained a certain position in his profession should go back to othe shops and rework his way up. No lawyer waiting for clients would care to become a copying clerk, or doctor go back to othele-washing. What a man who is thus completely out of the swim wants is a helping hand into it again ; and such an agency as Mr. Audain proposes would give it him. But it must be under influential management ; and we cannot sufficiently acknowledge our obliga-tion to you for allowing us to air our grievance in your columns, thus encouraging us to hope that the matter may be taken up in the right quarter. If not trespassing too much on your space, I should like to say a word or two as to the cause of this plethora of young engineers, a large connection, however moderate his abilities, seldom remains

Thin to you for allowing us to air our grievance in your columns, thus encouraging us to hope that the matter may be taken up in the right quarter.
The trespassing too much on your space, I should like to say a word or two as to the cause of this plethora of young engineers, and to suggest a remedy. The cause is, I think, not far to seek. All the professions are suffering, for obvious reasons, from the excess of supply over demand for workers; but the engineering profession most of all, and that for a two-fold reason. Increase of population and wealth produces a proportionate demand in all other professions, but it is not so in ours. In civil engineering, all the great railway and public works—speaking of the United Kingdom—are completed, and their further development for the most part only employs their ordinary staff; and the other branch of the profession has to contend with a growing competition from countries which, on account of cheaper labour and from other causes, have a pull over us. Emigration will remedy this. But secondly, and chiefly, in our profession there is no check on the supply. As long as the present system of pupilage alone qualifies a man for employment, and for receiving pupils himself, this must be so; and so long shall we have imperfectly—as some of your correspondents have complained that they do. We cannot expect that, while a man can get all his ordinary office work done by intelligent pupils who are paying him some £100 or £200 a year; must have time to be sell grounded in the sciences before entering it. The votaries of pass; and what we want, as Mr. Cobert, in your issue of June 27th, has suggested—and which would in no way interfere with the present system of pupilage—is a proper system of examinations, conducted, asay, by a Board appointed by the Council of the Institution and other leading societies of engineers, which a student ow, for any staff, has suggested—and which would in no way interfere with the present system of appliage—is a proper system of examinations, the world. Stafford, July 7th.

Stafford, July 7th. SIR,—The interest which has been evinced in this subject, as testified by the voluminous correspondence which has arisen, has far exceeded my greatest expectations. Your correspondent, "Self-Help," says "No engineer can devote himself, or spare the time if he has but a moderate practice, to educating his pupils by lectures or otherwise, and no parent possessing common sense would expect such a thing." In my opinion, any engineer who cannot devote a short time to instructing his pupils has no right to demand a pre-mium for them; and if he does take one, well knowing that he will not be able to instruct his pupils, he is simply taking money under false pretences; and any parent who pays a premium to have his son taught the profession has a right to expect that his son will receive full and proper attention. But the chief fault with some engineers now-a-days is that they not only fail to teach their pupils their profession, but also make use of them for other pup-poses than engineering. I know an engineer (2) in London who not only fills his office with pupils, but makes use of them as clerks, errand boys, &c., and I have known him send some of them out with letters, messages, &c., for several consecutive days from the time they arrived in the morning until the time they left in the evening. The other pupils have been in the office writing letters, endorsing letters, clearing out cupboards, racks, drawers, &c., and even cleaning the windows of the drawing-office and scrubbing the drawing-boards; in fact, doing office boy's work for perhaps a week at a stretch. The fact being that he has no work for them to do, and is incapable of teaching them anything. Is it not therefore a gross imposition to take pupils in such ar way? Is it not a fraud on their parents? Is this the way our future engineers are to be trained? Is it any wonder that there should be so many anxious to obtain work who have not had sufficient training to qualify them for any arduous duties? I hav -The interest which has been evinced in this subject, as

becomes a nuisance if the columns of one of our best papers are to be made a medium for publishing such stuff. As regards the personal remarks made by "Self-Help" in his letter, I merely treat them with the contempt which they so richly merit, and shall not condescend to take any further notice of them. I am far too well known amongst engineers, not only in the City, but also in Westminster, to be afraid of any of "Self-Help's" insinuations. However, I may add that the letter last week written by "Cylinder," gave me great satisfaction. And now, Mr. Editor, I fear my remarks have been somewhat lengthy, but hope you will be able to find space for them, and therefore, thank you in anticipation. CLAUDE E. H. AUDAIN.

CLAUDE E. H. AUDAIN.

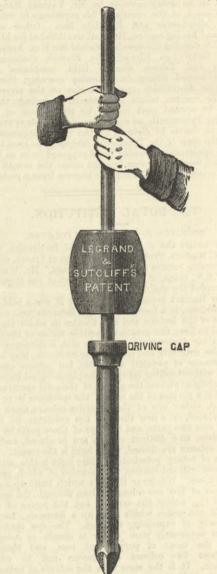
SIR,-I have been much interested in the discussion on "The Prospects of Young Engineers" now going on in your columns,

JULY 18, 1884.

but I think it useless to complain of a grievance, no matter how real, unless it elicits a remedy from some correspondent. As regards mechanical engineers, I think if owners of workshops, when in want of foremen or assistant managers, were to advertise for them, instead of giving the vacancies to men quite incompe-tent, but who have influence with the manager or head director, that it would be a great boon to engineers, as we should soon see the right men in the right place, and the men with influence and no practical knowledge would be left out in the cold. Railway companies might with advantage take the hint. We should then see many young men now in the shops occupying responsible mainteners.

positions. If "promotion by merit" were once fairly established, we If "promotion by merit" were once fairly established, we should not hear so much of young engineers wanting employment. The present system of influence works to the detriment of every-one, except, perhaps, the fortunate man himself. July 10th. LOCOMOTIVE.

TUBE WELLS. SIR,—We observe you describe in last week's issue an appliance SIR,—We observe you describe in last week's issue an appliance for driving tube wells, emanating from a firm whose principal was in our employ until last year. Will you permit us to illustrate a patent driver for Norton's Abyssinian tube wells which we intro-duced a few years ago, as we think a comparison between our patent and the arrangement you describe will readily show that the one bears a close resemblance to the other. This difference being, that whereas our patent is as simple as it can possibly be, the imitation introduces complication, sources of weakness, and increased cost. In fact, one of its features, the fixed guide bar for the cylindrical monkey, we have discarded for many years.



We may add in conclusion that our patent driver has enabled us to sink our Abyssinian tube wells to very much greater depths than heretofore; for instance, at Antwerp a 14in. well was driven 157ft., several 2in. wells have been driven from 100ft. to 142ft., in gravel, chalk, and fiints at Norwich and other places, while a 3in. one has been driven 90ft. in two days in the same soil. For large size tubes up to 16in. bore we make these patent drivers or monkeys, with a lug for raising by a rope, in place of the upper rod, ranging in weight from 300 lb. to 1300 lb. LE GRAND AND SUTCLIFFE. Magdala Works, 100, Bunhill-row, London, E.C., July 8th.

#### THE RAILWAYS OF NEW SOUTH WALES, AUSTRALIA.

SIR,-The "Royal Commission" alluded to in my last letter as SIR,—The "Royal Commission" alluded to in my last letter as having been appointed to inquire into and report upon the condi-tion of our iron railway bridges has not yet commenced its labours. I drew attention in that paper to the anomaly presented by the constitution of this Commission, and explained that its members were, with one exception, local men, and that neither the various English importers nor the inspecting engineer, Mr. John Fowler, had been invited to nor would in any way be represented at this Commission

Commission. Since that time a considerable amount of discussion has taken Since that time a considerable amount of discussion has taken place in our Parliament upon the very vexed questions now before the public of this colony as to the completely disorganised condi-tion of the Railway Department. A series of papers which appeared in two of the leading newspapers here, and entitled "The Civil Service," also threw a very strong light upon and very clearly disclosed the precise nature of the trouble and turmoil pre-vailing in the Railway Department, and in the papers referred to the two contending parties—*i.e.*, the engineer-in-chief for railways. the two contending parties—*i.e.*, the engineer-in-chief for railways, and the commissioner—are happily designated as the Montagues and Capulets. As bearing very directly upon the matter to which I am calling the attention of your readers, the following extract

"This particular department has for a very long time past being playing a sort of expansive, and expensive, game of battledore and shuttlecock; needless to say that the public interests are repre-sented by the latter. On the one hand, we have seen that there is sented by the latter. On the one hand, we have seen that there is a nominal engineer-in-chief for railways, who has charge of trial surveys, and who carries out all the works of construction upon authorised extensions. Works, including, of course, all necessary station buildings, &c., for opening and working the line; and that then this "chief" engineer ceases suddenly to be further identified with these works, and they are transferred to, and thenceforward are under the supreme control and direction of the Commissioner for Railways, and of his officers, the engineer for Existing Lines and his assistants. Careful inquiry undoubtedly establishes the

#### THE ENGINEER.

fact that from that moment, under the conditions which, as I have fact that from that moment, under the conditions which, as I have said, have long, unfortunately, prevailed in the department, the game of shuttlecock commences. The commissioner, perhaps, makes some genuine discoveries that the works so transferred to him are not in accordance with his views of the requirements for working the lines. At any rate, history shows clearly that large numbers of station yards, station buildings, and other engineering works thus transferred by the engineer-in-chief's 'construction' branch, are speedily discovered in the other branch to require either extensive modifications or additions, and money begins to be spent thereon freely, and without, of course, any reference to that thereon freely, and without, of course, any reference to that nominal 'chief' from whose charge these works have passed. One of these two, either 'Montagu' chief or 'Capulet' commissioner, must evidently be at fault herein, and it cannot possibly be a good sort of game at all, this shuttlecock; so far, I mean, as the public interests are concerned.

"Look at it in another way. Inquiry has also enabled me to ascertain that one of the parties to this game holds it as a com-plaint and impropriety that certain erstwhile subordinate officers of his who have left his department for various reasons, should not plaint and impropriety that certain erswhile subordinate onhers of his who have left his department for various reasons, should not only be welcomed and appointed to that other battledore branch; but that they should also be permitted, if not even directed, to constitute themselves inquisitioners upon the works executed by and transferred to their charge by the other branch. The shuttle-cock, as the result of this, looks considerably battered after the game has been played a bit. The Montagues hand over, as affore-said, their constructions to the Capulets. Amongst other items, say, perhaps, a dozen or two large structures which have cost a couple of millions or so of money—structures bearing a respectable and reputable endorsement of names of world-wide fame and asso-ciated intimately with the reputations of men of high position. Some of the Capulets—the Sampsons and Gregorys of this adapta-tion—forthwith bite their thumbs at the Montagues, and then the fun begins; such fun for the public interests as the frogs enjoyed so much! This sort of fun, and without even inviting an umpire to be present at the game to be played! "Says a Capulet to a sturdy henchman: "Get thee to those millions' worth of Montagu structures; arm thee with good trusty hammer, and see if there be not flaws to be found such as may avail a Capulet against a Montagu." Montagu."

"Now, a big man with a big hammer can make a big impression on lots of things; and even strong structures, such as railway bridges, &c., are not insensible to such Capulet attentions as these. bridges, &c., are not insensible to such Capulet attentions as these. To put the matter into still plainer words, I will state at once that amongst the discordant conditions ascertained in my inquiries are such items as these: That highly costly engineering structures which have been constructed under one branch of our Railway Department, have been pronounced by another branch thereof to be defective in design, of faulty construction, and requiring huge 'repairing.' That—whether justified or not in doing so I do not presume to say—on such decision being arrived at, such structures have forthwith been taken in hand and dealt with by the Capulets without any reference to, or consultation with, the Montagues. Whereat and wherefrom, much wrath amongst the battledores; and a very rough time, indeed, for that poor shuttlecock, public interests.

interests. "Such a condition of 'official hammer and tongs' as is dis-"Such a condition of 'official hammer and tongs' as is dis-closed by the above description is not, unfortunately, merely one of those family jars which occur in all large business concerns, and which may be satisfactorily settled by a little vigorous inquiry and swift judgment. When our departmental quarrels assume such a phase that they also involve reflections upon men of high character and repute in England—the fountain head of our own reputation and commercial position, and the source upon which we rely for our loans for public works—it becomes a very serious matter indeed, and one quite beyond the power of any local board of inquiry here in Sydney to satisfactorily deal with. "Reputations, commercial and professional, are yet held of too

of inquiry here in Sydney to satisfactorily deal with. "Reputations, commercial and professional, are yet held of too much value in England to admit of their owners allowing them to be impeached with impunity; and, unless the impeachments are justified, those who make them will assuredly not only bring injury upon themselves, but indirectly also upon the credit of the colony in whose employment they may be." The words italicised by myself in the last paragraph but one of the above rather amusing extract contain as it accounts to me a

The words italicised by myself in the last paragraph but one of the above rather amusing extract contain, as it seems to me, a considerable amount of pith, and they expound the important and correct principle that when high public officials in the colony fall foul of one another, and the character of English engineers and manufacturers becomes aspersed in the course of the quarrel, it is not within the power of a locally appointed and locally con-stituted board of inquiry, even with the imposing title of "Royal Commission" conferred upon it, to satisfactorily deal with the mottar matter.

matter. This opinion, I feel sure, will be shared in by the majority of your readers, and they will further, I suspect, be disposed to con-sider that such a tribunal as is offered and supplied by your columns is preferable, and in all respects a fairer and more impar-tial "commission of inquiry" than one which is composed of such materials which, as has been above explained, our "Royal Com-mission" consists of.

Fortunately for our character for fair play and common sense, similar opinions have to some extent influenced certain of our representative men here, and questions have been raised in Parlia-ment as to the position occupied by three of the gentlemen nomi-nated to the Royal Commission in respect to contracts held by them for Government work and materials, and it is tolerably sure that if the "Commission" does not fall through altogether, it will at least be re-constructed.

that if the "Commission" does not fall through altogether, it will at least be re-constructed. Many impartial persons here look upon the proposed inquiry as erroneous in every way, and as a waste of time and money, as well as being a most unusual and undesirable method of procedure; whilst as regards the principal combatants—*i.e.*, "Capulet Com-missioner" and his existing llnes engineer, of the one part, and "Montagu," engineer-in-chief, of the other part—the first-named gentlemen demand, and are, to be represented at the Commission by their counsel; and the latter gentleman, as I am informed, declares that he does not recognise the powers of the "Commis-sion" at all, that he shall decline to be in any way held respon-sible to it, and that the proper course for the Government to follow, in view of the very serious nature of the charges which are involved in the Commissioners' acts and reports—and in those of the professional officers under his control—would be to retain the services of an engineer from England—the selection to remain, of course, with the Government of the colony, but the man selected to be one of recognised standing and reputation in the profession, and that to him should be left the task of deciding both upon the character of our imported iron railway bridges and upon the neces-sity for and nature of the so-called "repairs" to which, as the "Montagues" assert, such structures have been unnecessarily and injuriously subjected. injuriously subjected.

Instructures assert, such structures have been unnecessarily and injuriously subjected. I may tell your readers that some of the reports which have been furnished by certain officers of the Capulet faction in condemnation of the bridges are worthy the careful consideration of the members of our profession. Questions of strength, stability, strains, work-manship, &c., are dealt with in a very novel manner, and some-times in language which is as novel in connection with such matters as—so professional friends hereabouts inform me—are the means which have been adopted both for testing the workmanship of the bridges complained of, and for repairing them. For instance, in one such report I am assured that the writer, a leading Capulet, in describing the bad rivetting of various plate and girder bridges—sent to this colony under an eminent English engineer's inspection—says: "I know that many parts of the various gir-ders I have personally examined would not retain Scotch porridge cold." To non-professional s this seems a curious sort of expres-sion to find in a professional and official report, and I rather fancy it will be so regarded by your readers. Possibly, however, it is merely an occult professional technicality for describing badly rivetted work.

The question of the quality of the workmanship and correctness

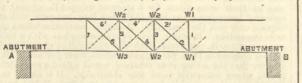
of design of our railway bridges, and the trouble which has arisen of design of our railway bridges, and the trouble which has arisen out of it, and which has yet to be dealt with, is by no means the only item of professional interest and character connected with the Montagu and Capulet embroglio. It would not, of course, interest the majority of your readers to be told all the details of such a purely local affair as the relative positions and functions claimed by the Commissioner and by the engineer in-chief respec-tively, but there are certain broad questions of a professional nature involved therein, and to these I will now refer; and in my next letter I will give some particulars of another phase of the trouble in our Railway Department, as it also considerably concerns English manufacturers of railway plant, &c., though I am glad to state that in this instance no libel or reproach is attached to them therein. therein.

therein. I do not think, however, I can better acquaint your readers with one of those broad questions referred to than by quoting anothen paragraph from the "Corvus" Civil Service papers, and says that writer, in describing the extraordinary anomaly under which, in our Railway Department, the custody and responsibility of the engineering works are removed upon their completion from the charge of the engineer-in-chief to those of the Commissioner, who is a non-professional may—"I take it that these facts hear inter-if he be independent of the head professional branch, of if he be under the direction, say, of a Capulet officer antagonistic to a Montagu, to do a great deal of mischief to public interests, to use unnecessarily expensive and unduly heavy rolling stock and locomotives, to greatly shorten the period of usefulness of railway structures by subjecting them without occasion to what is known to professionals as 'fatigue;' and in many other ways; and as a Civil Service item, we may remember how much discord is known to have occurred only recently in our Railway Department, between to professionals as 'fatigue;' and in many other ways; and as a Civil Service item, we may remember how much discord is known to have occurred only recently in our Railway Department, between a locomotive engineer, imported from England, and the Commis-sioner's departments and officers; and there was a rare bit of the shuttlecock game involved therein. It is surely most vitally necessary, and obviously desirable, that a speedy and proper sepa-ration and well-defined distinction of professional from adminis-trative functions and duties should be provided for in our present and future railway management. When this is effected—but certainly not before then—we may fairly expect that the Montagu and Capulet business will be at an end, and that the battledores will be no longer 'in it.' We may now, in the face of all that has been disclosed recently, and from the probabilities which are furnished by the appointment of that Royal Commission about to commence its duties, further conclude that the time has actually arrived when it is imperatively demanded that this branch of the Civil Service should be completely reconstructed. The mere creation of an additional or distinct Ministerial department for the railways, however far that may go in the right direction, will scarcely suffice to meet all that is required. A Railway Commis-sioner's Board, responsible to and presided over by a Minister for Railways, should perhaps effect for us a reconciliation of the present conflicting elements, and provide for the satisfactory future administration of this almost premier branch—so far as its pecuniary aspect is concerned—of our Civil Service." N.S.W.

#### STRESS DIAGRAMS

SIR,—Perhaps Mr. R. H. Graham would kindly give some fuller explanation of the stress diagrams of Neath Bridge—THE ENGI-NEER, November 2nd, 1883; and Cardiff platform girder—THE

NEER, November 2nd, 1883; and Cardiff platform girder—THE ENGINEER, June 20th, 1884. These girders are of the vertical and diagonal type; and is it not usually considered that in these the diagonals are ties, and the verticals struts; and that the load on the top flanges, or apices, is sent down the struts to the diagonals? e.g.—  $W_1^1$  on top apex would be transmitted to abutment A, through the strut 1, ties 2, 4, 6, and struts 3, 5, 7;  $W_1$  on lower apex to abutment A, through strut 3, tie 4, strut 5, &c.; and to abutment B, through strut 3, tie 2, strut 1, &c.  $W_3^1$  on top apex to abutment B, through struts 5, 3, 1, and ties 4<sup>1</sup>, 2<sup>1</sup>, &c.



In these girders, however, Mr. Graham seems to have assumed that the loads on the bottom flange are transmitted to the abut-ments through diagonals in tension and verticals in compression ; and those on the top flange through diagonals in compression and verticals in tension. Is this always true in all girders of the vertical and diagonal type

loaded at the top and bottom apices; or has it only been assumed for purposes of calculation in these instances, and in what cases generally would one be justified in considering the load as thus divided and apportioned to the two sets of lattices? C. S. July 14th.

#### THE SAND BLAST PROCESS.

THE SAND BLAST PROCESS. SIR,—Referring to the failure of our application for a prolonga-tion of the original sand blast patents, as reported in last week's ENGINEER, we beg to state, for the information of your readers, that this decision has no reference to the process of sharpening files, which is protected by two later patents of 1877 and 1879. THGHMAN'S PATENT SAND BLAST COMPANY, J. E. MATHEWSON, Secretary. Bellefield Works, Sheffield, July 14th.

Bellefield Works, Sheffield, July 14th.

### RUSSIAN GOVERNMENT TORPEDO BOATS.

WE conclude our series of illustrations of Russian Government torpedo boats with an engraving of the engine and fan employed to force air into the fire-room, in which a plenum of to 6in. of water is maintained while the engines are working 4in at full speed. The diameter of the piston is  $5\frac{1}{2}$  in., the stroke 3 in It will be seen that the piston is as light as possible. The bearings are enormous, and the balancing carried out with the is in the fire-room on the other side. A wind trunk, not shown, conveys the air from above deck into the centre of the fan from which it is discharged all round. We believe that this is the first set of fully dimensioned drawings of this interesting class of machinery ever published.

THE woodwork surrounding the sunlight ventilating shaft in the The woodwork surrounding the sunfight ventilating shart in the Albert Hall, South Kensington, caught fire on Wednesday evening. There were policemen on duty, who acted promptly, and got the fire under. As no one wishes the Albert Hall to be burned down, perhaps it would be well if the electric light were used.

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

#### (From our own Correspondent.)

ON 'Change in Birmingham to-day—Thursday—finished iron-masters did not report that the orders previously in hand had been masters did not report that the orders previously in hand had been much swelled as the result of the quarterly meetings. Indeed, the business which so far had ensued from those gatherings has been disappointing. Negotiations begun a week ago were to-day brought to a satisfactory conclusion in numbers of instances, but they did not relate to, with a few exceptions, heavy transactions. Shipping orders of much size are particularly difficult to get at prices at all satisfactory. The prices declared last week were to-day re-quoted with scarcely any alteration. In actual sales, however, rates were rather easier than a week ago. Yet consumers generally declined to enter the market with any spirit, being content to buy from hand-to-mouth. Consequently the works will continue to be only partially employed. Marked bars were quoted at £7 10s.; but it is an open secret that

Marked bars were quoted at £7 10s; but it is an open servet that several houses who quote this price would not refuse a favourable export order if offered at from 10s. to 20s, per ton less. Ordinary bars were £6 5s. to £1, and common, £5 15s. to £5 12s. 6d. A moderate business is doing in horseshoe and tire iron, and

angles and tees are in pretty good sale. Hoops and strips are slow of inquiry; a revival of the United States demand would be very welcome to this branch. Chain iron is in fair call, but nail rods are very slow of movement. Branded hoops were to-day £8 nominal, and common, £6 to £6 5s.

and common, £6 to £6 5. Ordinary merchant and galvanising sheets sold to-day in small lots as a rule, but here and there contracts were made extending throughout the greater part of the current quarter. Prices do not improve, and singles were to be had on 'Change at as low as £6 15s.; doubles were mostly £7 10s. The best sheet makers are more active in the manufacture of very thin gauges for special uses than in any other department. In their general trade there has recently been a falling off, the shipping orders not being so good. Leading makers, however, stand up for their price. John Knight and Co., of the Cookley Ironworks, quote working-up singles £10; stamping singles, £14; and charcoal singles, £20. Tin-plates the same firm quote at—Cookley cokes, 21s. per box; Cookley S.S. charcoal plates, 23s.; and Cookley K. charcoal, 25s. per box. Plates are without much increased demand. Prices are on the basis of £7 10s. easy for tank sorts, and £8 10s. for boiler qualities.

qualities. The local steelmakers are progressing satisfactorily. Messrs. The local steelmakers are progressing satisfactorily. Messrs. Knight and Co. report an increased demand for their steel sheets, and the Staffordshire Steel and Ingot Iron Company is this week in receipt of very encouraging accounts from local consumers of the quality of its manufacture as tested in the iron rolling mills of these buyers. The trade which is now being done in this district by steelmakers at a distance should largely fall into the hands of the Staffordshire Steel Company, seeing that consumers will not have to pay the carriage from a distance, which now amounts in some cases to 8s, per ton.

have to pay the carriage from a distance, which now amounts in some cases to 8s. per ton. Pig iron is moving off this week in limited lots, mostly of common qualities, at easy rates. Agents whose principals are not in want of contracts are generally standing off the market a little in the hope of preventing any further decline in prices. Derby-shire pigs are 42s., and Northamptons may be bought at 41s. 6d. Thorneliffe sorts are quoted 55s., but without business. Native all-mines are 60s. to 57s. 6d. for hot blast sorts, and cinder pigs 40s. down to 35s. as a minimum. The Lilleshall Iron Company, Shropshire, is blowing three furnaces on all-mine iron with a

40s. down to 35s. as a minimum. The Lilleshall Iron Company, Shropshire, is blowing three furnaces on all-mine iron with a production of about 800 tons of hot blast weekly, and from 200 to 300 tons of cold blast pigs. Mail advices this week from Melbourne state that galvanised iron is moving off quietly. Quotations ranged from £19 to £21, according to brand and parcel. Bar and rod iron continue in moderate request at £9 to £9 10s. Sheet iron had quitted at £11 10s. for No. 8 to 18, and hoop iron at from £9 10s. to £10. For fencing wire a slightly better demand had arisen, and fair sales were being made at full prices. Quotations ranged from £11 10s. to £12 10s., according to brand and number. Tin-plates were moving off steadily. I. C. coke plates had been placed at up to 21s. to 21s

The strike of the colliers is continued. The men show no signs In strike of the cohers is continued. The men show no signs of giving way, and the masters are equally determined. Mr. E. Fisher-Smith, the agent to the Earl of Dudley, has intimated that he has made arrangements to stop, when possible, the whole of his lordship's collieries, by discharging the enginemen and others employed about them, and if it should be necessary, he will damp down or blow out the blast furnaces. The ironmasters met in Birmingham to-day and decided to give a month's notice for a further reduction in ironworkers' more

a month's notice for a further reduction in ironworkers' wages. This step has been taken consequent upon the reduction in the North. At the gathering of coalmasters it was determined to make a call of £1 for each 10,000 tons of coal raised per year, £2 for double that quantity, other subscriptions being according to quantifice reised quantities raised.

quantities raised. Engineers and heavy ironfounders are not in receipt of many new contracts. The ironfounders in particular complain of the almost impossibility of securing export orders of much size, consequent upon the heavy railway freightage charges which now prevail, and which place competitors in Scotland and the North of England in particular at so great advantage. A few of the leading wrought iron tube makers are quite busy, and if only prices could be got up business would be fairly satis-factorv.

The demand for cycles keeps extraordinarily good. Indeed, had makers been possessed of the capacity, they could have booked more than double the orders which have this season been accepted. There seems no limit to the export call for these machines, and

There seems no limit to the export call for these machines, and preparations are being made for an enlarged output next season. The Local Government Board are urging the various local authorities in the Midlands to proceed quickly with their schemes for the disposal of sewage. Acting upon this request, the Wolver-hampton Town Council have decided to carry out immediately a scheme for diverting from the Stow Heath Brook that portion of the sewage from the borough which is now discharged into it, and have sanctioned the drawing up of the necessary plans and speci-fications. It was explained at the meeting of the Council that in a month's time the Sewage Committee would have completed its labours and would present a scheme for acceptance.

#### NOTES FROM LANCASHIRE. (From our own Correspondent.)

Manchester .- Business in all branches of the iron trade of this district continues in a depressed condition, and, as I have pointed out in previous reports, is most unsatisfactory as regards both buyers and sellers. Prices are so low that makers can see no profit on any business they may do, and consumers have so little work in prospect that they are quite indifferent about buying. It is really not a question of price that operates against business being done, but the continued absence of demand; consumers, on the one hand, are not tempted to buy even at prices that they know cannot come lower without absolute loss to the producer, and they confine their purchases to the barest possible requirements; whilst makers, on the orders that are to be cot, are only anxious to sell where it buyers and sellers. the other hand, unable to get anything like a remunerative return on the orders that are to be got, are only anxious to sell where it is absolutely necessary to keep works going. How long this con-dition of the market will continue, or where relief may be looked for, are both points upon which no one can apparently express any confident opinion. In the meantime the continued depression is causing a severe strain upon the iron industry of this district, and in some cases preparations are being made for the blowing-out of furnaces as the only possible alternative. There was a very dull market at Manchester on Tuesday, and both in pig and finished iron the weight of business doing was ex-tremely small. Lancashire pig iron makers are kept tolerably well employed with deliveries against contracts, which include the fairly large sales I reported a few weeks back; and they are holding pretty firmly to 42s. 6d., less 2½ per cent, as their minimum for forge and foundry qualities, delivered equal to Manchester. They are, however, booking very few new orders just now, and they are so much undersold by district brands, that they are practically out of the market, except where low rates of carriage give them the advantage. Both Lincolnehire and Derbyshire brands of pig iron are offering in this district at very low figures, owing to the heavy

advantage. Both Lincolnehire and Derbyshire brands of pig iron are offering in this district at very low figures, owing to the heavy stocks that are accumulating at some of the furnaces. Lincoln-shire pig iron can be bought readily at 41s. 6d. to 42s. 6d., less 24, delivered equal to Manchester, and there are good brands of Derbyshire in the market at figures very nearly as low as these. In the finished iron trade the result of the quarterly meetings has been, if anything, to leave behind a rather despondent tone. There has been no accession of new business of any weight, and although some of the leading local and North Staffordshire makers seem to be making a firm stand at £5 15s. as their minimum for bars delivered into the MancLester district, buyers who have good specifications to give out for prompt delivery have no difficulty in specifications to give out for prompt delivery have no difficulty in placing orders at under this figure, and are able to get reputed brands of quality, whilst common bars are offered at very low

prices. Ironfounders report only a very small quantity of new work giving out, and this is competed for at extremely low prices. In the brassfoundry trade business is also very quiet, and metal goods generally are depressed, owing to the downward tendency in the raw material. Nominally manufacturers' list rates are unchanged, but low prices are taken where orders are to be got. Although there is no actual scarcity of work in the engineering trades of this district, activity generally is on the decrease so far as the weight of new orders coming in is concerned, and where works are being kept fully employed it is only at extremely low prices, which, from the statements I hear on all hands from em-ployers, leave them no margin for profit. The present condition of the engineering trade is pretty accurately stated by the secretary of the Steam-engine Makers' Society, who, in his report for the present month, states that the locomotive builders and tool makers seemed to have an abundance of orders, whilst stationary engine The steamed give indexes botton, who, in the topot of makers seemed to have an abundance of orders, whilst stationary engine builders and millwright works appeared to be fairly employed at present; but how long this would continue it would be hard to tell, as new orders seemed to be limited, and future prospects were far from encouraging. To this it may be added that the returns as to the number of unemployed members have not maintained the favourable aspect which was presented in last month's report, but are again on the increase, and there are now about two per cent. of the members in receipt of out-of-work support. The reports received by the Amalgamated Society of Engineers are generally to the effect that trade is getting worse; but so far as the Manchester and Salford district is concerned there has, during the past month, been a slight decrease in the number of unemployed. The leading machine making works throughout Lancashire appear to be well supplied with orders, and in Oldham and Rochdale especially, there is a good deal of activity. All the centres of industry which are at all dependent upon marine work are, however, depressed, owing to the complete collapse which has centres of industry when are at all dependent upon marine work are, however, depressed, owing to the complete collapse which has taken place in the iron shipbuilding trade. The number of mem-bers at present in receipt of out-of-work support throughout the various branches of the Amalgamated Society of Engineers is about 3 per cent., with the average for Lancashire slightly under this

The chief feature in the coal trade is the commencement of the threatened strike in West Lancashire against a reduction of wages, but so plentiful are the supplies in the market, that the stoppage but so pientiful are the supplies in the market, that the stoppage of the pits is regarded with comparative indifference. The resolu-tion to resist the reduction in wages which was come to at the conference of miners' delegates held in Manchester this week, was adopted in a half-hearted manner, which indicated a consciousness of weakness on the part of the men, and there is so little appre-hension that the dispute will lead to any such restriction of the output as will at all seriously affect the market, that buyers show no anxiety to get in supplies; and although there has been a little output as will at all seriously affect the market, that buyers show no anxiety to get in supplies; and although there has been a little extra inquiry, this has been chiefly with the view of testing the possible effect the stoppage of the pits may have upon prices. All classes of round coal continue bad to sell, and buyers have been able to place out their orders at quite as low prices as last week. Engine fuel, except that slack is in some cases rather scarce owing to the small quantity of round coal now being screened, is also weak, with only a slow sale. At the pit mouth prices average about 8s. 6d. to 9s. for best coals, 6s. 6d. to 7s. for seconds, 5s. to 5s. 6d. for common coals, 4s. 6d. to 5s. for burgy, 4s. to 4s. 3d. for best slack, and 3s. 6d. to 3s. 9d. per ton for ordinary qualities. In the shipping trade there is a fair amount of activity, but business is only to be done at extremely low prices, and there is an abundance of good Lancashire steam coal offering at about 7s. per ton for delivery either at the high level, Liverpool, or the Garston

ton for delivery either at the high level, Liverpool, or the Garston Docks.

ton for delivery either at the high level, Liverpool, of the Garston Docks. Barrow.—There is no appreciable change in the hematite pig iron trade of this district. Very little animation is noticeable in the market, makers finding rather a searcity of orders. Some time ago I reported that several large contracts had been received from foreign consumers, and that makers confidently expected that others would come to hand. This, however, I am sorry to say, has not been the case. Makers have been pushing forward the orders in hand for speedy delivery, and the consequence is that allow of no profits being realised, and they are trying to get more remunerative prices. Mixed Bessemer samples are only bringing in about 44s. or 45s. per ton net at works. Stocks are not diminishing. The steel industry of the district is in a stagnant condition, and the orders placed out are restricted to more immediate wants. Rails are selling slowly at about 90s. per ton net prompt delivery. Merchant qualities are also in demand. Shipments have somewhat decreased. Engineers and boiler-makers are being made. Iron ore in slow demand at last week's rates. Stocks are heavy at mines. are heavy at mines.

# THE SHEFFIELD DISTRICT.

THE ENGINEER. quently they are not able to sell it when they get it there, and have to put it in stock, and the freight they obtain is less than 4s. per ton, which is unremunerative for the shipowner. This explains the increased export and the diminished price. The exports of Sheffield goods during the month of June are again most discouraging reading. In hardware and cutlery, as compared with the corresponding month of last year, the value has fallen from £297,716 to £250,932. Russia, whose dealings in English rails have been blank for a long time, is now a customer to the value of £22,453; this is more than counterbalanced, how-ever, by the defection of Italy, to which a value of £23,808 was sent in June, 1883, and only £25 worth last month; while the United States and Mexico, who took values of £30,291 and £37,835 in June, 1883, last month had only £9020 and £1428! The Argentine Republic has increased by nearly £5000-£45,008-£49,967. Railway enterprise appears to be at a stand in British Possessions in South Africa, for only £4935 in value was sent last month, as compared with £21,492 in June, 1883. Australasia shows the serious decline from £85,355 to £32,225. Steel, the great speciality of Sheffield, seems to be drifting from us as an export trade, the total value sent from this country last month being only £95,170, as compared with £145,824 in June, 1883. France has fallen from £12,090 to £8193; the United States from £45,367 to £26,935; and other countries from £88,367 to £60,042. For the six months the decrease is no less than from £741,197 to £587,517. Following the gratifying news from Copen-hagen last week comes the successful test of the compound plate at Portsmouth on Friday, which passes the compound armour for the United States warship, Miantonomoh. The order was equally divided between Messrs. Charles Cammell and Oo, and Messrs. John Brown and Co.

John Brown and Co.

#### THE NORTH OF ENGLAND. (From our own Correspondent.)

THE Cleveland pig iron trade was in a stagnant condition during THE Cleveland pig iron trade was in a stagnant condition during the whole of last week, and there was no sign of improvement at the market held at Middlesbrough on Tuesday last. Some con-sumers offered 36s. 9d. per ton for No. 3 g.m.b., but makers being for the most part supplied with orders for several weeks, were firm in their quotations, and 37s. per ton was the lowest accepted. Merchants are no longer able to do any business worth mention-ing, as they hold but small quantities of iron, and their offers to sell at 36s. 10<sup>1</sup>/<sub>2</sub>d. have no effect upon the market. There is a steady demand for grey force iron and the price continues firm at steady demand for grey forge iron, and the price continues firm at 35s. 6d. per ton. 35s.

There is no inquiry for warrants; the price is nominally 37s. per ton.

Messrs. Connal and Co.'s stock of Cleveland pig iron at Middlesbrough decreased 150 tons during the week ending Monday last.

The finished iron trade is no worse than it was a week ago The finished iron trade is no worse than it was a week ago. There is, in fact, more enquiry than for some time past, and it is probable that prices will not be lower. Ship plates are £5 to £5 2s. 6d. per ton according to specification; angles, £4 15s. to £4 17s. 6d.; and common bar iron £5 2s. 6d. to £5 5s., all free on trucks at makers' works, cash 10th less 2½ per cent. The distress amongst the unemployed ironworkers and their families to Middleshearch is still accounter. The worst cases

The distress amongst the unemployed honworkers and then families at Middlesbrough is still somewhat severe. The worst cases of destitution are being attended to by a relief committee, and employment has been given to a considerable number of men on a river embaikment which is being made by the Tees Conservancy Commissioners. More puddling furnaces have also been started at the Britannia Ironworks, affording employment to a certain number of puddlers. of puddlers.

of puddlers. According to the accountant's certificate issued in connection with the Cumberland coal trade, the average net selling price of coal for the quarter ending June 30th was 5s. 2°31d, per ton. Mr. Charles Wood, of Middlesbrough, has received an order for 10,000 of his patent wrought iron sleepers for a Brazilian railway. So much of the prosperity of the North-Eastern seaport towns depends on iron shipbuilding and marine engineering, that a sharp look-out is there naturally maintained in the direction of such events or tendencies as may possibly lead to an early revival of these industries. Among the more hopeful signs of the times the development of the triple expansion marine engine stands in the front rank.

industries. Among the more hopeful signs of the times the development of the triple expansion marine engine stands in the front rank. Fifteen years ago the invention of the compound engine with surface condensation forced shipowners everywhere to pull out jet-condensing, non-expanding engines, and adopt the improved ones. Any unwilling to do so would easily have been run off the high seas by their competitors, for a steamer using 41b. of coal per indicated horse-power per hour could not long compete with one burning only half that quantity. A similar revolution seems now to be impending. By using triple expansion engines with a boiler pressure of 160 b. per indicated horse-power per hour. It is obvious that the saving thus obtained would afford a respectable profit, where otherwise none was obtainable. It is stated that 400,000 tons of steam shipping is now laid up idle in British ports. Will these vessels ever emerge into activity again, provided, as they are, with ordinary machinery only? Will not the preference be given to vessels capable of being more economically worked, if there be such? Past experience leads me to believe that that must be the case. We may therefore expect to see great activity before long in marine engine building, and a gradual revival of shipbuilding. Triple engines consist of three complete engines side by side, the steam passing through the cylinders in succession. Each cylinder is larger than its predecessor, but is furnished with steam in an expanded condition. The proportions are so arranged that, notwithstanding the variation in dimensions and circumstances, the work done by each is about equal. But as a whole the engine is somewhat larger and more expensive than an ordinary one of equal power. Consequently it takes more room. Less steam being, however, required, the boilers are smaller, and the boiler space needed is less, and the bunker space very much less for equal lengths of run. Less bunker space is equivalent to more cargo space, which suits shipowners. Or if more carg

THE SHEFFIELD DISTRICT. (From our own Correspondent.) The application by Tilghman's Patent Sand Blast Company, of Belfeidl Works, Sheffield, for a prolongation of their patent for pulverising stone and other hard substances," was watched with considerable interest here, and the report, as given in THE ENC. NEER of last week, excited a good deal of conversation. I am informed that the failure of the application for a prolongation of the original sand blast patents has no reference to the process of and 1879. The file sharpening process will be still carried on bit the company, but the process as it applies to the ornamentation, kee, of glass, stone, and electro-plate expires on the 1st of August next. This is particularly the case as regards London. Gas coal contracts have been very freely placed of late at generally has been pretty firm in price, owing to the diminished output The export of coal has, in fact, increased. For the first months ending May last 11,718,392 tons have been exported, has been less than in 1883. The largest shipowners in Hull, for the loss for an infact, increased. For the first owar at log 38,492 tons for the previous year; but the process will be still carried on biter the second week of than it sets the corresponding period of last year. This is particularly the case as regards London. Gas has been pretty firm in price, owing to the diminished output the export of coal has, in fact, increased. For the first has been less than in 1883. The largest shipowners in Hull, for the issending May last 11,718,392 tons have been exported, has been less than in 1883. The largest shipowners in Hull, for the second week of July last year. But while the figures and the shipments to England have of late seen changed from ordinary pig iron to the manufacture of hematite, for which, however, the general during the which, however, the general during the which however, the general during the which how exports of hematite, for which, however, the general during the which howev

been somewhat on the increase. There are now ninety-six furnaces been somewhat on the increase. There are now innervests turnaces in operation as against 114 at the corresponding date in 1883. The stock of Scotch pigs in Messrs. Connal and Co.'s Glasgow stores is still decreasing to a small extent, and the aggregate is now less than it was twelve months ago.

Business was done in the warrant market on Friday at 41s. 3½d. to 41s. 4d., and back to 41s. 3½d. cash, and 41s. 5d. to 41s. 6d. and 41s. 5½d. one month. On Monday transactions took place at 41s. 3d. cash and 41s. 5½d. one month, while on Tuesday the quota-tions were 41s. 3½d. to 41s. 3d. cash and 41s. 5d. one month. In

Lions were 41s. 3½d. to 41s. 3d. cash and 41s. 5d. one month. In the iron market yesterday business was done at 41s. 4d. and 41s. 3½d. cash and 41s. 5½d. and 41s. 6d. one month. To-day— Thursday—business was done at 41s. 4d. to 41s. 3d. cash and 41s. 5½d. and 41s. 6d. one month. On account of fair holidays the market will be closed till Tuesday. The quotations of makers' pig iron are comparatively steady as follow:—Gartsherrie, f.o.b. at Glasgow per ton, No. 1, 51s. 9d.; No. 3, 50s.; Coltness, 57s. 6d. and 51s.; Langloan, 53s. 6d. and 51s.; Summerlee, 51s. and 47s.; Calder, 52s. and 46s. 6d.; Carn-broe, 50s. 6d. and 47s.; Clyde, 48s. and 45s.; Monkland, 43s. 6d. and 40s. 3d.; Quarter, 42s. 6d. and 40s. 3d.; Govan, at Broomie law, 42s. 6d.; Shotts, at Leith, 51s. 6d. and 51s.; Carron, at Grangemouth, 48s.(specially selected, 54s.) and 47s. 6d.; Kinneil, at Bo'ness, 44s. and 43s.; Glengarnock, at Ardrossan, 50s. and 42s. 6d.

42s. 6d. The manufactured iron and steel trades continue very quiet. During the The manufactured ron and steel trades continue very quiet. There is a good business in coals for shipment. During the past week upwards of 18,000 tons were despatched from Glasgow harbour, 8971 tons from Grangemouth, and good cargoes, as a rule, from the other ports. Prices are nominally unchanged. The Shotts Iron Company has begun sinking operations at Hyndshaw Farm, Carluke, Lanarkshire, for the purpose of opening out a four-feet seam of coal, which is believed to extend to from thirty to forty acres.

thirty to forty acres.

thirty to forty acres. The miners of the Lanarkshire district have arranged to hold a great meeting on the last day of the present month, with the object of furthering the short-time movement. The coalmasters of Fife and Clackmannan are at present considering a basis for the arrange-ment of a sliding scale to regulate wages, and the miners are also in favour of the principle of such an arrangement. A considerable amount of new shipping was launched on the Clyde in the course of the week, and a number of fresh contracts have been booked by different firms, principally for sailing vessels. The trade as a whole is, however, comparatively slack.

#### WALES AND ADJOINING COUNTIES. (From our own Correspondent.)

(From our own Correspondent.) THINGS are being gradually rectified at Dowlais Works, and on Monday several mills were again in action. A supply of water was had from the pond which is to supply the Lührig washing machine, which is now in almost a perfected state, and since then the rains have been plentiful. This makes the 116th machine put up by the Lührig Company. I shall note results shortly. It is rather singular that with such a large extent of flat mountain land the company should not be in possession of greater reservoirs. Every summer, as a rule, there is an alarm about the water supply, but this last drought is the most serious one experienced at the works since Donati's comet, about twenty-six years ago.

this last drought is the most serious one experienced at the works since Donati's comet, about twenty-six years ago. I am glad to note that the collieries at Dowlais appear disposed to take a peaceful course in regard to their differences. Several interviews have been had with Mr. H. Martin, the colliery manager, and the prospect looks less gloomy than it did. The iron and coal trades retain pretty much the position they have occupied for some time past. I cannot see any signs of im-provement in iron and steel; but for Canada, things would be very slack, but good rail orders are held for this colony, and home re-quirements are moderately good. The animation in the tin-plate trade reacts also favourably on the ironworks, and the demand for leading brands, including steel, is firm at last market prices.

trade reacts also favourably on the fromworks, and the demand for leading brands, including steel, is firm at last market prices. A fair proof of the improvement setting in with respect to the tin-plate trade is the interest taken by capitalists in some of the old and stagnant works. I see that one of these, Pontclown, near Llantrissaint, is about to show life again. The necessary workmen are being gathered, and operations will soon begin. The works lie well for railway purposes, and are thirty miles nearer London than these of Swanses. those of Swanse

those of Swansea. The Swansea Bay Graving Dock Company is to be wound up. I am sorry to see this, as it may lead to the impression that Welsh industries are in a low state; but the fact is that it is the overdone shipping trade, combined with slackness in iron ore, which affects the dry docks and kindred works. The capacity of sending up a thousand tons per diem from a Rhondda pit has aroused similar activity at the docks. One day last week a Swansea vessel was laden with 1200 tons and despatched in one tide.

Inst week a Swansea vessel was laden with 1200 tons and despatched in one tide.
I hear that one of the Cardiff steamship companies is to be wound up voluntarily. It would not surprise me that the same fate attended others, seeing how much the trade has been overdone.
The Barry case is being "rushed" through the Lords at a great speed. The promoters evidently fear postponement, but the risk is a great one, especially after the tie in the House of Commons Committee. In the course of cross-examination this week, it transpired that the success of the Barry Bill means an increase of 25000 annually to Lord Windsor.
The appointment of Mr. W. T. Lewis as High Sheriff of Breconshire has given great satisfaction, and a complimentary demonstration awaits him next week, when an address will be presented signed by a large number of influential residents—and deserved, most certainly. The prosperity of the coal trade is the outcome of those remedial and pacific measures which he originated. The Coalowners' Association, sliding scale, Provident Fund, the start at Cyfarthfa—these and a number of others were his successful achievements; and I see that he has now established a collier's scholarship at the South Wales and Monmouthshire University, and done in an unostentatious manner while the colliers have been debating and halting about their "farthing" subscription.
Things are not looking up in the Forest of Dean. It is true that the coal trade retains its average, but in iron, and iron ore, business is dull. One of Mr. Crawshay's ore pits will close in a few days, and the hope of going again is remote.
Messrs. Burt and Broadhurst, M.P.'s, have been having a miners' demonstration in the Forest, and met with a hearty reception. The points they mooted were union, formation of, in the Forest; modification of the long-pay system; and appeals to Government to remedy existing land laws. "Mabon," the representative of the South Wales steam coal district, assisted in the gathering,

proposition was carried unanimously.

(From our own Correspondent.) THE Glasgow warant market has exhibited comparatively little animation during the week, and as the fair holidays have now commenced, there is likely to be still less doing in the next two weeks. The transactions in warants, while they have been on a moderate scale, took place at comparatively steady quotations. For shipment the inquiry has not been altogether unsatisfactory, and it is a source of wonder to some that the falling off in the exports is not considerably larger than it really is at this date, in view of the general dulness of trade. The inland consumption is also fair, and the shipments to England have of late been larger than usual. Our imports of Cleveland pig iron are but 7000 tons less than they were in the second week of July last year. But while the figures on all these heads are not entirely discouraging, there is not much in the immediate prospect to unduly raise expectation. Since last report one furnace has been changed from ordinary pig iron to the manufacture of hematite, for which, however, the general demand is not at all very lively; indeed, the stocks of hematite have lately

#### 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 inding 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.

#### 8th July, 1884.

9872. GLOVE FASTENERS, W. P. Thompson.-(W. F. Ware, New York.) 9873. FAUCETS, W. P. Thompson.—(Frank Loomis, New York.) New York.)

19874. LIFEBOATS, J. Rees, Liverpool. 9875. MASHING CLOTHES, J. H. Bastow, Keighley. 9876. MATHEMATICAL COMPASSES, J. F. Bennet and B. B. Smith, Sheffield.

B. Smith, Sheneld,
 9877. STAY FASTENINGS, A. Downing, Birmingham,
 9878. KNITTING MACHINES, C. J. Appleton, Manchester,
 9879. IMPARTING LONGITUDINAL MOTION to LOOMS, C.
 U. Distributional Motion to Looms, C.

H. Clegg, Littleborough. 9880. LOOM TEMPLES, J. Blezard and N. Blezard, Padi-

ham 9881. HEAT ENGINE VEHICLE, W. S. Sutherland, Bir

mingham. 988?, CHIFELS and Gouges, D. Ward and P. Ashberry,

Sheffield.
9883. PRESERVE STANDS OF FRAMES, J. Burley, Birmingham.
9884. TENNIS SHOES, F. W. Stoddart, Bristol.
9885. VENETIAN BLINDS, D. E. Langham, Wimbledon.
9886. SUPPORTING GLASS, T. W. Helliweil, Brighouse.
9887. COATING BRICKS, &c., H. M. Smith, London.
9883. COLOURING STONES, L. de Liebhaber, London.
9883. ROTARY ENGINES, A. M. Clark.—(D. McColgan, Montana, U.S.)
9890. METALLIC PACKINGS, A. M. Clark.—(T. Johns, Oregon, U.S.)

net, Condover.

BLIND-CORD PULLEYS, &c., B. Whitehouse, Bir-9894.

9894. BLIND-CORD PULLETS, &C., B. Whitchouse, Bir-mingham.
9995. MOULDS for FIRE-CLAY, F. Grosvenor, Glasgow.
9896. PREVENTION and CURE of CRIB BITING, B. S. Weston and H. S. Wilton, London.
9897. CHECKING PASSENCERS and FARES, J. J. Dunne, J. F. Hoyne, and T. McKenna, London.
9898. EXPANDING STRETCHER FRAMES, W. H. Borham, London.

Lo PHOTOGRAPH, L. A. Groth.-(Theodor Münch, 98

9809. FROTORATH, D. A. GIOLL. (Incom. Internet, Vienna.)
9900. PLUCKING SKINS, E. G. Colton. (F. Peterhansl, New York.)
9901. STOP-PLUGS, E. G. Colton. (W. F. Cosgrove and E. F. Jennings, Jersey, U.S.)
9902. LAWN TENNIS RACQUET, S. MORTISON, London.
9903. MOVABLE TRESTLES, A. J. Boult. (T. Favret, France.)

France.) 04. WEIGHING APPARATUS, H. J. Haddan.—(L. Colas-9904.

sot, Frenchville.) 9905. DEVICES, H. J. Haddan. - (A. Kolb and A. Tischler, Vienna.)

9906. UNIONS for PIPES, N. Thompson, London. 9907. CARRIAGES, G. H. Morgan, London. 9908. REAPING, &c., MACHINES, M. Jenkinson, Gran-tham tham. 9909. SCREW-PROPULSION of VESSELS, P. E. Sorbé,

Paris. 9910. SHEET METAL, C. D. Abel.-(R. Poensgen, Dusseldorf.) 9911. LOCKING, &C., RAILWAY SIGNALS, E. J. Hough

9911. LOCKING, &C., RAILWAY SIGNALS, E. J. Houghton, London.
9912. HARNOM CARS, E. J. C. Welch, London.
9913. HARNOWS, I. Wilderspin, St. Ives.
9914. VIGNETTING APPARATUS, E. D. Adcock, Norwich.
9915. DINOS, W. L. Hays, Greenwich.
9916. LOCKS, J. H. Johnson. -(Messrs. Variclé and Co., and M. M. F. Moulin, Paris.)
9917. APPARATUS for USE in CHEMICAL OPERATIONS, J. H. JOHNSON. -(Messrs. J. B. Mallion and Son, Turin.)
9918. PRINTING MACHINES, J. H. Johnson.-(R. Hoe and Co., New York.)

9918. PRINTING MACHINES, J. H. Johnson. (R. Hoe and Co., New York.)
9919. PRINTING MACHINES, J. H. Johnson. (R. Hoe and Co., New York.)
9920. PRINTING MACHINES, J. H. Johnson. (R. Hoe and Co., New York.)
9921. PRINTING MACHINES, J. H. Johnson. (R. Hoe and Co., New York.)
9922. TRIMMING LEATHER, W. R. Lake. (G. L. Tyler, Lynn, U.S.)
9923. PRICE-CARD, &C., H. Bornstein, Boston.
9924. BRICE-CARD, &C., H. Bornstein, Boston.
9925. GUMMING PAPER, W. W. R. Lake. (J. Hunt, A. R. Finck, and R. H. Mitchell, Philadelphia.)
9926. GUMMING PAPER, W. Wallace, London.
9927. REPRODUCING SIONS at a DISTANCE, T. Tubini and G. C. Cooke, Sutton.

9th July, 1884.

9523. COOKING FOODS, J. Robson, London. 9929. ELECTROMFTER, A. Wright, Brighton. 9930. DRV-PRESSURE GAUGE, T. Thorp, Whitefield. 9931. REGISTERING POWER of GAS, T. Thorp, White-9223. COOKING FOODS, J. Robson, London.
9929. ELECTROMETER, A. Wright, Brighton.
9930. DRY-PRESSURE GAUGE, T. Thorp, Whitefield.
9931. REGISTERING POWER of GAS, T. Thorp, Whitefield.
9933. BEARINGS for VEHICLES, J. G. Inshaw, Aston.
9934. ELECTRIC ARC LAMPS, W. Kingsland, Leeds.
9935. GLOW-LAMPS, J. Swinburne, London.
9936. LAWN-TENNIS, &c., RACKETS, H. and C. J. Elton and C. S. Madan, Manchester.
9937. STEAM BOLLERS, J. D. Morrison, Gateshead.
9938. SAFETY-LAMP, W. K. Fulleylove. Rugby.
9940. LENNES, T. G. Webb, Manchester.
9944. MAKING OIL-CLOTH, J. Blackwell, Manchester.
9943. MANUFACTURE of SCHSSORS, &c., W. A. Whiteley, Hilbero.

9944. PLACING COP TUBES UPON SFINDLES, J. B., G., and J. B. Swailes, Moorhey. 9945. AUTOMATIC GAS REGULATOR, &C., H. C. Braun, London

10940. AUTOMATIC GAS AREOLATION, CARLEN, C. M. London.
10940. Doc, &c., LATHE CHUCKS, A. M. Clark.—(S. N. Silver, U.S.)
10947. FLOATING TUNIC, S. S. Bromhead, London.
10948. SPINNING MACHINERY, E. Capitaine.—(G. Eben-

auer, Germany.) 9949. GAS MOTORS, E. Capitaine.-(Benz and Co.,

Germany.) 9950. SoAP for PURIFYING SKIN, &c., G. H. Goodman,

9950. SoAP for PURIFYING SKIN, &c., G. H. Goodman, Newington.
9951. HANDLES combined with NAME PLATES for DRAWERS, E. Kent, London.
9952. PINTLES for IRON VESSEL RUDDERS, F. Willies, Plymouth, and J. Doldge, Deptford.
9953. ACTUATING MECHANICAL TOYS, G. Cole, London.
9954. OFENING, &c., SWING FANLIOHTS, &c., A. B. Milne, Lozells.
9955. HOUSES, C. H. C. Holmes, Derby.
9956. HOUSES, C. R. Beesley, Coventry.
9957. AUTOMATIC ELECTRIC LIGHTING APPARATUS, C. S. Snell, London.
9958. FIRE-ESCAPE, C. Allen, Highpate.

Snell, London. 9958. FIRE-ESCAPE, C. Allen, Highgate. 9959. PIPE JOINTS, &C., H. L. Weymersch, London. 9960 RAISING, &C., WEIGHTS, J. Swalwell, London, and J. Moore, South Stockton-on-Tees.

9961. DIAPHRAGMS for TELEPHONIC PURPOSES, G. Gray, CONSTRUCTION OF CRANKSHAFTS, H. B. Young, Barnstaple. 9963. Christich, Brockley. 9964. HATS and like COVERINGS for the HEAD, H. Dinn,

THE ENGINEER.

Marlow

10,077. M. London.

10,055. COMPOUND for CURING PHTHISIS, A. McGuffie,

10,055. COMPOUND for CURING PHTHISIS, A. McGuffie, Glasgow.
10,056. SIDE REFLECTING LAMPS, C. R. Stevens, Kent.
10,057. ENVELOPE FASTENERS, C. G. Andrews.-(J. H. Bufford's Sons, New York.)
10,058. CHILDREN'S COTS, G. W. Moon, London.
10,059. PISTON PACKING RINGS, J. Whitehead and J. Pollock, Belfast.
10,060. FRICTION GEARING for ELECTRIC MOTORS, W. B. Brain, London.
10,061. PRIMARY and SECONDARY BATTERIES, W. B. Brain, London.
10,062. STARTING, &c., VELOCIPEDES, E. A. Norrington, London.
10,063. MILK CHURNS, J. Askew, London.
10,064. BUTTER COOLERS, J. Askew, London.
10,065. BOTTLES and STOPPERS, G. Neal, Birmingham.
10,065. HOTTER COOLERS, J. Askew, London.
10,065. BOTTLES and STOPPERS, G. Jackson, Little Marlow.

10,067, DISPLAYING ADVERTISEMENTS, T. Sunderland, Blackpool. 10,068, BRAKE APPARATUS, W. L. Wise.-(Mr. Huve-

10,068. BRAKE APPARATUS, W. L. Wise.—(Mr. Hwié-Lemoine, Paris.)
10,069. STORT FEED APPARATUS, J. Dewrance and G. H. Wall, London.
10,070. MUZZLE STOPPERS for GUNS, T. Nordenfelt.— (R. Ferraciu, Venice.)
10,071. CHAIRS, R. J. Lee, London.
10,072. COMBINED CRANE, FIRE ENGINE, &c., BOAT, G. W., and J. G. Penn, Cardiff.
10,073. LITHOGRAPHIC PRINTING SURFACES, H. H. Lake. —(J. Eberle, Vienna.)
10,074. AERIAL IRON SHIP, A. de Schuttenbach, Paris.
10,075. REGISTRATION of MARINE COMPASSES, J. Lea and G. C. Harvey, London.
10,076. PACKINGS for STEAM JOINTS, &c., W. J. Adams, London.

London. 9,077. MACHINE GUN CARRIAGES, T. Nordenfelt,

12th July, 1884.

1206 July, 1897.
10,078. AMBULANCE CARRIAGES, J. Furley, Ashford.
10,079. COATINGS of METAL, W. A. Thoms and A. J. Large, London.
10,080. Sonium CARBONATE, &c., W. Robinson, Gateshead-on-Tyne.
10,081. LAMP GUARDS, W. H. Freeman, Aston.
10,082. BRONZING and DUSTING PAPER, &c., D. and A. Dodds, Salford.
10,983. FINISHING RINGS, E. Weild, Manchester.
10,084. SUBSTITUTE for HORN, J. Püschner, Bohemia, Austria.

Austria. ,085. Utilising Spent Pickle after Cleaning Iron, AUSTRA. 10,085. UTILISING SPENT PICKLE after CLEANING IRON, T. Bayley, Birmingham. 10,086. POLISHING, &c., COFFEE, A. D. Gordon.-(J. Smont, Guatemata.) 10,087. SPIKES for BOOTS and SHOES, B. Rawlings,

10,088. REPRODUCTION at a DISTANCE of CHARACTERS,

10,088. KEPRODUCTION at a DISTANCE OF CHARACTERS, &C., T. TUbini, London.
10,089. SCREW PROPELLER SHAFT and CRANK, C. L. H. Lammers, Gosforth.
10,090. FURNACES for MAKING GAS, W. P. Thompson.
- (Stettiner Chamotte Fabrik Action Gesellschaft vormals Didler, Germany.)

- (Steturer Cuannets and Didier, Germany.) 10,091. HEELS for BOOTS, T. C. Ferrand, Leeds. 10,092. CONNECTING TRACES to CARRIAGES, C. Colom-bati, London. 10,093. REAPING MACHINES, D. Wyllie, Ayr. 10,094. CLOCK for VKHICLES, A. Bourgeois-Weber, Switzerland.

10,095. BILLIARD, &c., TABLES and BALLS, J. Honeyman, Glasgow. 10,096. EXTRACTING LIQUID from SUBSTANCES, G. B.

BOOMEY, New York. 10,097. DUPLEX STEAM ENGINES, M. W. Hall, Brooklyn. 10,098. SEPARATING SEMOLINA, W. L. Wise.—(C. Seck,

10,090. GEVEN ALLEY DESCRIPTION OF A CONTROL OF A CONTROL

Dreach, Soccong.)
10,099. GUEE or SIZE, W. R. Lake.—(V. Ducancel and E. Fortin, Reims, France.)
10,100. EXTRACTING GRAPES, &c., E. H. Newby.—(E. Thiebaut, Montdidier, France.)
10,101. BREECH-LOADING SMALL-ARMS, H. Tolley, Bir-mingham.
10,02. SCREENING CORN, &c., W. Rainforth, sen., W. Rainforth, Jun., and H. S. Rainforth, London.
10,103. CENTRIFUGAL MACHINES, C. A. Day.—(D. M. Weston, Boston, U.S.)
10,104. CLOSING the HOLES of CESS PITS, &c., T. Dur-rans, London.
10,105. ATACHMENT for BUILDERS' and JOINERS' SQUARES, A. M. Clark.—(A. G. Olson and J. McFar-lane, St. Louis, U.S.)
10,105. MENTING COLOURS, S. P. Wilding, London.
10,107. MEASURING WATEB, &c., W. R. Lake.—(A. C. Spanner, Vienna.)
14th July. 1881.

14th July, 1884.

10,108. PROPULSION of AIR, &c., C. W. Crossley,

Londo

ford.

Alnwick

London

Clark.-(P. Pinede, Paris.)

checking the arrival and departure.

London. 10,109. DRAUGHT BEVERAGES, W. A. How, Ongar. 19,110. SHIRTS, &c., W. W. Murray, Manchester, and J. Lorrimer, Aylestone. 10,111. LAST STANDS, T. H. and B. Hartley, Accrington. 10,112. CALCULATIONS of NAVIGATION, J. Silversides, Grimsby, W. Dudding and H. Megson, Newport. 10,113. FENCE SPIRES, G. Whitford, London. 10,114. WASHING MACHINES, H. Hirst, Accrington. 10,115. VENTILATING RAILWAY WAGON, J. Kerr, Lon-don.

10,116. AUTOMATIC RAILWAY JOINT, J. Kerr, London.

10,116. AUTOMATIC RAILWAY JOINT, J. Kerr, London.
10,117. TEAT, J. HOWELS, Neath.
10,118. SADDLE ATTACHMENTS, S. Littlejohns, London.
10,119. GAS REGULATORS, F. Ochlmann, Berlin.
10,120. TOOLS for BOTTLE NECKS, J. T. Creasy, London.
10,121. STOVE BRUSHES, H. J. Allison.—(A. B. Arper, Oakland, U.S.)
10,122. DEFARTING SWITCHES, E. Capitaine, London.— (C. Ammon, Germany.)
10,123. SHAFT TUG, T. W. Hill, Hendon.
10,124. BICYCLES, & C., W. Cheesman, London.
10,125. SLOW COMBUSTION STOVES, E. Jagger, Oldham.
10,126. SHARPENING RAZORS, & C., H. Bezer, Tedding-ton.

10,127. MARKING DEVICE, A. J. Boult.- (V. Clairdent-Genot, France.) 10,128. PISTONS for BLOWERS, T. H. Thwaites, Brad-

10,129. LIGHTING VEHICLES by ELECTRICITY, B. P. Stockman, London. 10,130. WATERPROOF ULSTER, &c., J. de C. Paynter,

JUNES, JUNES, JUNES, JUNES, A. E. Westhorp, London. 10,132. OLLECTING DEBRIS, A. E. Westhorp, London. 10,133. MENORANDUM, &C., H. P. Lavender, Wolver-hometer, Wolver-hometer, Wolver-hometer, Wolver-

10,134. SLIDE VALVES, J. P. Goulson and A. Spiel, Berlin. 10,135. PROPELLING BOATS, &c., E. Mannion, de Beau-

10,136. REMOVING WOOL from SKINS, E. Belknap,

London. 10,137. SECURING RUDDERS, W. Abbott, Richmond. 10,138. HVDRATE OF STRONIA from SULPHATE OF STRONIA, C. M. Pielsticker, London. 10,139. SETTING TYPES, H. Springman.—(C. G. Fischer and A. von Langen, Prussia.)—12th April, 1884. 10,140. THERMOMETER, J. Husband, Lucknow. 10,141. BICYCLES, E. R. Settle, London. 10,142. FASTENING for HEELS of BOOTS, &c., A. M. Clark.—(P. Finde, Paria)

ABSTRACTS OF SPECIFICATIONS.

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

4664. CHECKING THE ARRIVAL AND DEPARTURE OF EMPLOYES, W. T. G. Ellis, Glasgow.--1st October, 1883. 6d. Relates to a clockwork mechanism for automatically

hampton, 134. SLIDE VALVES, J. P. Goulson and A. Spiel,

55

5386. MANUFACTURE OF COMBS, W. H. Spence, London. --15th November, 1883.-(A communication from L. M. Chorier, Paris.) 6d. Relates to the construction of a machine for cutting

16 teeth.
5389. STEERING GEAR FOR SHIPS, W. H. Harfield, London, and G. T. Burden, Neucostle-on-Tyne, – 15th November, 1883. 6d.
The object is to provide a steam-steering gear, which in the event of the steam supply being inadvertently or otherwise shut off, will automatically enable the steering gear to be worked by hand.

steering gear to be worked by hand.
5401. CUTTING NAILS AND SPRIGS, G. Williamson, Leeds.—15th November, 1883. 6d.
Consists partly in the use in conjunction with a rest cutter, of a wheel or disc armed with cutters and caused to rotate, the arrangement being such that as each cutter, a nail or sprig will be cut from a strip of metal fixed thereto.

5535. TELEGRAPHIC RELAYS AND REPEATERS, J. H.

5535. TELEGRAPHIC RELAYS AND REPEATERS, J. H. Johnson, London.-27th November, 1883.-(A com-munication from J. A. Maloney and G. W. Cooper, Washington, U.S.) 6d. The object is to obtain a relay which shall be very sensible to weak currents. The electro-magnet has legs composed of bundles of soft iron wire, one being provided with a coil wound in steps so as to gradually reduce the mass of wire in the direction of the neutral point. The other leg is bare and placed in close proximity to the covered leg.

5549. LOOMS, R. Hall, Bury.-27th November, 1883. 40. Relates to the construction of a shuttle guard or apparatus to prevent the shuttle from flying out of

5552. SYPHON-BOTTLE, H. H. Lake, London.-27th November, 1883.-(A communication from La Société J. Vidie et fils, Pantin, France.)-(Not proceeded with.) 4d. The outer surface of the bottle is smooth, whilst the internal surface is polygonal in transverse section.

Section. 5553. TREATMENT OF MIXED FABRICS TO OBTAIN ANIMAL FIBRE, &C., THEREFROM, S. Pitt, Sutton. – 27th November, 1883. – (A communication from Madame Robert, Iseron, France.) 4d. Relates to submitting the fabrics to the action of a boiling bath composed of sulphuric acid and caustic soda, followed by washing in water either pure or slightly alkaline.

5554. MANUFACTURE OF TEXTILE OR OTHER FABRICS

5554. MANURACTURE OF TEXTILE OR OTHER FABRICS COATED WITH XVLONITE, PYROXYLINE, &C., H. H. Lake, London,--27th November, 1883.-(A communi-cation from J. B. Edson, Adams, U.S.) 8d. Relates to the method of coating substances with xylonite or its pyroxyline equivalent, which method consists in introducing a thin sheet of the xylonite and a sheet of the material to be coated between gradually advancing surfaces, slightly dissolving the contact side of the xylonite and then compressing the sheets between the gradually advancing surfaces.

5555. UMBRELLAS AND PARASOLS, J. H. Johnson, London.-28th November, 1888.-(A communication from J. N. Coby, New London, U.S.) 6d. The object is to enable the umbrella or parasol to be

5556. DRESSING FLOUR, &c., G. C. F. P. Janssen, Hamburg.-28th November, 1883.-(Not proceeded with.) 2d.

with.) 2a, The object is d draw the air required for sifting the meal from the dressing-box, thus causing a permanent or continuous circulation of the same air through the

5557. OPENING AND DISCHARGING INTERNALLY STOP-5557. OPENING AND DISCHARGING INTERNALLY STOP-PERED BOTLES CONTAINING AREARED LIQUIDS, R. Swales and W. P. Cherry, Hull.—28th November, 1883.—(Not proceeded with.) 2d. The object is to open and discharge internally stoppered bottles without waste.

5558. CUTTING AND DRESSING MARBLE, &c., W. H.

5558. CUTTING AND DRESSING MARBLE, &C., W. H. Burke, London.-28th November, 1883.-(A commu-nication from Messrs. Puissant fries, Belgium.) 6d. The table to receive the stone to be dressed is actuated by a screw, and has a quick return imparted to it, the speed during the working stroke being capable of variation as the stone is presented to the action of a series of cutters rotating round a fixed axis, or the stone may be held stationary while the cutters descend for the purpose of forming mouldings at a single passage of the cutter on adjacent sides or edges of a block or slab. 5559. LAMPS. G. Wood. Warrington -28th Narrowher

5559. LAMPS, G. Wood, Warrington.-28th November, 1883. 6d.

Consists principally in manufacturing shades or lanterns from pressed glass with a smooth or plain surface outside, and of a prismatic form inside.

5560. TRACTION ENGINES, W. Wilkinson, Wigan.-28th November, 1883. 6d.

28th November, 1883. 6d. Relates principally to the arrangement of driving gear, the construction of boiler, and the construction of the superheater.

5561. KNITTING SELVAGES OF PILE FABRICS IN LOOMS, S. C. Lister and J. Reixach, Bradford. - 28th November, 1883. 8d.
 Relates to fastening or knitting the inner selvages of two or more pieces of double pile fabrics, woven face to face at one operation, in a power loom, with one or more shuttles thrown simultaneously.

5564. REDUCTION OF IRON AND OTHER ORES, A. M. Clark, London.-28th November, 1883.-(A communi-cation from J. B. O. Thieblemont, Paris.) 6d. The object is the reduction of ores, such as those of

The object is the reduction of ores, such as those of iron, by means of hydrogenised and carburetted gases, either together or separately, at a more or less elevated temperature, without bringing the ore into contact with solid fuel, whereby the iron alone is reduced and the silicon, and more particularly the phosphorus, remain unreduced and separate from the iron. The product obtained is a finely divided spongy iron which is readily oxidisable, but is constantly maintained in a reducing atmosphere or in baths that allow it to agglomerate or melt without permitting it to become oxidised, and to be afterwards made into iron or steel.

5566. SHUTTLE TONGUES, W. Carr, Bury .- 29th November, 1883.—(Not proceeded with.) 2d. Relates to the construction of the pegs or tongues of shuttles employed in looms for weaving, the object being to facilitate the introduction of the same into the cop of weft, and to hold the latter more securely

5567. METALLIC BOSSES FOR CARRIAGE WHEELS, H. J.

3501. meratic Bosses for CARRING WHEELS, H. J. Haddan, London.—29th November, 1883.—(A commu-nication from J. J. Schmidt, Erfurt.) 2d. The object is to relieve the axle-boxes or bearings of thrust in the direction of their axis.

5568. MANUFACTURE OF BESSEMER METAL, H. D. Pochin, London.-29th November, 1883. 6d. Consists in the use of chromate of iron (crome ore)

as a hing.
5570. GAS MOTOR ENGINES, T. M. Williamson, J. Malam, and W. A. Ireland, Southport.-29th Novem-ber, 1888.-(Not proceeded with.) 2d. Two cylinders are placed side by side, and in one the oharge is fired, while the other is the exhaust cylinder into which the products of combustion pass.

5571. BLOWING AND MOULDING GLASS BY MEANS OF

5071. BLOWING AND MOULDING GLASS BY MEANS OF COMPRESSED AIR, A. M. Clark, London.-29th No-vember, 1883.-(A communication from La Société Appert frères, Paris.) 1s. 4d. The objects are to enable compressed air to be me-chanically applied for blowing and moulding glass articles, and also to utilise the expansion of the escap-ing compressed air for cooling the glass in course of manufacture, and the moulds employed.

when in place.

as a lining.

oparatus, whereby a very strong current of air oplied without loss of material.

used as a cane when occasion requires.

the teeth.

the shed.

the interest section.

apparatus,

Gravesend. Gravesend. 9965. PAPER TUBES for CIGARS, J. Ploy, Linz. 9966. ADJUSTING SHAFT PEDESTALS, &c., A. E. and H. M. Butler, Kirkstall. 9967. SHEAF-BINDING MACHINES, J. Howard and E. T. Bousfield, Bedford.

BOUSHEIG, BEGIOFG. 9968, METALLIC PACKING FOR PISTON ROD STUFFING-BOXES, W. R. Lake.-(W. H. Jacobs, Netherlands.) 9969, ANTI-MAGNETIC SHIELDS FOR WATCHES, C. K. Giles, U.S. 0020. T.

9970. TENSION for LOOM BEAMS, J. Imray.-(P. Paris,

9970. TENSION for LOOM BEAMS, J. IMRAY.—(P. Paris, France.)
9971. BICYCLES, A. M. Clark.—(W. Clemson, U.S.)
9972. RAISING WINDOWS OF RAILWAY CARRIAGES, H. E. Winter, J. L. Mérigot, and W. Frost, London.
9973. SOCKET PIPE JOINTS, W. H. Haley, Bradford.
9974. STEAM GEAR for WINCHES, F. H. LIVENS, Lincoln.
9975. SEPARATING GOLD from AURIFEROUS QUARTZ, B. F. Atkinson, London.
9976. SECRET LOCKS, J. H. Johnson.—(Messieurs Farielé and Co. and M. M. F. Moulin, Paris.)
9977. FOLDING BEDS, D. J. POWETS, U.S.
9978. ELECTRICAL SELF-REGISTERING MONEY TILLS, B. W. Webb, LONDON.

9978. ELECTRICAL SELF-REDISTERIST MONEY TILLS, D. W. Webb, London.
9979. WRINGING CLOTHES, J. Ireland, Dundee.
9980. WHEELED VEHICLES, W. Buskin, New Zealand.
9981. METALLIC PACKING for GLANDS of ENGINES, J. Tomlinson, jun., and G. Ingram, London.
9982. TRANSFORMING ELECTRIC CURRENTS, C. D. Abel. -(C. Zipernowsky and M. Déri, Austria.)

10th July, 1884.

9983. STEAMSHIP PROPELLERS, G. E. Serjent, Newport. 9984. "CEE" Springs for Carriages, J. C. Windover,

9984. "CE" SPRINGS for CARRIAGES, J. C. Windover, Huntingdon.
9985. SEWISG MACHINES, W. P. Thompson.-(The Mortey Sewing Machine Company.)
9986. APPARATUS for PAINTING, A. R. Strachan, Gates-head-upon-Tyne.
9987. CYCLOMETERS, C. V. BOYS, London.
9988. EFFECTING EFFICIENT CONSUMPTION of FUEL, E. Entwistle, Blackpool.
9989. SEEDDING MOTION employed in LOOMS, C. Bed-ford, Birstall.
9990. STUDE and SOLITAIRES, R. Hall and E. Richard-son, Birmingham.
9991. PIANOFORTE ACTIONS, T. TURNER, Bristol.
9992. SCALES for POCKET and PEN-KNIVES, J. Dawson, Sheffield.
9936. CUITING SLATE, S. W. Davids and C. H. Rees, One and Solid Science Scie

9993. CUTTING SLATE, S. W. Davids and C. H. Rees, Carnarvon.

Oarharvon. 9994. Boring, &c., Metals, W. W. Hulse, Salford. 9995. VELOCIPEDES, W. Wright, Droylsden. 9996. MECHANICAL MUSICAL INSTRUMENTS, W. Britain,

jun., London. 9997. VINEGAR, W. H. Perry and J. O. Boulton, Nottingham 9998. FIRE-LIGHTING MACHINES, J. Sainty, East Derehan

9999, WOOD FIELD GATES and SHEEP HURDLES, J 9999. WOOD FIELD GATES and SHEEP HURDLES, J. Sainty, East Dereham.
10,000. SHEEP DIPPER, T. Blake, Ross.
10,001. POSTAL ENVELOPES, T. Field, London.
10,002. ELECTRIC BATTERIES, J. H. Johnson.—(P. G. Skrivanov, Paris.)
10,003. FUENACES, I. S. M'DOUGAI, Chadderton.
10,004. PREPARING, &C., LIME for AGRICULTURAL PURPOSES, I. Brown, Edinburgh.
10,005. VENTILATING BOOTS and SHOES, M. A. Israel, London.

London. 10,006. BREECH FASTENERS of FIRE-ARMS, H. Webley, Birmingham.

10,007. REDUCING WHEAT and other SEEDS, T. Sheldon, Oxford. 10,008. CRUME SHOVEL and BRUSH, W. Spurrier, Birmingham. J. Smith Hockley.

LOUNC. CRUME SHOVEL and BRUSH, W. Spurrier, Birmingham.
10,009. BUCKLES, J. Smith, Hockley.
10,010. BREAD, &C., H. W. Hart, London.
10,011. SCREW PROPELLERS, W. H. Bradford, London.
10,012. HEATING, &C., WATER, A. J. Boult. - (K. Wegener and H. Passburg, Moscow.)
10,013. PARCEL-ROLDER, T. McCulloch, Leyton.
10,014. WIND GUARD OF CHIMNEY-TOP, H. K. Bromhead, Glasgow.
10,015. DISINFECTANTS, H. B. Condy, Battersea.
10,016. PENCIL-HOLDERS, H. J. Haddan. - (K. Strössenreuther, Nürnberg.)
10,017. PROPELLING BOATS by MANUAL POWER, J. Barrett, London.
10,018. PAYEMENTS OF COVERINGS for STREETS, &C., H. Saunders, Brighton.

Saunders, Brighton. 10,019. BISCUITS, &c., J. W. Hoffman and P. Erbach, London. LORION. 10,020. SECURING ARTICLES IN TRAVELLING BAGS, &c., C. D. Abel.—(La Société Veuve Paul Sormani et fils)

C. D. Abel.—(La Société Veuve Paul Sormani et Jus, Paris.) 10,021. TELEPHONIC, &C., CONDUCTORS, G. H. Smith,

Martock,
10,022. LUBRICATORS, G. F. Redfern.—(P. Barclay, East Boston, U.S.)
10,023. KILLING the GERM of WOOLSORTER'S DISEASE, dc., E. F. L. Linck, Bradford.
10,024. ATTACHING ROPE STOPPERS to a SHIP'S DECK, W. H. Harfield, London.
10,025. PUDDLING FURNACES, J. A. Crawford, Northum-berland.
10,026. COUPLING PUNS OF KEYS, W. H. Deven During

10,026. COUPLING PINS OF KEYS, W. H. Benson, Bristol, 10,027. SECURING the TIRES of WHEELS, W. H. Benson,

Bristol. 10,028. SEALING LETTERS, &c., A. M. Clark.-(C. Blan

(an, Paris.)
 10,029. PLATE CHANGING APPARATUS for PHOTOGRAPHIC CAMERAS, J. Brown and F. Bishop, London.

### 11th July, 1884.

10,030. TEMPLES EMPLOYED in LOOMS, J. Haydock,

10,030. TEMPLES EMPLOYED in LOOMS, J. Haydock, Blackburn.
10,031. BICYCLES, &C., A. C. Robinson, Burnage.
10,032. WINDOW VENTILATION without DRAUGHT, W. Fullwood, Cork.
10,038. PORTRAIT HOLDER, W. H. Richards and W. D. Wilkinson, Birmingham.
10,034. CORKS for STOPPING BOTTLES, G. Hurdle, Southampton.
10,035. DEASTING TOWN REFUGE B. D. Healey, Ligne.

Southampton. 10,035. TREATING TOWN REFUSE, B. D. Healey, Liver-pool, and B. H. Thwaite, St. Neots. 10,036. TRAM RAILS, P. Kirk, Banfield. 10,037. BEDS of BILLIARD, &C., TAELES, J. Marsden, Liverpool.

Liverpool. AMMOCKS, R. H. Hol

10,038. HAMMOCES, R. H. Holman and W. Cariton, Grantham.
10,039. LACING BOOTS, C. B. Voisey, London.
10,040. SAVING WASTE in MEASURING SPIRITS, H. E. Phillipson, Dublin.
10,041. UMBRELLA PROTECTOR, A. Moxley, Hull.
10,042. DYEING, W. D. Thornton, Bradford.
10,043. VELOCIPEDES, R. C. Thompson, London.
10,044. CONDENSING, &C., WATER, H. Hocking, Liver-pool.

10,045. CURTAIN HOLDER, G. Parsons, Birmingham.
 10,045. CURTAIN HOLDER, G. Parsons, Birmingham.
 10,046. VARIABLE DRIVING GEAR for VELOCIPEDES, M. McCarthy, London.
 10,047. THE URANOGRAPHE, J. P. Stroesser, East Dulwich.

10,048. CARDING COTTON, W. Macpherson, Manchester. 10,049. Stoves, A. Besson, Paris. 10,050. CANDLE CLAMPS, J. Berliner and H. Ziegler,

Germany.
 10,061. CRICKET BATS, G. P. Milnes, G. J. and H. E. Hildrid, Boston.
 10,052. DISENSAGING SHIPS' BOATS, W. F. Rees, Greenwich.

WILL.
 10,053. INCREASING COMBUSTION IN TUBULAR STEAM BOILERS, J. TODIN, Poplar.
 10,054. PROTECTING, &C., WIRES, A. Parkes, West Dulwich.

5572. CASTING STEEL INGOTS, J. G. Poole, Glasgow.-29th November, 1883.-(Not proceeded with.) 2d. The object is the production of steel ingots having a core or an inner layer of comparatively soft and ductile steel, and an external coating or layer of a harder variety of steel. 5578. PERAMBULATORS, W. Dawson, Leeds. - 29th

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**DOTA:** FREAMBULATORS, W. Davson, Lecas. — 29th November, 1883. 6d. The vehicle is supported by two central wheels on the same shaft, while a smaller wheel is provided at each end, and is arranged to clear the ground when the vehicle is in motion, running on the central wheels. A brake is connected to the handle and is applied, when the hand is removed therefrom. **5574**. Rows no **P** harder **Poers** for **T** S. Suks

5574. BOXES FOR PARCEL POST, &C., T. S. Sykes, Liverpool.-29th November, 1883.-(Not proceeded with.) 2d

Relates to the construction of a folding box. 5575. TRICYCLES, H. Knight, London.-29th November, 1883.-(Not proceeded with.) 2d. Relates to the steering gear.

5576. PROTECTING BUILDINGS, CLOTHING, OR OTHER ARTICLES FROM HEAT, &c., T. H. Fielding and A. N. Johnson, New South Wales.-29th November, 1883. -(Not proceeded with.) 2d.
Consists in the application of a thin bright metallic coating or covering to the article to be protected.
5577. MANUFACTURE OF COKE FOR OBTAINING PRO-DUCTS THEREFROM, &c. A. B. COVERN, Spennimoor.

DUTS THEREFROM, &C., A. B. Covan, Spennymoor, DUTS THEREFROM, &C., A. B. Covan, Spennymoor, Durham.—29th November, 1883. 6d. Consists partly in connection with coke ovens worked by the Jameson process of the employment of steam applied to the resulting gases. Other improve-ments are described.

5578. CASKS ON VESSELS, F. C. Glaser, Berlin.—30th November, 1883.—(A communication from F. West-phal, Prussia.) 8d. Relates to the manufacture of air-tight and water-tight casks of paper.

5579. CHECKING APPARATUS FOR TRAMWAY CARS, &c.,

DDYA. CHECKING APPARATUS FOR TRAMWAY CARS, EC., A. Johnston, Birkenhead. - Soth November, 1883.-(Not proceeded with.) 2d. Two rollers deliver a ticket from a roll to a slit in the ease of the apparatus, each ticket being cut off by a pair of scissors actuated at each revolution of the rollers. A counting apparatus and a bell are also actuated as each ticket issues.

actuated as each ticket issues.
5580. COUPLINGS FOR TRAMWAY VEHICLES, &c., C. E. Newill, Rochdale.—30th November, 1883.—(Not proceeded with.) 2d.
A double hook has a shank secured in a slot in a buffer head pivotted to one vehicle, and the other vehicle has a buffer head with a pin through it to engage the lower part of the double hook, while a link pivotted to the upper part of this buffer head engages the upper part of the double hook.
5581 FUNETURE DEFERTION FOR THE DEFERTION FOR THE DEFERTION FOR THE DEFERTION FOR THE DEFENSE TO T

the upper part of the double hook. 5581. FINISHING TEXTILE FARENCS, F. Dehaitre, Paris. -30th November, 1883. 6d. This relates to the combination of machines for finishing fabrics made of wool mixed with cotton by a continuous operation, and comprises a calendering machine, a hot chamber with a fan, a spreading machine, a drying cylinder heated by steam and pro-vided with an endless felt, and an air cooler or blower. These machines can be followed by a teasling machine, a folding machine, a pressing machine, or other machine used in cloth works.

5582. MANUFACTURE OF SALICYLIC ACID, T. Kempf, Berlin.-30th November, 1883.-(Not proceeded with.)

2d. Diaphenyl carbonate and phenolsodium are heated in a vessel and stirred for about six hours at from 320 deg. to 338 deg. Fah., and the salicylic acid is sepa-rated from the product in the ordinary manner, the sodium salicylate of sodium being dissolved in water, and the salicylic acid being separated by means of hydrochlore acid.

5583. VELOCIPEDES, T. Humber, Beeston.-30th Novem

ber, 1883. 6d. The object is to enable the "Humber" and analogous tricycles to accommodate two or more persons, and it consists in attaching a framework to the front part of the tricycle and securing the seat or seats and pedals thereon, a small wheel being secured to the bottom, a short distance above the ground, to prevent overbalancing.

5585. WINDOW SASHES AND SASH FRAMES, W. J. Penny, London.—30th November, 1883. 6d. This relates to the construction and arrangement of window sashes, so as to enable them to be turned inwards for cleaning and repairs. Runners are placed between the sashes and frames.

finwards for cleaning and repairs. Runners are placed between the sashes and frames.
5586. DISENGALING SHIPS FROM THEIR MOORINGS, G. H. Levis, Southampton...-30th November, 1883.-(Not proceeded with.) 2d.
The object is to enable a cable to be let go suddenly, no matter what strain is on it, and it consists of a double hook formed with claws, the bottom ones of which can be made to fall down and release the cable when actuated by a tripping line.
5587. WORKING AUDIBLE FOG SIGNLS, J. R. Wigham, Dablin...-30th November, 1883. 4d.
This relates to an arrangement of gas motor engine, with air-compressing pump for working fog signals, such as sirens or fog horns.
5588. CIRCULAR KNITING MACHINES, &c., W. R. Lake, London.- 30th November, 1883.-(A communication from A. Bonamy, France.) 6d.
The inventor claims, First, the application at the head of the cylinders of a circular knitting machine used for the production of ribbed or plain work, of participating to be effected without tension upon the fabric, the upper part of the machine for products obtained by the improved machines.
5589. VELOURDER and work is secondly, the application of the described mchanism to the making of folded hems of any desired length; and Thirdly, the novel products obtained by the improved machines.

5589. VELOCIPEDES, &c., S. Hall, London.—30th No-vember, 1883. 1s. 2d.
The objects are to lessen the vibrations imparted to the riders of velocipedes by the employment of helical springs, and also to provide effective means for apply-ing the brakes and for propelling the velocipede.
5590. KNITTING MACHINES, E. Educards, London.—30th November. 1883. - 4 comveniention from L. Besi

November, 1883.—(A communication from L. Bosi, Italy.) 6d. The inventor claims the method of making the The inventor claims the method of making the needle carriers in separate pieces; the method of sepa-rating and bringing together the rows of needles; the method of constructing and operating the regulator or displacer; the method of arranging and operating two or more thread carriers upon the same machine.

5591. APPARATUS FOR GAUGING, &c., CASES AND OTHER VESSELS, J. C. Stevenson, Liverpool. -30th November, 1883.—(Not proceeded with.) 2d. The apparatus consists in means for gauging and indicating the specific gravities of the contents of casks or other vessels by the use of floats acting in combination with pointers moving over a dial or scale.

5594. Wool-washing Machines, J. Campbell, Brad-ford.—Ist December, 1883. 4d. A thin plate or blade is caused to press against the bottom squeezing roller of the washing machine, so as to maintain a smooth surface and prevent damage to the wrapping round the roller and also the accumula-tion of wool thereon.

100 of wool thereon.
5595. MANUFACTURE OF STEEL AND IRON, E. Edmunds, Pontnewydd.—1st December, 1883.—(Not proceeded with.) 2d.
A "Bessemer" converter is fixed, and is provided with tuyeres at the lower part, the back of each being fitted with a blast box, and provided with means to regulate the blast, such means consisting in a disc valve and lever capable of being worked by hand or power. regulate valve an power.

5596. VENTILATING APPARATUS, G. Greig, Harvieston, N.B.-1st December, 1883.—(Not proceeded with.) 2d A central aperture is formed in the ceiling of the apartment, and a deflecting plate arranged to spread air entering by the aperture in a horizontal direction, the air preferably being caused to enter by a fan or blower. A central tube may be arranged in a sun burner to carry off the products of combustion and foul air from the apartment. 5597 Hoop Stutes and Bustles. M. Rozenslock New

5597. Hoop SKIRTS AND BUSTLES, M. Rosenstock, New York.—1st December, 1883.—(Not proceeded with.)2d. The hoop skirt or bustle is made from a continuous wire

5598. OPENING, STRAIGHTENING, OB COMBING DYED HANKS OF YARN, H. A. Crowther and J. Moorhouse, Huddergield.,—1st December, 1883.—(Not proceeded

with.) 2d. Consists in combing the threads forming the hank, either by means of a vibrating comb or by passing the threads through or between a stationary comb or gill. 5599. INDICATING THE POWER OF STRAM ENGINES, &c., T. H. Blamires, Huddersfield.—Ist December, 1883.— (Not proceeded with.) 2d. Refers to apparatus for indicating the amount of power of steam or other engines, and in recording the variation of the temperature of steam at the time it enters and leaves the cylinder or cylinders of steam engines. 5600. Supersymptotic

5600. SUBSTITUTES FOR STONE, BRICK, &C., G. F. Red-fern, London.--1st December, 1883.-(A communica-tion from J. Stickle, Denver, U.S.)-(Not proceeded with.) 2d.
 Relates to utilising scoria, the refuse produced from smelting mineral ores.
 5601. BUYOLES J. G. Pasker, London , Let Turning

5601. BICYCLES, J. G. Parker, London.—1st December, 1883.—(Not proceeded with.) 2d. Relates to a means of preventing accidents, and to the driving gear.

166 driving genr.
5602. WORKING RAILWAY SWITCHES, A. M. Clark, London.—1st December, 1883.—(A communication from the Railway Speciality Manufacturing Co., New York.) 6d.
This relates to means for operating switches which when closed are held in place by a spring, so that a train can pass through a closed switch, which will then again close automatically, leaving the main line always open.

5603. FOLDING CASES FOR FLOOR-CLOTH ROLLS, &C., C. Mace, London.—1st December, 1883.—(Not proceeded with.) 2d. The case consists of a number of laths of wood, which are mounted on an outer canvas or other flexible and by preference waterproof covering.

5605. MANUFACTURE OF SODA, W. Weldon, Burstow.-3rd December, 1883. 4d. This relates to the treatment of sulphate of soda by ammonia and carbonic acid, or by bicarbonate of

ammonia.

ammonia. 5606. HAULING NETS, &c., G. Souter, Elgin, N.B.—3ra December, 1833.—(Not proceeded with.) 2d. Three sheave pulleys are mounted on a frame, the centre one being below the others. These sheaves are keyed upon the ends of their spindles, and the gear wheels are arranged close behind the bushes of the spindles. Another frame is attached behind the wheels, which are thus entirely enclosed.

5606. SHAFT COUPLINGS, L. Sterne, London.—1st De-cember, 1883.—(Not proceeded with.) 2d. Relates to the arrangement of flexible couplings.

5609. DRVING AND AIRING BED CLOTHES, &c., J. W., Hawkesworth, Stokeford.—3rd December, 1883.—(Not proceeded with.) 2d. This relates to a frame capable of receiving hot embers or a suitable heated material, and serving to dry and air bed clothes.

dry and air bed clothes. 5610. TRICYCLES, &c., W. J. Lloyd, Harborne.—3rd December, 1883. 6d. This relates to the construction of the axles of tricycles driven by means of a middle chain wheel, and it consists in forming the axle tubular and con-necting the wheel thereto by wire ribs forming two cones, of each of which one end of the axle is the apex, and the wheel forms the base. The chain wheel is of special construction. 5611. INSULATORS, G. W. Haanaan, London.—3rd

5611. INSULATORS, G. W. Haanam, London.—3rd December, 1883.—(Not proceeded with.) 2d. The interior surface has an annular recess to receive a body of parafilme. Immediately below this is an annular shield and an upwardly projecting recess.

5612. Thiovers, &c., E. R. Settle, Coventry.—3rd December, 1883. 6d. Consists in applying worm gear, so that both parallel or main wheels run at the same speed when the velocipede is travelling straight (the said gear forming a lock), and when travelling in a curve or circle the worm gear allowing the loose wheel to run at a different speed to the fixed wheel.

as a difference speed to the fixed wheel.
5614. PRESERVING, STORING, AND AERATING LAGER AND LIKE BEERS, W. Aubert, jun., London.—Srd December, 1883.—(Not proceeded with.) 2d. Relates to the means of forcing carbonic acid or other gas or air under pressure, so as to charge the liquid.

5615.

Handi, FORTABLE ELECTRIC LIGHT APPARATUS, H. J. Haddan, London.—3rd December, 1883.—(A com-munication from J. Beduwé, Liège.)—(Not proceeded with.) 2d. This relates to an engine, boiler, electric generator, and a hydraulic tubular mast mounted on wheels.

and a hydraunic rubular mast mounted on wheels. 5616. PRODUCTION OF COLOURS, MARKS, OR DESIONS IN MARELE, WOOD, &C., G. Hand-Smith, London.— 3rd December, 1888. 8d. The colours are applied to the surfaces to be orna-mented, which are then subjected to the action of vapour in a closed chamber, the temperature of such vapour being subsequently reduced. 5617. DRIVING WHEELS OF BOAD LOCOMOTIVE

5617. DRIVING WHEELS OF ROAD LOCOMOTIVE ENGINES, T. L. Aveling, Rochester.—3rd December, 1883. 6d. Relates to the construction of wheels with inner rings or tires suspended within an outer ring or tire by coiled springs which are always in compression.

by could springs which are always in compression. 5618. FARTENERS FOR CLOTHING, &c., W. P. Thompson, London.—3rd December, 1883.—(A communication from Messre, de Saint Denis and Co., Paris.) 6d. This relates to a hook-button for use without buttonholes, and having a shank forming the hook attached near to the edge, the opposite part of the button bearing a loop or catch to be sown to the one side of the garment, the bent shank passing through such earment and catching in a ring or loop attached to the arment and catching in a ring or loop attached to the other side thereof.

other side thereof. 5619. TELEGRAPH AND TELEPHONE WIRES, A. J. Boult, London.—3rd December, 1883.—(A communica-tion from G. Gray, Boston, Mass, U.S.) 4d. This relates to means for lessening the relative con-ductivity of the outer portion or shell of the wire by increasing the density of the central portion or core, and at the same time interrupting the continuity of the shell by spirally grooving or fluting it. 5620. LUBRICATING MECHANISM FOR COLLIERY AND OTHER WAGONS, A. H. Leech and W. Bateson, Wigan. —3rd December, 1883.—(Not proceeded with.) 2d. The inventors use a simple disc with a projecting periphery of india-rubber or other material or com-position unaffected by oil, and of a flexible elastic character.

5621. WOOD PAVEMENT, G. W. von Nauerocki, Berlin.-3rd December, 1888.-(Not proceeded with.) 2d. The wood blocks are joined together by metal strips inserted in grooves formed in the sides of the blocks.

5622. MANUFACTURE OF ARTICLES FROM WOOD PULP, &cc., P. Jensen, London.—Srd December, 1883.—(A communication from A. Anderson, Stockholm.) 6d. Consists in the manufacture of ornamental and other

articles from paper pulp by heavy pressure while employing strong metallic top and bottom mould and a felt or other suitable porcus wad.

JULY 18, 1884.

the other side subjected to steam pressure, and de-vices for transmitting the motion of the piston to the valve and thereby causing the latter to rest on its adjustable bearings, substantially as set forth. The combination, with a slide valve provided with adjust-able rollers, of a piston connected with the valve, and having one side thereof in communication with the exhaust cavity of the valve and its opposite side cone end to the piston, and their opposite ends con-structed and arranged to engage the roller frames and brackets on the valve, substantially as set forth. 300.038. INDEX GAUGE FOR DEILLING MACHINES

300,038. INDEX GAUGE FOR DRILLING MACHINES Albert B. Bean, New Haven, Conn.-Filed December

27th, 1885. Claim.—The combination, with the spindle of a drilling machine, of a sleeve provided with a recess in which a rack is placed, and a pinion lying in said

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recess and meshing into said rack, said pinion being carried upon a shaft to which a pointer or other indicator is attached, as set forth.

indicator is attached, as set forth.
300,095. ELECTRIC LAMP, Mirabeau N. Lynn, Indianapolis, Ind.—Filed August 23rd, 1883.
Claim.—In an electric lamp adapted for using curved carbons, a base supporting an axis, upon which are mounted a pair of arms carrying carbon holders, the arms rotating in opposite direction, and actuated by suitable mechanism through differential gear wheels mounted on a sleeve carrying a face plate, whose movement is adapted to be reversed by a brake actuated by a current of electricity passing through a helix provided with a core connected with the brake mechanism, all combined substantially as described. In an electric lamp, a feeding mechanism operated by

mechanism, all combined substantially as described. In an electric lamp, a feeding mechanism operated by

a mechanical force which exerts a constant and uni-form strain at any point of their movement upon a pair of arms mounted on a common axis, adapted to rotate in opposite directions upon such axis, and carry-ing the carbons, the arms provided with suitable stationary weights, and the upper arm with a mov-able weight, so that a balance is preserved at all times while the lamp is burning, the mechanical force drawing the arms together, in combination with suit-able mechanism actuated by an electric current for separating the arms and reversing the feeding mechan-ism at the proper point to focus the light at one point, substantially as described.

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a feit or other suitable porous wad. 5626. ELECTRO-TELEGRAPHIC SYSTEM PARTICULARLY APPLICABLE TO LONG CABLES, S. Roos, Twrin, Italy.—4th December, 1883. 6d. This relates to an electro-magnetic apparatus for controlling the working of printing instruments, the change of polarity in an oscillating pallet acting in combination with springs, and a local electro-magnet serving to control two clock movements, one set to go faster than the other.

to go faster than the other.
5628. MANUFACTURE OF SALIGYLIC ACID, &c., J. H. Johnson, London.—4th December, 1883.—(A com-munication from 0. Leupoid, Stuttgart.) 4d. Consists in causing alcoholic carbonic eithers to react upon combinations of sodium and phenols or upon a mixture of these combinations with hydrate of soda or an alcoholate of soda.

5630. PENS, W. H. Thomson, London.—4th December, 1883.—(Not proceeded with.) 2d. The object is to produce parallel lines of different shades or different colours by one stroke of the pen.

5631. VALVES OR COCKS, H. F. Hill, Notingham.—4th December, 1883.—(Not proceeded with.) 2d. Relates to improvements in ball and other valves or cocks for measuring, regulating, and supplying steam, water, and other fluid under pressure.

5634. SPRING MATTRESSES, I. Chorlton, Manchester,-4th December, 1883. 6d. This relates to simple means for securing a network of wire to a framework so that it is stretched thereon, and can readily be disconnected and folded up.

5635. PLANOFORTES, E. W. Brinsmead, London, -4th December, 1883.-(Not proceeded with.) 2d. Relates to the system of constructing the wood framing, the iron or steel framing, the sounding boards and the resonators.

5638. AMMETERS, VOLTMETERS, &C., F. V. An London.-4th December, 1883.-(Not proceeded 4d.

This relates to a "universal electricity meter," designed to measure ampères, volts, watts, and ohms. 5639. STUD BUTTON, W. G. Delf, London.—4th December, 1883.—(Not proceeded with.) 2d. The button has a hollow concave base with holes in it, by which it is sewn to the garment.

5641. DECORTICATING RICE, WHEAT, &C., J. H. C. Martin, Walthamstow.—4th December, 1883. 6d. A stome or emery wheel is caused to revolve rapidly in a cylindrical case set at an angle of about 45 deg. in a frame, the lower end having an outlet aperture and regulating slide, and the upper end an inlet aperture. 5643. ROLLING MILLS, C. D. Abel, London.—4th December, 1883.—(A communication from W. Garret)

5643. ROLLING MILLS, C. D. Abel, London.—4th December, 1883.—(A communication from W. Garrett, Beaver Falls, U.S.) 6d. Consists essentially in a rolling mill for rolling wire rods directly from blooms, of the combination of a billet train, a rod train, and an intermediate train having its rolls approximately in line with the last rolls of the billet train and the first rolls of the billet train and the first rolls of the sources being provided between the successive trains for the to-and-fro movements of the metal rod operated on by the rolls.

metal rod operated on by the rolls.
5646. ILLUMINATING BY MEANS OF THE INCANDESENCE oF REFRACTORY SUBSTANCES, W. H. Spence, London. -5th December, 1883.—(A communication from 0. Fahnehjelm, Sweden.) 6d.
A suitable refractory substance is made in the form of small wires or pins fixed in a holder, and can be adjusted and brought to a state of incandescence by subjecting them to the heat of a flame produced by burning "water-gas" in air at the ordinary pressure and under the ordinary conditions of the atmosphere.
5647. SEVING MACHINES H. Lorging Machinescence

5647. SEWING MACHINES, H. Leeming, Manchester.-5th December, 1883. 6d. Relates to means for regulating the speed and the driving of sewing machines.

5648. VELOCIPEDES, J. While and J. Asbury, Coventry. -5th December, 1883. 6d. This relates to an arrangement of gear wheels to enable the speed and power of driving to be varied without changing the speed of rotation of the pedal short

5649. BOOTS AND SHOES, W. H. Stevens, Leicester. -5th December, 1883. -(A communication from W. James, Chicago.) - (Not proceeded with.) 2d. This consists in forming a toe cap for boots and shoes from a continuation of the sole or middle sole, and then sewing it to the upper.

5650. WOOD PAVING, R. Hall and C. C. Woodcock, Leicester.—5th December, 1883. 4d. The blocks are provided with slots, grooves, or recesses, into which concrete or cement is poured.

5653. UMBRELLAS, PARASOLS, OR SUMBRADES, T. Wrench, Liverpool.—5th December, 1883.—(Not pro-ceeded with.) 2d. This relates to means for facilitating the attachment and removal of the covers to and from the frames of umbrellas and parasols.

umbrellas and parasols.
5654. TORFEDO, A. J. Boull, London.-5th December, 1883.-(A communication from E. de Taund and W. de Szigyarto, Vienna.)-(Not proceeded with.) 2d.
This relates to means for causing the torpedo to automatically rise and fall with the tide, so that it always remains submerged at a given depth.
5655. ABDOMINAL BELT, E. Edwards, London.-5th December, 1883.-(A communication from H. L. Mar-quis, Lulle.) 4d.
Relates to belts used to support and keep a con-tinued pressure upon the abdomen, especially for females in pregnancy or as a protection against or remedy for prolapsus uteri.
5656. BROUGHAMS, Earl of Lonsdale.-6th December,

remedy for prolapsus uterl. 5656. BROUGHAMS, *Karl of Lonsdale.*—6th December, 1883.—(Not proceeded with.) 2d. This relates, First, to furnishing sliding windows with spring bolts; Secondly, to constructing the upper or cushioned framework of the seat in two parts, lengthwise, and between each of them and the seat beneath a spring is placed at the back, the front edge of the cushioned part being hinged to the correspond-ing edge of the seat beneath. A cushioned flap or leg rest is hinged in front of each seat.

5657. BICYCLES, TRICYCLES, &C., E. Nunan, London. --6th December, 1883. 6d. Relates to the arrangement of the driving and steering gear.

5658. SHEET OR OTHER PILING FOR MAKING OR PROTECTING FOUNDATIONS BELOW WATER LEVEL, dc., W. P. Thompson, Liverpool.-6th December, 1883.-(A communication from M. F. Paponot, 2000).

Paris.) 6d. Relates to the form given to the piling.

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#### SELECTED AMERICAN PATENTS. From the United States' Patent Office Official Gazette.

299,950. BALANCED SLIDE VALVE, Louis James Massey Boyd, Annapolis, Md.—Filed January 22nd, 1884. Claim.—The combination, with a slide valve pro-vided with adjustable bearings, of a piston connected

with the valve, and having one side thereof in com-munication with the exhaust cavity of the valve and

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