THE FAILURES OF CONTINUOUS BRAKES. In our last impression we dealt at some length with the "Continuous Brakes Return" for the six months ending 31st December, 1882, but we by no means exhausted the subject. These returns show very clearly the nature of the defects to which the various types of continuous brakes are liable, and they consequently supply much valuable instruction. For once the nature of a defect is known, it becomes possible to consider whether it is or is not inherent in the brake to which it applies, and if the answer is in the negative, then steps can be taken with some prospect of success to eliminate it. We propose here, therefore, to consider what the returns of a few of the principal railway companies have to tell us, and it will be seen as we go on that not only are there special defects appertaining to each brake system, but that each railway has also defects peculiar to itself. To what this curious fact

is due it is not easy to say. Beginning with the Great Northern Railway, we find that 406 engines and 1455 coaches, besides other vehicles, are fitted with the vacuum brake. We have already given an extract from the report showing the nature of the defects which made themselves manifest with this brake. It will be seen that they may be classed under two principal heads, namely, the pipes becoming uncoupled, and water or ice collecting in the diaphragms and pipes. It would seem that the brake could be improved by the

introduction of a better sys-tem of coupling; but the freezing up of the pipes is a radical defect, due to the deposit of moisture from the air, and the refrigerating action of a provide the second action of a vacuum. It is not generally known that by reducing one half the pressure of air at 62 deg. in a vessel it can be cooled down to 33 deg. below zero. If the air could not obtain heat from external sources, and if the pressure was reduced to about five pounds on the square inch, the temperature would fall to 81 deg. below zero. In fact, the vacuum brake could not be worked at all unless external heat were available in some form to compensate for the loss of temperature pro-duced by the formation of the vacuum.

The Great Western Railway Company has 421 engines and 1860 coaches, all fitted with the automatic vacuum brake. We are here introduced to a different class of defects. We find few complaints concerning the couplings, but a great many con-cerning the ejectors and the gear under the coaches. For example, on the 4th of July there was a delay of three minutes at Taunton, because of "the brake being tight on the wheels of a van owing to the india-rubber

owing to the india-rubber gland sticking to the piston and preventing the cylinder falling." On the 28th of October, a similar event occurred at Chester, and the train was delayed ten minutes. This brake seems to be peculiarly sensi-tive to dirt, a mere trifle in this way being sufficient to make it useless. Thus on the 31st of August a delay of seven minutes took place at Oxley sidings, "in con-sequence of the brake blocks being tight on the wheels of passenger van No. 390, owing to leakage hole being choked with dirt." Ten delays occurred from this cause, and one of four minutes at Oxford, on the 14th of October, "owing of four minutes at Oxford, on the 14th of October, "owing to a small piece of twine getting into the leakage hole." Here we have a passenger train delayed by a little bit of string. Truly this is an admirable brake. But dirt was not found in the cylinder only. On the 23rd of August a delay of three minutes took place at Albrighton, "in consequence of part of the india-rubber of the ejector check sequence of part of the india-rubber of the ejector check valve of engine No. 1010 getting under the valve and preventing it from closing." Dirt has been defined as "matter in the wrong place," and the india-rubber check valve was evidently in the wrong place at Albrighton. Another delay took place at Goring because "the india-rubber seating of hand valve on engine No. 71 became displaced." Again, a delay of six minutes occurred at Newport on the 8th of September because of "a piece of cinder getting under the relief valve between the vacuum Newport on the stn of September because of "a piece of cinder getting under the relief valve, between the vacuum chambers, and preventing the valve from closing." On October 3rd a second delay took place at Oxley, owing to "the brake going on and stopping the train, owing to dirt getting under the ejector check valve of engine No. 12, and preventing the valve from closing." We fear that what may be called dirt defects are incurable, for unless some device for filtering the air was adopted, it is not easy to see how small quantities of dirt can be excluded. In order to make what we have written intelligible, we give above two engravings, and the following description of the brake issued as a circular to engine drivers and others by the Great Western Company:

the Great western Company :—

 The automatic vacuum brake stops the train by the application of the brake blocks to the tires, in the same way as the ordinary screw brake; but the levers which apply the blocks instead of being worked by a screw are worked by a cylinder and piston, actuated by atmospheric pressure.
 The following are the principal parts of the apparatus on the carriages, the reference letters showing the corresponding parts on the diagrams given below :—
 Continuous pipe A connected by flexible pipes between the carriages. Hollow piston-rod B connected by branch pipe to the continuous pipe. Piston C. Cylinder D capable of moving freely up

and down on the fixed piston, and connected at the bottom with the brake levers E. The piston is packed with an india-rubber ring, so arranged that air can pass freely from the bottom of the cylinder to the top, but not from the top to the bottom. The piston-rod is also packed with an india-rubber ring or gland. Brake off, Fig. 1.—The air is exhausted from the pipes and cylinders by the ejector on the engine when the train is at rest, or by the air-pump on the engine when the train is in motion. The gauges on the engine and in the guards' compartments indi-cate the power available for stopping the train, and should show not less than 20in. nor more than 30in. of vacuum when the train is running. The vacuum being equal on both sides of the piston, the cylinder falls by its own weight and holds the brakes off the wheels. wheels

the cylinder falls by its own weight and holds the brakes off the wheels. Brake on, Fig. 2.—The moment air is admitted into the con-tinuous pipe, whether by the engineman or by the guard, or by the accidental severance of the couplings, it rushes through the con-tinuous pipe down the hollow piston-rod into the upper part of the cylinder, and, pressing the india-rubber packing ring against the sides of the cylinder, seals the vacuum on the under side of the piston, so that the pressure of air in the upper part of the cylinder having nothing to balance it on the other side of the piston thrusts up the cylinder and presses the brake blocks against the wheels. Release of brake.—When the brake has been applied it will remain on, unless released either by the exhaustion of the air from the upper side of the piston. In practice the latter mode is generally found convenient, and a small hole h is provided, through which the air from the upper to the lower part of the cylinder, and gradually release the brake. It is therefore necessary in the event of a train parting for the guard in the rear portion at once to apply the hand brake, and to keep it tightly screwed on until the train is again coupled to the engine. Brake setters.—In order to apply the brakes on each carriage in

twenty-five minutes delay occurred there. Brakework required adjusting." Evidently. Those connected with the triple valve, &c., we gather from the report to have resulted from want of proper supervision, and some com-panies evidently take much better care of their brakes than others

The Westinghouse brake is reported on by several companies. It would appear that nearly all the defects of this brake have now been eliminated but two. The record from all the railway companies using it is the same; it is little more than a list of burst hose. We have not in any previous reports met with anything like this, and it would seem to indicate that the india-rubber hose makers do not supply as good an article as they did. The statement of delays caused by failure of the triple valve, or the pump, or, indeed, anything else, is quite insignificant. We understand that steps have been taken to obviate the bursting of hose in future and if this case he does the the bursting of hose in future, and if this can be done, then the brake may be regarded as probably being as nearly perfect as any brake can be. India-rubber hose can be made which will stand a pressure of 1000 lb. on the square inch, and there ought to be no difficulty in getting a suitable material to stand 100 lb. We understand that the result of recent experience on the Brighton line is satisfactory; and that by raising the hose pipes up between the carriages the defect is obviated.

The second defect in the brake to which we have alluded is the absence of any arrangement for telling the driver of a train whether he is or is

not coupled up properly to his train. For example, on the North British we find that the train from Glasgow to Kinross on the 8th of July overshot Bishoprigg platform. "Brake failed to act owing to rear cock of first vehicle being shut; mismanagement by guard." Here the brakes throughout the rest of the train were isolated from the engine, but the driver did not know this. Again, on the North-Eastern line, we find the 12 noon train from Newcastle to Sunderland, on the 23rd of August, overran the usual stopping place at Gates-head platform. "It was found that the fireman had forgotten to open the cocks on the brake pipes on engine and van when he attached the engine to the train." Such defects as these ought to be

easily overcome. We have we think said enough to prove the proposi-tion with which we began. It will be seen that not only has every type of brake its peculiar failings, but that the nature of the failings varies within certain limits on different roads. The weak place on one line is not the weak place on another, and we think it would be worth while to hunt the cause of this want of uniformity down.

AUTOMATIC VACUUM BRAKE, GREAT WESTERN RAILWAY. the train as nearly as possible at the same moment, it is necessary to admit the air to the continuous pipe in more than one place. For this purpose a valve or brake setter is provided in each guard's compartment, so constructed that any sudden increase of pressure in the pipe instantly causes the valve to open automatically and admit a supply of air, after which it closes again by its own weight. By lifting the handle attached to the brake setter the guard can, on an emergency, apply the brakes on the entire train.

On the Midland Railway the Sanders and Bolitho automatic vacuum brake is fitted to 417 engines and 1616 coaches, and 1134 other vehicles. The defects attending the working of this brake are, on the whole, different from any we have yet noticed. They are of two principal kinds, namely the breaking of the any we have yet noticed. They are of two principal kinds, namely, the breaking of the copper pipe of the small ejector used continuously to maintain a vacuum, and the failure of the automatic valve—the equivalent of the triple railure of the automatic valve—the equivalent of the triple valve of the Westinghouse brake. Ten delays were brought about by the last-mentioned defect and three by the former. There were besides numerous delays caused by the porters coupling up the hose imperfectly. We have said that once the cause of failure is ascertained, it becomes possible to take some steps to remove it; but this brake appears to baffle inquiry in this respect for this brake appears to baffle inquiry in this respect, for no fewer than three delays took place from unex-plained causes. Thus, on November 4th, the 11.22 p.m. plained causes. Thus, on November 4th, the 11.22 p.m. train from Birmingham was delayed two minutes. "Driver said he could not maintain vacuum after leaving Burton. No defect found." The 7.30 a.m. train from Bradford was delayed on the 30th November five minutes at Saltaire and Steeton. "Driver stated he could not retain a full vacuum. No defect found." On the 21st of December the 1.55 p.m. train from Sheffield was delayed right minutes at Swinton and Bolton on Dearne "Brake eight minutes at Swinton and Bolton-on-Dearne. "Brake was applied at Swinton by some means unknown, and driver stopped at Bolton-on-Dearne to examine. defect found." No

Turning to the London and South-Western Railway, we find that Smith's automatic vacuum brake is fitted to65 engines, 241 coaches, and 61 vans. The expe-rience of the company with this brake does not seem satisfactory. Here, again, we are introduced to another class of defects. We find nineteen delays reported, notwithstanding the small amount of stock fitted, and fifteen of these were due to the fact that the brake could not be got off after it had been put on. Thus, on October 20th, "brake hard on throughout 5 p.m. train to Exeter at Woking causing eleven minutes delay. No. 355 van had to be shunted off at Weybridge through its brake being on, and

It seems to us that it is mainly due to those who have the management, repairs, and supervision of the brakes in their hands. Thus the failures of the vacuum brake on the South-Western seem to result from bad construction, while those on the Great Northern are the result of want of competent supervision. Of course we refer only to that class of defects which appears to be removable, and not to

those obviously inherent in the nature of the brake. We may add here that a bad accident recently occurred at Faringdon-street. The 4 p.m. South-Western train from Richmond arrived at Ludgate-hill station, and having depo-sited its passengers, proceeded down the steep incline from Ludgate-hill to the Snow-hill sidings close to the Meat Mar-In going down the hill the vacuum brake refused to act, Ret. In going down the nill the vacuum brake refused to act, and the train ran away. The engine tumbled into a turn-table pit, two third-class coaches were wrecked, and the driver and stoker severely hurt. It has long been foreseen that a brake which frequently permits trains to overshoot stations must bring about a catastrophe some day, and that which took place at Snow-hill will not fail to con-var a useful lesson. vey a useful lesson.

ON RADIAL VALVE GEARS. By ROBERT HUDSON GRAHAM, C.E. No. III.

IN Joy's gear, the classical type of radial gears, some of the centres of motion are, within certain limits, arbitrary; and others are derived from these arbitrary centres, once they have been definitely chosen in position. For the sake of clearness it will be better to make a division between these two classes, taking first the arbitrary centres.

Arbitrary centres of motion .- The centre A .- The practical rule adopted by Mr. Joy for fixing the position of A_2 , Fig. 7, on the connecting rod, consists in placing this point where the minor axis of the ellipse path described by it may be equal, or preferably a little greater than the double stroke of the valve. Within certain limits, however, its position may be varied to suit the arrangement of other parts of the engine, such as the slide bars, brackets, &c. If the minor axis of the ellipse path of A were made less than the double stroke of the valve, the angle of cant given to the slot in full gear would require proportionate increase in order to obtain the same admission of steam. In some cases, as for instance in Fig. 8, the point A is taken a little above or below the centre line of the connecting



stroke of the piston is not directly or indirectly transmitted

to the valve. Again, the circle described by the arm of the valve excentric being small, the length of the excentric

rod can be regarded as infinite, whereas the length of the connecting rod must be looked upon as finite. Hence,

while the horizontal displacement of the piston is affected by the obliquity of the connecting rod, the horizontal displacement of the valve is practically independent of the

obliquity of the excentric rod. Consequently, these two horizontal motions are not harmonic, but vary relatively to

each other on opposite strokes of the piston. But in radial systems, such as the Joy gear, the valve motion is wholly, though indirectly, derived from the motion of the connecting rod; and, therefore, the vary-

ing displacements of the crosshead are felt by and communicated to the valve itself. At first sight this

might be regarded as an imperfection in the gear, whereas,

in fact, it is its chief recommendation, insomuch that it brings the motion of the piston and the valve into closer and more intimate connection. Nevertheless, even in Joy's gear differences do exist in the percentages of cut off and

release for opposite strokes of the piston, but they do not attain the same proportions as in link gears. In the latter, owing to the influence of the connecting rod, the periods of admission, expressed in terms of the piston

The arrangement of other parts of the engine somerod. times necessitates this displacement of A ; but, as a rule, the practice is not commendable.

The centres M and N.-The centre N can be placed either on the mid-vertical line, Fig. 7, or it can be formed into the end of a small return crank MN—same figure— the extremity M being centred on the crank pin. We shall have more to say about this feature presently. If N be placed on the mid-vertical line, as at n_1 , Fig. 7, the point n_1 must be chosen low enough down to make the point n_1 must be chosen low enough down to make the angle $A_2 n_1 A_0$ less than, or at most equal to, 90 deg. The object in view is to avoid the end thrust and jerking action which would be brought to bear upon the lever D E if the point N were chosen too high up on the mid-vertical line. It is evident that for perfect action the force acting at the end D should be horizontal in direc-tion. Therefore, the lever the point N is the access tion; therefore, the lower the point N is, the nearer to perfection will be the working of the gear. The centre M is best placed somewhere on the line $m n_0$, bisecting the chord of the arc described by N; but it is sometimes placed, as in the Crewe engine, on a horizontal line passing threach a which however is the durate a light differential through n_i , which, however, introduces a slight differential action into the working of the gear. If the lever rod M N can be transformed into a return crank, as in Fig. 7, then M coincides with the centre of the crank pin. In



this case the point D will partake of the elliptic motion of A, and the complete circular motion of N, instead of partaking, as in the Crewe engine, of the arcal motion of In one case the point N describes an arc, the chord of which $n_1 n_2$ is equal to the minor axis $D_1 D_2$ of the irregular ellipse-path of D; in the other case, the end N of the return crank describes a full circle, the diameter of which is equal to the major axis $D_0 D_2$ of the same figure. The result is exactly the same for the ends of the stroke, though in the intermediate phases of motion slight differences may arise. Another variety of form is re-presented in Fig. 8, where M is attached to the end of the air pump lever, partaking of the arcal motion of the end of that lever. The centre N is then fixed to a point nearer to the fulcrum of the same lever, where the chord nearer to the fulcrum of the same lever, where the chord of the arc described is equal in length to the major axis of the irregular path of D. In the Crewe engine M was fixed, and the motion of N arcal. In the example, Fig. 7, M is no longer a fixed point, but has the same circular motion as the crank pin, whilst the point N also describes a complete circle. In Fig. 8 the motions of M and N are both arcal.



Derived elements .- The element AD. - Mr. Joy has given an empirical rule for finding this element, which consists in making it equal to one and a third times the half minor axis of the ellipse path of A; and then by a fitting process he deduces the correct position of the centre of the slot on the mid-vertical line. But it is far easier and more correct to follow the geometrical method developed in these ers, in order to determine the exact positions of D and H.

The angle of cant.—As to the amount of inclination to be given to the slot for working in full gear, Mr. Joy prescribes that the half-chord of the arc h_1, h_2 , Fig. 7, described, in the act of canting, by a point h in the slot, corresponding to the highest point touched by the movable fulcrum H, should be equal to one and a quarter times the full opening of the port required. For example, if lin. opening be required, then the chord h h, must be made equal to 14 in. Under these conditions suppression will take place at about 75 per cent. of the stroke.

Relative advantages of radial gears.—The great and essential difference between radial and excentric gears is that, in a link gear, the valve derives its motion from the revolution of the driving axle, and is independent of the borizontal motion of the crosshead. In other terms, the varying displacement of the crosshead during the double

stroke, are less on the stroke from than on that towards the stroke, are less on the stroke from than on that towards the crank shaft. In some cases these periods differ by as much as 12 or 14 per cent. for full gear, and even by greater amounts for half gear action. But in radial gears of the type under consideration, owing to the connection between the valve and connecting rod, the tendency is to lengthen the period of admission on the stroke from the crank, though the effect is considerably modified by the counter-valing action of other parts of the system. Still the valve vailing action of other parts of the system. Still the valve is bound to partake of the retardation of the crosshead displacement during this particular stroke, so that the back port is closed relatively later than it would be in a link



motion. Precisely, however, as in excentric gears, where the connecting rod is not the only disturbing element, and where other causes of uneven action, such as the differen-tial motion of the link, and the slip of the block, have to be taken into consideration, so in radial gearing the vary-ing displacement of the crosshead is not the only element influencing the equal distribution of steam. The relative positions of the various centres of motion, and the lengths and inclinations of the different levers, contribute to a combined movement, which must be arranged so as to obtain a practically equal distribution of steam

				For	vard (Fear.	POOT		12.00 h	anial
Notch.		Travel.	Lead.		Opening.		Suppression.		Release.	
Aning Aning	10.00	nat var ovil 19 davi o	Back- ward.	For- ward.	Back- ward.	For-	Back- ward.	For- ward.	Back- ward.	For- ward.
Full		in. 35	in.	in.	in. 78	in. 115	per ct. 761	perct. 74	per ct. 921	perct. 92
Third		231	32	35	1g 1g	18	63	63	88	88
Second		275	32	32	11	13	45	461	80	82
First		232	32	5	6 3 2	7 32	231	251	681	71
Lot M		bridge	(dir)	agive t	1.Szur	S.	21	-	1	1-0
Lap of value. Front port = $\frac{1}{2}$ in. Back port = $\frac{1}{2}$ in.						equal	equal	equal	equal	
						-	1늘	-	2	
						Ä	1.75	9	1.5.3	91

The above table, with which I have been favoured by Mr. Joy, furnishes the actual percentages of cut-off and release in a special case and for different inclinations of the slot, varying from full gear forward down to nearly mid-gear forward. It will be seen that, in accordance

with the principle just explained, the periods of steam admission during the backward, or stroke towards the crank shaft, are in excess; whilst on the opposite stroke these periods approach but never attain equal percentages. The differences, however, are very small, ranging from zero to $2\frac{1}{2}$ per cent. Table II. gives the differences in another spe cial case.

TABLE II.								
Le	ad.	Su	ppressio	n.	Release.			
Back- ward.	For- ward,	Back- ward.	For- ward.	Differ- ences.	Back- ward.	For- ward.	Differ- ences.	
18	18	75	74	1	921	92	Inniohi	
18	13	60	58	2	87	86	1	
18	18	50	49	1	84	82	2	
1	18	40	39	1	79	77	2	
18	18	33	30	0	74	72	2	
뷶	13	20	21	1	671/2	66	11/2	

We now come to the advantages claimed by Mr. Joy for his particular system of radial gear. These are :--(1) Greater simplicity and a saving in the factors of cost and weight of 25 per cent.-on outside cylinders of the American pattern 25 per cent. —on outside cylinders of the American pattern this first saving may reach as much as 30 per cent.; (2) more equal distributive action, both as to lead and cut-off; (3) the port is opened to steam and exhaust more rapidly, and the cut-off is more prompt than in link gears; (4) the working parts and centres of motion are more accessible for examination, oiling, and repair; (5) the maximum admission of steam, depending upon the cant of the slot, which in normal full-gear action limits the period of admission to about 75 per cent. of the stroke, can on an emergency be increased by giving a slight additional inclination to the reversing lever. After making a close study of this gear, I am pleased to add that, as far as I am competent to judge and from a theoretical point of view the low gear possesses most if not all of the advanam competent to judge and from a theoretical point of view, the Joy gear possesses most, if not all, of the advan-tages enumerated. I do not state; nor do I believe that the gear cannot be improved in minor details, such as the total elimination of the slot, and the substitution in its place of something less likely to create friction. If it were possible, it would be well to replace it either by an additional lower red or better produce the either by an additional lever rod, or better, perhaps by a movable sector-plate. But, on the other hand, Mr. Joy assures us that some of his engines have run from 90,000 to 100,000 miles without showing signs of frictional wear. He also tells us that he has tried the sector-plate without obtaining much success. Looking at the gear as it is, I should like to see further proof of the saving claimed in prime cost and weight of 30 per cent. over link gears, when applied to outside cylinders of the American type. This is the only point in reference to which I see any reason to question the truth of the claims and relative advantages of the Joy gear. Since the issue of the first article of this or the Joy gear. Since the issue of the first article of this series, I have seen a reproduction, from the pages of an American journal,* of a modification of the Joy gear, which has been designed by Mr. George H. Strong, of Philadelphia. Perhaps it would be more correct to state that the modification made by Mr. Strong affects not so much any features of the gear as the valve system moved be it. The Strong gear is simply a duplication of the Joy by it. The Strong gear is simply a duplication of the Joy system ; that is to say, it is merely a double system of Joy system, that is to say, it is interely a double system of Soy slot links and levers; one system working the steam and the other the exhaust valves. So far there is really no modification, but merely a duplication, which Mr. Strong adopts under arrangement with Mr. Joy. The essential difference consists in doing away with the D slide valve altogether, and applying four gridiron slide valves to each cylinder. Two of these valves are placed at its top ends, and work in conjunction with two straight ports for the admission of steam. The two others are placed at the bottom ends of the cylinder, and similarly work in conjunction with two straight ports for the exhaust of steam. These gridiron valves have their port openings cut at an angle to their length, and have a transverse instead of a longitudinal motion. The change of direction from the longitudinal motion of the valve rod to the transverse motion of the valve is effected by means of a bell crank and wiper action inside the valve box, which is so arranged as to bring each separate slide into play only when it has to perform its proper functions. The first idea derived from an inspection of the system is that it tends to complication. It is an evident departure from the unity and simplicity of the slide valve, and it would seem to be an attempt to revive the old controversy whether it be more economical to have one valve or four to perform equal duty. English engineers have long ago decided this question in favour of the D slide valve; whilst continental practice has to a great extent given its sanction to the four-valve system. But even there the D slide valve still holds its own in the locomotive shops. The slide valve, though less perfect in the performance of each particular function, retains the great recommendations of unity and simplicity. Four valves, independent to a great extent one of the other, are liable to get out of order. It may be true that they per-form each separate function better than the slide valve; but it is equally true that the danger exists of some of the but it is equally true that the danger exists of some of the four valves not performing their duty at all. Moreover, the addition of a greater number of valves adds to the weight and first cost of the engine. On the other hand, the four-valve system as applied by Mr. Strong possesses many good features. First, by means of the many perts cut in the gridiron type of valve, which multiply so many times the opening given to steam, and by reason of the reduction in travel due to the trans-formation from longitudinal to transverse motion, the formation from longitudinal to transverse motion, the traverse of the valve is restricted to its lap and opening. Secondly, as the steam valves move only when it is time to admit steam-or, in other terms-when the piston is near the end of its stroke-the pressure of steam above, and the pressure due to compression below the valve are in equilibrium. Hence the steam valve moves in perfect balance, * Mechanics (New York).

and the wear of its surfaces due to friction is reduced to a minimum. Thirdly, the waste spaces occupied by the steam canals leading to the ends of the cylinder are done away with, the clearances are diminished, and the steam works under better conditions than with a slide valve. In spite, however, of all these recommendations, it is not easy to accept this new complication of the locomotive valve system until the experiment, which is now being tried, and an enlarged practice have decided something definite in its favour. Fig. 9 is a very good valve diagram, drawn for an actual engine, from which it will be seen that, though favour. the port opening on the backward stroke is greater than that on the forward stroke, the smaller port opening is adequately large. This diagram also shows that, when the cut-off takes place at 75 per cent. of the stroke towards This diagram also shows that, when the crank shaft, it occurs earlier by only 1 per cent. on the stroke from the crank shaft. The same diagram witnesses also to the exceedingly rapid opening of the ports to steam, the maximum being attained at about 20 per cent. of the stroke. Fig. 9 and Table II. refer to the same





FIG.II



engine. Figs. 10 and 11 form a very interesting comparison of the performances of two sister Canadian engines, one fitted with the ordinary link, the other with a Joy These diagrams speak for themselves, and radial gear. serve to explain why the Joy gear is coming so largely into favour.

Before concluding this notice of the Joy gear I wish to acknowledge the courteous and obliging attention of the inventor, who has kindly furnished me with drawings and particulars from which Figs. 7, 8, 9, 10, and 11, and Tables 1. and II., have been prepared.

THE PREVENTION OF FIRE RISKS FROM ELECTRIC LIGHTING.

ELECTRIC LIGHTING. THE Society of Telegraph Engineers and of Electricians have issued the following amended rules and regulations for the pre-vention of fire risks arising from electric lighting, recommended by the council in accordance with the report of the committee appointed by them on May 11th, 1882, to consider the subject. The committee consisted of Professor W. G. Adams, F.R.S., Vice-President, Sir Charles T. Bright, T. Russell Crampton, R. E. Crompton, W. Crookes, F.R.S., Warren De la Rue, D.C.L., F.R.S., Professor G. C. Foster, F.R.S., Past President, Edward Graves, J. E. H. Gordon, Dr. J. Hopkinson, F.R.S., Professor D. E. Hughes, F.R.S., Vice-President, W. H. Preece, F.R.S., Past Presi-dent, Alexander Siemens, C. E. Spagnoletti, Vice-President, James N. Shoolbred, Augustus Stroh, Sir William Thomson, F.R.S., Past President, Lieutenant-Colonel C. E. Webber, R.E., Past President. These rules and regulations are drawn up for the reduction to a minimum, in the case of electric lighting, of those risks of fire which are inherent in every system of artificial illumi-nation, and also for the guidance and instruction of those who have, or who contemplate having, electric lighting apparatus installed in their normines. The different in every system of artificial illumi-nation, and also for the guidance and instruction of those who have, or who contemplate having, electric lighting apparatus installed in their normines. risks of hre which are inherent in every system of artificial illumi-nation, and also for the guidance and instruction of those who have, or who contemplate having, electric lighting apparatus installed in their premises. The difficulties that beset the electrical engineer are chiefly internal and invisible, and they can only be effectually guarded against by "testing," or probing with electric currents. They depend chiefly on leakage, undue resistance in the conductor, and bad joints, which lead to waste of energy and the dangerous production of heat. These defects can only be detected by measuring, by means of special apparatus, the currents that are either ordinarily or for the purpose of testing passed through the circuit. Should wires become perceptibly warmed by the ordinary current, it is an indication that they are too small for the work they have to do, and that they should be replaced by larger wires. Bare or exposed conductors should always be within visual inspec-tion, and as far out of reach as possible, since the accidental falling on to, or the thoughtless placing of other conducting bodies upon such conductors would lead to "short circuiting," and the consequent sudden generation of heat due to an increased current in conductors not adapted to carry it with safety. The necessity cannot be too strongly urged for guarding against the presence of moisture and the use of "earth" as part of the circuit. Moisture leads to loss of current and to the destruction of the conductor by electrolytic corrosion, and the injudicious use of "earth" as a part of the circuit tends to magnify presence of moisture and the use of "earth" as part of the circuit. Moisture leads to loss of current and to the destruction of the conductor by electrolytic corrosion, and the injudicious use of "earth" as a part of the circuit tends to magnify every other source of difficulty and danger. The chief dangers of every new application of electricity arise from ignorance and in-experience on the part of those who supply and fit up the requisite plant. The greatest element of safety is therefore the employment of skilled and experienced electricians to supervise the work. 1. The dynamo machine.—(1) The dynamo machine should be fixed in a dry place. (2) It should not be exposed to dust or fly-ings. (3) It should be kept perfectly clean, and its bearings well oiled. (4) The insulation of its coils and conductors should be

practically perfect. (5) All conductors in the dynamo room should be firmly supported, well insulated, conveniently arranged for inspection, and marked or numbered.

inspection, and marked or numbered. 2. The wires.—(6) Every switch or commutator used for turning the current on or off should be constructed so that when it is moved and left it cannot permit of a permanent arc or of heating. (7) Every part of the circuit should be so determined that the gauge of wire to be used is properly proportioned to the currents it will have to carry, and all junctions with a smaller conductor should be fitted with a suitable safety fuse or protector, so that no portion of the conductor should ever be allowed to attain a tem-perature exceeding 150 deg. Fah. (8) Under ordinary circum-stances, complete metallic circuits should be used; the employ-ment of gas or water pipes as conductors for the purpose of com-pleting the circuit should not in any case be allowed. (9) Bare wires passing over the tops of houses should never be less than 7ft. clear of any part of the roof, and all wires crossing thoroughfares ment of gas or water pipes as conductors for the purpose of com-pleting the circuit should not in any case be allowed. (9) Bare wires passing over the tops of houses should never be less than 7ft. clear of any part of the roof, and all wires crossing thoroughfares should invariably be high enough to allow fire-escapes to pass under them. (10) It is most essential that joints should be electrically and mechanically perfect, and united by solder. (11) The position of wires when underground should be clearly indicated, and they should be laid down so as to be easily inspected and repaired. (12) All wires used for indoor purposes should be efficiently insulated, either by being covered throughout by some insulating medium, or, if bare, by resting on insulated supports. (13) When these wires pass through roofs, floors, walls, or partitions, or where they cross or are liable to touch metallic masses, like iron girders or pipes, they should be thoroughly protected by suitable additional cover-ing; and where they are liable to abrasion from any cause, or to the depredations of rats or mice, they should be efficiently encased in some hard material. (14) When indoor wires are put out of sight, as beneath flooring, they should be thoroughly protected from mechanical injury, and their position should be indicated. The value of frequently testing the apparatus and circuits cannot be too strongly urged. The escape of electricity cannot be detected by the sense of smell, as can gas, butait can be detected by appa-ratus far more certain and delicate. Leakage not only means waste, but in the presence of moisture it means destruction of the conductor and its insulating covering by electric action. 3. Arc lamps.—(15) Arc lamps should always be guarded by proper lanterns, to prevent danger from falling incandescent pieces of carbon, and from ascending sparks. Their globes should be pro-tected with wire netting. (16) The lanterns and all parts which are to be handled should be insulated from the circuit. 4. Danger to person.—(1

THE INSTITUTION OF CIVIL ENGINEERS.

THE INTRODUCTION OF IRRIGATION INTO NEW COUNTRIES, AS ILLUSTRATED IN NORTH-EASTERN COLORADO.

AT the meeting on the 10th of April, Mr. Brunlees, president, in the chair, the paper read was on "The Introduction of Irriga-tion into New Countries, as Illustrated in North-Eastern Colorado,"

In the chair, the paper read was on "The Introduction of Irriga-tion into New Countries, as Illustrated in North-Eastern Colorado," by Mr. P. O'Meara, M. Inst. C.E. The objects of the paper were stated to be three-fold:—First, to give an account of the development of irrigation in North-Eastern Colorado; secondly, to inquire into the principles which should guide the introduction of irrigation into new countries; and thirdly, to examine how far the methods being pursued in North-Eastern Colorado were in accord with them. The development alluded to was influenced by most of the defects manifested in older countries, such as inaccurate measurement of water, growth of ill-defined rights, excessive waste of water, &c., but there was a prospect of improvement through better legislation. The climate of Colorado was described as such, that agriculture was all but impossible without irrigation. Both were begun in 1860. There were 155.000 acres under cultivation in 1880, and it was estimated that in 1883 there would be 465,000 acres, with prospects of still further development. The amount of irrigation possible would be limited by the quantity of water obtainable, and by the area which each unit of it could be made to irrigate. It would amount to 9,750,000 acres under a hypothetical water duty of 12in. in depth for one season.

each unit of it could be made to irrigate. It would amount to 9,750,000 acres under a hypothetical water duty of 12in. in depth for one season. It was laid down that the duty of water in irrigation must vary with (1) the character and condition of the soil; (2) the rainfall, temperature, and evaporation; (3) the method of application; (4) the kind of crop; and, in some cases, (5) the depth of the water-line below the surface of the ground. As regards (1) the influence of different soils, this must affect the duty of water, because, on the nature of the soil depended the quantity of water, because, on the nature of the soil depended the quantity of water, because, on the nature of the soil depended the Quantity of water, because, and absorb, and the rate of filtration and of evaporation from within it. The author gave details of experiments made by him to ascertain the amounts of water, and the times required to moisten two different typical soils in the Cache La Poudre Valley, and he drew some inferences from them. The formation of swampy lands and the prevalence of rust in wheat on some of the older farms, were held to indicate that the quantity of water required for beneficial irrigation became gradually less year by year for a few years after the commencement. (2) The rainfall of the season should be added to the artificial irrigation, and account should be taken of the surplus water not absorbed by the soil, otherwise all estimates of water duty must be misleading. The use of ordinary statistics of temperature and evaporation was at present vague and unsatisfactory, owing to the absence of experiments on the drying of soils. Nevertheless the question of evaporation was so important that it was doubtful if any loss of irrigating power occurred in Colorado other than that which was due to it. (3) Irrigation methods were conducted on two antagonistic principles, viz., to increase to the most profitable extent, in the one case, the quantity of water supplied to a given area, and in the other the area irrigate drains underground. Sprinkling had been tried in Scotland on seven acres of land by the Duke of Sutherland. The methods of flooding with compartments, and of distributing through furrows, were described in detail, as also the method of flooding without compartments, as practised in Colorado. This was characterised as extremely wasteful. It was shown from the experiments on dry soil, before alluded to, that 6in. or 8in. in depth, instead of 42*8tin. as at present extended, ought to suffice for cereals in Colorado. The experience of Professor Blount, of the State Agricultural Collego, was quoted to show that excellent crops of wheat could be grown with a rainfall of 4jin. only without irrigation. As regards (4) the water-duty for different crops, it was the degree of moisture required in the soil around its roots, and not the absolute quantity which the plant itself absorbed, that had to be considered. The author furnished, in a tabular form, a list of statistics, derived from various sources, in which he had endeavoured to include the essential elements. He considered it, however, to be nothing more than an approximation, because of the incompleteness of almost every statement of the kind. In the column of "totals" the limits of water-duty appeared much narrower, because of the rainfall being added to the irrigation depth, than they would be otherwise. Countries where good crops were grown without irriga-tion were included in the table, being considered to furnish a "natural duty of water," which should be useful for comparison

with water duties in places where irrigation was practised. Some remarks followed with respect to the peculiarities of certain crops, viz., rice, alfalfa, sugar-cane, summer meadows, potatoes, cereals, and tea. The author then discussed the sources and works of supply, and the legislation of irrigation. The sources were stated to be two, viz., springs and rivers. The supplies were made avail-able for direct irrigation by canals, and for indirect irrigation, after storage, by reservoirs. The works of the North Poudre Irrigation Canal, of a capacity of about 300 cubic feet per second, which had been carried out under the author's charge, were described. Those most worthy of remark were a crib dam, 30ft. 6in. high, some storage, by reservoirs. The works of the North Poudre Irrigation Canal, of a capacity of about 300 cubic feet per second, which had been carried out under the author's charge, were described. Those most worthy of remark were a crib dam, 30ft. 6in. high, some shelf-work, tunnels, and "gulch" bridges. Details were also given of a larger canal, the Northern Colorado. These works showed a considerable departure from the practice of older countries, owing to the abundance of timber, and to the preference of Americans for economy and rapidity in construction over durability. The principal supplies of water in Colorado came from the snows of the Rocky Mountains. The rivers rose, reached their maximum and fell again, frequently before the end of the irrigation season. Hence measurements of the snow remaining on the mountains were of importance to agriculturists. The construction of reservoirs was dealt with as a means of reducing risk in cultivation in countries where the rivers failed in the crop season. Reservoirs for equalising the flow, "main" reservoirs which received the enture volume of a canal, and "detached" reservoirs which received a portion only. A serious error in the construction of some reservoirs in Colorado was pointed out. The gauge first used for measuring water in Colorado was the Max Clark's gauge, and the improved system at present in use, with the formula of Francis: -Q = 3'33' $(I - 0^{-1}n k) h^{\frac{3}{2}}$, were described and commented on. A short account of the legislation of a "inch of water" was given in full. Those laws were such, that any holder of land in the State was entitled to take and use the waters of the rivers, and any one could construct reservoirs and store unappropriated water. A fruitful crop of litigation had, as a matter of course, been developed in the State; and some cases were still pending. A series of laws were passed in 1879 to determine the order and priority of existing and future claims, to fix the price of water, and to control its distribu-tion. The author fina

THE METEOROLOGICAL SOCIETY.

CLOUD OBSERVATIONS

THE METEOROLOGICAL SOCIETY. ICLUD OBSERVATION The meeting of the Meteorological Society on Tuesday, last """ at meeting of the Meteorological Society on Tuesday, last """ at meeting of the Meteorological Society on Tuesday, last """ and Circo Cumulus." By way of preface to some of his remarks, we may state that the attention of meteorologists is now being seriously drawn to the phenomena presented by the higher clouds, it having been discovered that they often afford trustworthy clues to the nature of coming weather. As a cele-brated example, it may be mentioned that the Rev. Mr. Ley, who is an authority on the subject, one fine bank holiday happened to be in London, and noticing certain indications given by the upper clouds, the telegraphed from the Strand to Mr. Robert Scott, of the Meteorological Office, "Heavy thunderstorm ordered for four of the devices type was crashing over London. One reason why cirrus clouds give early indications of approaching changes in the weather, is that the axis of a cyclone is not vertical. In the upper part is inclined in the direction in which the whole clouds before the influence of the cyclone is felt at certain paces. The Nollo Russell said that, next to frequent readings of the work of foot at the influence of the cyclone is felt at certain paces. The Nollo Russell said that, next to frequent readings of the height may probably sometimes be more than filteen miles. It is nore; but according to Mr. Glaisher's balloon observations, the height may probably sometimes appears to radiate from a cance in the determination of form; it is the only cloud which presents angular forms and nearly parallel threads, the appearant dheir real length in their appare. divertion. The may probably sometimes appears to radiate from a cance the norizon, thus showing that the lines are paraful. The may probably sometimes appears to radiate from a cance the more cases that of the divided them into the dasses, and in some cases stated what kind of coming watch th

This kind of cirrus generally gives from twelve to forty-eight hours' notice of an approaching storm. Mr. Russell then argued that the Government should incur some little expense in establishing daily cirrus observations. He stated that a great and terrible loss of life occurred on the east coast in the storm of the 14th of October, 1881, and as this storm was travelling with great rapidity, and broke upon the west coast during the night, when the office was closed, a warning from London was out of the question. The barometer had sunk to a low point on the Berwickshire coast when the fishermen went out, but this warning seems to have been altogether neglected on the spot. The cirrus observed on the 13th of October gave earlier intimation than the barometer of the coming storm, and with a regular system all the ports might have received warning on the afternoon of the 13th. It may be stated generally, he said, that cirrus of a long, straight, feathery kind, with soft edges and outlines, or with soft delicate colours at sunset and sunise, is a sign of fine weather. Curly wisps and blown back pieces are not a bad sign, but their exact appearance should be noted, the rapidity of their movement, and the definiteness of their outlines. When the tails are turned down-wards, fair weather or slight showers often follow. Misty, con-fused, and curdled cirrus should be carefully noted, but does not-always foretell bad weather. The harder and more distingt in outline, and the more particular forms are reneated the fused, and curdled cirrus should be carefully noted, but does not always foretell bad weather. The harder and more distinct in outline, and the more particular forms are repeated, the worse the result. Long, hard, greasy-looking streaks, with rounded edges or knobs, whether crossed by fibres at right angles or not, are a sign of storms; but the storm may pass at some distance from the point of observation. Cottony shreds, either by themselves ar detached from a long streak, rounded and clear in distance from the point of observation. Cottony shreds, either by themselves or detached from a long streak, rounded and clear in outline, something between cirrus and cirro-cumulus, indicate dangerous disturbances. Regular wavy tufts, with or without cross-lines, are bad, especially if the tufts end not in fibres, but in rounded knobs. Feathery cirrus in thick patches at equal dis-tances apart is a sign of storm, or any appearance of definite waves of alternate sky and cloud. So is any regular repetition of the same form. Slightly undulating lines of cirrus occur in fine weather, but anything like a deeply indented outline precedes heavy rain or wind. Cirrus simply twisted or in zigzag lines of a fibrous character often appears in fine weather, and if not hard or weather, but anything like a deeply indented outline precedes heavy rain or wind. Cirrus simply twisted or in zigzag lines of a fibrous character often appears in fine weather, and if not hard or knotted or clearly marked off from a serenesky, does not often pre-cede any important change; but detached patches, like little masses of wool or knotted feathers, in a clear sky and of unusual figure, moving at more than the average rate, precede disturbances of great magnitude.



THE ENGINEER.

APRIL 27, 1883.

ELECTRICAL EXHIBITS AT THE WESTMINSTER AQUARIUM.





Fig. 3 .- SECTION OF ARMATURE

is generally so small that only extended use can decide as to its merits. One suggestive feature, not only of the exhibitions now being held, but in electric lighting work generally, is in the attention that is being paid to details. The manufacture of gas fittings is a large trade; the manufacture of electric light fittings promises to be as extensive, and it is to be noted that the manufac-turers of the one are taking up the other. One of the first chande-liers or electroliers, Fig. 1, designed for electric light purposes was the one shown by Messrs. Siemens Frères, at Paris; this piece of apparatus also did duty subsequently at the Crystal Palace, and is now to be found at the Acuarium. Even if the work was of apparatus also did duty subsequently at the Crystal Palace, and is now to be found at the Aquarium. Even if the work was not sufficiently interesting in itself, we should gladly illustrate it for its historical bearing. It is made of iron, and, as will be seen, is designed for arc lighting, whereas most of the recent fittings are for incandescent lighting. Again, the ordinary gas tap is not suited for electric lighting, but a similar apparatus has to be used, and various designs are before the public. These are known as switches, some of these switches being comparatively simple, others more complicated, yet all aiming at the same thing, viz., to make good electrical contact on being turned one way, and to break contact with the least amount or tendency to way, and to break contact with the least amount or tendency to

extent from those who wish to enter into competition in designing such parts of the electrical apparatus as we have just now referred to. The opposite is the case if it desired to compete in the construction of dynamo machines. The room for increased electrical efficiency is here so small that the better the knowledge of what is to be done the less seems the better the knowledge of what is to be done the less seems the possibility of beating the record. In fact, the greater portion of the new machines are put forward as better, because of greater mechanical simplicity than as being better electrically, and it is in the mechanical details that good work is to be done. At the Aquarium the Lumley Company exhibits the Lumley machine, built for the company by Messrs. Paterson and Cooper. It is impossible to give trustworthy details as to the efficiency of machines that have not been tried by independent authorities It is impossible to give trustworthy details as to the endeted of machines that have not been tried by independent authorities, and, therefore, we must restrict ourselves to the description of construction. The machine shown is compact. Fig. 2 gives a side view, Figs. 3 and 4 sectional views of the machine. The weight of the small machines shown is somewhat less than 4½ cwt. The field magnet cores are of cast iron of flattish sec-

CONCERNING recent inventions little new is to be chronicled so far as electrical apparatus is concerned, and what there is new is not of startling importance. Several new lamps claim to be improvements over those generally known, but the improvement is generally so small that only extended use can decide as to its merits. One suggestive feature, not only of the exhibitions now being held, but in electric lighting work generally, is in the mediate projections, as shown in the figure. The core is built up alternately of these discs—one end of the spokes fitting into a groove in the shaft—and brass rings which fit upon the shaft and are comparatively narrow. The core is wound longitudinally with insulated wire as shown, each section being separated by the spokes, and these being equidistant, the quantity of wire in each coil is similar. The makers of these machines state that is their trick a churt precision with an electromotive force at in their trials a shunt machine with an electro-motive force at terminals of 46.25 volts, and a speed of 1680 revolutions per minute gave a current of 74.2 ampères, the external circuit The armature resistance of a having a resistance of 62 ohms. The armature resistance of a shunt machine is 079 ohms, of the field magnets about 7.79 ohms, whilst the similar resistances in the series machine are, armature 1 ohm, field magnets 1 ohm, the electro-motive force of the latter being about four times that of the former. The Lumley exhibit also includes a new arc lamp, Fig. 5. The

Fig. 2.-LUMLEY DYNAMO, SIDE VIEW

figure shows the action of the lamp. A ring clutch on the upper carbon rod is tightened or loosened by the differential action of the solenoids A A and B, excessive action being moderated by the use of a dash-pot D.

LETTERS TO THE EDITOR.

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

PATENT LAW. The general consensus of opinion with which I, on the important advance upon anything which has been heretofore pro-posed ; but it is marred by one great defect—the retention of the heavy renewal taxes of fifty and hundred pounds. Evidently the Government are not prepared to surrender the income which is anticipated from the payments, and equally evidently inventors and patentees will not be satisfied with a system which exacts so heavy payments upon patents for all inventions, be they important or trivial, profitable or not. More than one device has been sug-gested for avoiding the evil of this unequal incidence, such, for instance, as the proposal to grant patents for different periods, according to their merit, to be determined by examiners; but to this that any applicant who did not receive a grant for the maximum term for his invention would always remain a dissatisfied man, convinced that he had been unjustly used. There seems to me, however, to be another possible system, to which I do not, on the face of it, see any valid objection, and which is, briefty, this: Let every applicant main in the manner proposed by the Government Bill now being discussed; and with the same amount, and no more, of preliminary examination. This being, in my opinion, one of the strongest. This intention to prolong his patent, paying with such notice a fee of, say, 52. During the following three months his application would be considered by a staff of sufficiently capable examiners-whom it should not be difficult to obtain—and who would deter-mine the amount which he should pay for the extension of his patent to seven years. Such payment should in no case exceed 50, and the termined would be proportioned to the character, importance, and value—present and prospective—of the invention should the applicant consider the amount so fixed to be to obligh, bould the applicant consider the amount so fixed to be to obligh.

and the amount determined would be proportioned to the character, importance, and value—present and prospective—of the invention. Should the applicant consider the amount so fixed to be too high, he should be at liberty to abandon the proposed extension; but his patent should, in such case, remain in force for, say, six or twelve months longer in consideration of the fee paid by him in applying for its extension. If he make no such application, of course the patent would lapse at the expiration of the four years of its original grant. As the seventh year approached its termination, of course the same course would be adopted, the maximum limit of payment demanded from the patentee being one hundred instead of fifty pounds. Now, Sir, it seems to me that some such system as that indicated

of fifty pounds. Now, Sir, it seems to me that some such system as that indicated would possess the inestimable advantage of pleasing everyone. The Govarnment, whilst reducing in most cases the amount of the fees paid at the end of the third and seventh years, would lose nothing, for the reduction would be more than recouped to them by the very much larger number of patents than at present, which would be continued, if at a lower cost, but which would un-questionably be dropped were the present payment of £50 insisted on. The patentees, on the whole, would also be satisfied. He who was allowed the renewal of his patent for, say, £5, would have a consolation for the apparent slight put upon his invention in the smallness of the amount which he would have to pay; whilst he who was assesd at the maximum amount of £50 would have the satisfac-tion of knowing that his invention stood so well the examination was assessed at the maximum amount of £50 would have the satisfac-tion of knowing that his invention stood so well the examination of the assessors that they put the highest value in their power upon it; whilst even if he declined to pay the sum fixed, as being larger than he expected, he would at least have some short exten-sion of his term in return for the fee paid by him. Of course, I assume that the patentee has a right to the exten-sion of time sought by payment of the amounts fixed. The examiners and assessors should have the power, though not, per-haps, the right, of taking information from the applicant as to the present and prospective value of his invention before fixing the amount of his tax. If you think, Sir, that my scheme has any merit I should he

amount of his tax. If you think, Sir, that my scheme has any merit, I should be glad to see it inserted in your paper, and I enclose my card, from which you will see that I am not without considerable experience as a PATENT AGENT AND ENGINEER. London, April 23rd.

[We publish our correspondent's letter, not because we think his We publish our correspondent's letter, not because we think his scheme possesses any merit, but because we wish to see all the questions raised by the new patent law fully threshed out. We are quite at a loss to understand on what basis the proposed assessors are to work, for the income derived from any patent worth pro-longing must be out of all proportion to the fees. Cases would arise again in which an income of, say, £10,000 a year was derived from one patent, while £50 a year was drawn from another. If the first patentee paid £30, the second ought to pay but three shillings. Does our correspondent mean this? —ED. E.]

PATENT AGENTS.

PATENT AGENTS. STR,—It was fondly hoped by the promoters of the Institute of Material Agents that amongst other improvements a higher tone would be infused into the profession, and that we should hear of no more "scandals." I remember that some letters appeared hughed at the whole affair, and predicted that it would not prove particularly useful. The Council has now a grand opportunity of showing whether their zeal for the honour of the profession is real or simulated. Permit me to ask what course they intend to adopt with regard to the patent agent who went the other day to the Patent-office search room, armed with a shilling and a pen-knife, and made a surreptitious erasure in a specification to hide one of his own blunders? I do not mention his name, but I suppose the faots are pretty well known in Chancery-lane by this time. He was detected, and is now, of course, deeply penitent. He was always looked upon as a most respectable man. HONESTY. Chancery-lane, April 24th.

STRAINS ON SCREW-SHAFTS.

STRAINS ON SCREW-SHAFTS. SIR,—Your short criticism upon my remarks in the discussion on Professor Greenhil's paper appears to invite a reply. I may, perhaps, take a future opportunity of expressing my views on the whole subject at greater length, and I hope more clearly than is possible in the short time available at these meetings, when all that can be done is rapidly to state leading facts and ideas upon one side of a question, and therefore certainly in a more dogmatic

that can be done is rapidly to state leading facts and ideas upon one side of a question, and therefore certainly in a more dogmatic style than might be expected if unlimited time, and previous know-ledge that the subject would arise, had been at my command— although I guessed that theoretical investigation would certainly lead to an advocacy of hollow shafts—against which I have, in the opinion of some of my good friends, a craze—and I therefore brought with me the results of my latest experiments. I propose to confine myself here to pointing out that, after all, the sole question is whether my views are practical—*i.e.*, correct. I cannot even accept the position so happily expressed by my friend, Professor Kennedy, to the effect that failures were evidence of want of scientific knowledge, and that a proper application of scientific principles would avoid failure, as, in my opinion, there is a hard-and-fast line between science and practice—viz., in our knowledge, which is purely experimental, of the strength and capacity for endurance of materials generally—the latter being the question here. question here.

I perhaps may mention, as the reverse appears to be implied, that I am not only competent to perform the schoolboy calcula-tions necessary to show that for all static strains the hollow form is generally preferable, but probably no one is more careful than I am to check by figures every detail of my work, even in repeating old and successful work. I only decline to ignore the results of

experience. You have aptly summarised the position in the words, "way of proving the value of a structure never intended to be subjected to such a strain." It is true that the shaft of a screw subjected to such a strain." It is true that the shaft of a screw steamer is not intended to bear transverse strains, but unfortu-nately they have to be borne, and I have obtained distinct evi-dence by treatment with acid of large shafts from long ships that the transverse strains which are probably far within the elastic limit at first, have at length taken the form of often-repeated actual focume. This is probably the acdinary accurse of detryion actual flexure. This is probably the ordinary course of deteriora-tion of any elastic body which, like a spring, ultimately fails if its

tion of any elastic body which, like a spring, ultimately fails if its work is severe. Now I must "dogmatise" a little by stating that I consider that experience has amply shown that the only form of test which shows within available limits of time whether the material or form of it is of a nature to endure this kind of distress more or less well, is the test by transverse flexure produced by shock, as merely static tests, though taking extension, &c., most carefully into account, would certainly indicate the use of not only the hollow form, but of a much harder material than that which events of the purpose. Sheffield, April 24th. EDWARD REYNOLDS.

ON THE LOSS OF USEFUL EFFECT BY FRICTION IN HYDRAULIC PRESSES

SIR,—By most experimenters with hydraulic presses it seems to be tacitly assumed that the only or principal loss of useful effect in such machines is that due to the friction of the leather collars. Now I cannot but think that this assumption must be erroneous. The frictional loss,



The first of the second the second of the second the second of the second of the second the the plunger. London, April 13th.

London, April 13th. THE IRISH MAIL CONTRACT. Str. – I have read with some amusement a letter signed "J. G. E." in your paper of the 20th inst., *in re* the Holyhead mail contract. A little knowledge is a dangerous thing, and he has evidently been " crammed." It may be true that the four express boats have made each a selected passage in the time he named, choosing perfectly calm days, favourable tides, and fired with hand-picked Welsh coal; but on the occasion of the Lily's trial, at any rate, the mail boat Munster, with a dirty bottom, on her ordinary day trip, beat the Lily by several minutes; and in the same day, could have a strong head wind and heavy sea both ways, I leave him to explain. There is nothing wonderful in a big boat beating a small one in heavy weather; and the tonnage of the express boats is, as your correspondent says, 1137, that of the mail boats 2039 tons. No engineer now reckons by nominal horse-ptwo of them 96in, and two 98in. All have common engines and jet condensers; and it is in bad weather that people want to cross the Ohannel with comfort and regularity. In such weather no practical man will expect, *e.g.*, Britannic, with her 5400 I.H.P., to compete with Alaska, which is 2000 tons larger, and indicates above 1,000-H.P.; and so with the express mail boats. As to " extor-tionate fares" vid Kingstown, it is quite true that the North-Western Railway Company did exact extortionate fares for the ailway journey until the Railway Commissioners compelled a town and Holyhead is only 2. I may add also that the railway company admit that during the past two years their boats have prease on such thing has occurred to the mail boats. On Monday ine times failed either to start or to enter Dublin in tiver; in twenty years no such thing has occurred to the mail boats. On Monday ine times the add that I have no pecuniary interest of any king ta there are add that I have no pecuniary interest of any king ta there the railway oreached the mail boat Leinster, on the

either the railway or steamboat company, but am a lover FAIR PLAY.

SAVED BY THE COLLISION BULKHEAD.

SAVED BY THE COLLISION BULKHEAD. SR,—There was launched from Pointhouse Slip Dock one day hast week, after extensive repairs, the screw steamer Ardandhu, of 190 tons gross, belonging to Messrs. M'Laren, Orum, and Co., Glasgow. This vessel, it may be remembered, while on a voyage from Tarragona to Liverpool, came into collision with the Kron-prinz, a large German screw steamer, on the 1st March last. The collision occurred during a fog, near Cape Sines, about fifty miles ank in a short time after the occurrence. All the crew, however, were fortunate in getting on board the Ardandhu, which was only preserved from a similar fate by the presence of her water-tight admirably under what would appear to have been most trying and momentous circumstances. The damage being mostly under water-thed safely reached Lisbon, it was found on beaching her that the whole of the forefoot back almost as far as the peak bulkhead and up to the water-line, had been virtually carried away, thus laying

APRIL 27, 1883.

the peak compartment completely open to the sea, and rendering

the peak compartment completely open to the sea, and rendering muning useless. After lightening the vessel forward by jettisoning part of the strong on about 100 tons — the vessel proceeded towards Lisbon, strong ourrent. When beached it was found that the damage to the bows was of an exceptionally severe character. The rounded protion of the keel, together with three or four of the strakes of plating above it, were wholly carried away. The twisting and curvature of the portions of plating left on the vessel showed that the iron used in the construction must have been of first-class quality. Indeed, in this respect the material more resembles steel than the iron generally employed in ships' hulls. It is also note-worthy that the bulkhead, although exceptionally far back from the stem, and therefore less rigid owing to the greater breadth, remained perfectly waterproof throughout the ordeal of the collision and the subsequent steaming to Lisbon. Although the privat in the whole bulkhead was as much as disturbed. This and other like facts reflect the highest credit on the original workman-ship of the vessel—which was built in 1879, by Messrs, Henry Murray and Co., of Port Glasgow, her dimensions being 235ft. X 31ft. X 17ft. Temporary repairs were effected in Lisbon by native workmen, under the superintendence of Mr. James Donaldson, somulting engineer for the owners, and on the 25th March she left Lisbon, and arrived safely on the Clyde on the Slst. Very heavy weather was experienced on the passage, but on the vessel's arrival the whole of the repair work was found on examination to be perfectly intact. Messrs. A. and J. Inglis, of Pointhouse, on whose slip dock the permanent repairs have been executed, have perfectly intact. Messrs. A. and J. Inglis, of Pointhouse, on whose slip dock the permanent repairs have been executed, have perfectly intact. Messrs. A. and J. Inglis, of Pointhouse, on whose slip dock the permanent interesting illustrations of the value of collision and str

THE REMOVAL OF REFUSE BY TRACTION ENGINES.

SIR,—I venture to trouble you with this letter to address an inquiry to your readers, the answer to which, if satisfactory, may lead to the development of a branch of engineering manufacture in a new direction.

The a new direction. In Birmingham the refuse is collected by vans, the excretal por-tion in galvanised iron pails, and the dry household rubbish in a bin at the back of each van. These vans are drawn by horses, but we think that the work ought to be done much cheaper and better by traction engines, if we can find the right sort. The vans make their rounds between 9.30 p.m. and 10 a.m. It would be intoler-able to have night made hideous by such noises as are usually uttered by these engines. Silence is an absolute essential, both as to the exhaust, the wheels, and the working parts. At present our vans each hold eighteen pans, and nearly a ton of rubbish. They weigh when loaded about 3 tons. But to work economically the engine should draw a much larger van, weighing, when full, 10 to 12 tons. Some of our streets are very hilly, with rises of about 1 in 20. The engine would have to go along some rather narrow streets.

rises of about 1 m 20. The engine which is rather narrow streets. If any of your readers can tell me of an engine which is simple in construction, easy in driving, silent in motion, and economical in working, and can let us see it in operation, it may lead to business. R. F. MARTINEAU, Lead to business.

Chairman Interception Sub-Committee. Montague-street Wharf, Birmingham, April 23rd.

CONVICT EMPLOYMENT.

SIR,-To sixteen projects for employing convict labour which were before the recent committee, one may add the construction

SIR,-To sixteen projects for employing terms were before the recent committee, one may add the construction of head reservoirs for rivers. Dams of the type given in your number of 13th inst. are much wanted in our hill gorges to equalise the flow of streams, reducing floods, and increasing water power. The massive, concentrated work required, seems well suited for the prolonged employment of slow, unskilled labour, under close supervision. A convict barrack might easily become a factory on the comple-tion of the dam, and the rental which Government might be em-powered to charge mill owners whose coal bills were reduced, might tend to recoup the original cost of convict maintenance. In dealing with such a general scheme, the State would be able to still the raging of petty local interests, and preclude litigation. The rivers to be first chosen would be those whose efficiency could be most increased by source-damming. Your readers will know them. Such employment, unlike harbour work, would be almost uninterrupted. Tidal hours are apt to clash with convict routine, and a seldom-recurring spring tide may thus be missed. The chief reason for carrying out sea work by convicts seems to be that, if harbours were not made thus, they would probably remain unmade. W. M. C.

remain unmade. Edinburgh, April 20th.

WOLVERHAMPTON SEWAGE.—In further reference to the para-graph which appeared in THE ENGINEER a short time since as to the appointment of an engineer for the purpose of reporting upon the subject, we understand that the Sewage Committee of the Corporation of Wolverhampton, after having had before them the names of several eminent sanitary engineers, have finely decided upon the selection of Mr. Edward Pritchard, C.E., of Westminster and Birmingham, and that gentleman has been instructed to make a personal inspection of the district, and also of the sewage farm, for the purpose of reporting generally upon the sewage and also of the disposal of sewage.

the disposal of sewage. GLASGOW INVENTORS AND THE PATENT BILLS,—An influential meeting of patentees and inventors was held in Glasgow on Tuesday afternoon—Sir William Thomson presiding—for the purpose of considering the Patent Bills now before Parliament. It was unanimously agreed to petition Parliament in favour of Mr. Anderson's Patents for Inventions Bill. With reference to the Government measure the following memorial was adopted :—"That your petitioners have carefully considered the Patents for Invent tions Bill brought before your honourable House by the Righ-Hon, the President of the Board of Trade. Your petitioners believe that the passing of a sound measure of reform of the laws relating to patents for inventions would not only be welcomed by inventors and patentees, but would prove most beneficial to the nation at large. Your petitioners, however, are of opinion that many of the provisions of the Patents for Inventions Bill (No. 1) are most unsatisfactory, and they respectfully suggest that the Bill should large. Your petitioners, however, are of opinion that many of the provisions of the Patents for Inventions Bill (No. 1) are most unsatisfactory, and they respectfully suggest that the Bill should be so amended as to provide for (1), the appointment of three or more paid Commissioners in lieu of a Comptroller-General to manage the business of the Patent-office; (2) the extension of the term of patents to seventeen years at least; (3) greater facilities for securing prolongations of the term of patent rights for meri-torious inventions; (4) a substantial reduction of the amounts payable for continuation of patents and extension of the time for payment of the stamp duties to the fifth and tenth years respec-tively. Your petitioners respectfully suggest that the examination of applications for patents should be confined to questions of novelty or priority of invention, but that the examining body should not have the power to refuse applications either on the ground of questionable novelty, or on the ground that the appli-cant's inventions do not form matter for patents. The proposals to enforce the making of a statement of claims in the provisional specification, and to open the specification to public inspection before the grant of the patent, your petitioners consider most objectionable." It was also resolved that a deputation should wait upon the President of the Board of Trade, and impress upon him the necessity of amending the Bill in accordance with the above regulation. above regulation.

RAILWAY MATTERS.

now in course of execution; six of them are to be opened for traffic during the present year, while the rest are to be ready by January, 1884. SEVERAL new lines of railway from Chicago to the Atlantic are

A NEW Franco-Belgian railway is projected between Athus and the French Ardennes, the route by Florenville and Messempré having been preferred by the French military authorities. The fourteen kilometres in Belgium are estimated to cost four million francs.

A BILL promoted by the Great Eastern Railway Company was a bind photoe a Select Committee of the House of Commons, proposing to authorise the company to use a depót or market in Bishopsgate for the sale of fruit, meat, vegetables, and fish delivered from the Great Eastern lines. The Committee deter-mined not to sanction the use of the market.

In the House of Commons, on the second reading on Tuesday of a Bill promoted by the Metropolitan District Railway Company, an instruction to the Committee to which it will be referred was carried by a majority of 200 to 110, giving them power to insert in it a clause making it compulsory upon the company to pull down the ventilators, and to reinstate the streets and gardens upon terms that might seem reasonable to the Committee.

upon terms that might seem reasonable to the Committee. THE Select Committee of the House of Commons on Monday considered the Bill to authorise the London and North-Western Railway Company to make new railways at Birmingham, called the Soho, Handsworth, and Perry Bar Junctions; a railway from Goldborne to Springbranch Junction; the Platt-bridge Junction at Wigan; and the Hindley Junctions at Wigan; and to vest in the company the undertaking of the Lancashire Union Railway Company. After a short hearing the Court decided that the preamble was proved. THE Federal Council has reported strongly against the proposed

THE Federal Council has reported strongly against the proposed acquisition of the railways by the Government. The working expenses of Swiss railways, managed as they now are, do not exceed 55 per cent. of the gross receipts, while the State lines of Germany swallow up 59, those of Austria 73, of Belgium 63, of Norway 74, and of Denmark 71 per cent. of their revenues in working expenses. In view of these facts the Federal Council are of opinion that to purchase the railways would neither profit the State nor benefit the people, but they support a Bill for subjecting the accounts of railway companies to Government control, with power to limit the dividend.

THE report of the Railway Commissioners for the year 1882 has THE report of the Railway Commissioners for the year 1882 has just been issued. It describes the twelve cases that came before the Commissioners during the year. The judgments they delivered are given in an appendix, and other appendices contain a list of five applications made to the Commissioners in 1882 for the approval of working agreements with the results, and the judg-ment of Mr. Justice Demman and Mr. Baron Pollock on a case stated by the Bailway Commissioners in the matter of the stated by the Railway Commissioners in the matter of the "Tharsis Sulphur and Copper Company, Limited, v. the London and North-Western Railway Company" for the opinion of the Queen's Bench Division of the High Court of Justice.

Queen's Bench Division of the High Court of Justice. It is stated that one of the palace cars belonging to the United States Fish Commission started recently for California with a passenger list of young fish numbering 18,000. The middle part had an aisle running through the centre, and, in place of the seats on each side, were wooden ledges about 3ft. high, on which were placed the tin fish tanks. The fish were not placed in the tanks filled with water, as the motion of the train would dash the water about and destroy many lives among the young passengers. But, instead, about twenty fish were placed in gallon tin pails, and these pails were put in the tanks, and then the latter filled with water. With the carp, however, the water in the pails was sufficient, and the motion of the car tended to the circulation of air in the water, keeping it fresh. The attendants renewed the water every eight keeping it fresh. The attendants renewed the water every eight hours, and kept a careful watch to remove any fish that might have died. The percentage of fish loss by death, however, was very small.

died. The percentage of fish loss by death, however, was very small. THE Hounslow and Metropolitan Railway was inspected by Colonel Yolland, C.B., on Monday, April 23rd, on behalf of the Board of Trade, and will be opened very shortly. It commences by a junction with the Ealing extension of the District Railway at Mill Hill-park station, passes near Gunnersbury Park, through South Ealing, north of Brentford, crossing the Grand Junction Canal, and the Great-Western Brentford branch by a brick and iron viaduct, thence near Osterley Park and through the northern part of Spring-grove to the High-street of Hounslow, where for the present it terminates. There are stations at South Ealing, Broton-road—for North Brentford and Hanwell—Spring-grove, and High-street, Hounslow. The line will be worked by the District Company, who will run through trains from the Mansion House to Hounslow. The engineers are Messrs. Wells-Owen and Elwes, MM. Inst. C.E.; and the contractors, Messrs. Eckersley and Bayliss. and Bayliss.

and Bayliss. THE accidents on American railways in February last are given as follows by the *Railroad Gazette*:—Collisions: Rear collisions, 32; butting collisions, 17; crossing collisions, 3. Derailments: Broken rail, 24; broken frog, 1; broken switch-rod, 1; broken bridge, 5; spreading of rails, 4; broken wheel, 5; broken axle, 6; broken truck, 2; wash-out, 8; land slide, 2; snow, 5; accidental obstruction, 5; misplaced switch, 4; cattle on track, 2; flying switch, 1; runaway engine, 1; running off end of siding, 1; unex-plained 36. Broken connecting-rod, 8; broken truck not causing derailment, 1; broken wheel not causing derailment, 1; broken tire not causing derailment, 1; broken axle not causing derailderailment, 1; broken wheel not causing derailment, 1; broken tire not causing derailment, 1; broken axle not causing derail-ment, 3; broken piston-rod, 1; runaway engine, 1; cylinder head blown out, 1; cars burned while running, 2; total, 184. Three collisions were caused by the wrecking of other trains, three by misplaced switches, three by fog, two by trains breaking in two, one each by mistakes in orders, by a flying switch and by cars care-lessly left on the main track. The proportion of collisions to the total number of accidents is unusually small. Of the accidents given 112 are recorded as taking place in daylight and 60 at night, while in 12 cases the time is not definitely fixed. The following is given by a correspondent in the *Railroad Gazette*

THE following is given by a correspondent in the Railroad Gazette THE following is given by a correspondent in the Railroad Gazette for finding how many cut rails to order, or how many will be required on a given curve, so that sleepers may remain parallel and joints opposite. Let g = gauge of track, let R = radius of inner rail, then R + g = radius of outer rail. Then for a whole circle of 360 deg: $2 \pi (R + g) =$ length of outer rail, $2 \pi R =$ length of inner rail. Let d = difference in length of inner and outer rails, then $d = 2 \pi (R + g) - 2 \pi R = 2 \pi G$. For standard gauge g = 4ft. Skin, and d = 29:58ft. But an ordinary curve is only part of a circle. For a curve whose central angle is m degrees $\frac{90}{20}$.

 $d = \frac{m}{360}$ 29.58ft. Make m = 1 and we have $d = \frac{29.58}{360} = 0.986$ in.

 $d = \frac{m}{360} = 29$ -58ft. Make m = 1 and we have $d = \frac{m}{360} = 0$ -980m. For all practical purposes, it is correct to allow one inch for each degree of central angle. It will be noticed that R immediately disappears from the equation. That is, it is immaterial whether our curve is a 1 deg, or a 6 deg, curve, a simple or compound curve. The total central angle will show us how much the joints will run. For instance, if we have 870ft. of 4 deg. curve, the central angle subtended by this curve is 8.70 × 4 deg. = 34 0 deg. Hence the outer rail will be 34 Sin. longer than the innerone. To correct this we shall require eleven rails 29ft. 9in. long, and one rail 29ft. 10₄°₀in. long. The latter can be cut from a 30ft. rail. The 870ft. of curve will require twenty-nine 30ft. rails on the outer side, and we have twelve cut rails to put in the inner side, leaving seventeen whole rails for the inner side, or one cut rail to one and a-half whole rails for the inside. These should be arranged in ones and two alternately. To ascertain how many cut rails will be required on a given section of railroad, find the total amount of curvature on the section, then allow one inch to a degree. If the cut rails are to be Sin. shorter than the standard rail, we shall require one-third as many cut rails as there are degrees of curvature on the road.

NOTES AND MEMORANDA.

THE metrical system is made compulsory in Havanna from July next.

THERE were 2607 births and 1755 deaths registered in London last week, or 15.5 and 10.4 per hour respectively.

FROM a recently printed list of members of the Institution of Civil Engineers it appears that there are now on the books 1347 members, 1671 associate members, 524 associates, twenty-one honorary members, and 774 students; together 4337 of all classes.

The Guardians of the Birmingham Proof House report that the number of barrels proved in 1882 was 771,597, which is a con-siderable increase upon each of the preceding two years. The number of barrels proved during the same period in Belgium was 1,081,936.

At Cobham Hall, near Rochester, workmen a few days ago came upon a large earthenware jar, which was found to contain between 800 and 900 Roman coins in bronze, mostly of the fourth century, or about 100 years before the Romans left Britain, and are chiefly of the reigns of the Emperors Constantine, Constans, and Con-stantius. The spot where the coins were discovered was near the old Roman Watling-street, which ran through Cobham Wood towards London and the interior of the island.

towards London and the interior of the island. THE report on the Smoke Abatement Exhibition experiments on different coals burned in the grate of a Lancashire boiler shows that 11.69 lb. of water at 83 deg. Fah. were evaporated with 1 lb. good Welsh steam coal burned at the rate of 11.82 lb. per square foot of grate per hour. With feed at 84 deg. best round North-country steam coal consumed on a reduced grate at the rate of 20.87 lb. per square foot of gratesurface per hour, 11.14 lb. are given as evaporated per lb. of the coal, evaporation in both cases taking place at atmo-suberie pressure. spheric pressure.

spheric pressure. A LACQUER of great elasticity, perfectly supple and not liable to peal off, is made in the following manner :—About 120 lb. of oil varnish is heated in one vessel, and 33 lb. of quicklime is put into 22 lb. of water in another. As soon as the lime causes an effervesence, 55 lb. of melted india-rubber are added. This mixture is stirred and then poured into the vessel of hot varnish. The whole is then stirred so as to be thoroughly mixed, then strained and allowed to cool, when it has the appearance of lead. When required for use it is thinned with the necessary quantity of varnish and applied with a brush, hot or cold, preferably the former. This lacquer is useful for wood or iron and for walls; it will also render waterproof cloth, paper, &c. will also render waterproof cloth, paper, &c.

BEFORE the Academie des Sciéncés, M. G. Lippman recently pro-posed to measure the resistance of a column of mercury by opposing the current induced by a rotating magnet to another $2\pi n m K$; where current measured by a galvanometer. Then $r = \frac{2 \pi n m R}{K' H \tan a}$ K is a constant of the electro-magnetic apparatus, m the moment of the magnet, n its velocity of rotation, K' the galvanometer constant, and H the horizontal resultant of local magnetic forces.

is determined by Gauss's method. In a resistance of one to five

ohms the fractional error would be, the author says, within one-

tenth of 1 per cent. THE following velocities for wood-working tools are given by the Builder and Woodworker :--Circular saws, periphery of, 6000ft. to 7000ft. per minute ; band saws, 2500ft.; gang saws, 20in. stroke, 120 strokes per minute ; planing machine cutters at periphery, 4000ft. to 6000ft. Work under planing machine $\frac{1}{2}$, for each cut. Moulding machine cutters, 3500ft. to 4000ft.; squaring-up machine cutters, 7000ft. to 8000ft; wood-carving drills, 5000 revolutions; machine augers, 1½in. diameter, 900 revolutions; do., $\frac{2}{3}$ in. diameter, 1200 revolutions; gang saws require for 45 super-ficial feet of pine per hour, 1-horse power, incular saws require 75 superficial feet per hour, 1-horse power. In oak or hard wood three-fourths of the above quantity require 1-horse power. Sharpening angles of machines, utters-adzing soft wood across the grain, 30 deg.; planing machines, 40 deg.; hardwood tool-cutters, 50 deg. In their monthly report on the London water supplied by the

gauges and phogming machines, bottes, matteries to the system of the start of the system of the syst

or where, what a maximum in any individual sample, out of the sixty-eight averaged, falling short of three-quarters of a grain." TAKING the consumption of coke in the production of pig iron in the United Kingdom in 1882, at 23 cwt. per ton of iron made, it is estimated that Cleveland used 3,091,947 tons, West Cumber-land used 1,151,358 tons, South Wales used 1,015,801 tons, North Wales used 56,020 tons, South Staffordshire used 453,209 tons, North Staffordshire used 364,684 tons, Lincolnshire used 231,795 tons, Lancashire used 900,150 tons, Northamptonshire used 220,932 tons, West and South Yorkshire used 321,141 tons, Derbyshire and Notts used 512,595 tons, Shropshire used 92,546 tons, Gloucester-shire, Wiltshire, &c., used 55,200 tons; total of coke, 8,472,378 tons, representing about 14,120,627 tons of coal, to which must be added coal consumed in Scotland, say, 2,300,000 tons, or a total of coal, 16,420,627 tons. The British iron trade report, however, adds that it is probable that the average yield of the United Kingdom will be nearer 56 to 57 per cent. of coke per 100 of coal, 60 per cent. being, indeed, about the best average result that is obtained in the coke manufacture. It is probable also that the average consumption of coke per ton of pig made will, in the country generally, be nearer 25 than 23 cwt. The foregoing figures are, therefore, subject to these two modifications. A NEW method of bleaching paraffine is described by M. de

A NEW method of bleaching parafine is described by M. de Molon in the *Corps Gras Industriels*. It is said to be more rapid and less expensive than the older methods and incurs no waste. It consists in the filtration of the rough parafine, which is subjected in a boiler to the action of lime, there being added about subjected in a boiler to the action of lime, there being added about five per cent. of its own weight of sulphide of sodium and water. The mixture is let cool in order to allow of the solidification of the layer of parafine; it is then washed with boiling water and then pressed. The sulphide of sodium may be replaced by 10 per cent, of lime in powder. After boiling for an hour the mixture is filtered, and is treated as above with amylic alcohol. The residues from these operations are preserved in order to be treated sub-sequently by an acid—for instance, hydrochloric acid or sulphuric acid. The action of these acids is to form with the base a salt, and consequently to liberate the carburetted oily substances. The paraffine and the amylic alcohol are then set free by the process of distillation. The inventor remarks that in place of sulphide of sodium and lime other sulphurous combinations could be used. It of distillation. The inventor remarks that in place of subfide of sodium and lime other sulphurous combinations could be used. It is further stated that after the performance of the operations which have been described, the action in a suitable apparatus of sulphuret of carbon, of amylic alcohol, or other dissolvents, can be substituted for the filtration by means of animal charcoal, which has hitherto been customary. Care should be taken that the liquid intended to be used in the filtering process should be made as cool as possible. After this treatment has been carried out the paraffine has only to be filtered and pressed.

MISCELLANEA.

THE re-opening of the Parkes Museum of Hygiene by the Duke of Albany takes place on Saturday, May 26th, in new premises, 74A, Margaret-street, W.

THE prizes and diplomas awarded to exhibitors at the Crystal Palace Electrical Exhibition of 1882 were distributed on Wednes-day by the Duke of Teck.

THE work of altering French lighthouses for the adoption of the electric light has been begun with those which guide into the principal ports, and those which give warning of the most dangerous rocks.

ON Saturday last Messrs. Oswald Mordaunt and Co, South-ampton, launched a fine iron sailing ship of 2100 tons register, named the Albyn-length, 284ft.; breadth, 40ft. 3in.; depth of hold, 24ft.

On the 19th inst., Messrs. Earles' Shipbuilding and Engineering Company, Limited, launched from their yard the steamship Bolama, built for the Empreza Nacional West African line of steamers— length p.p., 180ft.; breadth, 26ft.; depth of hold, 18ft. 6in.

THE Vellatta, a new steel barque of about 900 tons register, launched on the 9th inst. from Messrs. John Reid and Co.'s yard, Port Glasgow, while coming up the Clyde on Monday in ballast, under tow, capsized about seven miles below Glasgow. The crew ware saved were saved.

It is stated that one Edison dynamo-electric machine supplying 250 Edison A lamps, and one Ferranti machine, which is driven at about 2000 revolutions, and supplying about 370 Swan lamps of normal size in the Aquarium Exhibition, consume over 90 indicated horse-power.

According to official information received by the Commissioners of the Exhibition, the Imperial German Government—who were invited by the k.k. Austrian-Hungarian Ministry on Foreign Affairs —have consented to exhibit at the Vienna Electrical Exhibition, and arrangements are being made accordingly.

ON Saturday, 21st inst., the King of the Belgians opened the new Musée Commercial, Brussels, where are, or are to be, deposited samples of the indigenous produce of other countries, and of articles suitable for export, as well as documents relating to con-tracts in the capital, the country, and abroad.

ON Wedgender, 2nd Numerical States and in Saving States and in Saving States and States

ON Wednesday, 2nd May, the representative of the Belgian Minister of Public Works will receive offers for the supply of bar iron and articles in wrought and cast iron in exchange for scrap. On the same day at noon, tenders will be received at the State Railway Works, Mechlin, for the supply of parts of wagons in any oak, not American. Particulars of both may be obtained at the Ministry of Public Works, Brussels.

Ministry of Public Works, Brussels. A NEW floating grain elevator, with two sets of boilers of 100-horse power each, was inaugurated at Bordeaux on the 7th inst. by M. Fargue, engineer, representing the French Minister of Public Works. Fifty tons of wheat were unloaded, weighed, screened, cleaned, and loaded on to a lighter in twenty minutes; and 25 tons were transferred from a vessel to the second floor of the warehouse in the minutes hereides being screened and weighed. in ten minutes, besides being screened and weighed.

ON Tuesday a Select Committee of the House of Commons passed a Bill, promoted by the Metropolitan Board of Works, authorising that body to carry out such alterations in the existing bridge across the Thanes at Hammersmith as will practically amount to its re-construction. The Bill empowers the Board to construct a wooden bridge across the river for the use of traffic during the time necessary for the completion of the proposed works works

works. Two competing schemes in Parliament this session, for the supply of water to a large part of Flintshire, have been before a Committee of the House of Lords last week and this. One scheme was the Flintshire Gas and Water—the engineer being Mr. Bate-man, C.E.; and the other the Hawarden and District Water—the engineer being Mr. Robinson, C.E. The Committee decided to pass the scheme of the Hawarden Company, and threw out that of the Flintshire Company. the Flintshire Company.

THE Belgian Chamber of Representatives has taken into consideration the report of the Permanent Committee of Industry, embodying the votes passed at the Liége Congress of 1881. All these votes have been rejected as involving the Government in too these votes have been rejected as involving the Government in too great expense, excepting one, the adoption of a uniform toll on canals. At present these dues press heavily on Belgian coal-masters and manufacturers, while English goods arriving by the Scheldt and canals pay next to nothing, French and German products also entering with little expense.

products also entering with little expense. ON Sunday afternoon a cyclone passed over Beauregard and Wesson, Mississippi. In Wesson, 200 dwellings, mostly inhabited by factory operatives, were wrecked, 12 persons were killed, 75 were injured, and three children are missing. Beauregard was entirely destroyed; not one building remains standing, 23 persons were killed outright, 17 were mortally wounded, and 90 more seriously hurt. Tillman was also destroyed, and West Point much damaged, several persons being killed and injured. Medical assist-ance was sent from the neighbouring towns. On the 20th February last, the vertical holler of a steam digrar

ance was sent from the neighbouring towns. On the 20th February last the vertical boiler of a steam digger, or navvy, burst while at work in a railway cutting now being made to connect High Blantyre with East Kilbride. The fire-box and the outer part of the boiler were connected by a 2in. stay bolt. The head of this came off; hence the explosion. When there is anything remarkable or noteworthy in the cause of a boiler explo-sion, it is well to have a proper and full report upon it; but nobody on earth, other than the Marine Department of the Board of Trade, could tell why it was necessary to have a two-colour 24in. × 18in, sheet of lithograph drawings of the boiler, and full-size views of the bolt, in this ludicrously simple case.

It is announced that it has been decided to extend the electric It is announced that it has been decided to extend the electric lighting plant established in the salt mines of Maros-Ujvor --Hungary. There are at present installed fourteen arc lamps, to which there will now be added fourteen more arc lamps of 600-candle power each. The arrangement will be carried out in such a manner that the new lighting plant will be fed by a separate electric machine for alternate currents, but both the old and new machine will be driven by a common steam engine. The new installation is to be carried out by the electro-technical establish-ment of Messrs. Ganz and Co., of Budapest, with their own electric machines and lamps-system Zipernowsky. The same firm has signed a contract for the electric lighting of the telegraph offices, at Budapest, with 200 Swan lamps, for ten years. Budapest, with 200 Swan lamps, for ten years.

THE watch committee of the Corporation of Nottingham have instructed the National Telephone Company to institute a system of electric fire alarms throughout the borough. An iron box with a glass face is fixed into a wall, and inside the box is an apparatus which is connected by wire with the central police and fire stations; to raise an alarm the glass in front of the iron box has to be broken. This breakage causes a strong spring to plunge forward, completing an electric circuit, which releases an armature carrying a red disc, indicating at the station where the alarm has been given, at the same time a bell rings in connection with all the fire-men's houses, and the central station, so that the men receive the alarm at the same moment. The whole arrangement works auto-matically, and only from three to four seconds are lost from the time the alarm is given. The company have already placed boxes in fifteen busy thoroughfares, and several more will shortly be put in operation. THE watch committee of the Corporation of Nottingham have in operation.



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THE ENGINEER.

APRIL 27, 1883.

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame BoyveAU, Rue de la Banque. BERLIN.—ASHER and Co., 5, Unter den Linden. VIENNA.—Messrs, GREDLD and Co., Booksellers. LEIPSIC.—A. TWIETMEYER, Bookseller. NEW YORK.—THE WILLMER and ROGEES NEWS COMPANY, 31, Beekman-street. LEIPSIC NEW Y

PUBLISHER'S NOTICE.

*** With this week's number is issued as a supplement, a Two-page Engraving of the Grasshopper Engines of the Tug-boat Henrietta, Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.

TO CORRESPONDENTS.

- *** In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a 1d. postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these intervations. with these instructions.
- with these instructions. * We cannot undertake to return drawings or manuscripts; we must therefore request correspondents to keep copies. * All letters intended for insertion in THE ENGINEER, or con-taining questions, must be accompanied by the name and address of the writer, not necessarily for publication, but as a proof of good faith. No notice whatever will be taken of anonymous communications. communications.

NIL.—There is no standard work on railway carriages and wagons.
 T. H. S. (Pittsburgh).—There is no treatise dealing fully with bar and guide mill rolling.

- mill rolling. DYNAMO.—Paget-Higgs "On Electric Lighting," published by Messrs. E. and F. N. Spon; and "Electric Light," by J. W. Urquhart, published by Messrs. Crosby Lockwood and Co. W. W.—There is little or no information published concerning the manu-facture of paper car wheels. The process of manufacture is a speciality, and as such is in some respects a secret. W. M. We have no crnorieve of an conting stores to quide us. You can

and as such is in some respects a secret. W. M. P.-We have no experience of gas cooking stoves to guide us. You can have a stove of almost any pottern from the gas company supplying your house for 2s. 6d. a quarter, or 10s. per annum; so it will not cost you much to try which of the stores you name is the best.

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- Foreign Subscriptions for Thin Paper Copies will, until further notice, be received at the rates given below .--Foreign Subscribers paying in advance at the published rates will receive THE ENGINEER veekly and postfree. Subscriptions s nt by Post-office order must be accompanied by letter of advice to the Publisher. Thick Paper Copies may be had, if preferred, at increased rates.
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ADVERTISEMENTS. *** The charge for Advertisements of four lines and under is three shillings; for every two lines afterwards one shilling and sixpene; odd lines are charged one shilling. The line averages seven words. When an advertise-ment measures an inch or more the charge is ten shillings per inch. All single advertisements from the country must be accompanied by a post-offic order in payment. Alternate advertisements will be inserted with all practical regularity, but regularity cannot be guaranteed in any such case. All eccept weekly advertisements are taken subject to this condition. Advertisements cannot be inserted unless Delivered before Six O'clock on Thursday Evening in each Week. Letters relating to Advertisements and the Publishing Department of the paper are to be addressed to the Publisher, Mr. George Lopold Riche; all other letters to be addressed to the Edditor of THE ENGINEER, 163, Strand.

MEETINGS NEXT WEEK.

MEETINGS NEXT WEEK. THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, May 1st, at 8 p.m.: Ordinary meeting. Paper to be discussed, "Resistance on Railway Curves as an Element of Danger," by Mr. John Mackenzie, Assoc. M. Inst. C.E. Thursday, May 3rd, at 8 p.m.: Special meeting. Con-cluding lecture "On the Applications of Electricity"—"Electrical Units of Measurement," by Sir William Thomson, F.R.S., M. Inst. C.E. CHEMICAL SOCIETY.—Thursday, May 3rd, at 8 p.m.: Papers to be read, "On a New Oxide of Tellurium, Tellurium Sulphoxide, a New Reaction of Tellurium Compounds," by Mr. Elward Divers, M.D., and Mr. M. Shimosé. "A Simple Modification of the Ordinary Method for Effecting the Combustion of Volatile Liquids by Glaser's Method with Open Tubes," by Mr. Watson Smith. "On Acenapthene," by Mr. W. R. Hodgkinson, Ph.D. by Mr Ph.D.

Ph.D. SOCIETY OF ARTS.—Monday, April 30th, at 8 p.m.: Cantor Lectures, "The Transmission of Energy," by Professor Obsorne Reynolds, M.A., F.R.S. Lecture II.—The storage of and conveyance of stored energy in forms available for power; the limited capacity of all reservoirs of energy; the limits to the possible distance through which power may be transmitted by mechanical means. Wednesday, May 2nd, at 8 p.m.: Twentieth ordinary meeting, "Electricity as a Motive Power," by Pro-fessor George Forbes.

DEATHS.

On the 21st inst., at Tempest-road, Beeston-hill, Leeds, ROBERT MCINTYRE, for 25 years Manager of the Boyne Engine Works, Leeds. On the 21st Inst., at Bonchurch, I. of W., THOMAS WILLIAM RUMBLE, F.R.S.E., F.G.S., M.I.M.E., &c., aged 50. On the 22nd inst., at Whithorn Villa, Pollokshields, in his 71st year, ROBERT HARVEY, sen., engineer. Friends will please accept of this intimation. ROBERT H intimation.

ENGINEER

APRIL 27, 1883.

THE CHANNEL TUNNEL. THE Select Committee of the Houses of Lords and

Commons, consisting of Lords Lansdowne, Camperdown, Aberdare, Devon, and Barrington, and Messrs. Baxter, Peel, and Harcourt, and Sir Hussey Vivian and Sir Massey Lopes, met for the first time on Tuesday at Westminster, to consider whether Parliamentary sanction should or should not be given for the construction of the Channel

heard Sir Edward Watkin, we were not aware of how little can be said in favour of the construction of the tunnel. Apart from considerations of the aggrandisement of a public company, the only argument worth naming that he had to urge in its favour from the national point of view, was that if we lost command of the sea and had our ports blockaded, we could get food and supplies of all kinds through the tunnel. That is, of That is, of course, if France were on good terms with us. Now, not to mince matters, it so happens that France is the only Power that could possibly blockade our ports. Neither Italy, Germany, nor Russia could do it; and as for the United States, they having no navy, are out of the question altogether. Sir Edward Watkin's fancy sketch of England being fed through the Channel tunnel while her foes lurk round her coasts, reminds us of the old tales of prisoners condemned to starvation, and fed by faithful friends through a straw thrust in at the keyhole. Sir Edward did not hesitate to push his arguments. He cited the cotton famine as an example of what might happen. Cotton rose during the American Civil War from 6d. to 2s. 6d. per lb. "That was the effect of the blockade of one article." The illustration was no doubt forcible; but he wasted his opportunities by not going on to point out that if we had had a Channel tunnel cotton could not have risen 2s. a pound. We hasten to supply a further want in Sir Edward's evidence, and add that if there had been a tunnel under the Atlantic between Liverpool and New Orleans, the chances are that cotton would have been cheap in spite of the war.

Sir Edward Watkin dealing with traffic was not less amusing than Sir Edward Watkin dealing with our international relations. The tunnel is to be lighted throughout by electricity, and well ventilated. Two hundred and fifty trains only per day will be run through the tunnel, and the speed of passenger and goods trains alike will be 45 miles an hour. But he did not say a syllable as to how the trains are to be drawn or the tuunel ventilated. On these points he was, as he always has been, discreetly silent. Like Mr. Micawber, he hopes no doubt that something will turn up before the tunnel is finished. There are compressed air, and electricity, and fireless locomotives, and rope traction. It cannot, he probably argues, be possible that none of these things will do what has to be done. We have, over and over again, pointed out that the absence of any proper scheme for working the traffic of the tunnel ought to be fatal to it. It ought to prevent the extraction of a single shilling from the pockets of the public. Concerning the military aspect of the question, Sir Edward has somewhat peculiar notions. He proposes that 500,000 yards of concrete shall be made out of the chalk taken out of the tunnel, and that a fort shall be constructed out of this. We have heard it said that anything will do for a locomotive, and Sir Edward which the second fort would be £250,000. Sir Edward did not say who was to pay this sum; but he hastened to assure the committee that in his opinion the railway companies would not be willing to pay the cost of maintaining a garrison in the fort. He also explained that although a private company ought to make the tunnel, because such a company would do the work quicker and better than the nation, yet the nation would be expected to buy the tunnel when it was finished. As to other Channel tunnels, he saw no objection to their construction, and he wound up by asking the committee to visit the works at both ends of the tunnel, which means two of those underground champagne luncheons for which Sir Edward has acquired considerable celebrity. They may be regarded as a specialty of his own invention. Taken as a whole, Sir Edward's evidence was, as might be expected, that of the advocate; but we did not expect that it would contain so many absurd and weak arguments. Indeed, Sir Edward Watkin paid but a poor compliment to the intelligence of the committee, or to his own, when he said many things better left unsaid. He was followed by Sir F. Bramwell, who was, as he

always is, attractive, interesting, ready, and amusing. He endorsed all that Sir Edward Watkin had said to begin with, a statement which promised well. Nor did the rest of his evidence belie this statement. He proposes to keep us safe from invasion by constructing a gigantic shot-pouch arrangement at the end of the tunnel. There are to be two steel portcullises, each weighing 100 tons, and a train on its arrival is to pass under the first raised by hydraulic power. Next the train is to be examined by Custom House officers to see that there are no foreign soldiers in it. The first-mentioned portcullis is then to be dropped and the second raised, and the train is to be passed on into England. This work is to go on all day, and the port-cullises are to be so coupled that when one opens the other shuts, and so on. We are not quite clear what the portcullises are intended to do; but Sir Frederick is of binion that as a matter "of course, allowing for human fallibility, if the machinery was in good order such a plan as this would reduce the danger of constructing the tunnel to a minimum." Nothing would give us more pleasure than to see Sir Frederick working two hundred and fifty trains per day, through his portcullises, and the Custom House officers searching the carriages for suspected soldiers. We fear that no traffic manager now alive would be found to undertake the work. A man will have to be specially trained to fill the post.

THE SMOKE ABATEMENT COMMITTEE ON STEAM COAL.

It formed part of the duty of the Smoke Abatement Committee to test fuels and boilers employed in raising steam. The investigation was carried out by Mr. D. K. Clark, who prepared a special report to be found in the volume recently issued by the Smoke Abatement Committee. We propose to say here something concerning tunnel. But two witnesses were examined—Sir Edward Watkin and Sir Frederick Bramwell. The evidence of these gentlemen was, we suppose, meant to be taken seriously, but it was very amusing. Indeed, until we

that it is much to be regretted he has supplied no data which will enable his readers to check his statements for accuracy. For the moment we shall confine our attention to the chapter which begins on page 134 of the volume. It is headed, "Report on Tests of Fuels," and it commences by describing the boiler with which the work was carried out. Twenty-nine varieties of anthracites and Welsh coals, with three samples of artificial fuel and three samples of Newcastle coal, were tried. These Mr. Clark classifies as—Anthracites, 10; Welsh steam coals, 13; Northumberland steam coals, 3; patent fuel, 3. The tests were made with the short Lancashire boiler, set on Livet's system, at Messrs. Clay, Sons, and Taylor's printing works, We ourselves Bread-street-hill, Queen Victoria-street. tested this boiler for evaporative efficiency in 1880, and drawings of it will be found in THE ENGINEER for May 28th in that year. The trials made by Mr. Clark extended over three months. Each test was made in one day of about $7\frac{1}{2}$ hours, and the water was drawn from a large rectangular tank on an upper floor. The essence of Mr. Livet's invention lies in setting the boiler with very wide and deep flues, so as to give the heated products of combustion time to part with their heat to the water in the

boiler. We shall take the most noteworthy result obtained first. Mr. Clark is responsible for the statement that in the twenty-ninth experiment, Aberdare Rhondda steam coal being used, he obtained an actual evaporation of 12.25 lb of water per pound of coal, the temperature of the feedwater being 60 deg., and the average pressure 61 deg. He gives the equivalent evaporation from and at 212 deg, at 1453 lb. We do not say that this result was not really obtained, but we do say that such an evaporative efficiency was never obtained before; and the more carefully we consider what it means the more reason do we find for making this statement. The work done by the fuel in any steam boiler is divided into two principal portions, viz., first, heating the air required for combustion, and secondly, making steam. No information is supplied by the report as to the quantity of air passed through the grates; but inasmuch as the combustion was very complete, we may rest assured that it was not less than 20 lb, per pound of coal. The air had to be heated from 60 deg. to that at which the products of combustion ceased to be in contact with the boiler. Unfortu-nately this temperature is not stated for the particular trial we are considering, but on another occasion we find that with the same coal and the same boiler it was 318.2 deg. We shall assume, then, that on the 22nd September, 1881-the day named—the temperature was 318 deg. The specific heat of air we shall take at 23 deg. Then (318-60)'23=59'34 units carried away by each pound of air, or per pound of coal, $20 \times 59'34 = 1186$ units. We have besides this, loss by radiation from the boiler front and its setting; but this we shall neglect. Now each pound of setting; but this we shall neglect. Now each point of steam from and at 212 deg. represents 966 units in round numbers, and $966 \times 14.53 = 14,036$ units. Adding to this the heat carried off in the products of combustion, we have 15,222 units per pound of coal. The value of the coal cannot possibly have been less than this, and must, if Mr. Clark's statement is true, have been considerably The more, for no allowance is here made for any waste. total quantity of coal consumed was 833.28 lb., and there were 20 lb. of ashes, representing 2.4 per cent. Now the coal being smokeless, is very nearly pure carbon; the quantity of hydrogen in it must of necessity be very small; but the theoretical value of pure carbon as a fuel is but 14,500 units. Rankine gives, as the result of elaborate calorimeter laboratory experiments, the maximum efficiency of caking coal as 15,837 units, and for a dry bituminous coal 15,370 units. The accuracy of these statements has never been impugned. Putting things together, we find then that the boiler at Messrs. Clay's works was so efficient that at least 15,219 units of heat out of a possible 15,370 were utilised; and deducting the heat expended in warming the air, it would appear that the coefficient of efficiency of this boiler is not less than, in round numbers, 92. This is certainly the most marvellous result ever obtained with any steam boiler, and assuming it to be true, it would place Mr. Livet's system of setting far in advance of anything of the kind ever invented. It may be worth while to add that in our own experience with steam boilers—which is not limited-we have not met with anything approaching this efficiency; and furthermore, it is noteworthy that with a similar trial of the same coal burned in the same boiler carried out on December 6th, 1881, the evaporation was not 14:53 lb., but 13:07 lb. from and at 212 deg. The difference—nearly $1\frac{1}{2}$ lb. of water per lb. of coal—is very great; how is it to be accounted for? The rate at which the fuel was burned on the 22nd September was extremely slow, averaging only 7.31 lb. per square foot of grate per hour, and the rate of evaporation was only 26 30 cubic feet, or 1643 7 lb. per hour. The heating surface of the boiler is not given by Mr. Clark; we supply the omission. The boiler is 18ft. long and 7ft. in diameter, the tubes being 2ft. 9in. in diameter at the furnaces and 2ft. 4in. at the far end. Making a deduction for the bottom of the flues, the total heating surface is about 390 square feet, and the rate of evaporation was therefore only 4.21 lb. per square foot of heating surface per hour, or less than one-half a usual rate for Lancashire boilers; and lastly, we may say that our own experiment with Welsh coal gave a very indifferent result, the rate of evaporation being only 6.66 lb. of water per lb. of coal, the temperature of the feed being about 60 deg. In a succeeding experiment with coke we 60 deg. In a succeeding experiment with coke we evaporated 8'12 lb. of water per lb., from 60 deg. It is a great defect in Mr. Clark's report that he supplies no information as to the way in which the trials with this boiler were carried out; whether he was present himself or acted by deputy is not stated. Neither Mr. Livet nor any of his representatives were present. Again, Mr. Clark speaks of cold feed-water, but during the trials we carried out

ance has been made there was an advantage gained. It is impossible to make a report of this kind too precise.

Leaving this extraordinary performance—one which stands without a parallel in Mr. Clark's report—we may go on to consider some of the results obtained with other coals, and inasmuch as the temperature of the feed-water did not vary, we shall take the actual evaporation. The best result got with anthracite coal was obtained from that supplied by the Anthracite Coal Company, the actual evaporation being given at 11:89 lb. The rate of evaporation was yet slower than that stated above; the least evaporation was at the rate of 6:84 lb. The best result got with Welsh steam coal was that about which we have said so much. The worst coal of the kind tested evaporated 6:88 lb. of water per pound. Nixon's Navigation evaporated at Brixton pumping station 11:69 lb. The particulars of the boiler supplied are inadequate; we are only told that it was a Lancashire boiler, 283ft. long, with two 33in flues. Northumberland steam coal at its best did but 8:90 lb., while the patent fuel was by far worst of all, evaporating only 7:87 lb. of water per pound of coal.

The report as it stands is interesting, and no doubt represents a great deal of hard work, but we cannot see that it possesses much value. It shows that, burned under certain conditions of slow combustion and very moderate draught, such and such results were obtained; but it is hardly necessary to say that in practice coals hardly ever are burned under similar conditions. Instead of burning 7 lb. to 10 lb. of coal per square foot of grate per hour, the usual rate is 15 lb. to as much as 20 lb., and sometimes in usual rate is 15 lb, to as much as 20 lb, and sometimes in marine boilers even more than this. The conditions would be entirely altered under such circumstances, and the results would also be changed. Again, no pains seem to have been taken to burn the coal really to the best advan-tage, the one object had in view being to burn it as slowly as possible, with the view to obtain the highest possible evaporative efficiency, while the quick steaming power of the coal a matter of great importance. was over of the coal, a matter of great importance, was overlooked. Mr. Clark has seen this, and supplements his table with certain deductions, pointing out, for example, that when the fire-grate was reduced in area and the rate of combustion augmented, the evaporative efficiency rose; and although his table shows Northumberland coal in a very unfavourable light, he says, "It may, there-fore, warrantably be concluded from the evidence of these tests that when the coals are treated according to their respective natures, and under the circumstances of the tests, the Northumberland steam coal was substantially of equal evaporative power, efficiency, and substantiany of with Nixon's Navigation coal." We give credit to the Smoke Abatement Committee for a praiseworthy endeavour to add to our knowledge of the value of various fuels but we can assure them that the time has long passed since such experiments as those carried out by Mr. Clark were of value. He could only go over old ground. It is, indeed, difficult to imagine how any set of experiments could be carried out with coal which would supply the steam user with information he does not now possess. Mr. Clark of course carried out the work intrusted to him with skill and care, as far as the means at his disposal would let him ; but the following passage from his own report shows the precise value which Mr. Clark himself sets on his own figures :—" In conclusion, on the Clay boiler tests it may be remarked that the fuel which may give the greatest degree of satisfaction to the intelligent stoker is not necessarily the most efficient for evaporation. A stoker places a high value on handiness, free burning, scarcity of clinker and ash, and on clinker, if there be clinker, that does not cling. For these reasons the Welsh steam coals as a class are preferred to the anthracites." We may add that no one knows more about the relative value of coals than a thoroughly well-trained, intelligent fireman. There are many such, and it is to be regretted that they are seldom appreciated as they deserve; and that so little is done by steam users to raise up and encourage a class of men who have more power in their hands of saving or wasting coal than that with which they are credited.

HOLLOW AND SOLID SCREW SHAFTS.

The discussion which took place on the paper which was read before the Institution of Mechanical Engineers on the 11th inst. by Professor Greenhill, and printed in our last impression, was brief, but it was sufficient to direct attention to a question of some interest. The paper leaned most distinctly on the side of hollow shafts, and as far as the disposition of the material from a mechanical point of view is concerned, the argument is indisputably in favour of the hollow shaft. Experience, however, indicates that for shafts employed in steamships, which are themselves farfrom being rigid, stiffness is an undesirable characteristic. There are certain not easily-definable qualities which must be included in a calculation having reference to the strength of large screw shafts, and which indicate that the application of mechanical theory must be guided by physical considerations.

If a shaft is to be employed in transmitting power to a distance over which it is to be supported on unyielding foundations, the argument in favour of the hollow form is almost as great as for the mechanically economical distribution of the material in a girder. Seeing that a hollow shaft with a hole of one-half the exterior diameter will have over 60 per cent. greater stiffness than the solid shaft of the same weight, the advantage in this respect is unquestionable. Very heavy shafting is, however, seldom employed on land as compared with its use at sea, and it is for the latter that some information more than at present exists is required. On the other hand, if the heavy shafts used in ships transmitted power without revolution, then there would be nothing to urge against the stiffness secured by the hollow form, for, of whatever material, the shaft might be expected to remain free from fracture caused by flexure of the ship, the latter being external to the shaft, and therefore having its material disposed to obtain stiffness 'without any view to, and at the expense of, flexibility. The flexure which the ship would experience with safety could, it follows, be imposed on the shaft, for the changes from flexure in one

direction to flexure in the other direction are never sufficiently rapid to impart a strain of the nature of a vibrating flexure of short range. The shaft, however does revolve, and this wholly changes the character of the strains visited upon it. If, for instance, we suppose a shaft to revolve a hundred times per minute, then it will be seen that any flexure brought about by the bending of the ship will be changed in sign at the rate of two hundred times per minute, and it is questionable whether this would not gradually destroy a shaft, even though the range of bending may always remain within the range of elastic flexure of the material of the shaft. The pe-culiar action on the material to which this rotation under a bending stress gives rise, may be said to par-take of a kneading character, and it may safely be said that if ordinary cart and wagon axles were subject to stresses of the same complicated sort, they would not long stand their work, though they are relieved of the severity of the impact strains to which they are subject, by the springs between them and their load. Such axles are, strained almost wholly in one direction, otherwise it would undoubtedly become necessary to give them greater sectional area until there came to be as great an apparent or seeming disparity between the static strength of the axle and the work to be done by it, as in the case of a railway axle. The greater the stiffness of a screw shaft the greater will be the tendency to locate the destructive bending near the bearings, where the diameter is some-what lessened, and in the case of the hollow shaft, as shown by Professor Greenhill, the rigidity of such a shaft carried in bearings at frequent intervals is such that flexure could not take place with sufficient freedom to produce an elastic curve. Under the enormously heavy torsional strains to which a screw shaft is subjected when a ship is pitching, curve. and the screw one minute deeply buried and the next half or wholly out of the water, it may be questioned whether there is not added to the destructive action brought about by rapid rotation under simultaneous bending stress, another source of destruction of a peculiar character, namely the tendency to an epicycloidal rotation of the material of the shaft upon itself—just in the same way as the tendency is set up in a rod rigidly fixed at one end, while the other end is caused to describe a circular path, a torsional strain being put on the rod at the same time. This tendency will of course be wholly absent so long as the shaft remains free from bending stress, but being bent, the tendency will be proportional to the torsional stress and some function of angle of flexure.

When it is admitted that the bending of a steamship is often sufficient to throw very considerable bending stress on its screw shaft, it appears to be a question whether the use of hollow shafts is not a step in the wrong direction, for it would be undesirable to impose upon the shaft the duty of relieving the ship; and yet if the shaft is not made heavy and strong enough for this, it must itself submit to more or less destructive flexure. Rigidity, short of absolute rigidity, would thus seem to be an undesirable quality; and even with hollow shafts this could not be obtained without great weight, and would be accompanied by very numerous and important objections as a shaft to be driven at a high and important objections as a shaft to be driven at a high speed by steam engines coupled direct. Experience with hollow shafts has not yet been sufficiently extended to prove their value, and it would be rash to agree with the statement made by Mr. Reynolds in the discussion above referred to, that "the history of hollow screw-shafts was a tale of disaster;" but sufficient failures have taken place to show that hollow shafts do not afford a complete solution of the most costly steamship trouble." An ideally perfect and possibly practicable, shaft would An ideally perfect, and possibly practicable, shaft would consist of a perfectly flexible core, of small diameter, carrying a number of annular rings freely interlocked, and capable of transmitting torsional stress only. With this shaft the action due to simultaneous rotation and bending would be expended in sliding the interlocking surfaces of the annular rings, instead of molecular distortion of the material of the shaft. From this point of view it might be argued that the solid shaft provides the flexible core— itself capable of transmitting torsional stress—and the annular rings; for these shafts often do good service long after a crack or cracks appear on the surface; the core holding the shaft together and the cracked outer parts, nolding the shart together and the cracked outer parts, with some assistance from the core, transmitting the power. It is probably impossible to obtain it, but if the neces-sary flexure could be obtained partly by surface sliding instead of molecular disturbance, immunity from breakage might be secured ; just as a long range of flexure is ob-tained in carriage springs by making them in several leaves free to slide on each other instead of in one piece, which to give the same range of flexure under the same loads would have to submit to much greater molecular distortion within its elastic range. That the large shafts of our big steamers do not fail

That the large shafts of our big steamers do not fail from want of original strength to transmit the power of the engines seems sufficiently recognised; and this being the case, the question for consideration is whether the failure is due to the development of flaws or whether it is due to the complicated stresses and workings herein dwelt upon. If the latter, then the resort to either hollow or very heavy sections does not seem to be the proper method of getting out of the difficulty, and it may be asked : Are the objections to a universal joint connection or coupling as great as usually supposed, or so dangerous as the frequent failure of the shafts themselves? Practice in the French Marine seems to give an answer in the negative.

THE GREAT MATHEMATICAL PRIZE OF THE FRENCH ACADEMY.

SINCE the death of the much-lamented Professor H. J. S. Smith, of Oxford, the French Academy have awarded to him the great mathematical prize for his dissertation on the representation of a number as the sum of five squares. The subject for the prize was announced in the *Comptes readus* of the Academy in February last year, and according to custom the essays were to be sent in before June 1st. There were three candidates, and the value of the prize is 3000f. The complete solution of the important problem proposed by the French Academy had been obtained by Professor Smith sixteen years

ago as part of a far more general investigation, and the results were published by him in the "Proceedings" of the Royal Society, in 1868, but without demonstration. The researches seem, however, to have escaped the notice of the French mathematicians. When the subject of the prize was announced last year, Professor Smith extracted from his manuscript books the demonstration of the propositions relating to the five-square problem, and it is to the dissertation so formed that the prize has been awarded. In 1868, Professor Smith won the Steiner prize of the Berlin Academy, so that had he lived till now he would have been "laureate" of both the Academies of Paris and Berlin. Oxford will feel a genuine pride, not unmixed with sadness, at the posthumous honour paid by the French Academy to the late Professor Smith, in according him its great mathematical prize. The essays—of which Professor Smith's has been adjudged the best—were sent up last year, as already stated, but it is only now that the award has been published, and Professor Smith's name has been added to the long list of great mathematicians who have been distinguished by the "Grand Prix," and is the first English name on the list. Had he lived a few months longer he would have had the satisfaction of adding another, and the greatest, to the acknowledgments of his brilliant services to science which he has received from foreign learned bodies. As it is, his success will be a great though sorrowful satisfaction to the friends of one who, profoundly as he was esteemed and valued by those who knew him, had not attained, in his own country at least, that general fame, which, on the Continent, is so readily accorded to first-rate men of learning. But this is not the end of the story. It now appears that the Academy of Sciences has got itself into, an awkward mess. When the prize was awarded, as already set forth, two were in reality awarded; one to Professor Smith, and one to M. Hermann Minkowsky, a student at the University of Königsberg, for having also sol

CRYSTAL PALACE SCHOOL OF ENGINEERING.

ON Saturday last the certificates awarded to the students of the Crystal Palace School of Engineering were distributed by Mr. J. F. Bateman, past president and honorary councillor of the Institution of Civil Engineers. The examiners, Mr. W. Ridley and Mr. Ewing Matheson, MM.I.C.E. in their report, expressed satisfaction at the result of the efforts of the students for the Easter Term. They stated that in the civil engineering division a high state of proficiency had been attained. In the mechanical course, the work in the drawing office and the fitting shop had been well done. Considering the short time available, and many different examples of work submitted to them, it displayed a quality of workmanship that indicated more than average skill and attention. The system adopted in the school afforded an admirable preparation for actual professional work, and the colonial section appeared to give an excellent training for work in India and the colonies. Mr. Bateman, before awarding the certificates, pointed out how difficult it was for a parent to know, when a lad was about sixteen years of age, what profession or business he would have a taste for. The boy might go in for the Bar or the Church. But no matter what profession was adopted, a knowledge of engineering would always be useful. A lad studying engineering acquired a vast amount of information which the Palace school should assume in the education of engineers was well defined by Mr. Batema. He said that a youth may spend a year or two to the greatest advantage of materials and methods which would enable him to make the best possible use of his time when he was subsequently placed under a civil or mechanical engineer, or in engineering works with a view to acquiring that practical knowledge and experience of real work of the kind that makes an engineer. The school could not be expected to make engineers, but it would and plainly did give the students that sort of applied theoretical knowledge which they should have when they enter their apprenic

ENGINE BUILDING IN ITALY.

THE Italian Government is doing its best to foster native industry, and for this purpose gives orders to native marine engine builders for the machinery of its ships of war. Hitherto it would seem that the result has been unsatisfactory, the Italian firms apparently being unable or unwilling to respond to the demands of their Government. The truth has only recently been made public. Signor Boselli, an uncompromising Protectionist, attacked in the Chamber of Deputies, Admiral Acton, the Minister of Marine, who has replied and defended himself, showing that he had done all he could to help Italian industry, with the most unsatisfactory results. He pointed out that, though animated by the best intentions towards native industry, the Government must see that the public money was spent usefully, and that they procured efficacious instruments of war within good time. When they could do so, as in the case of the Lepanto, they gladly applied to Italian establishments. But,

unfortunately, there was a great want in the country of firms devoted to some special branch of engineering industry, and keeping well abreast of all the latest improvements in it. He told his hearers that he had twice hesitated as to whether he might not order the 100 ton guns for the warships of the first line in Italy, but at last, like his predecessors, he had had to decide in favour of the Elswick gun. Then the Italian firms seemed to have no idea that despatch or punctuality was necessary. The cruiser Savoia, though ready to be launched since last Sep-tember, was still waiting for her engines, to manufacture which the firm of Ansaldo, of Venice, had asked and obtained twenty months' time. The term was now nearly up, but there was no certainty of the engines being forthcoming. The engines of the Vespucci should have been ready, acccording to contract, thirteen months and a-half ago. For want of them the launch fixed for the 31st July had to be put off. The engines were only now beginning to be erected in Venice. For the Andrea Doria's engines the Messrs. Ansaldo had required thirty months to run from the acceptance of the tender, making a total of thirty-eight or forth warether. or forty months. The English constructors undertook to deliver them within fifteen months. Four Italian firms, Messrs. Orlando, Odero, Guppy, and Pattison, 'ad received orders for as many torpedo boats, and had been engaged during the last eighteen months in copying a first-class torpedo boat, such as Messrs. Yarrow or Thornycroft would deliver finished in six or eight months. Not satisfied with this he had, as soon as he was assured that these tried tormed beats even in the second assured that these trial torpedo boats were in a fair way to succeed, given the same firms orders for four boats more. But the extraordinary improvements introduced meanwhile by Messrs. Yarrow and Thornycroft had obliged him to address himself again to them. It appears, too, that the commercial firms of Italy understand their countrymen too well to have much to do with them, buying their ships in Scotland. One of the offenders, the Società Generale dei Transporti, had "caused its steamers to be built exclusively in Scotland," to wit, the Iniziativa, the Persevere, the Risveglio, the Scrivia, and others still on the stocks. Up to the present at least it would appear that we have little to fear from our somewhat torpid Italian rivals.

ORDERS IN COUNCIL RESPECTING STORAGE OF EXPLOSIVES, AT a Court, held at Osborne on Thursday, the 19th inst., three Orders in Council dealing with the possession of explosives were made, and they are published in the *Gazette* of the 20th. These orders, which materially extend the scope of the Explosives Act, are to come into operation in ten days. The first revokes the Order in Council of November, 1875, for the keeping of explosives for private use without a certificate; and directs that except for industrial, agricultural, or sporting purposes, for which certificates may be obtained, "there shall not be kept for private use any authorised explosive other than such amounts of gunpowder and of safety cartridges made into gunpowder, and such percussion caps, safety fuses for blasting, and railway fog-signals, as are authorised by the Act, and such amount as hereinafter mentioned of the following explosives, that is to say := (a)Cartridges for small arms which are not safety cartridges, and are made with gunpowder, if containing not more than 5 lb. of gun-powder. (b) Cartridges for cannon or blasting, made with gun-powder, and not containing their own means of ignition, if conpowder, and not containing their own means of ignition, if con-taining no larger amount of gunpowder than is for the time being allowed to be kept for private use. (c) Fireworks, if not more than 51b. in weight, or to an unlimited amount if obtained for immediate use and kept for a period not exceeding fourteen days in a safe and suitable place and with all due precautions for the public safety." The amount of explosives to be kept for private purposes, for which certificates may be obtained, is restricted to 101b. besides 100 detonators. The second order directs "the 10 lb., besides 100 detonators. The second order, directs " there shall not be kept on any premises registered for mixed explosives any explosive other than gunpowder, safety cartridges made with gunpowder, cartridges or charges for cannon or blast ing, made with gunpowder and not containing within themselves ing, made with gunpowder and not containing within themselves their own means of ignition; percussion caps, safety fuses, or fireworks, except in pursuance of a certificate under this Order, that the occupier of the registered premises is a fit person to keep them." The third Order similarly restricts the storage of explosives.

THE PAY OF BRITISH MARINE ENGINEERS.

AMONGST a series of tables ordered to be printed by the House of Commons, and showing the "Progress of British Merchant Shipping," are several tables that deal with the pay of engineers in merchant ships. The first of these relates to engineers in vessels under 500 tons. Summarised, it shows that the salary of the first engineer in such a steamship was in the year 1850 ± 114 s. 4d. per month, and after a little fluctuation it rose until for the year 1882 it is given as $\pounds 13$ 9s. 2d per month; whilst similarly the salary of the second engineer is given as $\pounds 7$ 3s. 9d. for the year 1850, and for the year 1882 $\pounds 8$ 17s. 11d. per month. Somewhat singularly, in vessels between 500 tons and 1000 tons there has been a reverse movement, according to these tables. The first engineer had in 1850 ± 1517 s. 3d. per month; the second engineer, £11 7s. 5d.; and the third, £8 6s. 8d. per month; and last year these amounts were less by 17s. 3d., 17s. 5d., and £1 8s. 8d. respectively. Similarly, in vessels of between 1000 and 1500 tons the salary of the first engineer is reported to have fallon in the particular for the first engineer is reported to have fallen in the period referred to about $\pounds 1$ 10s.; that of the second engineer over 11s.; and that of the third engineer, $\pounds 1$ 16s. The salaries of engineers of vessels between 1500 tons and 2000 tons are given only from the year 1855, but between that time and are given only from the year 1850, but between that time and 1882 there was a declension of $\pounds 3$ in that of the first engineer; of over $\pounds 1$ 13s, in that of the second; and of nearly $\pounds 2$ 10s, in that of the third. In vessels of 2000 tons and above we have tables for the same period as that just referred to. The salary of the first engineer was $\pounds 21$ 11s. 4d, per month in 1855, accord-ing to the tables, and in 1882 it had fallen to $\pounds 18$ 7s.; that of the second envineer was at the second product that the the second engineer was at the earlier date $\pounds 13$ /s.; that of $\pounds 13$ 17s.; and that of the third, $\pounds 10$ 19s., and at the close it had risen to £11. There is no explanation given of any of the causes that have conduced to these fluctuations, but the fact that they are given in a parliamentary paper makes them of some interest, and also makes it desirable that some attempt should be made to ascertain the reasons for the very remarkable movement upwards and downwards as recorded above.

THE PATENT BILL.

MR. HINDE PALMER has given notice of a very extensive series of amendments to be brought forward in committee. The law officers disappear altogether, their place being filled by three paid Commissioners appointed under Royal Warrant, one to be paid Commissioners appointed under Royal Warrant, one to be recommended by the Lord Chancellor, and the other two by the Board of Trade. He proposes that the provisional specification shall end with a "general statement" instead of a "claim," and the Controller is required to hear the applicant before refusing a patent. In an application to amend, the party seeking relief is to state the nature of the amendment as well as his reasons is to state the nature of the amendment as well as his reasons for wishing to amend. As regards legal proceedings, the Judge is empowered to dispense with a jury if both sides consent, and M.D., Hull

one of the Commissioners may be required to act as assessor. The defendant will not be allowed to plead that a patent is bad "A patent shall have the like effect against her Majesty, her heirs and successors, as it has against a subject, but the Secretary of State, or the president or chief officer at the head of any public department, may, with the consent of the Treasury, require the patentee to grant a licence or licences for the use for the public service of a patented invention, or any part thereof, on such terms as may be agreed on with such patentee, or, failing on such terms as may be agreed on with such patentee, or, failing such agreement, as may be settled by the Board of Trade after hearing all parties interested." The only other alterations of moment refer to the fees. Mr. Hinde Palmer proposes that the fee payable at the end of the fourth year shall be £30 instead of £50, whilst that payable at the end of the seventh year shall be reduced from £100 to £70.

LITERATURE

Professional Papers of the Corps of Royal Engineers. 1882. London: Edward Stanford, Charing-cross.

THIS volume is of an exceptional character, dealing entirely with the question of permanent fortification. The reasons for this are explained in the preface, in which Major Vetch very truly says that the difficulty in obtaining information such as would bring this subject up to date at the present time is very great, so that the idea was conceived of publishing a complete course of lectures on the subject, which were delivered by Captain J. F. Lewis, R.E., of the Fortification Branch of the War-office. The very valuable paper read by Colonel Inglis at the Royal Artillery Institution in 1881 "On Armoured Defences," printed at the end to complete the whole. This, then, is an admirable publication for reference on the subject of modern fortifications, and we think it is wise to keep it as such, unmixed with other matter. To an engineer it has its maximum value; probably any military engineer who does not receive these professional papers would do well to buy it, if, as we suppose, it can be bought at the publishers. To other officers it is very valuable for refer-It deals with the following subjects :- Lecture I.: ence. Land fortification, and its defence and attack generally. Lecture II.: Heavy guns mounted, mines, passages, com-munications, &c. Lecture III.: Magazines. Lecture IV.: Coast defence—ships and their attack, and effect of projectiles. Lecture V.: General arrangement of coast batteries. Lecture VI.: Details as to casemates and batteries. Lecture VII.: Artillery stores, and questions of range-finding, blast of discharge, and other questions as to works : what foreign nations are doing, and tables of guns and armour. After these comes Colonel Inglis's paper. It would be difficult to review this work fully to any pur-There appears to be a great deal of information pose. collected on most subjects. On the defence of harbours, high command is of course advocated for batteries, and the advantage which the breech-loading system affords in enabling curved low shields is pointed out. We do not think the short paragraph on the possibility of using howitzers-which is well as far as it goes-at all represents the importance of the subject of the attack of decks by means of vertical fire, which is a feature now fully recognised abroad as a formidable measure when vessels are driven to engage at anchor, as may often be the case in dangerous water when mines are in use. The author contemplates vessels anchoring under some circumstances. This being so, the very formidable attack furnished by a comparatively insignificant battery of rifled mortars or howitzers is surely an important matter to keep in view. "What foreign nations are doing" is interesting, but we should have hoped that more information might have come from such a source on this head. We trust that the War-office authorities have more than is here published, and we do not their any frequency of the source not think any foreign nation is likely to complain of breach of confidence. We confess there are points we should have wished to have read more about, such, for example, as the advantages of Griison's cupolas employed as forts d'arret, and the employment of iron on land forts; also the possible powers of muzzle-pivotting guns, like Krupp's ball-and-socket gun, might have been dealt with, as well as his guns, pivotting, carrying shields on them, &c. In fact, on what many would call fancy matters, and also on new foreign questions, we do not find as much information as we should expect; but all the essential matter required for an

authoritative text-book appears to be well supplied. All this must be read carefully to be appreciated. For example, we have a record of the application of as sound and good a device as can well be found—that is, the employment of a breech-loading smooth-bore gun to defend ditches by firing case. Case is the one thing that is dis-charged much better from smooth bores than rifles. A ditch or flank is the one place where case only is required. The application of breech-loading to a smooth bore under these conditions, although unambitious, is so admirable a thought, that we could wish the name of the man who devised it was supplied.

Colonel Inglis's ewed at considerable length in THE ENGINEER of May 6th, 1881.

BOOKS RECEIVED.

The Materials of Engineering. In three Parts. Part I.: Non-metallic Materials, Stone, Timber, Fuels, Lubricants, dc. By R. H. Thurston, A.M.C.E. New York: John Wiley. London: Trübner and Co. 1883. Transactions of the National Association for the Promotion of Social Science. Nottinghan Meeting, 1882. London: Longmans, Green, and Co. 1883.

Green, and Co. 1883. Through-booking of Goods between India and the United Kingdom. By Sir W. Andrew, C.I.E. London: W. H. Allen and

Co. 1883. Elements for the Construction of Electro-magnets. By Count Th. Du Moncel. Translated from the French by C. J. Wharton. London: E. and F. N. Spon. 1883. Journal of the Society of Telegraph Engineers. No. 46. Vol. xii.

London: E. and F. N. Spon. 1883. Useful Suggestions in Cases of Accident or Illness for the Use of the Employés of Messrs. Lucas and Aird. By A. H. Robinson, M.D. Hull

Saw Filing; a Practical Treatise, in Popular Form. By Robert Grimshaw. London: Trübner and Co. 1883. Professional Papers of the Corps of Royal Engineers. Edited by Major R. H. Vetch, R.E. Royal Engineers' Institute Occasional Papers. Vol. vii., 1882. London: Edward Stanford. Economy of Coal in House Fires, or How to Convert an Ordinary Fire-grate into a Slow Combustion Stove at Small Cost. By T. Pridgin-Teale, M.A. London: J. and A. Churchill. An Account of the Duties on Coal and the London Coal and Mine Duties. By Theo. Wood Bunning, Secretary to the Northumber-land and Durham Coal Trades. Newcastle: Andrew Reid. The Gas Manager's Hand-book; consisting of Tables, Rules, and Useful Information for Gas Engineers, Managers, and Others. By Thos. Newbigging, M.I.C.E. Third edition. London: Walter King. 1883. 1883. King.

Minutes of Proceedings of the Institution of Civil Engineers, ol. lxi. Edited by James Forrest, A.I.C.E., Secretary. Lon-Vol. lxxi.

don: The Institution. Dictionnaire Technologique dans le langues Française, Anglaise et Allemande. Redige par M. Alexandre Tolhausen. Revu par M. Louis Tolhausen. Third edition. Supplement to the above. Leipzig: Bernhard Tauchnitz. 1883.

GRASSHOPPER ENGINES.

WE publish as a supplement this week, engravings of a pair of disconnecting surface condensing grasshopper paddle engines, which were fitted on board the tug steamer Henrietta in the autumn of last year, to the order of Messrs. Raylton Dixon and Co., Cleveland Dock and Shipbuilding Yard, Middlesbrough, the hull of the vessel being built by them. Her length between perpendiculars is 92ft., breadth of beam 18ft. 9in., depth to top of floors 8ft. 9in., and moulded depth 9ft. 9in. The light draught of the vessel is about 5ft. from the bottom of the keel. The engines were constructed at Greenock by Messrs. Kincaid and Co., of the Clyde Foundry there, and fitted on board at Middles-brough. They consist of two cylinders 24in. in diameter by 36in. length of stroke of piston, each cylinder being fitted with a separate surface condenser, air, circulating, and feed, and bilge pumps. There is a disconnecting clutch in the centre of the crank shaft worked from the starting platform by a strong lever, the separate reversing gears for each engine being also worked by levers situated in close proximity to the disconnecting lever. The valve gear is on the ordinary link principle with double excentrics. Steam is supplied by a horizontal tubular boiler, having two furnaces, of the ordinary marine type. The boiler was tested by hydraulic pressure to 100 lb. per square inch. The paddle-wheels are on the feathering principle, brass bushed throughout, and of strong construction, having inner and outer rings. On the trial trip on the Tees the machinery worked very satisfactorily, a speed of 101 knots having been obtained against a strong wind and tide. The Henrietta left Middlesbrough in a strong wind and tide. The Henrietta left Middlesbrough in November last, her destination being Samarung, Java, where she is to be employed in the towing trade. The engines, it will be seen, are of the grasshopper type, which appears to be the best ever put into a tug boat, and apparently possessing very con-siderable advantages for all paddle boats. Its defect is that it is slightly heavier and takes up more room than oscillating engines, but on the other hand the cost of repair is very small, and it will work well when very much out of order. The system has been admirably carried out by Messrs. Kincaid, and the adoption of the surface condenser may be said to give the system a new lease of life. lease of life.

SHIP LAUNCH AT MIDDLESBROUGH .- On Tuesday afternoon Messrs. Raylton Dixon and Co. launched a large iron screw steamer, which has been built to the order of the Greenock Steamship Comwhich has been built of the bire of the largest turned out by her builders, is of the following dimensions:—Length over all, 340ft.; breadth, 42ft. 3in.; depth moulded, 28ft. 4in., and she will carry over 4500 tons dead weight. She is built on the spar-decked rule, having cellular bottom throughout.

tons dead weight. She is built on the spar-decked rule, having cellular bottom throughout. THE ROYAL INSTITUTION.—On Friday evening last Professor Bayley Balfour delivered a lecture at the Royal Institution on "The Island of Socotra and its Recent Revelations." Socotra, an island in the Indian Ocean, to the south of the entrance to the Red Sea, has, said the lecturer, but two mammals, the bat and the civet cat; its snakes are of Asiatic affinity. He spoke chiefly of the botanical characteristics of the island. The dragon's blood tree grows in Socotra. In ancient times dragon's blood was used as a panacea; it is now replaced by art. It is a gum resin exuding from the bark of the tree, and is used by the inhabitants for painting pottery. The original dragon's blood tree is in the Canary Islands, but some trees in Nubia and in Somali Land also exude the gum resin. The number of frankincense trees in Socotra is exceedingly large; four species of them are entirely new; four or five species of myrrh are also found on the island. The true aloe grows in Socotra. The natives are lazy in collecting true aloes; when they do anything in that way they place a goat's skin on the ground, then cut the leaves of the plant; in two or three hours the juice trickles into the centre of the skin and gradually solidifies. Small box trees grow on the island. Of all the plants in Socotra about one in three is endemic. The endemic flora are many of them unique in type. Sir Frederick Pollock presided at this lecture, and among those present were Sir J. D. Hooker, of Kew Gardens, the Rev. W. W. Newbuld, as well as others interested in botany and geography. PETER COOPER.—The death of Peter Cooper removes one of the American railroad ioncers.—the first man to build a locemotive in

PETER COOPER.-The death of Peter Cooper removes one of the PETER COOPER.—The death of Peter Cooper removes one of the American railroad pioneers—the first man to build a locomotive in America. His machine was of little direct importance, it is true, and Mr. Cooper's connection with railroads was not long nor intimate; but his services were characteristic of the man—always ready to give time, labour, and money for the good of his fellow men. In 1829, when the Baltimore and Ohio Railroad had been opened for thirteen miles to Ellicott''s Mills, it was still a question whether it should eventually be worked with horses or by steam power, and it was feared that a locomotive could not be made to work on so crooked a road. Mr. Cooper, largely to prove that the road could be worked by steam, constructed on his own account a little engine of about 1-horse power, which on Saturday, August 28th, 1830, was tested on the road, and ran the thirteen miles and back, with one passenger car, carrying twenty-four persons, in two 28th, 1830, was tested on the road, and ran the thirteen miles and back, with one passenger car, carrying twenty-four persons, in two hours and ten minutes. The late Ross Winans, whose judgment in such matters carried great weight, and who had seen the "Rocket" win the prize at Liverpool the October previous, the very day of the trial wrote to the president of the Baltimore and Ohio Company, saying: "To-day's experiments must, I think, establish beyond a doubt the practicability of using locomotive steam power on the Baltimore and Ohio Railroad for the convey-ance of passengers and goods at such speed and with such safety— when compared with other modes—as will be perfectly satisfactory to all parties concerned." Some years ago, at a meeting of the American Master Mechanics' Association in New York, the venerable Mr. Cooper told the story of his tiny engine and the trial of it to the men who then had charge of more than 14,000 locomo-tives, by which 70,000 miles of railroad were worked in the United Siates, which, at the time of his death, had increased to 22,000 tives, by which 70,000 miles of railroad were worked in the United Siates, which, at the time of his death, had increased to 22,000 locomotives and 113,500 miles of railroad—represented at this trial by his little "Tom Thumb" and about twenty miles of track worked by horse power. Railroad men, remarks the *Railroad Gazette*, will be glad through this to connect with the beginning of American railroads the great philanthropist who seemed always aglow with a fine enthusiasm to help struggling mortals forward in the world.

APRIL 27, 1883.

ELEPHANT BOILERS.

WE illustrate herewith a type of boiler manufactured now almost exclusively by Messrs. Hall, of Dartford. The elephant boiler at one time enjoyed much favour in this country, and under various modifications it is preferred on the Continent to under various modifications it is preferred on the contractor to any other. It possesses many advantages. It is safe, economical, and when well made, extremely durable. We know one which has worked steadily for over forty years and required but few repairs, a result due in a great measure to the care with which it has been kept clean. It is possible that the type may again come into favour, and of this there are some recent indications we are happy to say.

WORSSAM'S CASK LIFT.

THE annexed engraving illustrates one of the forms of cask lift, as exhibited by Messrs. G. J. Worssam and Sons, of Wenlock-road, City-road, at the Brewing Exhibition. The chain and projecting bars, by which the casks are raised, are of wrought

iron, the chain having a speed sufficient to raise 600 casks an hour if required. The top and bottom plates are attached to the side frames, so that the whole lift is independent and requires but four bolts to fix it.

THE MANUFACTURE OF CAMPHOR IN JAPAN

THE MANUFACTURE OF CAMPHOR IN JAPAN. THE camphor tree is very widely distributed in Japan, being equally common on the three islands Niphon, Kinshin, and Sikok; but it thrives best in the southern portion of the kingdom, namely, in the provinces of Tosa and Sikok. The sea coast, with its mild, damp air, agrees with it best, and hence the chief production of camphor is in these provinces. Dr. A. von Roretz, of Otanyama, Japan, states that the only tree which yields the commercial camphor of Japan and Formosa is the *lawrus camphoratus*, which the natives call *tsunoki*. Camphor is collected the whole year through, but the best results are obtained in winter. When the camphor collectors find a spot with several camphor trees in the vicinity, they migrate thither, build a hut to live in, and construct a furnace for making the with several camptor trees in the vieltify, they ingrate studier, build a hut to live in, and construct a furnace for making the crude camphor. When that place is exhausted, the hut is torn down and carried to another place. The method observed in obtaining camphor is very simple. The workmen select a tree, and with a hollow-ground short-handled instrument begin to then of members there is the hurst tree fails the true. chop off regular chips. As soon as the huge tree falls, the trunk, chop off regular chips. As soon as the huge tree falls, the trunk, large roots, and branches are chopped up in the same way, and the chips carried to the furnace in baskets. The furnaces are mostly built on the side of a hill near a stream of water, and serve for the wet distillation of the chips. The furnace is of very simple construction. A small circular foundation A is built of stone, and upon this is placed a shallow iron pan F 2ft. in diameter, covered with a perforated cover E luted on with clay. This cover forms the bottom of a cylindrical vessel B 40in. high, and tangening to 18in, at the top. Near the bottom of this vessel This cover forms the bottom of a cylindrical vessel B 40in. high, and tapering to 18in. at the top. Near the bottom of this vessel is a square opening D, which can be tightly closed with a board. The whole vessel is covered with a thick coating of clay C, held in place by strips of bamboo. The cover of this vessel G, which is also luted on with clay, has an opening K closed with a plug. Passing through the side of the vessel near the top is a bamboo tube L leading to the condenser H. This condenser is merely a quadrangular box, open below and divided up by four partitions into five compartments communicating with each other. The open side of this box dips into water and is kept cool by water drizzling over it.

The manipulations in the preparation of the camphor are as follows :—The cylindrical vessel B is filled, after removing the cover G, with chips of camphor wood; the lid is then luted on, and a definite quantity of water poured in through the hole K, which moistens the chips and collects in the pan F. It is now heated gently for twelve hours, a small fire being kept up as soon as the water in the pan begins to boil. The ascending vapours, passing through the chips, carry off all the camphor and oil in the wood, and both are deposited on the surface of the water in the condenser H. At the end of twelve hours the exhausted chips are removed through the square hole D, and fresh chips and fresh water put in. At the expiration of twenty-four hours the process is interrupted, the whole apparatus cleaned, and the camphor collected in H is placed in barrels. Here it is very

lightly pressed, and the oil, which amounts to at least 25 per cent., and is as clear as water, is poured off from the solid camphor, and both products are sent to market. At certain places the crude camphor is again pressed somewhat harder, when quite a good deal more oil runs through the crevices in the vessels. The tolerably dry product is sent mostly to Osaka, the chief export town for this important article of commerce. The camphor oil, called by the Japanese *shono abura*, is used by very poor people only as an illuminating oil; and in spite of its strong camphor oil, called by the Sapanese show work is detering poor people only as an illuminating oil; and in spite of its strong smell and smoke, it is burned in open lamps. Perfectly pure camphor is not exported, but the crude country product is first freed from the still adherent oil by further distillation in Europe. The exhausted chips are dried on the scaffold I by the side of the furnace, and are then used as fuel.—Dingler's Poly-technicky Lourged technisches Journal.

PICHLER'S ELASTIC WHEEL.

THE wheel illustrated by the accompanying engraving has been invented by Mr. J. F. Pichler, 162, Great Portland-street, W., with the object of securing a wheel that is really elastic in every direction at the same time. Many so-called elastic or

flexible wheels have been made which are not really flexible in the plane of the wheel at all, for rigidity in one direction prevents flexure in the other. This, however, is not the case with the wheel of which the above is an illustration of the principle.

the dressing of magnetic iron ores, and sands containing that ore, and in this direction the greatest progress has been made in this country. It may be of interest, however, here, to recall the fact that, at a number of places abroad, magnetic separation has been extended to other classes of ores, notably close mixture of spathic iron ore, or iron pyrites and blende, previously roasted, as it is possible that by this remain similar ores, now useless, may be made available here. The principal field of magnetic separation will, however, always remain the dressing of magnetic iron, sands, and ores. In the case of the former, dry-ing in a suitable revolving cylinder is resorted to, while with the ing in a suitable revolving cylinder is resorted to, while with the ing in a suitable revolving cylinder is resorted to, while with the latter class of material a system of crushing, pulverising, and sizing is necessary. Mr. C. G. Buchanan, of this city, the inventor of the machine we are about to describe, has shown us a sketch of mill for this purpose, in which he has, by suit-able exhaust arrangements, provided for the removal of the dust made during the crushing and screening, which would prove made during the crushing and screening, which would prove objectionable in the latter separation. The principal market for fine magnetic ore, obtained by this system of dressing, is, of course, for forge fires and puddling furnace fix, the quantity which could be used in blast furnaces being limited by the incon-venience which raw material of such finences would entail in the venience which raw material of such fineness would entail in the

The Buchanan magnetic separator, which we illustrate this week, has been at work for upwards of two years on sands at Block Island, and possesses features of special interest. A and B represent the two cast iron rolls, provided with heavy wrought Block Island, and possesses features of special interest. A and B represent the two cast iron rolls, provided with heavy wrought iron shafts or journals. In section these rolls have an oval core, so that the surface of the rolls is uniformly magnetic. The distance between the surface of the two rolls is 2in. C C repre-sent the iron standards supporting the rolls, and having journals in which they revolve. The rolls are provided with brass collars $b b^1$, intended to prevent the ore from dropping outside of them. D represents the wooden frame to which the stands are bolted, and it also supports the hopper E and the chutes F and G. The standards C are first insulated and then closely wound with heavy insulated copper wire, and the two ends of the wire are connected with the poles of a dynamo machine. It is evident that if a strong current of electricity is passed through the wires, the standard C will become powerful electro-magnets, and that, if they are properly wound, each end of the same standard will be of opposite polarity, as indicated by the wires marked positive and negative. It is also evident that the rolls will be charged by induction, and that one roll will be of north polarity and the other south. The peculiarity of this arrangement is, that a powerful magnetic field is formed between the rolls, and they are capable, while charged, of holding a weight of 500 lb. or 600 lb., if it is placed between them, while on their opposite side they are practically non-magnetic, and will not hold a tack. The variations needed in dressing ores of different grades and sizes are controlled by completing the result of the same standard between the more of the same standard between the same standard between the same standard the same standard between the same the act.

The variations needed in dressing ores of different grades and The variations needed in dressing ores of different grades and sizes are controlled by regulating the power of the current of the dynamo-electric machine. The latter is of a special pattern, producing a current of a low electro-motive force, the wire being heavier and larger electro-magnets being chosen. It is built by the well-known Weston Electric Light Company. The operation of the machine is as follows:—The rolls are rotated toward each other, at a circumference speed of 150ft. per minute, and the hoppers opened so that the ore falls upon the top of the and the hoppers opened so that the ore falls upon the top of the rolls. In passing over the rolls, it is carried through the magnetic field, and all that is magnetic is attracted and attached to the faces of the two rolls, and carried around by them to a point where they lose their magnetic effect, and the ore falls into the chutes F F. The rock being acted upon by gravity alone, falls directly into the chute G, and a nearly perfect separation is thus effected.—*The Engineering and Mining Journal.*

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—James Jessop, chief engineer, to the Hibernia, additional, for service in the Thunderer, vice Ingledew; Henry Coller, engineer, to the Raven, when com-missioned; and Thomas Hughes, engineer, to the Indus, for service in the Watchful.

NATIONAL MINING AND INDUSTRIAL EXHIBITION AT DENVER, COLORADO.--We have received through the Science and Art Department a communication to the effect that an Act has been passed by the United States Government admitting free of duty articles intended for the Denver National Mining and Industrial Exposition, and that this Exposition will open on 17th July and close on 30th September, 1883.

This engraving explains itself. This engraving explains itself. BUCHANAN'S MAGNETIC SEPARATOR. Among the many recent applications of electricity to the arts, one of the most interesting to those engaged in mining and metallurgy is that of concentrating ores. Though repeatedly attempted, particularly for magnetic iron ores, by the use of permanent magnets, it was not until the perfection of dynamo-electric machines permitted the economical generation of electricity Naturally, the first field in which any effort was made was in

THE ENGINEER.

THE LONDON, CHATHAM, AND DOVER RAIL-WAY NEW BRIDGE AT BLACKFRIARS.

THE enormous traffic on the London, Chatham, and Dover Company's main lines, Crystal Palace lines, and Metropolitan Exten-Company small lines, Crystal raidee lines, and Metropolitan Exten-sion lines, has long, as most Londoners are aware, made it neces-sary that increased accommodation should be provided at Ludgate Hill, where a most inconvenient and unfinished station, with only two platforms, has long had to do duty as an important terminus, though the real terminus is at Holborn. It is really remark-able that it has been possible to conduct so much traffic with so much experimentary that is the post war or two able that it has been possible to conduct so inthe trained trained much regularity as has been noticeable in the past year or two, especially when it is considered that the inadequacy of the Ludgate Station has made so much crossing necessary. To avoid this, and to get the extra station room required, it became necessary to widen the existing or build another bridge at Blackfriars, and for the latter purpose an Act was obtained in 1981. Which have a station to be the engravings on pages 318 necessary to widen the existing or build another bridge at Blackfriars, and for the latter purpose an Act was obtained in 1881. This bridge we illustrate by the engravings on page 318 and 322, from which it will be seen to be quite different in design from the existing parallel lattice girder structure, and will be a few feet to the east of it. Granting that a separate struc-ture must be built, the necessity for placing it so close to the other is unfortunate, and whatever beauty the Blackfriars-road bridge may have is marred by the proximity of the existing railway tracks. The new bridge will be so close to the railway, and its piers will so correspond with those of the present rail-way bridge, that it will be hardly visible from Blackfriars-road, but from some distance down the river its design will be well shown, as its breadth will be sufficient to keep the high iron girders of the existing railway bridge out of sight. The bridge will consist of five arches, three of which will be of 185ft. span, and two of 175ft. each. The height from high-water line to soffit will be 26ft. The arch girders are of wrought iron, and the spandrel filling is also of wrought angle iron, formed as shown at Fig. 3, so as to produce a spandrel free to " breathe," but at the same time of great strength. At the third pier from the Surrey side the new bridge, which will carry four lines of railway, commences to widen out to receive the five platforms of the station, as shown in the plan, page 318. Messrs. Lucas and Aird, the contractors, who are represented on the works by Mr. H. Turner, are now busily at work, and will commence sinking large caissons through the superstrata in to the London clay in a day or two. These caissons will extend to a depth of 46ft. below T.H.W., and the excavations to about 9ft. below the in a day or two. These caissons will extend to a depth of 46ft. below T.H.W., and the excavations to about 9ft. below the caissons. When this is reached, the caissons will be filled with concrete, and will form the foundations for the piers. The per-manent caissons will be surmounted by temporary caissons to 3ft. above T.H.W., the wrought ironwork for which and manent catssons will be surmounted by temporary catssons to 3ft. above T.H.W., the wrought ironwork for which, and for the rest of the bridge, will be made by the Thames Iron Company. Unless any unforeseen events should occur, there seems no reason to doubt that the work will be ready well within the stipulated two years. The estimated cost of the works of the bridge and station is £300,000.

within the supulated two years. The estimated cost of the works of the bridge and station is £300,000. The whole of the masoury in the piers and abutments is to be of granite. The minimum width on the bed of all stones is to be 2ft. 3in. The courses may vary in height, but no course may be less than 2ft. high, and the thickest courses must be in the bottom of the pier. The height of any course, including the joint, must be a multiple of 3in. The two footing courses are to be rough-hammer dressed on the face, but the remainder of the exposed surfaces up to the belt, as well as all beds, will be fine picked. Every third stone up to the belt is to be a header, and the minimum dimensions on the bed to be, stretchers 4ft. 6in. by 2ft. 3in, headers 2ft. 3in. by 3ft. 6in. In the circular cutwater every alternate stone is to be a header, and the joints are to be truly radial, the stretchers being checked into the headers as shown at Fig. 7; they are to be dowelled together with wrought iron dowels 12in. long, 3in. wide, 3in. thick, with cogs 11in. deep, which are to be let in flush with the top of the stone and run in with neat cement. The belt is to be the stone and run in with neat cement. The belt is to be fine-axed on all exposed faces, and to be of the size shown. It will be a stretcher course throughout except in the cutwater. Checks are to be cut in the throughout except in the cutwater. Checks are to be cut in the intervals between the ribs for the reception of the filling in course 1ft. 4½in. thick. The springers are to be of an uniform depth of 5ft. 6in., and 1ft. 10in. wide on face. Chaces are to be cut on each side of the stone 7ft. by 2in. for the reception of the holding-down rods. The course immediately above the springers and filling-in course is to be composed of stones all 5ft. 6in. long by 3ft. 6in. on the beds. The joints of this course are to come over the centre of the stones in the filling-in course. Above this last-neared equates the stones in the face of the pier may be of reduced named course the stones in the face of the pier may be of reduced

named course the stones in the face of the pier may be of reduced size, 2ft. on the bed being allowed. The new station will have a frontage of 130ft. on Queen Victoria-street, immediately opposite the *Times* office, and will adjoin and communicate with the present Blackfriars station of the District Company. It will stand on the east side of the Chatham Company's main line, and will extend back to the river, the platforms, however, running some little distance on to the new bridge, which will be carried within a few feet of the design, which, like that of the bridge, has been prepared by Mr. John Wolfe Barry, is the arrangement by which the streams of arriving and departing passengers will be kept entirely distinct. There will be five platforms. From Queen Victoria-street the entrance will be by a fine flight of twelve steps from a central hall, which will be by a fine flight of twelve steps from a central hall, which will contain the booking-offices, refreshment, waiting, and other rooms. From this hall staircases will lead to the platforms by rooms. From this hall staircases will lead to the platforms by means of wide corridors, which will be sufficiently long to allow of the breaking up of the large press of passengers which arrive by the morning trains from the southern suburbs. From Ludgate-hill and the District Company's Blackfriars station, covered ways will be built, so that the whole will practically form one large depôt. Owing to the position of the station, ordinary foundations could not be made, and the expense of providing the requisite supports adjoining the District line, and arranging for the abutments of the bridge. have consecuently

and each containing two conical tubes rivetted in. Two ditto, tapered, and with one conical tube in each, to form the upper and lower end of the flue. Six neck pieces with broad flanges, and lower end of the flue. Six neck pieces with broad flanges, top and bottom, for double rivetting, such as are used for marine boilers, each made out of one piece of iron. Six wrought iron boiler manholes, one flange being broad for double rivetting, and the other being in. thicker than the body of the forging. Two boiler plates 6ft. 6in. diameter. Twelve uptakes, in three sizes, for vertical donkey boilers, welded throughout, and flanged at the lower end. Two boiler plates, 5ft. 7in. finished diameter, with a 6in. flange all round. Twelve conical tubes, welded, and flanged at the lower end only, as usually required for exporta-tion. Three domes for boilers, in diminishing sizes. The top piece, in which are inserted the flagstaffs, is a small iron vase. At either side of the domes is a circular plate 4ft. finished

diameter, made of Cleveland mild steel, flanged externally and

diameter, made of Cleveland mild steel, flanged externally and internally. All the other articles are made of iron. The edges and flanges of each of the above pieces have been turned up in the lathe. An inspection of the trophy will, we think, satisfy the most sceptical that the most difficult speci-mens of smith and boiler work can now be made in Cleveland, and of purely Cleveland materials. The present initial value of the treble best iron or steel boiler plate used is about £9 10s. per ten for ordinary eiges ton for ordinary sizes.

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

(From our own Correspondent.)

THE uncertainties as to the early future of iron prices are not lessened this week. The decision of the coalmasters to reduce rates 1s. per ton on the 1st prox., gives rise to an expectation by some buyers that a fall in iron will follow. Hence, they are this week

rates 15. per ton on the 1st prox., gives rise to an expectation by some buyers that a fall in iron will follow. Hence, they are this week purchasing sparingly. Makers strongly discourage the expectation. Prices are, they declare, already so low that it will be impossible to make any further concessions. Such a reduction as 5z. per ton in all-mine pigs and 10s. per ton in marked bars, which in a time of normal trade often ensues when Earl Dudley's coal is dropped 1s., iron-masters state is at this time out of the question. All-mine pig makers are especially emphatic. Present prices, they assert, leave no profit, and rather than reduce they will blow out. They quote 85s. for cold blast sorts and 65s. for hot blast. Second-class pigs are 50s. to 45s., and cinder sorts 40s. easy. A quiet trade did not prevent agents of pig makers outside this district being very firm this—Thursday—afternoon in Birmingham. Best Derbyshires were quoted 49s. at stations, and Lincolnshires 50s. delivered. Northampton pigs were 47s. 6d. upwards. Hema-tites were slow of sale at 62s. 6d. to 65s. nominal for Welsh and Cumberland brands.

£7 10s. to £8, while superior T-bars were quoted £8 5s. to £9 5s. and £10 5s., according to quality. Makers of mild steel sheets, who mostly roll them down from blooms obtained from South Wales and the Sheffield district, as well as from Staffordshire Steelworks, view with dissatisfaction the new Canadian tariff proposals. That a duty of five dollars per ton should, after July 1st, be imposed on steel sheets, bars, and ingots, which have bitherto been admitted free, is unwelcome news.

should, after July 1st, be imposed on steel sheets, bars, and ingots, which have hitherto been admitted free, is unwelcome news. Makers of iron sheets, however, who now have to sell against a Canadian duty of 17½ per cent., seem likely, according to the present limited information, to benefit by the changes. Galvanisers report a continuance of the little improvement announced last week, but prices are still low and irregular. Some makers quote £14 per ton at outports and others £13. But this last figure is not the minimum which certain new firms are reported to be accepting.

last figure is not the minimum which certain new firms are reported to be accepting. The drop in Earl Dudley's coal will leave furnace sorts at 10s. and forge 9s. Slack will fall 6d. The colliers are agitating for another conference with the masters before consenting to the reduction in wages, urging that last week's meeting was not suffi-ciently representative on the employers' side. As 'Change closed in Birmingham this afternoon it became known that it is practically arranged for a meeting of coalmasters to be held at Wolverhampton next Wednesday to again consider the miners' wages question, and the men will be asked to continue work subject to the decicion of the meeting. It was reported on 'Change that the Cannock Chase coalowners will not reduce quota-tions on May 1st.

On Saturday the coal and ironstone masters of North Stafford-shire will give their men fourteen days, notice for a reduction of

15 per cent. To obtain more definite information concerning the precise effect To obtain more definite information concerning the precise effect of the new American duties, a few hardware firms, who already do some business with the States, and who seem likely to do more, are sending out representatives to make inquiries on the spot. The new classifications impart to the tariff an amount of uncertainty which it is desirable should be cleared up.

NOTES FROM LANCASHIRE. (From our own Correspondent.)

NOTES FROM LANCASHIRE. (From our own Correspondent.) Manchester.—There is still an absence of any weight of new busi-ness coming forward in the iron market of this district, and this applies both to pig and manufactured iron. For the most part con-sumers are not actually in want of pig iron for their present require-ments, and even where they have orders to give out they hold back as long as possible in the expectation that prices will have to give way, and to effect sales inducements in the way of concessions upon present rates have to be offered to buyers. Where, however, iron can be bought at low figures consumers only give out orders for small lots unless they can obtain long forward deliveries, which makers are not at present disposed to entertain. Pig iron makers are still delivering fairly large quantities against old contracts, and are, therefore, not actually pressing sales, but as they are gradually getting nearer the end of their order books with little or no new husiness coming in, there is an evident growing anxiety to secure new orders which, although quoted rates do not give way to any material extent, causes an under current of weakness in the market which operates in the favour of buyers. Manufacturers of finished iron are scarcely so well off for orders are already so low that they have no legitimate margin upon which they can give way to meet buyers, and they are, therefore, under the necessity of making a strong effort to resist any further downward movement in prices. There was an extremely flat market at Manchester on Tuesday, with a want of firmness in prices. For Lancashire pig iron delivered equal to Manchester, the prices quoted were 46s. for forge and 47s. for foundry, less 24 per cent.; but these figures were out of the market, and 1s. per ton less would have to be taken to do business. Local makers, however, although they are getting no new orders of any weight, and stocks are now beginning to accumulate at the owerks, at present show no disposition

In hematites the tendency of prices continues downwards, but

In hematics the tendency of prices would by makers. Finished iron continues very dull, and merchants are still low sellers; but makers hold for $\pounds 6$ 5s. as their minimum figure for bars, and about $\pounds 6$ 15s. for hoops, delivered equal to Manchester

arranging for the abutments of the bridge, have consequently been very heavy; but, on the other hand, the company has not had to purchase much expensive land or property, as a portion

of the bridge serves for a part of the station. The engineers are Mr. W. Mills, of the London, Chatham, and Dover Company, Mr. John Wolfe Barry, and Mr. H. M. Brunel, Mr. E. Crutwell being the resident engineer.

TROPHY OF BOILER PLATES AND FLANGED WORK FOR THE AMSTERDAM EXHIBITION.

THE annexed engraving represents an exhibit of boiler plates and flanged work, which have just been sent by Messrs. Fox, Head, and Co., of Middlesbrough, to the Dutch International Industrial Exhibition, to be opened at Amsterdam on the 1st May next. All the articles shown were manufactured by the above-named firm from plates rolled by them at Middlesbrough of iron produced in the Cleveland district. Beginning at the bottom and according meanly consecutively

Cumberland brands. Marked bars were tame, but the demand for the bars of Earl Dudley, Wm. Barrows and Sons, and Noah Hingley and Sons will, it is anticipated, be larger from the United States after July 1st. Already such bars go to America to some extent, in much part for shoeing purposes. Earl Dudley's rounds were quoted this after-noon at: ordinary quality, £8 2s. 6d.; single best, £9 10s.; double best, £11; and treble best, £13. His lordship's ordinary T-iron was £9 2s. 6d., and the following quotations applied alike to rivet and T-iron: single best, £10 10s.; double best, £12; and treble best, £14. Round oak angles were £8 12s. 6d, £10, £11 10s., and £13 10s., according to quality.

213 10s., according to quality. Hoop and strip makers, as also the firms who produce sheets and tin-plates, are looking to benefit from the easier American duties, and certain of them are now putting forth efforts to get more American custom.

May next. All the articles shown were manufactured by the above-named firm from plates rolled by them at Middlesbrough of iron produced in the Cleveland district. Beginning at the bottom and ascending—nearly consecutively— the articles comprising the trophy consist of the following, viz.: —Two boiler plates, 6ft. 6in. square. Four sections of a vertical puddling furnace boiler flue, welded and flanged at both ends,

328 income for 1882 had been £124,408, and their total expenditure £102,165, leaving a surplus of income over outlay of £22,243, which, added to their last year's balance, gave them an accumulated capital of £168,200, or £3 9s. 6/d. per member. A new feature in gas engines, and one which has been called into requisition to render them more adaptable for electric driving pur-poses, is the introduction of double cylinders. In a previous refer-ence to the Manchester Exhibition 1 called attention to the fact that several makers were pushing forward the completion of new engines of this type, and the credit of being first in the field with a double-cylinder gas engine must now be given to Messrs. Good head, Fickard, and Barker, of Manchester, who have this week put down in the exhibition a "Whittaker" gas engine working with two cylinders. This engine is on the same principle as the Whittaker single cylinder, which I have already noticed; two cylinders are placed side by side, and the valve gear is carried in the centre between the cylinders, where it is cased over. With the exploding whilst the other is exhausting, thus ensuring a steadiness of action. The engine, which is 4-horse nominal, but indicates 7-horse actual, is very compact, and allowing for the full sweep of the fly-wheels and the outside of the crank shaft, does not occupy a floor space of more than 7ft. by 3ft. 6in. Messrs. Ashbury and Summer have also completed a double-cylinder engine, in which the engine, and either end, and both work on one common shaft in the centre. A fly-wheel is carried on each side of the engine, and either of the cylinders can be readily uncoupled if required. This engine is of S-horse power nominal, and it is engine, and either of the cylinders can be readily uncoupled if required. This engine is of S-horse power nominal, and it is engine, and either of the cylinders can be readily uncoupled if required. This engine is of S-horse power nominal, and it is engine, and either of the cylinders can be readily uncoupled if requ

Messrs. Crossley Brothers have also in hand an engine of the double-cylinder type. Messrs. Monks, Hall, and Co., of Warrington, have this week commenced operations at the ironworks at Asput, near Wigan, recently purchased by the firm, where they will manufacture hoops and puddled bars for their rolling mills in Warrington. A con-siderable extension of the Warrington Works has also been carried out by the erection of additional bar mills, and the combined works will be capable of turning out 650 to 700 tons of puddled bars and finished iron per week. In the coal trade business has been slackening off with the close

In the coal trade business has been slackening off with the close of the month in anticipation of a reduction in prices, and in some cases this is already being discounted, to secure orders, by conces-sions of about 6d. per ton. The pits, however, are being kept going pretty near full time, and there is not as yet any heavy weight of stock going down. At the pit mouth prices average 9s. 6d. for best coals, 7s. 6d. for seconds, 6s. 6d. for common house coals, 5s. 6d. to 5s. 9d. for steam and forge coal, 4s. 9d. to 5s. for burgy, 4s. to 4s. 3d. for best slack, with common sorts to be bought at 2s. 9d. to 3s. 3d. per ton. Shipping continues very quiet, and Lancashire steam coal delivered at Liverpool and Garston can be bought at from 7s. to 7s. 6d. per ton.

denote at Inversion and Gausson can be bought at the relation of the second se

resulted in the men being awarded an advance of 2½ per cent. in the rate of wages, this advance being based upon the prices realised during the quarter ending March. Barrow.—The iron trade of this district is still very dormant, and there is no apparent increase in the demand, which has been shack for a considerable time past. Buyers show no disposition to increase their orders, merely contenting themselves with ordering what they immediately require. The orders held are being gradually worked out, and are not being replaced by others quite so large. Stocks as a consequence are increasing, as the output of metal at the furnaces is fully maintained, and there has been no damping down of any of the producing plant. The present slack-ness of trade, however, which has continued so long, is making itself felt, and makers are seriously considering the advisability of restricting the output with a view of checking the downward ten-dency of prices; 52, per ton for mixed samples is still quoted, but a few sales have been effected at 51s, per ton. Steel makers are still fairly employed, but orders are not coming to hand so rapidly as could be wished, as the output of metal is heavy; £5 per ton for steel rails is the official quotation. Shipments of rails are not heavy at present, and stocks are increasing. The shipbuilding trade is more actively employed consequent upon the orders re-ceived. Negotiations are in progress for further orders. Iron ore 9. to 12s, per ton at the mines. The demand is not large. A meeting of iron smelters was held at Workington on Monday, to consider the advisability, in view of the depressed state of the wages of the men, which will shortly take effect. It is understool that the reduction will not be a slight one. The general opinion of the meeting seemed to be in favour of a diminished output.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.) (From our own Correspondent.) THOUGH the weather is now variable, and generally very cold— the 23rd being one of the coldest days of the year, with frequent showers of hail and sleet—the colliery companies seem disposed to anticipate the usual drop of prices in May. The Nunnery Com-pany, which does a very large business in the district, has lowered quotations by 1s. per ton, the rates now ruling at depôts being— hand-picked Silkstone branch, 14s.; best Silkstone hards, 12s. 1d.; best Silkstone screened, 11s. 3d.; second ditto, 10s.; screened Silk-stone nuts, 7s. 11d. per ton. Messrs. Newton, Chambers, and Co., of Thorncliffe, who send the largest quantity of Silkstone coals to London, have also reduced their quotations by about 1s. per ton. Manufacturing fuel of all sorts, as well as steam coal, is in con-tinued request, and values are slightly better where any change has taken place. taken place.

taken place. Iron keeps languid, the business done being limited to immediate requirements. Marked Staffordshire bars are still quoted at £710s., and on this basis very great reluctance is shown to do business beyond what is absolutely necessary. Work is plentiful in most of the heavy branches, particularly in armour plates and ordnance. Steel rails are not so freely ordered as at the corresponding period last year. Engineering establish-ments are generally well employed, and a large amount of work is now being turned out for plant and machinery, which will have the effect of taking business from Sheffield, as the orders are for machines which can only be employed in manufacturing articles which were at one time the extensive speciality of our manufac-turers. turers.

The dispute in the file trade has now assumed serious dimensions, so serious that the men have offered to submit the matter to arbitration, and with that view they have named several gentlemen from whom it was thought the manufac-turers might make a selection. These names will be submitted to the employers. The strike in the razor trade still continues, but the call from foreign markets is rather lighter, and this will have the officient of programmers and the application of the strike of the

the call from foreign markets is rather lighter, and this will have the effect of preventing other employers from making the conces-sion sought by the workmen. Mr. C. E. Rhodes, of Aldwarke Main Colliery--Messrs. John Brown and Co., Limited--has been communicating to the Midland Institute of Mining, Civil, and Mechanical Engineers the results of experiments made in the Swallow Wood and Parkgate Seams at Aldwarke Main, with the newly-invented lime cartridges. The practical outcome appeared to be that in some instances the lime would not take the place of gunpowder, which is generally felt to be a matter of regret, as some less perilous explosive than gun-powder is much needed. A discussion which followed the reading of the paper was adjourned, in order that Colonel Smith, who was unavoidably absent from the meeting, might be present when it was considered.

now 13,896 members, with a revenue of £9798, being an increase of £1611 on the year. During 1882 there were 2312 cases of minor injuries, in which members were admitted to benefits, or 403 more than in the preceding year; and the entire number of non-fatal accidents for the six years of the fund's existence was augmented to 7859. There were twenty-five fatal cases during the year, causing fifteen widows to be placed on the list, increasing the number to fifty; thirty-one children had become chargeable to the society. ociety

The Sheffield Town Council are now fairly launched on a scheme The Sheffield Town Council are now fairly launched on a scheme of sewerage. They have obtained their Improvement Bill—unless a hitch takes place in the Lords, which is not expected—and Mr. John Thornhill Harrison, M.I.C.E., has been appointed to make an inquiry on the 3rd day of May into the Corporation's application to the Local Government Board for sanction to borrow £150,000 for the scheme. The Corporation further ask for £12,000 to construct a new road across Crooksmoor Valley, connecting Winter-street with the hilly region of Walkley. The Gas Appliances Exhibition, promoted by the Sheffield Gas Company, has been a greater success than was anticipated. Some 10,000 people have visited the Corn Exchange, where it was held, and the gas company have orders to lease some 200 gas cooking stoves.

stores. Mr. Chamberlain's Patents Bill includes a provision for trade marks, which seems to aim at extinguishing the Cutlers' Com-pany's privileges, and substituting a Sheffield register. It is pro-posed that at the expiration of five years from the commencement of this Act the Cutlers' Company shall close the Cutler's register of corporate trade marks, "and thereupon all marks entered therein shall, unless entered in the Sheffield register, be deemed to have been abandoned." These proposals in the Bill are certain to receive a great deal of attention from the company and the local Chamber of Commerce as well.

THE NORTH OF ENGLAND.

(From our own Correspondent.) THERE is little new to report with respect to the Cleveland iron trade. At the market held at Middlesbrough on Tuesday last only a small amount of business was transacted, and the prices of the previous week were fully maintained. Makers have recently booked a few good orders, and being somewhat sanguine as to the future, they are not pressing their iron on the market. For prompt delivery of No. 3 g.m.b. they will not take less than 40s. per ton, and for forward delivery they demand 3d. per ton more. Merchants have only small quantities to offer, and are not taking less than the prices quoted by producers. The stock of Cleveland iron in Messrs. Connal's Middlesbrough store declined 1135 tons during last week. The shipments of pig iron from Middlesbrough are remarkably good this month. Up to Monday night the total had reached 69,550 tons, of which 23,410 tons were sent to Scotland, and 16,820 tons to Germany and Holland. Business is very quiet in the manufactured iron trade. Inquiries are not so numerous as they were, and some makers complain that they have difficulty in obtaining specifications. Prices remain about the same as before, viz.:-Ship plates, £6 5s. to £6 10s.; shipbuilding angles, £5 15s.; engineering angles, £6; and common bars, £6 per ton, free on trucks at makers' works, less 2½ per cent. Puddled bars are £3 15s. per ton net. Messrs. Bolokow, Vaughan, and Co., Limited, have given a fortnight's notice to leave to the moulders, boilersmiths, and fitters employed at their Middlesbrough works. It is understood that the general manager intends to reduce the wages of these men 5 per cent. The restrictions in the Cleveland pig and the finished iron trades (From our own Correspondent.)

The restrictions in the Cleveland pig and the finished iron trades is beginning to be felt at the ironstone mines, and steps are being taken to reduce the output at several of them. Last week between forty and fifty men were discharged at Boosbeck, and at Craggs Hall and Skinningrove only five days per week will be worked for the present. the present.

the present. Messrs. Allhusen and Co., of Newcastle-on-Tyne, have just made contracts for the sinking of two brine wells, and the erection of evaporating pans, on land recently purchased by them near Middlesbrough on the Durham side of the Tees. Mr. John Vivian, C.E., of Whitehaven, has undertaken to sink the wells, and the work will be commenced immediately. The members of the Cleveland Institution of Engineers paid a visit to Messrs. Bell Brox's salt works at Port Clarance on Saturder.

and the work will be commenced immediately. The members of the Cleveland Institution of Engineers paid a visit to Messrs. Bell Bros', salt works at Port Clarence on Saturday last. Mr. F. H. Bell conducted the visitors over the works, and pointed out everything of interest. The brine reservoir was first inspected. It is capable of holding 500,000 gallons of brine, which is equivalent to from five to six hundred tons of salt. The reservoir is about a mile from the bore-hole. Near the bore-hole were seen the actual cores obtained whilst boring down to the salt. They were cut out by a cylindrical drill studded on its lower edge with diamonds, and were drawn to the surface in pieces as they happened to break off. The rock salt lies some 1100ft. from the surface, and is over 70ft. thick. The pumping engine was seen at work, and Mr. Bell tested a sample of the brine with a salin-ometer, showing it to contain 23 per cent. of salt. The nine evaporating pans were then seen in operation, and an explanation given as to how they were worked. The salt settles in crystals on the top of the water, and forms a covering. This, on being broken, allows the vapour to escape and the salt falls to the bottom of the pan. Thence it is at intervals of forty-eight hours shovelled into trucks. Messrs. Bell Bros, are now arranging to erect chemical works for the manufacture of soda ash, or anhydrous carbonate of soda (Na₂ CO₃) by the new ammonia process, the brine being treated as it comes from the bore-hole with bi-carbonate of ammonia, N H₃ 2 (CO₂). An important case under the Employers' Liability Act was tried at the Stockton county-court on Thursday last. A puddler named

An important case under the Employers' Liability Act was tried at the Stockton county-court on Thursday last. A puddler named Saunders, in the employment of Messrs. Fox, Head, and Co., Middlesbrough, was kneeling down marking off a piece of iron to be afterwards cut at the shears. He was not at the time exactly on the spot usually occupied by him when at work, but three or four yards from it. Looking up when he had finished what he was doing, a "flash" or drop of molten einder from a shingling hammer 70ft. distant struck one of his eyes and instantly blinded it. Saunders now sued his employers for £300, on the ground that had the locality in question been sufficiently screened from the hammer the accident could not have occurred. After a hearing of four hours, Judge Turner decided in favour of the plaintiff, and gave a verdict of £100 damages and costs. The firm are insured with the Employers' Liability Assurance Corporation, of King William-street, and will not themselves suffer any loss. A similar action is proceeding against Messrs. B. Samuelson and

A similar action is proceeding against Messrs. B. Samuelson and o. for compensation to the widow of a mine filler employed at when at the top and struck the man in question, killing him on the spot. The result of the action is not yet known.

NOTES FROM SCOTLAND. (From our own Correspondent.)

THERE was considerable strength in the warrant market on THERE was considerable strength in the warrant market on Friday last, when the quotations advanced to 47s. 6bd. per ton. This movement was attributed to rumours put in circulation to the effect that a Scotch pig iron producing company was about to stop the manufacture of pigs, and devote itself to the raising and sale of coals. These reports having become discredited early in the present week, the former buyers became sellers, and the quotations would not take the place of gunpowder, which is generally felt to be a matter of regret, as some less perilous explosive than gun-powder is much needed. A discussion which followed the reading of the paper was adjourned, in order that Colonel Smith, who was unavoidably absent from the meeting, might be present when it was considered. Earl Fitzwilliam presided on Monday at the annual meeting of the West Riding Miners' Permanent Relief Society. There are

Business was done in the warrant market on Friday morning at Business was done in the warrant market on Friday morning at 47s. 3d. to 47s. 4 $\frac{1}{2}$ d. and back to 47s. 2 $\frac{1}{2}$ d. cash, and from 47s. 5d. to 47s. 6 $\frac{1}{2}$ d. and 47s. 5d. one month, the afternoon quotations being 47s. 3d. to 47s. 6 $\frac{1}{2}$ d. cash, and 47s. 7d. to 47s. 9d. and 47s. 8 $\frac{1}{2}$ d. one month. On Monday business took place between 47s. 3 $\frac{1}{2}$ d. and 47s. 4 $\frac{1}{2}$ d. cash, and at 47s. 6d. one month, while on Tuesday there were transactions done at 47s. 1d. cash. Business was done on Wednesday from 42s. to 42s. 1d. cash. To-day—Thursday—trans-actions took place at 47s. 1 $\frac{1}{2}$ d. to 47s. cash, and 47s. 2 $\frac{1}{2}$ d. one month. month.

improvement in the demand for Cleveland pigs for consumption in

month. The values of makers' iron, which do not exhibit much change, are as follows:-Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 60s. 6d.; No. 3, 54s. 6d.; Coltness, 63s. and 54s. 6d.; Langloan, 63s. 6d. and 54s. 6d.; Summerlee, 61s. and 51s. 6d.; Chapelhall, 59s. and 53s. 6d.; Calder, 61s. and 52s.; Carnbroe, 55s. and 49s. 6d.; Clyde, 51s. and 49s.; Monkland, 48s. 6d. and 46s. 6d.; Quarter, 48s. 3d. and 46s. 3d.; Govan, at Broomielaw, 48s. 6d. and 46s. 6d.; Shotts, at Leith, 63s. 6d. and 56s.; Carron, at Grangemouth, 50s. and 48s.; Kinneil, at Bo'ness, 48s. and 47s.; Glengarnock, at Ardrossan, 54s. 6d. and 48s. 6d. There is much activity in the different branches of the manu-factured iron and engineering trades. Large quantities of

There is much activity in the different branches of the manu-factured iron and engineering trades. Large quantities of machinery and other iron and steel goods are being exported from Glasgow to the colonies, and to other countries. The past week's shipments included £23,336 worth of machinery, £2753 sewing machines, £5920 steel goods, and £37,315 iron manufactures, evaluation of nig iron

shipments included £23,336 worth of machinery, £2753 sewing machines, £5920 steel goods, and £37,315 iron manufactures, exclusive of pig iron. Two very large castings were made in the Glasgow district on Saturday last. At the works of the Govan Forge and Steel Com-pany, Limited, which are situated in Helen-street, Govan, a monster anvil block, 160 tons in weight, was cast for the new 12-ton hammer of the firm. The operation commenced at five o'clock in the morning, and occupied about fourteen hours. The block was cast in two portions, the lower one weighing 140 and the upper 40 tons. The anvil was cast in its seat, which consists of a large concrete bed, over which was laid about 36in. of log timber to diminish the effect of the blow from the hammer, which has been supplied by Messrs. Jas. Taylor and Co., of Birken-head, is about to be erected to convey the ingots and forgings between the heating furnaces and the hammer. The other casting, which was of a similar nature, and also for a 12-ton hammer, was made at Mr. David Colville's Dalziel Iron and Steel Works, at Motherwell. The quantity of metal run into the mould for this anvil was 170 tons. The block was cast upside down with trun-nions in the centre, so that when the plant was removed it would cant over to its place by its own gravity. The hammer, which will exert a power of about 400 tons, is to be used in slabbing steel ingots. Performed by Mr. Colville's regular workmen, the opera-tion of casting was quite successful. These works have lately been much extended and improved, and their capacity is now equal to the production of a large amount of work. It is reported that a new company is about to re-open the coal-field on the estate of Gartsherrie, in Lanarkshire. The field is a very extensive one, and will give employment to a large number of miners.

very extensive one, and will give employment to a large number of ers.

The coal trade in the West of Scotland is yet quite active for the season, the shipping department being especially brisk. In main coal there is now, in certain localities, a slight reduction in price, but the other sorts of coals are without material alteration. At Leith there is as yet not much improvement in the coal shipments, a number of vessels having left to load at other ports. In the course of the week 3740 tons of coal were shipped at Grangemouth, and about 3000 at Bo'ness.

a number of vessels having left to load at other ports. In the course of the week 3740 tons of coal were shipped at Grangemouth, and about 3000 at Bo'ness. Boring operations conducted for some time on Mr. D. S. Ire-land's estate of Denork, in Fife, have disclosed a valuable mineral field. A seam of good coal, 3ft. lin. thick, has been found at a depth of 16 fathoms. In another part of the field seams of 3ft. 3in. at 26 fathoms, 3ft. 5in. at 32 fathoms, and 5ft. 1in. at 37 fathoms have been got; and the discovery has given much satisfaction in the locality. It is believed that the strata also contains iron ore. Rapid progress is being made with the preliminary operations for the construction of the Forth Bridge, and the railway between South Queensferry and Dalmeny has been doubled to admit of the more expeditious transmission of materials. There are now about a thousand workmen employed on both sides of the Forth. The blacksmiths in the employment of the Clyde shipbuilders have asked for an advance of 1d. per hour on time, and 7d per cent. on piece work. They expect an answer to their request at the close of the present week. The Town Council of Renfrew has agreed to widen and improve the harbour at that port. They are to purchase ground for the purpose adjoining the present basin, and they. will require to borrow money to meet a portion of the expense.

WALES AND ADJOINING COUNTIES (From our own Correspondent.)

(From our own Correspondent.) MR. W. T. LEWIS is at length getting that co-operation from the mineral landlords which is now the only thing needed for the Miners' Provident Fund to become a great success. He has issued a letter to them, and responses are coming in favourably, Lord Windsor in particular subscribing £50 per annum. The need of the fund is daily brought home in the district, as fatalities are common. Three men were killed by a fall in Rhondda Junction Colliery last Saturday. The Barry Dock question is dragging its slow length along, the promoters having done their part to pile up a "big" case. I must now, however, forbear to comment until the issue is known. The question has been removed from the field of conjecture and intention into the courts, virtually, the committee being the judges and the promoters witnesses. Hence it is *sub judice*; but this I may say, that if the promoters get the Bill they will "gain a loss." The prophets of the district are pretty unanimous in the saying that if the Bill is passed by the House of Commons it will be thrown out in the Lords.

thrown out in the Lords. The iron and steel works are kept in tolerable activity. At the scene of business there is not much to complain about; the only tangible complaint is that prices are too low and prospects of a change not very well defined. 6000 tons of iron and steel left the Welsh ports last week, the principal cargoes being for Baltimore and Algoa Bay. Indian business is satisfactory and prospects assuring, and the same may apply to the Cape in the event of a peaceful settlement of existing difficulties. At present, judging from the fact that the railways there, which are under Government direction, are reducing their employés considerably, things are not quite so good as one would wish.

quite so good as one would wish. The coal trade is as animated as ever, and full average at all ports has been maintained; prices firm. One failure is reported

The purchase by the Messrs. Crawshay of a colliery at Ponty-pridd still hangs fire, owing, I hear, to a "difference" between the partners who had offered it for sale. I note that Morlais Tin-plate Works are to be re-started. Trade

dull. but better Mr. David Morgan, colliers' delegate, has retired from his position.

THE PATENT JOURNAL. Contensed 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.

17th April, 1883. 17th April, 1883. 1929. METALLIC SPRINGS, J. Pring, Sandbach, Chester. 1930. HINGES OF MOVABLE JOINTS, J. D. Sprague, Upper Norwood. 1931. SEWING, &C., FABRICS, J. H. Johnson.-(C. H. Wilcox, New York.) 1932. GALVANIC BATTERIES, C. L. Clarke, Manchester. 1933. PREPARING GUM TRAGACANTH, A. C. Duncan, Manchester.

1984. TRAMWAYS, A. E. Adlard, London. 1985. VPSSENS for HOLDING LIQUIDS, G. A. J. Schott, Bradford.

1985. VESSELS for HOLDING LIQUIDS, G. A. J. Schott, Bradford.
1986. CENTRIFUGAL MACHINES, A. G. Brookes.—(D. McC. Weston, Boston.)
1987. CENTRIFUGAL MACHINES, A. G. Brookes.—(D. McC. Weston, Boston.)
1988. LIFEBOATS, N. Hamblin, jun., London.
1989. DOKES, &C., A. G. Speight, London.
1940. SADDLES for BICYCLES, &C., J. Redpath and F. H. Anderton, Sheffield.
1941. APPARATUS for INDICATING the NAMES of STATIONS to PASSENCERS in RAILWAY TRAINS, E. Collier, London.
1942. STOPPERS for BOTLES, N. Thompson, London.
1943. ALEUMS, R. Moser, Berlin.
1944. DETECTING LEAKS in PIPES, J. J. Tylor, London.
1945. PILE FARRICS, W. R. Lake.—(C. Coupland, U.S.)
1946. CUTTING CLOTH, A. J. Boult.—(G. Hoyer et Cie., Germany.)
1947. Dender

Germany.) 1947. HAND WEAVING DEVICES, E. Wernicke, Berlin. 1948. LAWN TENNIS POLES, &c., J. Mellor, Corwen. 1949. UNHAIRING HIDES OF SKINS, A. Galwey.—(A.

Depierre, Brussels.) 1950. PUMPS for Extinguishing Fire, E. J. C. Welsh,

London

London. 1951. SWING LOOKING GLASSES, C. I. Bell, Greenwich. 1952. TRANSMITTING ELECTRICAL SIGNALS at a DISTANCE, C. D. Abel.–(*B. Abdank-Abakanovics. Paris.*) 1953. BREAD, J. H. Johnson.–(*Geneste Herscher and Co.*) 1954. TYPE CASES, J. H. Johnson.–(*La Société de typo-graphie par procédés rapides, Paris.*) 18t. *Anvil* 1969

18th April, 1883.

1955. DOOR FURNITURE, E. V. Bailey, Birmingham. 1956. TELEGRAPHIC APPARATUS, E. J. Houghton, Peck-

1950. IELEGRAPHIC APPARATOS, 2. 5. HOUGHON, POLY-ham.
 1957. BOTTLES, &c., J. Edwards, London.
 1958. PADDING, &c., APPARATUS USED in PRINTING FABRICS, C. A. PATERSON, Lennoxtown.
 1959. SURFACING LITHOGRAPHIC STONES, G. Cochrane,

Edinburgh.
1960. ENAMELLING PHOTOGRAPHIC STONES, G. Cochrane, 1960. ENAMELLING PHOTOGRAPHS, G. Robey, London.
1961. SLIDE VALVES, J. F. JOHNSTONE, Belvedere.
1962. FURNACES for the MANUFACTURE of COKE, F. C. GHASET. --(H. Stier, Germany.)
1963. PARING the BRIMS of SUK, &c., HATS, L. F. March, Bristol, and J. Cree, Denton.
1964. PRODUCING & YELLOW DYE, G. A. Bang.--(G. A., B., and R. Dahl, Germany.)
1965. OTL LAMPS, H. E Philipson, Dublin.
1966. RAISING SHEET RORN, J. TIND, Bristol.
1967. GALVANISING SHEET RORN, J. T. B. Wilkie, North Schields.

Shields.
1960. RECEPTACLES for SECONDARY BATTERIES, G. Binswanger and T. S. Sarney, London.
1970. CARDING ENGINES, A. C. Henderson.-(L. A. Perin. Paris.)
1971. AUTOMATICALLY EXPOSING BODIES, &c., to the ACTION of the SUN'S RAYS, W. Cooke.-(R. Schlotterhoss, Vienna.)
1972. CARTEDICES, H. Simon.-(Schweizerische Industrie Gesellschaft, Switzerland.)
1973. CARTEDICES, J. H. Dunn, London.
1974. DECORTICATING FLAX, &c., W. R. Lake.-(T. Burrows, Paris.)
1964. April, 1883.

19th April, 1883. 1975. REVERSING VALVE MECHANISM for ENGINES, A.

Faul, Dumbarton. 1976. FELT HATS, J. Eaton, Stockport. 1977. SELF-ADJUSTING SAW HANDLE, B. Goulton, Kaeo

1976. FEIT HATS, J. Eaton, Stockport.
1977. SELF-ADJUSTING SAW HANDLE, B. Goulton, Kaeo Wangaroa.
1978. PRINTING FABRICS, W. Mather, Manchester.
1979. SELF-ACTING SIGHT-FEED LUBRICATORS, J. Clyne, Aberdeen.
1980. REGULATIVE GEARING, W. O. Aves and G. Moss, London.
1981. TIRES, W. O Aves and G. Moss, London.
1982. CONVEXISO OIL to the SURFACE of the SEA, &c., J. BOWMAN. HUNTLEY.
1983. SUBTERRANEAN ELECTRIC CABLES, H. J. Allison. (S. F. Shelbourne, New York.)
1984. MERCURIAL AIR PUMPS, J. BATTett, LONDON.
1985. ROTARY ENGINES, J. C. Mewburn.-(E. Genty and J. Deschamps, Paris.)
1986. SOLID LEATHER BUTTONS, T. F. Finch, A. L. Finch, and J. Finch, Works, A. Rettich.-(Messrs. Schwintzer and Gräff, Berlin.)
1988. TRAMCARS, &c., J. H. Johnson.-(Messrs. Husard and Bude, France.)

and Bude, France.) 1989. SEWING MACHINES, J. Fox, London. 1990. VELOCIPEDES, H. B. Crawford and J. King,

1662. GAS COOKING APPARATUS, F. W. Hartley, London. -22nd April, 1880.
Patents on which the Stamp Duty of £100 has been paid.
1638. BUILDING, &C., the HEELS of BOOTS, J. Blakey, Leeds. -19th April, 1876.
1638. BUILDING, &L. Haddan London -22nd
1638. BUILDING, &C., the HEELS of BOOTS, J. Blakey, Leeds. -19th April, 1876.
1638. BUILDING, &C., the HEELS of BOOTS, J. Blakey, Leeds. -19th April, 1876.
1638. BUILDING, &C., the HEELS of BOOTS, J. Blakey, Leeds. -19th April, 1876.
1639. BUILDING, B. L. Haddan London -22nd
1630. KNEADING DOUGH, R. Alexander, Glasgow. -28th Description 1882. 2010. CUTTING OF STORING FODDER, &C., J. H. JOHNSON. —(A. Albaret, France.)
2011. CATALOGUING OF FILING MEMORANDA, E. Magnusson, Cambridge.
2012. MANUFACTURE OF FLUXES, H. F. Taylor, Glamorgan, and G. Leyshon, Tividale.
2013. BARRELS, &C., J. H. Hedley, Liverpool.
2014. LOOMS for WEAVING, J. B. Greenhalgh, Whitefield.
2015. FURNACES, W. McG. Greaves, Manchester, and J. Lund, St. Anne's on-the-Sea.
2016. GROOVING METAL, &C., ROLLS, A. B. Wilson, Holywood. nas been paid. 1638. BUILDING, &c., the HEELS of BOOTS, J. Blakey, Leeds.-19th April, 1876. 1707. MINING MACHINES, H. J. Haddan, London.-22nd April, 1876. 1619. BERLYING, A. STONYER, C. E. Hall London. 19th

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1874.

BREAKING, &C., STONES, C. E. Hall, Leeds.—18th

April, 1876.
April, 1876.
1692. WINDING, &c., PAPER for PRINTING, E. E. Colley, Kennington --21st April, 1876.
1675. WEAVING, S. O'Neill, Strand. --21st April, 1876.
1651. SCREENING, &c., COALS, J. D. Thorp, Leeds.--20th

April, 1876. 1696 COATING METALS, E. Morewood, Llanelly.-21st

April. 1876. 1703. MACHINE GUNS, W. R. Lake, London.-21st

April, 1876. 1863. CANDLES, G. H. Spicer, Battersea.-3rd May,

NO. CARACTERISTING, &C., MUSICAL IMPRESSIONS OF STA. TRANSMITTING, &C., MUSICAL IMPRESSIONS OF SOUNDS TELEGRAPHICALLY, E. Chabot, South Nor

(Last day for filing opposition, 11th May, 1883.) 982. SUPPORTS for CURTAIN RODS, &c., T. Smith and J. Drewitt, London.-14th December, 1882.
 992. STOVE GRATES, H. Hoyles, Sheffield.-15th Decem-ber, 1889.

1395. TRANSFERRING COAL in WAGONS, G. Taylor,

Penarth. —16th March, 1883.
 1397. LOADING VESSELS with COAL, G. Taylor, Penarth. —16th March, 1883.

-16th March, 1883.
 1443 PEN-HOLDER, C. E. Orrell, Kidsgrove. - 19th March, 1883.
 1451. PORTLAND CEMENT, J. Johnson, London.--Com. from J. De Smedt and R. Lesley.-20th March, 1883.
 1475. VOLTAIC BATTERIES, J. Gray, Gateshead.-21st March, 1883.
 1504. GERERATING GASES, J. McEwen, Manchester.-22nd March, 1883.
 1505. FAN for MINES, &c., F. L. Jeyes, London.-22nd March, 1883.

March, 1885. 1527. KNITING MACHINERY, F. and S. Keywood, Not-tingham.—24th March, 1883. 1535. WINDOW-FRAMES, &c., J. Booth, Bolton.—24th

March, 1883. 1910. SCREW-CUTTING MACHINES, A. M. Clark, London. —A com. from L. E. Lepine.—14th April, 1883.

329

6190. KNEADING DOUGH, R. Alexander, Glasgow.-28th December, 1882.
6196. INSULATING CONDUCTORS, W. Smith, London.-28th December, 1882.
6213. MATCH BOXES, J. Darling and J. Long, Glasgow. -29th December, 1882.
91. COOLING AIR, A. B. Wilson, Holywood, and J. Sturgeon, London.-6th January, 1883.
92. CARPET LOOMS, G. W. Grosvenor and J. Bedford, Kidderminster.-6th January, 1883.
284. MAKING SUGAR, A. Fryer and J. B. Alliott, Not-tingham.-17th January, 1883.
287. VENTLATING SEWERS, G. F. Harrington, Ryde.--24th January, 1883.

-24th January. 1883. 439. MECHANISM for CLOCKS, A. M. Clark, London.-A com, from D. Roussialle.-26th January, 1883. 464. INDICES for METERS, S. Grey, Chelsea.-27th Janu-

com. from D. HOUSSIAHE. --20th January, 1883.
fd4. INDICES for METERS, S. Grey, Chelses...-27th January, 1883.
f38. CABLE-STOPPERS, A. M. Clark, London.-A communication from J. B. Lynch.--31st January, 1883.
f34. COKE OVENS. H. Simon, Manchester.--A communication from F. Carves.--1st February, 1883.
f32. COUPLING APPARATUS, W. R. Lake, London.--A com from C. C. Mark.--14th February, 1883.
f35. COUPLING APPARATUS, W. R. Lake, London.--A com from C. C. Mark.--14th February, 1883.
f100. BAR for EXCLUDING RAIN from DOORS, &c., C. A. Wheeler, Swindon.--lat March, 1883.
f125. FRODUCING "GUIPURE D'ART" LACE, A. Mosley, Nottlingham.--3rd March, 1883.
f226. STRAIGHTENING BARS, W. F. Gilmer, Gosforth.---7th March, 1883.
f238. TELEPHONIC APPARATUS, S. P. Thompson, Bristol.--7th March, 1883.
f236. CRUSHING SUGAR CANES, A. S. Brindley, New Radford, & J. WORSNOP, London.--12th March, 1883.
f377. SPANNERS, J. ROBSON and J. W. Tingle, Sheffield.--15th March, 1883.
f434. SCREW PROFELLERS, G. E. Vaughan, London.--A com. from C. H. MacDonald.-19th March, 1883.
f435. TORTABLE CONSERVATORIES, &c., E. M. Harris, London.-20th March, 1883.
f366. STATING WINDOWS. &c., E. and J. M. Verity, Leeds.-22nd March, 1883.

1457. PORTABLE CONSERVATORIES, &c., E. H. Harris, London.-20th March, 1883.
1506. STAVING WINDOWS. &c., E. and J. M. Verity, Leeds.-22nd March, 1883.
1555. EXTRACTING COBALT and MANGANESE from their ORES, J. Imray, London.-A com. from H. Herren-schmidt and M. Constable.-27th March, 1883.
1561. FLUID METERS, W. R. Lake, London.-Com. from J. Thomson and C. C. Barton.-27th March, 1883.
1567. FREVENTING DOWN DRAUGHT IN CHIMNEYS, W. Lord, Middlesbrough.-28th March, 1883.
1573. SHUTTLES, T. Brooks and T. Tweedale, Rawten-stall.-28th March, 1883.
1583. DOUBLE-RIBBED WARP LOOMS, J. D. Harris and A. Shuttlewood, Leicester.-29th March, 1883.
1560. DATING TICKETS, J. B. Edmondson and J. Carson, Manchester.-29th March, 1883.
1601. TANNING HIDES, W. R. Lake, London.-Com. from B. D. Hyam and W. H. Howell.-20th March, 1883.
1623. ELECTRIC ARC LAMPS, F. M. Newton, Bellast.-31at March, 1883.
1963. SUETERFREEN FLOOTED CLIMESE, H. L. Allicon

31st March, 1883.
1983. SUBTERRANEAN ELECTRIC CABLES, H. J. Allison, London.—Com. from S. Shelbourne.—19th April, 1883.

Patents Sealed. (List of Letters Patent which passed the Great Seal on the 20th April, 1883.)

5012. PLOUGHS, E. Edwards, London.-21st October,

5012. PLOUGHS, E. Edwards, London.-21st October, 1882.
5037. GOVERNORS for STEAM ENGINES, W. P. Thompson, London.-23rd October, 1882.
5041. SEWAGE-TRAPS, &c., E. Green, Halifax.-23rd October, 1882.
5045. BRUSHES for PAINTING, J. Culmer, London.-23rd October, 1882.
5046. CARRIAGE BODIES, J. S. G. F. Horscher, Altons.-23rd October, 1882.
5051. AUTOMATIC REGISTERING APPARATUS for CARRIAGES, W. H. Beck, London.-23rd October, 1882.
5055. GENERATING ELECTRICITY, F. H. Varley, London.-24th October, 1882.
5056. STANDS for SCENT BOTTLES, J. Hall, Sheffield.-24th October, 1882.

24th October, 1882. 5059. APPLYING ELECTRICITY to BRUSHES, N. J. Holmes,

London.-24th October, 1882. 5064 PARALLEL VICES, H. F. Read, Brooklyn, U.S.-

 DOBD, COMBINATION - 24th October, 1882.
 5074. STEERING VESSELS, W. M. Walters, Bristol.-24th October, 1882. 5082. Bir Stocks, G. F. Redfern, London.-24th Octo-

5082. Bit Stocks, G. F. Redfern, London.-24th October, 1882.
5090. DISCHARGING OLL UPON WAVES, R. Rose, London. -25th October, 1882.
5123. DERLING, &c., MACHINES, J. MORTIS, Poplar.-27th October, 1882.
5160. DRAWING CORKS from BOTTLES, A. Olsson, Sandviken, Sweden.-30th October, 1882.
5175. BOBEINS, E. Tweedale, Accrington.-31st October, 1882.

1882. 5198, PRODUCTION OF BI-SULPHIDE OF CARBON VAPOUR, W. R. Lake, London.--31st October, 1882. 5206. RETENTION SPRINGS for UMERELLAS, &c., W. H. Belknap, London.--1st November, 1882. 5222. SPINNING, &c., FIBROUS SUBSTANCES, E. Rush-ergenth London.-1st November, 1889.

5222. SPINNING, &C., FIBROUS SUBSTANCES, E. Rush-worth. Leeds.—Ist November, 1882. 5245. MACHINERY for SPINNING, H. B. Barlow, Man-

chester.—3rd November, 1882. 5249. PREPARING WICKS of LAMPS, H. Defries, London.

-3rd November, 1882. 5253. Toy LOCOMOTIVE, W. H. Hall, Beckenham.-3rd

5255. 10Y LOCKOTTE, W. H. Hat, Beckelman, -ora November, 1882.
5286. MACHINERY for MAKING BOBBINS, J. Clayton, Bradford.--6th November, 1882.
5303. PURIFYING SEWAGE, F. Petri, Berlin. --6th November, vember, 1882.
5312. GAS STOVE, J. Bartlett, London.--7th November, 1999

24th October, 1882. 69. COMBINATION SHOE-HORN and BUTTON-HOOK, S.

31st March, 1883.

5069

2016. GROOVING METAL, &C., ROLLS, A. B. WHISON, Holywood.
2017. VELOCIPEDES, G. G. TAIDdy, Clapham.
2018. RABBIT BUTCHES, G. F. MORART, DUIVERTON.
2619. LOCKING the NUTS upon the BOLTS by which FISH-PLATES are SECURED to RAILWAY RAILS, G. Grover, Clapham.
2020. TELEPHONE, &C., CALL APPARATUS, H. A. C. Saunders and A. C. Brown, London.

Clapham.
2020 TELEPHONE, &C., CALL APPARATUS, H. A. C.
Saunders and A. C. Brown, London.
2021. STOP VALVES, W. R. Lake.—(*R. Beaumont, U.S.*)
2022. LEVER CORK-SCREWS, R. Dolberg.—(*C. F. A. Wienke, Germany*)
2033. SUPPLYING. &C., ELECTRICAL FORCE for BATTERY CHARGING, R. P. Sellon, Surbiton.
2024. SIDE SADDLES, T. G. Smith, Easton Grey, and B. Brook, Sherston Magna.

21st April, 1883.

1874. TRANSAITTING, GC., MONOM LATRANSAITTING, SOLDS TELEGRAPHICALLY, E. Chabot, South Norwood.—20th July, 1876.
1908. SHIP, &C., COMPASSES, W. Clark, London.—5th May, 1876.
1697. FILTERING WATER, J. H. Porter, Lavenham.—21st April, 1876. 2025. APPARATUS to be USED in TELEPHONIC SYSTEMS for putting any of the INSTRUMENTS CONNECTED with a CENTRAL STATION in COMMUNICATION with each other, W. R. Lake.—(H. T. Cedergren and L. M. Kriesson Stackhan) Notices of Intention to Proceed with Applications.

other, W. R. Lake.-(H. T. Cedergren and L. M. Briesson, Stockholm.) 2026. BOOTS, &c., J. Leighton, Netherfield, Kendal. 2027. DISPLAYING GOODS, W. P. Thompson. -(Y. Rogiers, Brussels) 2028. GENERATING, &c., ELECTRIC CURRENTS, Sir W. Thompson, Glasgow. 2029. LOCKING BRICKS TOGETHER, C. E. Davis, Bath. 2030. COMPRESSING, &c., AERIFORM FLUIDS, H. Lano, London.

2030. COMPRESSING, CC., ARAMANAN, London.
2031. PRIMARY VOLTAIC BATTERIES, P. Jensen.-(Dr. A. Prinz, W. Wenzel. and J. Kahn, Vienna.)
2032. REFRIGERATING APPARATUS, A. S Haslam, Derby.
2033. DELIVERING PREPAID GOODS, J. G. Sandeman and P. Everitt, London.
2034. ELASTIC SETS OF TEETH, I. Beutelrock, Germany.
2035. CONCENTRATING SULFHURIC ACID, S. B. Bowen, Lanelly.

LIABELY. JOSE, ATTACHMENT for SEWING SHUTTLE MACHINES, H. J. Haddan. – (J. Gutmann, Berlin.) 1957. PROPELLERS for VESSELS, A. Figge, London. 035. WASHING CLOTHES, J. H. Johnson.–(G. Bozérian,

2038. WASHING CLOTHES, J. H. Johnson.-(G. Bozérian, Puris.)
2039. FISH-PLATES, G. Robson, Newcastle-upon-Tyne.
2040. REGULATING, &C., the PRESSURE of FLUIDS, J. H. Johnson.-(H. L. J. Parenty, France.)
2041. INDICATING the VELOCITIES of AIR CURRENTS, J Thompson, Bolton-le-Moors.
2042. MAGNETO-ELECTRIC MACHINES, &C., G. HOOKham, Birmingham.
2043. RIFLED TUBES, H. Pieper, Belgium.
2044. DYNAMO-ELECTRIC MACHINES, A. M. Clark.-(La Société Solignac et Cie., Paris.)

23rd April, 1883.

GUN CARRIAGES, W. R. Lake.- (H. Gruson, 2045. 2046. HORIZONTAL STEAM ENGINES, T. A. Adamson,

2040. HORIZONTAL STEAM ENGINES, T. A. Adamson, Belfast.
2047. SEPARATING SUGAR from MOLASSES, &c., C. Pieper.-(C. Scheibler, Berlin.)
2048. PERMANENT ANCHOR, E. C. G. Thomas, London.
2049. AUTOMATIC DREDGER, E. C. G. Thomas, London.
2050. MODEL of GLASS LAMP CHINNEY, P. Bayle, Paris.
2051. SECTIONAL BOLLER and FEED-WATER REGULATOR, H. J. Haddan.-(B. Schmidt, Leipzig, Saxony.)
2052. METALLIC ROOFING, &c., R. Hudson, Gildersome.
2053. STEAM GENERATORS, H. F. Phillips, London.
2054. CLEANING, &c., BOOTS, J. Hargrave, Leeds.
2055. MANUFACTURING METALLIC OXID'S OF BASES, H. A. Bonneville.-(L. C. E. Faucheux, France.)
2056. WORKING BRAKES, J. Armstrong, New Swindon.
2057. FLECTRIC LAMPS, &c., W. HOCHAUSEN, New York.
2058. MAGNETO and DYNAMO-ELECTRIC MACHINES, W. Hochhausen, New York.

Inventions Protected for Six Months on Deposit of Complete Specifications.

1907. PROTECTING FIREMEN, W. R. Lake, London.-A communication from S. Richards, Philadelphia, U.S.

1907. FROFECTING FIRESEN, W. R. JAKC, DORDAT M. Communication from S. Richards, Philadelphia, U.S. — 14th April, 1883.
 1910. SCREW-CUTTING MACHINES, A. M. Clark, London. — A communication from L. E. Lepine, Paris, —14th April, 1883.
 1936. CENTRIFUGAL MACHINES, A. G. Brookes, "London. — A communication from D. McC. Weston, Boston. — 17th April, 1883.
 1937. CENTRIFUGAL MACHINES, A. G. Brookes, London. — A communication from D. McC. Weston, Boston. — 17th April, 1883.

Coll. -Coll. FIGH & JOHNSOL.-Hisk December, 1882.
6049. WARER-CLOSERS, R. H. Leask, Dublin.-194k December, 1882.
6051. SOREWING MACHINES, S. Dixon, Salford.-194k December, 1882.
6052. MAKING PAPER BAGS, E. K. Dutton, Manchester. -A communication from F. W. Leinbach and C. A. Wolle.-194h December, 1882.
6061. TREATING FIBROUS MATERIALS, T. Routledge, Sunderland.-194k December, 1882.
6064. CALCINATION of REGULUS, &c., J. W. Chenhall, Mortiston.-194h December, 1882.
6089 TREATING FERMENTED LIQUORS, A. G. Salamon, London.-204h December, 1882.
6089 TREATING FERMENTED LIQUORS, W. R. Lake, London.-20th December, 1882.
6092. VESSELS for PRESERVING LIQUIDS, W. R. Lake, London.-20th December, 1882.
6015. COUPLING, &c., VERICLES, J. Anderson and J. Darling, Glasgow.-22nd December, 1882.
6115. COUPLING, &c., VERICLES, J. Anderson and J. Darling, Glasgow.-22nd December, 1882.
6126. WARMING APFARATUS, E. HOPGOOd, Ryde, and E. Jenner, London.-22nd December, 1882.
6216. APPARATUS, F. HOPGOOd, Ryde, and E. Jenner, London.-29th December, 1882.
6236. MAKING SCREWS, W. R. Lake London.-A communication from F. Bisson.-29th December, 1882.
6236. MAKING SCREWS, W. R. Lake London.-A communication from J. Bisson.-29th December, 1882.
6236. MAKING SCREWS, W. R. Lake London.-At communication from J. Bisson.-29th December, 1883.
637. GOVEKNORS for STEAM ENGINES, J. D. Sprague, Upper Norwood -18th January, 1883.
638. DEVICES to be ATTACHED to DRIVING REINS. W. R. Lake, London.-A communication from L. Nevière. -7th February, 1883.
638. CLEANING BRUBHES, C. Hinksman, London.-15th February, 1883.
639. TRANG, KC., MACHINES, C. W. Vincent, Hollo-way. 17th April, 1883. 1945. PILE FABRICS, W. R. Lake, London.—A commu-nication from C. Coupland, Seymour, U.S.—17th April, 1883.

April, 1883.
1883. SUBTERRANEAN ELECTRIC CABLES, H. J. Allison, London.—A communication from S. F. Shelbourne, New York.—19th April, 1883.

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

nas Deen paid. 1650. BUCKETS, CANS, &c., R. R. Gray, Liverpool.— 22ad April, 1880. 1557. INDICATORS for PRIME MOVERS, J. Casartelli, Manchester, and W. Potter, Lower Broughton.—16th April 1880.

1557. INDIGATORS for PRIME MOVERS, J. CASATTEIII, Manchester, and W. Potter, Lower Broughton.—16th April, 1880.
1573. FACILITATING REPAIRS, &c., upon a SCREW PRO-PELLER whilst the VESSEL is AFLOAT, J. B. D'A. Boulton, London.—16th April, 1880.
1570. RAILWAY BUFFERS, W. Tijou, London.—17th April, 1880.
1586. CHRONOMETRIC MOTOR AFPARATUS, W. R. Lake, London.—17th April, 1880.
1588. REDUCING FRICTION OF AXLES, &c., J. G. Wilson, Manchester,—17th April, 1880.
1844. MANUFACTURE OF ENEMAS, &c., J. Burbridge, R. C. Thorpe, and T. Oakley, London.— 5th May, 1880.
1844. MANUFACTURE OF ENEMAS, &c., J. Burbridge, R. C. Thorpe, and T. Oakley, London.— 5th May, 1880.
1875. PRODUCING REFERGERATION in ICE-MAKING, &c., MaCHINES, C. C. Palmer, Oakland.— 29th April, 1880.
1597. ROLLING METALLIC RODS OF BARS, A. BETTY, Tinsley, near Rotherham.—19th April, 1880.
1632. ARTIFICIAL FUEL, W. R. W. Smith, Glasgow, and J. F. M. POllock, Leeds.—21st April, 1880.
1726 SHIPS BERTHS, A. M. Clark, London.—27th April, 1880.
1726 SHIPS DENCIL SHARPENERS, &c., M. C. Stone,

and Eude, France.)	1586. CHRONOMETRIC MOTOR APPARATUS, W. R. Lake,	1910. SCREW-CUTTING MACHINES, A. M. Clark, London.	1919 GAS STOVE J Bartlett London -7th November.
1989. SEWING MACHINES, J. Fox, London.	London17th April, 1880.	-A com, from L. E. Lepine14th April, 1883.	1000
1990. VELOCIPEDES, H. B. Crawford and J. King,	1588. REDUCING FRICTION of AXLES, &C., J. G. Wilson,	The count is one as an end and the state of	1004. E200 Companyo PLATES S and S R Chatwood.
Nottingham.	Manchester.—17th April, 1880.	(Last day for filing opposition, 15th May, 1883.)	Dolton 7th November 1889
1991. DYNAMO-ELECTRIC MACHINES, W. P. Thompson	1844. MANUFACTURE of ENEMAS, &c., J. Burbridge, R.		Bolton The Automatic 1004.
(M. l'Ingénieur Bartolomeo Cabella, Milan.)	C. Thorpe, and T. Oakley, London 5th May, 1880.	6031. PIANOFORTES, W. Thomas, London18th Decem-	1341 Manual 1999
1992. ENGINES, &c., for ELECTRIC MACHINES, R. Brown,	1673. BIOYCLES, &c., E. C. F. Otto, Peckham,-23rd	ber, 1882.	-11th November, 1002.
Gainsborough.	April. 1880.	6040. WAGONS, H. C. Bull, Brooklyn, U.S18th Decem-	5390. OBTAINING ZINC, &C., IFOID ORES, W. R. Lake,
1993. APPARATUS for the RECEPTION, &c., of CIGARETTES,	1752 PRODUCING REFRIGERATION in ICE-MAKING, &C.,	ber, 1882.	London,-Ilth November, 1882.
F. Hipgrave, London.	MACHINER C. C. Palmer, Oakland - 29th Amril, 1880.	6054. SADDLE-BAR, J. Pearse, Cheltenham19th Decem-	5428. STEAM PACKING, H. W. Jonns, New York, U.S
1994. STAMP-BOX CHARM. &c., C. Halford, London.	1507 ROLLING METALLIC RODS OF BARS A. Berry.	ber, 1882.	14th November, 1882.
1995. OBTAINING ALUMINIUM from its ORE, H. A.	Tingley near Rotherham _10th April 1880	6063, VELOCIPEDES, E. Marshall, Birmingham19th	5462. CHUCKS for MACHINES, W. R. Lake, London
Gadsden (E Foote, New York.)	1629 Appresent Fuer W R W Smith Glasgow and	December, 1882.	16th November, 1882.
1996 CARDED WOOL for WEAVING, H. J. Haddan -(J.	TE M Bollook Loods - 91st Annil 1880	6069 SAFETY-VALVE, J. Williams, London20th Decem-	5480. TIPPING TRUCKS, P. G. B. Westmacott, Newcastle.
Renazet, Lavelanet, France.)	1700 Supp' Departy A M Clault London 97th	her. 1882	-17th November, 1882.
1997 DOORS, &c., for FURNACES, J. Shepherd, Man-	1/20 SHIPS DERTHS, A. M. CIAIK, LOIDON 2100	6075 INCANDESCENT ELECTRIC LAMPS, L. Groth, London.	5493. BULKING, &C., TEA, B. Tydeman, Erith18th
chester	Apru, 1000.	-A com from A. Bernstein, -20th December, 1882.	November, 1882.
1008 ELECTRIC BATTERIES, B. W. Webb, H. P. F.	Delbas and 10th Amil 1990	6077 Trps for Boors, L. Groth, London, -A com, from	5498. TREATING DUFF COAL, &c., J. Jameson, New-
Jensen and J. Jensen London	Baltimore19th April, 1880.	I. Losser and J. Kyeser20th December, 1882.	castle —18th November, 1882.
1000 PETRAPING MACHINERY for FLAX &c. J.	1070. SHAPING, &C., HATS, E. Editorius, London, 2270	6078 WINDOW-BLINDS, L. A. Groth, LondonA com-	5541. ROTARY ENGINES, A. M. Clark, London21st
Raynolds Balfast	April, 1880.	munication from H. Olausen - 20th December, 1882.	November, 1882.
2000 Corouping Ou A M Clark -(H R Burk	1022. HOISTING APPARATUS, F. R. EIIIS, LIVETPOOL-	6070 Surps F H F Engel, Hamburg,-A communi-	5627. PORTABLE RAILWAYS, H. A. Spalding, Prussia
Brooklym)	20th April, 1880.	action from G de Laval -20th December, 1882.	27th November, 1882.
Divident	1043. LOCKS and LATCHES, J. Kaye, KIrkstan, near	6089 HAND SHEARS, E. Numan, London, - 20th	5682. SCREENS for SEEDS, R. Boby and T. Stevens,
20th April, 1005.	Leeds21st April, 1880.	Desember 1000	Bury St. Edmunds 29th November, 1882.
2001. DRILLING BOILER SHELLS, &c., S. Borland, Man-	1657. STEAM PUMPS, C. P. Deane, Springheid, U.S	CORA PROTINTOPS for STEAM ENGINES, E. Edwards.	5792. DIGGING MACHINES, J. Parker, Stevenage5th
chester.	22nd April, 1880.	London A com from A Zalm -20th December, 1882.	December, 1882.
2002. FIRE - EXTINGUISHING APPARATUS, W. Miller,	1659. LAMPS, M. Marichenski, London22na April,	cool Empringers F Bannis Bolton _20th December.	6083. ELECTRO-MOTORS, L. Milne and L. B. Miller, Lon-
Glasgow.	1880.	10091, FURNAULS, E. Dennis, Doron. 2000 December,	don20th December, 1882.
2003. PREVENTING the CORROSION, &c., of WOODEN	1679. NEW FABRIC for MAKING HORSE CLOTHS, W.	1002.	6170. BAR-BOLLING MILLS, J. Imray, London,-27th
SHIPS, J. B. Hannay, Glasgow.	Jenkinson, London, and J. F. Mayman, Dewsbury.	Dismingham - 21st December 1882	December, 1882.
2004. STENTERING, &C., WOVEN FABRICS, J. Smith,	-23rd April, 1880.	BITHINGHAM2180 December, 1002.	6183. ELECTRICAL GENERATORS, T. J. Handford, Lon-
Thornliebank.	1692, ATMOSPHERIC AIR, dc., ENGINES, H. WIIIams	Faultmar Donton and R I Metcalfe and W. N.	don -27th December, 1882.
2005. KNIFE-CLEANING MACHINES, T. Ashmore and F.	and J. Malam, Liverpool24th April, 1880.	Paines Dukinfield _91st December 1882	6199. DISTRIBUTING ELECTRICAL ENERGY, T. J. Hand-
W. McDonnell, Liverpool.	1749. PREVENTING EXPLOSIONS IN STEAM BOILERS, A.	Alles, Duringer Appapartie S H Framers	ford, London,-28th December, 1882.
2006. FRICTION CLUTCHES, H. Simon (Berlin-	M. Clark, London28th April, 1880.	Landon and I Munro Wost Crozdon - 29nd	6206 INCANDESCING CONDUCTORS, T. J. Handford,
Anhaltische Maschinenbau-Actien Gesellschaft, Berlin.)	1634. TRAMWAYS, J. Gowans, Edinburgh21st April,	Describer 1999	London -29th December, 1882.
2007. CUTTING LABELS, L. Alderson. Bradford.	1880.	December, 1002.	182 PREVENTING RADIATION OF HEAT, C. TOODE
2008. LAWN TENNIS REGISTER, E. J. C. Baird, Ripple	1649. ELECTRIC LIGHTING APPARATUS, W. R. Lake,	10110. STEERING APPARATUS, J. Imray, London, -A	London -11th January, 1883.
House, near Deal.	London21st April, 1880.	COM. ITOM J. O. LAKC22nd December, 1802.	188 ELECTRIC ARC LAMPS, J. G. Lorrain, London,-
2009. MANUFACTURE of ULMIN-BROWN, H. J. Haddan.	1655. KNIFE-CLEANING MACHINES, E. M. Knight, Man-	dan A com from E Boads 22nd December 1989	11th January, 1888.
-(La Banque Industrielle de Belgique, Paris.)	chester22nd April, 1880.	don, -A com, from E. Roads 2240 December, 1002.	

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March, 1883.

 PRODUCING ALUMINIUM, &C., G. B. de Overbeck, London.—22nd January, 1883.
 CULTIVATING SOIL, J. Cooke, Richmond.—30th January, 1883.
 BUILDING ARCHES, &C., W. R. Lake, London.— 90th January, 1889. BUILDING ARCHES, etc., W. R. LARG, LORIDI. 30th January, 1883.
 RENDERING WALLS DAMP PROOF, W. White, Lon-don -6th February, 1883.
 ELECTRIC LAMPS, J. G. LOTTAIN, London.-6th February, 1883.
 FURACES, T. Robinson, Preston.-7th February, 1982

Correlation of the second state o

COMPRESSING AIR, J. IMPRAY, London.-10th February, 1883.
 ARRON FILAMENTS, G. BOWTON and W. Hibbert, London.-12th February, 1883.
 GOVERNING STEAM ENCINES, W. Knowles, Bolton.-13th February, 1883.
 MAKING NICKEL, &C., ALLOYS, F. Lotter, Altona, Prussia.-14th February, 1883.
 MAKING NICKEL, S. Pitt, Sutton.-27th February, 1883.
 SBURTON-HOLE LININGS, A. J. Boult, London.-27th February, 1883.
 Viet of Letters Patent which massed the Great Seal on the

(List of Letters Patent which passed the Great Seal on the 24th April, 1883.) 1618. ELECTRIC LAMP, J. B. Rogers, London.-3rd

April, 1882. 4906 STEAM ENGINES, W. Crook, Preston.-16th October. 1882.
5066. RATCHET WRENCHES, L. Bagger, Washington, U.S.-24th October, 1882.
5095. REGULATING SUPPLY OF GAS, H. and T. A. Greene, London.-26th October, 1882.
5096. CUTTING GIGARS, G. Weston, Sheffield.-26th Octo-Le 1920.

ber, 182.
ber, 182.
5110. MAKING, &C., BLANKS for BOXES, S. Cropper, London. -- 27th October, 1882.
5114. TLITING CASKS, E. Hogg, Gateshead. -- 27th Octo-114. 71. TLITING CASKS, E. Hogg, Gateshead. -- 27th Octo-

5114. THITING CASES, E. HOGZ, Gateshead.—27th October, 1882.
5117. COUPLINGS for CARRIAGES, T. Smith, London.— 27th October, 1882.
5120. GETTING PORATOES, T. Hodgkinson, Huddersfield.—27th October, 1882.
5121. WINDING THREAD, J. H. Pickles, Burnley.—27th October, 1882.
5122. ELECTRIC CURRENT GENERATORS, S. P. Thompson, Britsloi.—27th October, 1882.
5134. ADMITTING AIR in CUPOLAS, &c., C. Landreth and and I. Renis, Valencia.—27th October, 1882.
5160. BUTT HINGES, J. Dyer, Birmingham.—30th October, 1882.
5160. ROLLER MILLS, E. Fiechter, Liverpool.—30th October, 1882.
5172. FURACES, T. Layton, Redditch.—31st October, 1882.

5172. FURNACES, T. LAYON, MARKET, R. H. Woodley, 1882.
5183. SECONDARY VOLTAIC BATTERIES, R. H. Woodley, and H. F. Joel, London.—31st October, 1882.
5194. FASTENINGS for BRACELETS, &c., E. Jones, Lon-don.—31st October, 1882.
5196. Soar, J. T. Armstrong, Nowcastle, and W. Bos-tock, Liverpool -31st October, 1882.
5215. METHOD of MOULDING for CASTING METALS, E. Peyton and C. Burley, Birmingham.—1st November, 1882.

5220. SAFETY-VALVES, D. Cockburn, Glasgow .- 1st No-

vember, 1882.
5240. FACILITATING the STOPPING, &c., of MACHINERY,
W. R. Lake, London, *—2nd November*, 1882.
5813. REGULATING STEAM SUPPLY, C. D. Abel, London. *—7th November*, 1882.
582. MAKING LACE, L. Marceuil, Paris. —11th November, 1882.

ber, 1882.
51. AUTOMATIC APPARATUS for FEEDING HORSES, J. P. Milbourne, Manchester. -- *Ath January*, 1883.
424. DIFCHING MACHINES, R. Fowler, Leeds.--25th January, 1883.
747. TREATING IRON ORES, A. Adair and W. Thomlin-son, Seaton Carew, Durham.--10th February, 1883.

List of Specifications published during the week ending April 21st, 1883.

3428,	6d.;	3857,	6d.;	4051,	8d.;	4067,	6d.;	4075,	2d.,	
4077,	2d.;	4086,	6d.;	4087,	18.;	4088.	6d.;	4099.	2d.;	19
4100,	2d.;	4101,	2d.;	4111,	8d.;	4114.	2d.:	4120.	6d.;	
4121,	6d.;	4122,	6d.;	4123,	2d.;	4124.	2d.:	4125.	6d.;	
4130,	6d.;	4134,	2d.;	4136,	6d.;	4139,	8d.;	4142.	2d.;	
4143,	2d.;	4145,	6d.;	4146,	2d.;	4148.	6d.;	4149.	2d.;	
4150,	8d.;	4153,	6d.;	4158,	2d.;	4164,	6d.;	4166.	2d.;	п
4171,	2d.;	4173,	2d.;	4174,	2d.;	4175.	4d.:	4176.	6d.;	V
4177,	4d.;	4178,	4d.;	4181,	6d.;	4182,	8d.;	4183.	10d.;	P
4185,	6d.;	4186,	2d.;	4188,	2d.;	4189,	2d.;	4190.	2d.;	n
4191,	2d.;	4192,	2d.;	4193,	6d.;	4194,	2d.;	4195,	8d.;	4
4196,	6d.;	4197,	4d.;	4198,	4d.;	4199,	6d.;	4200,	2d.;	
4201,	2d.;	4202,	2d.;	4203,	6d.;	4204,	2d.;	4205,	2d.;	
4206,	2d.;	4207,	2d.;	4208,	2d.;	4209,	6d.;	4210,	6d.;	
4211,	6d.;	4212,	4d.;	4213,	1s.;	4214,	6d.;	4215,	2d.;	
4216,	6d.;	4217,	2d.;	4318,	2d.;	4219,	4d.;	4221,	2d.;	c
4222,	2d.;	4223,	2d.;	4224,	6d.;	4225,	6d.;	4226,	4d.;	V
4227,	6d.;	4228,	6d.;	4229,	6d.;	4230,	2d.;	4231,	2d.;	b
4232,	6d.;	4236,	8d.;	4237,	2d.;	4238,	6d.;	4239,	6d.;	a
4241,	6d.;	4242,	4d.;	4243,	6d.;	4244,	6d.;	4245,	6d.;	d
4246,	6d.;	4250,	4d.;	4251,	2d.;	4252,	6d.;	4253,	2d.;	P
4254,	2d.;	4264,	6d.;	4265,	6d.;	4266,	2d.;	4267,	2d.;	t
4271,	6d.;	4272,	2d.;	4273,	, 4d.;	4276,	2d.;	4281,	4d.;	a
4283,	6d.;	4286,	6d.;	4289,	6d.;	4297,	2d.;	4298,	6d.;	a
4300,	2d.;	4303,	4d.;	4314,	2d.;	4328,	6d.;	4351;	6d.	4
4376,	8d.;	4508,	6d.;	4537,	4d.;	4717,	6d.;	5526,	6d.;	1
86, 8d.; 134, 6d.; 150, 6d.										

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

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

3428. SHOES FOR HORESS, &C., T. H. Baker (Executor of A. Laird) and T. Wilson, London.—19th July, 1882. 6d. This relates to forming the treading surface of blocks of hard wood or other suitable material, which will not wear smooth, and which can be easily renewed when worn out.

when worn out. 3857. CORRESPONDENCE PAPER AND ENVELOPES, G. W.

SOD 7. CORRESPONDENCE PAPER AND ENVELOPES, G. W. Simmons, London.-12th August, 1882. 6d.
This relates to a memorandum paper combined with and secured by a closing flap.
SOBO. INSULATION OF WIRES AND OTHER ELECTRIC CONDUCTORS, J. H. Johnson, Lincoln's-inn-fields, London.-19th August, 1882.-(A communication from I. M. Hirsch, Chicago, U.S.)-(Not proceeded with.) 4d. ith.)

with.) 4d. Relates to the insulation of wires by covering them with a mineral gelatine, the object being to enable such insulation to resist heat.

3001. INCANDESCING CONDUCTORS FOR ELECTRIC LAMPS, T. J. Handford, Southampton-buildings.-19th August, 1882.-(A communication from T. A. Bilson, Menlo Park, New Jersey, U.S.) 4d. This relates to the manufacture of carbon filaments by baking "drying oil," or a mixture thereof, into a

THE ENGINEER.

tough flexible sheet. The filaments are punched out of this sheet, and then carbonised by heat under strain and pressure. Other methods of manufacture are also described.

and pressure. Other methods of manufacture are also described.
 S995. UNDERGROUND CONDUCTORS FOR ELECTRICAL DISTRIBUTION, T. J. Handford, Southampton-buildings.-21st August, 1882.-(A communication from T. A. Edison, Menlo Park, New Jersey, U.S) 6d.
 This invention relates to the arrangement and connection of underground conductors at the intersection of streets, so that they may be more readily accessible for repairs and the replacement of "safety catches," and is an improvement on the previous arrangement adopted by the inventor. According to the present improvement one junction box is used at the intersection of eight conductors, in place of four as heretofore.
 4003. SAFETY DEVICES FOR USE WITH ELECTEIC APARATUS OF CONDUCTORS, &c., S. P. Thompson, Bristol.-21st August, 1882.-(No proceeded with.) 4d.
 This relates to improvements in the ordinary lead fusible safety plugs.

4015. APPLIANCES FOR WORKING GATES AT RAILWAY CROSSINGS, C. H. Lea, Stafford.-22nd August, 1882. 6d. This relates to means for ensuring that the gates may hang in a proper position, and to allow any devia-tion from such position to be readily corrected.

Hay hang in a proper product, and to allow any deviation from such position to be readily corrected.
 4025. IMPROVEMENTS IN THE WORKING GEAR AND APPLIANCES USED IN ELECTRIC LIGHTING, K. W. Hedges, Westminster.—22nd August, 1882. 6d.
 This relates to a method for controlling the motor driving the generator at any distance away. The inventor uses a 'separate wire, either connected with the earth or with the main return wire, and through this wire he passes either a portion of the current from the generator as a shunt or current obtained from batteries. The current is brought into action by a switch placed in the building to be lighted. It actuates an electromagnetic apparatus connected either with the regulator or throttle valve of the motor, or it throws into and cuts out of the circuit field of the generator. The invention further relates to improvements in switches and safety plugs.
 4028. FILTERS AND APPARATUS FOR CLEANSING THE

4028. FILTERS AND APPARATUS FOR CLEANSING THE SAME, E. Perrett, Westminster.—22nd August, 1882.

6d. This consists partly in the mode or method of cleansing a filtering medium, preferably whilst in a free, loose, or expanded condition, inside the filtering or containing vessel, by causing a body of water to be moved by any suitable displacer through the said medium to and fro or in opposite directions alternately, whereby the impurities are disturbed and the cleansing of the medium is effected.

of the medium is effected.
4033. CARBURETTING LILUMINATING GAS, C. Crozat, Bastchazp.-22And August, 1882.-(Void.) 2d.
This relates to the employment for carburctting or enriching illuminating gas of such hydrocarbons, which, being homogeneous, practically maintain a fixed point of ebuilition whilst giving off vapour, so that the same hydrocarbons do not become sensibly impoverished as they are used.
4036. APPARATUS FOR WINDING COILS OF WIRE UPON THE AMATURES OF DYNAMO-ELECTRICAL MACHINES, W. B. Espeut, Jamaica, West Indies. -23rd August, 1882. 6d.
This consists of a rotating ring driven by cogs.

1882. 6d. This consists of a rotating ring driven by cogs, which carries a reel of wire and a series of pulleys, over which the wire passes to the armature to be wound. The pulleys are fitted on long spindles so as to change their positions in accordance with the posi-tion of the wire on the reel. The inventor claims to be able to wind any kind of armature, round or other-wise.

wise. 4051. PRESERVING MEAT, MAKING ICE, &C., W. H. Northcott, London.-24th August, 1882. 8d. The machine for producing cold air is constructed with one or more single-acting compressing cylinders, and one or more single-acting expansion cylinders bolted to a bed-plate in which are generally placed the cooling tubes. The invention relates to improvements in the general construction of the machine.

in the general construction of the machine.
4052. PHAETON GIG, H. Lloyd, Liverpool. - 24th August, 1882. 4d.
The object is to construct a carriage capable of being rapidly and easily converted from a phaeton or double to a gig or single-seated carriage.
4053. SLEEPER CHAIRS FOR RAILWAYS, J. Mac L. Blair, Glasgow. - 24th August, 1882. 6d.
This refers to wrought iron or united steel sleeper chairs formed more or less hollow on one side and rounded on the other.
4056. Bull ALTE E AUGUST. IN STRUME THE SAME AND ALL AND

counded on the other. 4056. APPARATUS EMPLOYED IN SPINNING, TWIST-ING, OR DOUBLING WORSTED, &c., H. Illingworth, Bradford.—24th August, 1852. 4d. This relates to improvements in apparatus employed n spinning, twisting, and doubling worsted or other ibres in what is called cap spinning or twisting, whereby twisting in the opposite direction desired is prevented by the caps being formed with saw teeth or notches at the edge thereof. 4057 MANUELCTURE of AUGUST, AD REMEMBER, 2015.

notches at the edge thereof.
4067. MANUFACTURE OF ANMONIA AND BONE-BLACK, *B. P. Alexander, London.-24th August, 1882.-(A communication from H. Y. and E. B. Castner, New York.)* 6d.
The process consists essentially in first passing crushed bone continuously through a closed heated vessel or carbonising cylinder, thereby charring the bone; then conducting it without exposure to air in an air tight receptacle; in drawing the gaseous products from the cylinder, combining them with air, passing the combined gases through heated pipes, then over slacked lime, and finally cooling the gases and bringing them into intimate contact with an aird, thereby forming salt of ammonia in solution.
4058. LACE BOOTS AND SHORS, &c., A. C. Andrews,

.058. LACE BOOTS AND SHOES, &c., A. C. Andrews, Birmingham.-24th August, 1882.-(Not proceeded

Birmingham.-24th August, 1882.-(Not proceeded with.) 2d. The inventor employs long narrow cyclets in the fronts, sides, or other openings of lace boots and shoes, in place of the usual circular cyclets, and a broad, flat lace or strap is used of a width corresponding to the length of the cyclets.

4061. COVERS OR LIDS FOR PROVISION CANS, &c., H. J. Haddan, Kensington.—24th August, 1882.—(A communication from Schreider and Lemp, Leipzig.)

6d. This consists in providing the can on its inner side, a little below the upper edge, with a circular or ring-shaped platform or edge, soldered air-tight to the can, and in placing on the same a pad or layer of discs of paper treated so as to be oil, air and water-tight.

4062. SEWING MACHINES, H. J. Haddan, Kensington. -24th August, 1882.-(A communication from J. A. Doering, Leipzig.) 6d. This relates to the construction of shuttles for sewing machines.

Sewing machines.
4063. APPARATUS FOR RETAINING HEAT, WARMING FOOD, AND SMOOTHING FABRICS, &c., J. Cavargna, Manchester.—24th August, 1882. 6d.
This consists in constructing receptacles for keeping food warm, with a chamber at bottom in which fuel is caused to burn slowly, such fuel consisting of granu-lated charcoal, nitrate of potash, and gum water, or other matter which will cause the particles to cohore. The fuel can also be used for heating smoothing irons.
4065. Electron LAWES C. & Savel Research 2005

4065. ELECTRIC LAMPS, C. S. Snell, Hackney.-24th August, 1882.-(Not proceeded with.) 2d. This relates to an arc lamp in which the upper carbon holder passes through two coils, one in shunt, the other in the main circuit. The arc is regulated by means of these coils and armatures acting on the carbon rod

4067. REVOLVING PAPER-CUTTING MACHINES, P. Jen-sen, London.-25th August, 1882.-(A communication from E. Dietz, Berlin.)-(Not proceeded with.) 2d. The object is to avoid the use of deep naves, while at

the same time to retain the elastic contact between the utting o 4068. MOULDING TOBACCO AND OTHER ARTICLES INTO PACKETS, H. Clarke, Shoreditch. -25th August, 1882.

6d. August, 1882. Round a circular revolving table eight open-ended cylinders are arranged, and corresponding to the posi-tion of one of them a pair of pistons are provided, one below and one above the cylinder, while corresponding to the position of each of the four next cylinders a pair of fingers are arranged. To the next cylinder a pair of pistons, and to the next a single top piston are provided.

provided.
4069. BREAKING DOWN COAL, E. G. Robinson, Barns-iey.-25th August, 1882. 6d.
A hydraulic cylinder is divided longitudinally into two parts, one of which contains a number of ram cylinders all in connection with each other through a waterway, the other half containing a corresponding number of projections equal to and which enter the ram cylinders. The complete ram cylinder is mounted upon the end of a hollow rod, and on being inserted in the drill hole formed in the coal, and water forced into the ram cylinders, the halves of the cylinder are forced apart, breaking down the coal.

apart, breaking down the coal.
4070. Looms FOR WEAVING, J. Williams and H. Burnes, Burnley.-25th August, 1882.-(Not proceeded with.) 2d.
This relates to apparatus whereby lengths of cloth with a heading and a fringe at one or both ends may be woven continuously without stopping the loom, and it consists of an arrangement of levers or cams actuated so as to raise the catch out of contact with the pattern cylinder, and thus render the pattern surface inoperative.

face inoperative.
4072. FILTERING APPARATUS, J. F. C. Farquhar and W. Oldham, Long Arre.-25th August, 1882. 6d.
In patent No. 1051, A.D. 1879, the top of the filter bed is scraped to remove the dirt deposited, and a box is provided to receive such dirt. In order to be able to abolish this box, the shaft carrying the scraper is made hollow, and the fluid to be filtered is introduced through it, so that it enters beneath the material removed by the scraper from the upper part of the filter bed. The invention further relates to the mechanism for actuating the scraper, the method of supporting the bed upon a domed grid, and of drawing off the filtered liquid.
4074. HEATING BATHS, D. Jones, near Liverpool.-24th August, 1882. 4d.

August, 1882. 4d. This relates to the use of a hand pump in the bath-room, a pipe from which dips into the kitchen boiler.

4075. MANUFACTURE OF CLOGS, G. Glover, Liverpool.-25th August, 1882.-(Not proceeded with.) 2d. To obviate noise, to the sole or heel is attached a layer of india-rubber; the tops are made of canvas or stout cloth suitably prepared.

4076. ROTARY STEAM ENGINES, W. B. Espeut, Jamaica.-25th August, 1882.-(Not proceeded with.) 4d.

4d. This consists of a circular plate fixed on the engine shaft and formed with two or more pockets (in which balls are placed) and faced against a plane surface of a fixed head, having a short circular channel into which the balls drop, and successively constitute the piston heads of the engine. The invention further consists of valve mechanism whereby the steam may be used expansively, and also of a compound arrangement of the engine. the engine

4077. GAS STOVES, J. F. and G. E. Wright, Birmin, ham.-25th August, 1882.-(Not proceeded with.) 22 This relates to the arrangement of chambers an tubes.

tubes.
4079. SECONDARY BATTERIES, L. H. M. Somzée, Brussels.-25th August, 1882. 6d.
The inventor coats thin sheets of lead, perforated or not on both sides, with a slight layer of minium, rendered adherent by mixing with starch or other agglutinative substance. Several of these plates are connected at convenient distances by insulating cross pieces, and the whole surrounded by a thick sheet of lead. The inventor claims the following composition for application to the plates, viz., a mixture of pulverised coke or similar substance and a first oxide-or salt of lead, impregnated with sugar or syrup, and with an acid added if required.

with an acid added if required. 4080. ELECTRIC MEASURING, RECORDING, AND REGU-LATING APPARATUS, S. H. Emmens, Argyll-street.— 25th August, 1882.—(Not proceeded with.) 2d. This relates to apparatus for measuring the quan-tity and intensity of a current, and the resistance of a circuit, also for recording the quantity of electricity traversing a circuit and regulating the production of the current.

Charles and the constraints of the current.
4081. FRICTION COUPLINGS FOR SHAFTS, PULLEYS, AND TOOTHED WHEELS, F. C. Glasser, Berlin.-26th August, 1882. - (A communication from T. Braun and A. Stackfleth, Berlin.) 8d.
A casing is fixed on the shaft to be driven, and on the shaft is fixed a cross-shaped piece, carrying in slots toothed wheels fixed on screws with right and lefthanded threads. Two arms of the cross piece serve as guides for brake blocks, containing nuts, in which the right and lefthanded screws work. A second casing is lose on the shaft, and has spiral ribs on its front side and an internal toothed ring on the shaft. A lever extends equally on either side, and through its ends pins pass, and carry small pinions on one side and larger pinions on the other, the former gearing with a toothed tring inside a third casing, while the latter gear with the internal ring of the second casing. The second and third casings are acted upon by brake rings.
4083. APPARATUS FOR OPENING BOTLES CONTAINING

This relates to a special construction of hinged wooden frame covered with waterproof canvas. 4105. LOOMS FOR WEAVING, J. Dawson, Lawiston, U.S. -28th August, 1882. 6d. This relates to that class of weft stop mechanism employed in fancy looms having rising and falling shuttle boxes, and where the apparatus for detecting the absence of weft is fixed about the middle of the slay board. The needles or feelers are attached to a rocking shaft with teeth gearing with a rack on the top of a vertical rod hinged at bottom to a counter-balanced lever serving to raise and lower it. A series of three adjustable cams are fixed under the breast beam, so that as the slay moves to and fro the forward point of the lever will be operated by the cams. The lever has two points, one to raise and depress the needles, and the other to stop the loom. 4106. PRINTING INK, &c., C. F. Claus, Mark-lane.-28th August, 1882. 4d. This consists, First, in the manufacture of black paint or pigment by a process in which the precipitate covered hus the action of a sail of ince upon a subjuid rings. 4083. APPARATUS FOR OPENING BOTTLES CONTAINING ARRATED LIQUIDS, D. Cole, Swindon. --26th August, 1882.-(Not proceeded with.) 2d. This consists of a metallic vessel in the form of a sugarloaf, open at the wide end, and having in the centre of the bottom a thumb or conical extension projecting inside the vessel, and having grooves for the escape of gas. The bottom has a circular border to fit over the neck of the bottom, the projection acting upon the stopper and pushing it inwards. 4084 ARC EXECUTED LANCE B. B. due Londont 28th August, 1882. 4d.
This consists, First, in the manufacture of black paint or pigment by a process in which the precipitate formed by the action of a salt of iron upon a sulphide of an alkali, or of an alkaline earth, is enveloped in oil, resin, or gum, or in fused or melted sulphur; Secondly, in obtaining chloride of barium or of strontum simultaneously with such pigment, when it is produced by the action of a solution of sulphide of barium or of strontum upon a solution of chloride of iron; and Thirdly, the production of ochre from the black precipitate by exposing it to atmospheric air.
4107. WHITE FIGMENTS, ALKALIES, &c., C. F. Claus, Mark-lane.—28th August, 1882. 4d.
This consists, First, in the manufacture of a white pigment by dissolving carbonate of zinc in caustic ammonia liquor, and precipitating with a solution of sulphide of an alkali, or of an alkali or of an alkali, or of an alkali, or of an alkali and or of sulphide of zinc by dissolving flux skimmings in ammonia without previously removing the chloride contained in the same.
4108. PREFARATION AND USE or POROUS SLICEOUS MARKED ALLES ALLES

4084. Arc ELECTRIC LAMPS, P. R. Allen, Lambeth.— 26th August, 1882. 6d. This relates to means for keeping dust, &c., out of the mechanism of arc lamps, and consists in covering the regulating parts by an air-tight box. The upper carbon holder is also covered as far as the carbon with an electric air-tight covering which reaches up and is attached to the above mentioned box.

4086. RAILWAY CARRIAGES, &C., W. J. Bennett and C. H. Rosher, London. – 26th August, 1882. 6d. This relates to constructing railway and other car-riages with splinter-prior compartments of cylindri-cal or approximately cylindrical form, and mounting the compartment certification form, and mounting the compartments on their platforms in such a way that they shall become detached from the said plat-forms in the event of a collision, and shall be free to rise up and occupy less area.

1786 up and occupy less area.
40088. APPARATUS FOR REGULATING, CONTROLLING, INDICATING, AND REGISTERING FLOW OF FLUIDS, J. C. Stevenson, Liverpool.—26th. August, 1882. 6d. The flow of fluid takes place through or past a double valve or opening, controlled by apparatus sub-ject to the action of the fluid in the main or recoptacle whose pressure is to be regulated. This pressure acts upon a floating body, which can be more or less weighted as required.

Contained in the same.
4108. PREPARATION AND USE OF POROUS SILICEOUS MATERIALS FOR FILTERING ACID AND OTHER LIQUIDS, &c., C. F. Claus, Mark-lane.-28th August, 1882. 4d.
This consists, First, in the manufacture of a spongy or porous acid-resisting material, by combining or mixing ganister or infusorial earth with a silicate of more than one base, either with or without alumina; and Secondly, in the utilisation of such material in the construction of filters, acid towers, and similar apparatus. weighted as required. 4089. HAMMERLEES GUNS AND RIFLES, W. Anson, Warvick.-26th August, 1892. 6d. This relates to means for securing guns against acci-dental discharge, and consists, First, in the use of a spring in the mechanism for locking the triggers, such spring bearing on the tails of the sears so long as the gun is at "astety" but rising clear of them when the safety bolt is moved; and Secondly, in the application of a secondary sear to each tumbler, and arranging it so 4109. GAS LAMPS, F. H. Wenham, Shepherd's Bush.-28th August, 1882. 6d. This consists of a gas lamp in which an inverted Argand burner is arranged at the lower end of an air-heating chamber, the space between the chamber and the burner, and also the central orifice in the burner,

that it will hold the tumbler if the sear proper should ret injured

APRIL 27, 1883.

get injured. 4000 MEANS AND APPLIANCES FOR HEATING AND WARMING, W. Thornburn, Boroughbridge.-26th August, 1852. 6d. The object is to form heating stoves so that the pro-ducts of combustion will be free from smoke and smell, and that the heat may be applied, by means of a large metallic heating surface, to the heating of air, or air may be heated by hot-water tubes, the water of which is heated by such stoves. The stove consists of two concentric cylinders with an intermediate space, into which open tubes arranged at an angle within the inner cylinder, and through which air or water is caused to circulate.

4092. DRILLING BRACES AND DRILLING MACHINES, &c., J. Rettie, Hatton Garden.—26th August, 1882. —(Not proceeded with.) 2d. This relates to the employment of a combination of gearing, whereby the drill is driven at a greater speed to that part of the tool to which the power is applied by the hand. 4093. HARVESTING MACHINES, J. Howard and E. T.

4093. HARVESTING MACHINES, J. Howard and E. T. Bousyleld, Bedford. -26th August, 1882. 8d.
This relates to improvements on patent No. 4092, A.D. 1881, and it consists, First, in the combination with the frame supporting the binder table of a rocking segmental bearing, so as to enable the driver to adjust the table without leaving his seat; Secondly, in the combination with the binding mechanism and gathering reel of a jointed connector, to allow the mechanism and reel to be moved independently of the binding arm with a groove of semicircular form, and which, in combination with a fixed string guide, enables the string to be retained in place without leave of the use of rollers. The invention further relates to means for preventing undue wear of the automatic trip lever actuated by the sheaf compressor, and which acts on a clutch.
40086. GAS BURNESS, W. R. Lake, London.-26th

AO96. GAS BURNERS, W. R. Lake, London.-26th August, 1882.-(A communication from E. Z. I. Teterger, Paris.) 6d.
This relates to a burner which spreads the gas in a thin sheet of ring form round the circumference of the burner. A tube is closed at top, where openings are formed through the sides to allow the gas to pass into an annular space enclosed by a cup below and a disc above, a narrow passage being left all round between the cup and disc, through which the gas issues in the form of a thin ring.
4097. WHEELS, J. Fry. Lisson Grove -98th August

form of a tinn ring. 4097. WHEELS, J. Fry, Lisson Grove.-26th August, 1832. 6d. This relates to the method of fixing the spok cs and bending the hub of metal wheels, and it consists in bending the inner ends of the spokes at right angles alternately in opposite directions, and inserting them into two metal rings which can slide on the hollow axle-box so as to adjust their distance apart and so regulate the tension. The rings and the spokes are then arranged in a mould and the hub cast round them.

4098. BALLOONS, J. A. Fisher, Queen Victoria-street, and C. G. Spencer, Holloway.-28th August, 1882. 4d.

4d. This relates to Montgolfier balloons, in which the inflating agent is rarified heated air, and the object is to so construct such balloons that there shall be no danger of them being set on fire. For this purpose the lower part of the balloon around or near the heat pro-ducer is made of asbestos cloth or fibre, while the upper part may be of any suitable fabric rendered fire-proof by a solution of silicate of soda, asbestos paint, or other non-inflammable compound.

ACO99. SAFETY GUARD FOR CHAFF OR HAY-CUTTING MACHINES, E. Rigby, Liverpool.—26th August, 1882. —(Not proceeded with.) 2d.
 This consists in providing that part of the feeding-box or trough nearest to the machine with a guard.

4100. MANUFACTURE OF HORSESHOE NALLS, W. J. Bingham, Sheffield. -28th August, 1882. - (Not proceeded with.) 2d. This consists in completing by the aid of machinery the operations that in ordinary hand-made nails are done by the farrier or shoeing smith, namely, stiffening and setting and pointing. 4101. PLOURDE, W. Stroaturen, Disa. - 28th August. and setting and pointing.
4101. PLOUGHS, W. Swootman, Diss.-28th August, 1882.-(Not proceeded with.) 2d.
A screw is provided whereby the position of the breast may be altered so that the land can be put down sharp or left at any desired pitch. A wheel-outter is adapted to the plough and fixed in front of the skim coulter of the plough.
4104. Decrements for the second se

4104. PORTABLE FOLDING OR COLLAPSIBLE BOATS, L. W. Jelf, Piccadilly,-28th August, 1882. 6d. This relates to a special construction of hinged wooden frame covered with waterproof canvas.

being covered with gauze for distributing and con-trolling the supply of heated air to the flame. 4110. TELEPHONIC APPARATUS, G. L. Anders, Queen Victoria street. - 28th August, 1882. - (Not proceeded

with.) 2d. This relates to loose contact instruments and to the employment of tellurium as the contact surface.

4111. DYNAMO-ELECTRIC MACHINES, H. H. Lake, Lon-

4111. DYNAMO-ELECTRIC MACHINES, H. H. Lake, London. —29th August, 1882. —(A communication from S. F. pan Choate, New York.) 8d.
This relates to improvements in dynamo machines, the object of which is to produce a more simple, compact, economic, efficient, and durable machine than usual. The inventor uses compound U-shaped magnets encompassing the armature, and constructs his commutator so that the field magnets may be supplied with unipolar or continuous currents, while the currents sent to line may be either bipolar—alternate —or unipolar—direct. Many other improvements are described, and there are twenty-three claims.

4113. SEWING AND TRIMMING KNIT GOODS AND OTHER FABRICS, &C., J. H. Johnson, London. - 29th August, 1882. - (A communication from C. H. Wilcox, New York.) 8d.

1882.-(A communication from C. H. W1002, New York.) 8d. This relates, First, to the use of a trimmer acting in advance of an over-seaming sewing mechanism, so as to trim the seam ready for sewing; Secondly, to the employment of a guide or guides in the formation of welks or hems in knit goods and other fabrics, for the purpose of folding and guiding the fabric to the trimming and over-seaming sewing mechanism.

AUTOMATIC NIPPER FOR WIRE ROPE, J. C. Spence and B. G. Nichol, Newcastle-upon-Tyne.— 20th August, 1882.—(Not proceeded with.) 2d. This consists in an arrangement of grooved carriage of considerable length in reference to the diameter of the groove provided in it, which carriage is to be bolted securely to a substantial foundation, or otherwise secured, so as to take the strain applied by the rope to be nipped.

be nipped.
4115. STEAM PUMPS, J. F. Spencer, New Broad-street.— 20th August, 1882.—(Not proceeded with.) 2d.
This relates to the valve and valve gear of steam pumps, and consists essentially in the use of a rotary or segmental or cylindrical valve, somewhat similar to a Corliss valve, for governing the inlet and outlet.
4116. TREATMENT OF MATERIALS USED IN THE MANU-FACTURE OF PAPER, C. O. McAllum, Neucostic-on-Tyne.—20th August, 1882.—(Not proceeded with.) 2d.
This relates to the bleaching of vegetable fibre pulp or "half stuff" by the decomposition of ehlorine com-pounds mixed with the pulp by means of electricity.
4117. MACHINE FOR WASHING LAWN TENNIS BALLS. 4117. MACHINE FOR WASHING LAWN TENNIS BALLS, &c., A. T. Openshaw, Birmingham.-29th August, 1882. 6d.

1882. 6d. This relates to a machine consisting of a cylindrical case or vessel, and its cover, provided with brushes, and of a circular disc capable of rotating in the said case or vessel, and having at its edge a series of plates or holders for holding and separating the balls or articles to be washed.

to be washed. 4118. CASK or BARREL, S. T. Thomas, Wolverhampton. —29th August, 1882.—(Not proceeded with.) 2d. The cask is of sheet steel or iron, and is made in two halves brazed or rivetted together around the middle of the cask, the ends being afterwards rivetted in.

4120. SELF-INDICATING TEA OR COFFEE URN, HEATING JACKET, AND FEED KETTLE COMBINED, R. W. Raphael, Ballymoney, Ireland.-29th August, 1882.

Raphael, Ballymoney, Ireland.-29th August, 1882. 6d.
This relates to the combination formed by the arrangement of an outer and inner cylindrical vessel, provided with a water kettle or reservoir at the top.
4121. FASTENINGS FOR SCYTHES, A. J. Boult, London. -20th August, 1882.-(A communication from A. Hagedorn, Osmutrick.) 6d.
A circular plate or ferrule is placed upon the end of the handle, being strengthened by an additional thick-ness if necessary. A T-headed or similar bolt passes through the ferrule and handle, and a slot is provided in the T-head, into which the tang or heel of the blade is inserted, and the nut being screwed up tight holds the blade firm. To prevent side play a second plate of the handle; a projection upon the tang fits into this slot, so that when the scythe is in use the side play of the blade tends to drive the projection down the slot and holds the blade all the firmer.
4122. SAFETY STIRIUFS, A. J. Boult, London.-29th

4122. SAFETY STIRRUES, A. J. Boult, London.—29th August, 1882.—(A communication from F. Lehmann, near Magdeburg.) 6d. The object is to cause the stirrup to become detached from the stirrup strap should the rider fall from the bound

horse.
4123. FILTERS, M. Richards, Brierley Hill.-29th August, 1882.-(Not proceeded with.) 2d.
The object is to open the filters, so as to examine the internal parts in a very short space of time, and to seal the said parts up again just as quickly.
4124. METALLIC BOXES OR CASES, S. Rossé, Brixton.-20th August, 1882.-(Not proceeded with.) 2d.
This relates to the manner of stamping the metal and to the means of folding it.
4125. August prop. ROMETING COFFEE, W. T. Sugar

and to the means of folding it.
4125. APARATUS FOR ROASTING COFFEE, W. T. Sugg, Westminster.—29th August, 1882. 6d.
The apparatus consists of a roaster, a small steam generator and engine for driving the same, and a con-denser to condense the steam from the steam engine.
The roaster and steam engine are heated by gas.
4126. SPEED-ACCELERATING DRIVING MECHANISM, W. R. Lake, London.—29th August, 1882.—(A commu-nication from L. S. Fithian, New Jersey, U.S.) 6d.
This relates to the arrangement of toothed wheeled gearing. aring.

gearing. 4127. ELECTRIC CONTROLLER AND INDICATOR FOR CLOCKS, &C., T. Wright, Malta.-20th August, 1882. 6d. This relates to a method of obtaining rotary move-ment by means of a circuit closer and duplicate levers working in combination with electro-magnets and a battery, which rotary movement is communicated to indicating hands, so as to cause them to indicate hours and minutes by means of ratchet wheels, &c. 41000 Employee Thy Series and a Description.

and minutes by means of ratio that of indicate hours and minutes by means of ratio that with the indicate hours PULVERISED ORES TO EXTRACT THE METAL THERE-FROM, &c., J. Joy, Heliston, and X. H. Stephenes, Sithney, Cornwall. - 20th August, 1882. Sd.
 This relates to improvements on patent No. 677, A.D. 1872, and consists, First, in forming the bottom of the pan of a concave ring form, and with a flat bottom well; Secondly, in introducing the feed near the centre of the machine, and conveying it preferably by several branch pipes under the shoes or rubbers; Thirdly, in making the periphery of the shoe in the form of an involute curve, and securing the shoes to the arm of the muller by means of a dovetail catch on top of the shoe taking into a slot on the arm; and Fourthly, in taking off the weight from the grinding surfaces by means of a lever acting upon the muller shaft.

4180. MANUFACTURE OF BOXES FROM PAPER, CARD

4130. MANUFACTURE OF BOXES FROM FAPER, OAD BOARD, &C., H. J. Haddan, Kensington. - 29th August, 1882.-(A communication from E. B. and H. S. Munson, New York.) 6d. This consists in simultaneously cutting the lines, dividing the material into proper form, and embossing their lines of ultimate folding, by pressing the same between a die composed of sharp cutting and blunt embossing rules and a co-acting counter die.

embossing rules and a coacting counter dis. 4132. AppARATUS FOR LETTING-OFF MOTION FOB WEAVING LOOMS, R. G. Swaann, Burgees Hill, Sussex. -29th August, 1882. - (A communication from M. Parser, Holland.)-(Not proceeded with.) 2d. This consists in the use of a steel friction band lined with leather, and fastened by eye and hook to a steel spring, which is fastened by a bolt on the cross

beam, and by a nut to the hook having a screw thread. Two weighted levers press the cloth against the taking-up roller. 4184. SPINNING FRAMES, St. J. V. Day, Glasgow.

THE ENGINEER.

1134: SPINNING FRAMES, St. J. F. Day, Glasgow.-asth August, 1882.-(A communication from J. Robertson, Calcutta.)-(Not proceeded with.) 2d. This consists in the employment of much shorter spindles, whether solid or hollow, than hitherto used, and in placing the driving pulleys or wharves above the flyers instead of below as hitherto.

4136. INDICATOR FOR CABS, &C., J. Finney, Man-chester.—30th August, 1882. 6d. The object is to enable the passenger in a cab to communicate with the driver by means of a visible signal or indicator.

signal or indicator. 4139. MACHINERY EMPLOYED FOR PRESSING WOOLLEN FABRICS, &C., J. Burras and W. Renton, Leeds.-30th August, 1882. 8d. Within suitable framework is mounted a roller, and in suitable bearings on a table or carriage are provided corresponding rollers below and round the periphery thereof, such table or carriage being so arranged that by the application of hydraulic apparatus it can be raised or lowered at pleasure, whereby the rollers thereon can be raised and brought in contact with the upper roller for the purpose of imparting the required pressure, or withdrawn therefrom.

pressure, or withdrawn therefrom. **4140.** SPINNING FLAX AND HEMP, J. S. Coey and J. *Medrthur, Leeds.*—80th August, 1882. 4d. The object is to prevent the accumulation of waste or dirt on the drawing rollers of wet spinning frames used in spinning flax or hemp. Over one or both of the delivery rollers is suspended at one end a rubber, consisting of an elastic or pliable fabric, which rests on the upper surface of each roller, so as to remove the dirt therefrom. **4142** Door Locare H. L. Hudden, Koningdon, 2001.

dirt therefrom.
4142. DOOR LOCKS, H. J. Haddan, Kensington.--30th August, 1852.-(A communication from 0. Belger and F. Preller, Hanover.)-(Not proceeded with.) 2d. This consists chiefly in the combination of a latch with one or two operating levers fixed to a tube, which projects on both sides of the lock and carries the door handles, a locking lever mounted on a shaft which passes through the said tube and fits in its locking position into a recess of the latch, preferably a spring and a key, for turning the inner shaft.

and a key, for turning the inner shaft. 4143. DIVING APPARATUS, E. Easthope, Wolverhampton. -30th August, 1882.-(Not proceeded with.) 2d. This relates, First, to apparatus employed for sup-plying oxygen gas to a receiver or reservoir attached directly to the diving dress or dress worn by a person in order to enter a vitiated atmosphere, or to the diving bell or submarine boat; and Secondly, to apparatus whereby such gas after passing into the dress, bell, or boat, is, together with the air con-tained within such dress, bell, or boat, circulated and purified.

nurified

purified.
4144. CAUSTIC FOTASH AND SODA, W. L. Wise, West-minster. - 30th August, 1882. - (A communication from La Société Anonyme Lorraine Industrielle, Paris.) 4d.
This consists in the manufacture of caustic potash or caustic soda by causing litharge to react on chlorides of potash or soda in presence of water, and subsequently extracting the resulting alkalies with alcohol, and also in necovering litharge and obtaining chloride of iron in such process.

in such process. 4145. MARINE AND FLUVIAL STRUCTURES TO SERVE AS FOUNDATIONS FOR FORTS, PIERS, &C., J. G. Tongue, London. -30th August, 1882. -(A communi-cation from C. J. Keenan, Paris.) 6d. This relates to the arrangement, application, and use of coffers, caissons, or any other floating bodies what-ever, held down under the surface of the water by ties or other fastenings holding on to the bottom by means of suctions, weights, or any other means, so as to con-stitute a hydrostatic basis for supporting any required superstructure, such as a raft, platform, bridge, land-ing stage, or other similar structures. 4146. EXTRACTING JUGE OF LIGUID FROM STORM

119 Stage, or other similar sectorities. 4146. EXTRACTING JOICE OR LIQUID FROM SUGAR CANE, &c., H. H. Grierson, Manchester. — 30th August, 1852.—(A communication from C. Hughes, Matanzas, Cuba.)—(Not proceeded with.) 2d. This consists in expressing juice or liquid from "bagasse" or crushed sugar cane.

¹¹ bagasse" or crushed sugar cane. 4147. GALVANIC BATTERIES, S. H. Emmens, Argyll-street.—30th August, 1882. 6d. This relates to a peculiar construction of battery cell, and to novel combination of elements for use therein. The plates are composed of zinc and carbon separated by a porous pot. The carbon is placed in liquid arsenic acid, whilst dilute acid is used as the exciting agent; or the inventor places the carbon in nitric acid.

4148. GENERATING, INTENSIFYING, AND ACCUMULATING OB STORING ELECTRICAL ENERGY, P. de Villiers, Lancaster-road, -Soth August, 1882. 6d. This relates to a generator consisting of a revolving drum containing metals and chemicals, which generate a current, an exciter—whereby the current when generated is intensified—and an accumulator to store such current.

4149. APPARATUS FOR HANGING ELECTRIC AND OTHER LAMPS, &c., A. M. Clark, Chancery-lane.—20th August, 1882.—(A communication from H. G. Fiske, Springfield, Mass., U.S.—(Not proceeded with.) 2d. This relates to portable suspension tackle for electric and other lamps. 4150. Supplys. Cath. L. Commun. Commun. 2010.

4150. STEERING GEAR, J. Granroth, Greenock, N.B.-

4150. STEERING GEAR, J. Grantout, Greenock, M.D. 31st August, 1852. 8d. This consists of steering gear, in which a pair of screw and feather blocks, moved in opposite longitu-dinal directions by right-hand and left-hand screw threads on the same longitudinal shaft, act directly by vertical pins on blocks sliding in radial slots formed in the rudder head, the said screw and feather blocks being connected together by feathers and grooved parts on each other or partly on fixed guide bars.

parts on each other or partly on fixed guide bars.
4151. COUPLINGS FOR RAILWAY WAGONS, &C., S. Keeton, Lenton, Notts.—31st August, 1882.—(Not proceeded with.) 2d.
In one modification a rocking axle shaft is provided at the centre with an arm hinged to link attached to a looped link, which is hinged to the draw-bar between the draw-bar hook and the wagon end. A hooked lever forms a handle at each end of the shaft, and can be engaged with catch levers forming the outer ends of a second rocking axle above the former, and secured to the end of the wagon, by which means the link or coupling can be secured either when up or down.
4152. Supervive Ly TO Pars. G. R. Hughes and T.

4152. SUPPLYING INK TO PENS, G. R. Hughes and T. Carvardine, Hampstead.-S1st August, 1882. 6d. This relates to a pen, the holder of which is made hollow to receive an indiarubber bag, through the lower end of which the nib passes, whereby the ink contained in the bag is supplied to the nib as required.

4153. CARPET FASTENER, E. Edwards, London .-

1153. CARPET FASTENER, E. Bawaras, Education from J. A. Wilmot, New Brunswick.) 6d. The object is a device for the purpose of holding the dge of carpets, by means of a fastening secured to the loor in proper position to receive such edge. The levice consists of a clasp fastening composed of two aw plates connected together by a hinge joint, and naving their inner surfaces provided with teeth or miles. devic

spikes. 4156. APPARATUS FOR INTRODUCING INTO THE EARTH MANURES IN A GASEOUS FORM, L. A. Groth, London, --Sist August, 1882.-(A communication from K. Zaruba and A. Kounowsky, Behemia.)-(Not pro-ceeded with.) 2d. _____ for introducing amounts.

ceeded with.) 2d. This relates to apparatus for introducing ammonia, chlorine, and potash in a gaseous form into the earth, such gases being obtained by heat from sal-ammonia, and potash lye with red phosphorus, and are led by a pipe to a ploughshare, so that its mouth is con-stantly covered with earth turned up by the latter.

4154. CHIME CLOCKS, &C., H. Robert, Clerkenwell, and F. Coursennon, Theobald's-road.-31st August, 4104. OHME CLOCKS, etc., H. Robert, Cherkenbedt, and H. F. Gouvernon, Theobald's-road.—Sist August, 1882.—(Not proceeded with.) 2d. This consists in converting a quarter chime clock into a clock that will play a tune at each hour, and without necessitating the taking to pieces [of the movement, but simply by changing the pin cylinder or barrel. Other improvements are described. [157]

4157. TRICYCLES AND OTHER VELOCIPEDES, W. L. Lloyd, Harborne. -31st August, 1882. 10d. This relates, First, to the driving gear; Secondly, to

cne sceering apparatus. 4158. MEASURING AND REGISTERING ELECTRIC CURRENTS, A. L. Lineff, Wilmington-square. — 31st August, 1882.— (Void.) 2d. This relates to apparatus for indicating thestrength, and measuring the quantity of electricity passing through a circuit, which the inventor calls a hydraulic electric dynamometer. 4159. Theremoneter.

electric dynamometer.
4159. TELEPHONIC APPARATUS, J. H. Johnson, Lincoln's-inm.fields.-31st August, 1882.-(A communication from Dr. A. D'Arsonval, Paris.)-(Not proceeded with.) 2d.
According to this invention the inventor constructs his magnet so that one pole is a solid cylinder encircled by the other pole, which is in the form of a ring. In the annular space between them is placed a coll wound on a hollow core attached to a diaphragm.
4160. TELEPHONE INSTRUMENTS. J. D. Husbands.

on a nonlow core attached to a unpuragin. 4160. TELEPHONE INSTRUMENTS, J. D. Husbands, Queen Victoria-street.—31st August, 1882. 6d. This relates to improvements on the transmitters described in the inventor's patent No. 3008, dated 24th June, 1882, and relates to modifications and improve-ments of the instruments therein described. 4161. Fure and Hearman Plances, do. P. Laurent

4161. FILE FOR HOLDING PAPERS, &c., P. Lawrence, Farringdon-street.—31st August, 1882.—(A commu-nication from W. R. Clough, Nevark, U.S.) 6d. A base plate has a wire clamp forming a flat frame, connected to the base on one side only, the three other sides being free, so as to permit the introduction of the articles to be held.

4163. FILTERS, A. M. Clark. London.-S1st August, 1882.-(A communication from W. Maynard, New

4163. FILTERS, A. M. Culter, Polar, Maynard, New ISS2.-(A communication from W. Maynard, New York.) 6d. The filtering medium is a disc of corundum or other similarly bisected conglomerate, enclosed within a vessel formed of two hemispherical cups, between which the disc is clamped. The water enters the lower cup, and passing through the disc, leaves by an opening in the upper one. 4164. HYDRAULIC LIFTS, J. M. Day, W. R. Green, H. C. Walker, and R. Carey, London.-31st August, 1882. 6d.

C. Walker, and R. Carey, London.—31st August, 1882. 6d. The invention relates to an arrangement of apparatus for raising and lowering loads, and consists essentially in a novel construction of the accumulator usually employed in connection with the above apparatus, whereby the raising of the load is effected by a much lower pressure than that required by the apparatus hitherto in use.

hitherto in use.
4165. STEAM AND HOT-WATER APPARATUS FOR HEATING BUILDINGS, W. R. Lake, London.--31st August, 1882.-(A communication from E. F. Osborne, St. Paul, U.S.) 1s. 2d.
This relates to the system of steam heat and power supply described in patent No. 46, A.D. 1881, and consists in devices for metering the water of condensation in steam-heating apparatus, in which a circuit of pipes conveys steam to a building, and returns the condensed water to a generator; improvements in registering devices in connection with such meters; improvements in devices for signalling defects in a heating system; improvements in devices for controlling the movement of the condensed water in return pipes considerably inclined, and a special arrangement of the boliers and engine.
4166. APPARATUS TO FACILITATE THE IMPREONATION

4166. APPARATUS TO FACILITATE THE IMPREGNATION OF AIR OR VAPOUR WITH ANTISEPTIC MATTERS, J. Mayer, London.-1st September, 1882.-(Not pro-ceeded with.) 2d. The object in the section of

The object is to apply dry sprays as a means of neutralising the evil effects of noxious vapours or exhalations, or the production of agreeable odours in hospital wards, &c.

nospital wards, &C.
4168. CARBONISATION AND PREPARATION OF A MATERIAL FOR THE ELECTRODES OF ARC LAMPS, &C., H. J. Marshald, Linslade, Bucks.—Ist Septem-ber, 1882.—(Not proceeded with.) 2d. This relates to a peculiar preparation of cane, after which it is carbonised and ready for use. 4168.

This relates to a peculiar preparation of cane, after which it is carbonised and ready for use.
4169. PADDLE WHELS, P. M. Crause, Eastbourne.— Ist September, 1882 — (Not proceeded with.) 2d.
The object is to lesson the vibration, reduce the slip, and economise fuel in vessels driven by paddle wheels. The floats of the wheels are of helical form, and they are placed in pairs, one forming a portion of a right-handed screw, and the other of a left-handed screw.
4170. ROCKING CHAIRS, J. Hopewell, Salford.—Ist September, 1882.—(Not proceeded with.) 2d.
A platform supported on castors carries the rockers, which are connected thereto by springs or other means, so that the chair cannot be turned right over.
4171. SAFETY COUPLINGS FOE WAGONS, &c., G. R. Snowden, Bradford.—Ist September, 1882.—(Not proceeded with.) 2d.
This relates to a construction and arrangement of safety couplings for wagons and other railway rolling stock, whereby the operation of coupling and uncoupling can be automatically, rapidly, and easily performed, and with absolute certainty from either side of the wagon or vehicle.
4173. CONSTRUCTION OF SHIPS, &c., C. D. Abel, Londen-List September, 1882.—(Motomanication)

4178. CONSTRUCTION OF SHIPS, &c., C. D. Abel, London.—1st September, 1882.—(A communication from E. Lavarenne, Paris.)—(Not proceeded with.)

Schlember, 1852.—(A communication from P. R. P. J. Duvernay, Cluny, France.)—(Not proceeded with.) 2d.
This consists chiefly in constructing the lubricators of a vertical glass cylinder, held at top and bottom by a flanged disc of metal or other suitable material, and provided with a central screw, which is servered with its lower end into a boss of the lower holder, and penetrates through the upper disc or cover, so as to hold the latter tight against the top of the glass cylinder, between which and the holding discs suitable packing discs are inserted. The central boss of the lower holder, which projects upward into the cylinder, is perforated from top to bottom for the escape of oil, for which purpose the lower position of the screw spindle is also provided with a small longitudinal groove gradually widened towards the bottom.
4218. APPARATUS FOR SEPARATING DUST FROM Alls, W. B. Dell, London.—5th September, 1882.—(A communication from the George T. Smith Middlings Purifier Company, Jackson, U.S.) 2d.
This consists in the use for separating dust or solid impurities from air, of a series of electrified surfaces placed in close contiguity to each other, between which the said air is caused to flow in thin strata, so that practically the whole of the dust or impurities is or are readily separated therefrom by the attraction of the electrified surfaces, while the air passes away from the more or less pure state.
4219. DECORATING BRICKS, TILES, & c., I. B. Shawa Walstantom.—5th September, 1882. 4d.

2d. The invention consists mainly in forming in the angle of the bows on each side of the stem two recesses, in which are placed paddle wheels rotating on vertical axes, or other apparatus of a similar nature so arranged that the pressure of the water due to its resistance in being displaced by the advancing vessel causes them to rotate, developing an amount of force in proportion to the pressure of the water, which force, in being transmitted through their shafts, may be utilised either in aiding the propulsion of the vessel or for other purposes. other purposes

4198. GALVANIE BATTERIES, E. B. Burr, Waltham store, and W. T. Scott, Stratford.-2nd September stow, and 1882. 4d.

stor, and w. 1. close, bit dependent 1882, 4d. This relates to improvements in a battery described in the inventors' patent, No. 5604, 22nd December, 1881, and to means for preventing the too rapid oxida-tion or consumption of the zinc electrodes in such battery. The inventors first electrocyld, and then coat said electrodes with mercury.

4203. DEVING ALL KINDS OF WASTE ANIMAL MATTER, &c., J. F. Johnstone, London.—4th September, 1882. 6d.

6d. The machine consists of a shallow pan, the lower part of which forms a jacket for holding the drying agent employed; it is provided with an opening at the top to allow the waste material to be operated upon being placed in the pan. The waste material is kept in motion during the drying process by agitators fixed to an upright shaft, so as to come as near as possible to the bottom of the pan; a series of flat springs are also rivetted to the agitators, so as to completely scrape the bottom of the pan.

4210. DISCHARGING BILGE WATER FROM THE HOLDS OF VESSELS, A. M. Clark, London.—4th September, 1882.—(A communication from H. Cordes, Hoboken.)

6d. This consists in the combination with a vessel's hull having an opening in its bottom of a semi-tubular shield or deflector fitting into the said opening, and having a covoring plate attached to its lower end, a tapered plug seat placed within the said opening and shield to receive a plug fitting into the said seat, and

rack bars attached to the said shield and plug respec-tively, whereby an aperture through the vessel's bottom can be opened and closed.

can be opened and closed.
4211. CONSTRUCTION OF RAILWAY SIGNALS, P. Lofthouse, Raddiffe. -5th September, 1882. 6d.
The inventor claims the combination with the ordinary signal wires of an audible signal or signals actuated by a lever placed just inside the rails, and operated by the flanges of the wheel.
4212. Perspective. App. The provide statement of the st

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Operated by the hanges of the wheel. 4212. PRODUCTION AND TREATMENT OF CARBONISED MATERIAL TO BE USED FOR FILTRATION AND IN THE CONSTRUCTION OF ELECTRICAL BATTERIES, &c., J. H. Johnson, Lincoln's-inn-fields. — 5th September, 1882.—(A communication from A. Caron, Paris.) 4/

4d. The inventor takes vegetable fibres, such as hemp, that have been woven into a fabric, and places this fabric in superposed layers with pulverised wood char-coal interposed between the layers. The whole is then placed in a mulfle and carbonised, care being taken to preserve the form of the fabric.

preserve the form of the fabric.
4218. APPARATUS FOR LOADING AND UNLOADING VESSELS, A. M. Clark, London.-5th September, 1882.-(A communication from J. W. Brown and J. W. Brown, jun., Baltimore, U.S.) 1s.
One part consists of a removable framework of peculiar construction and arrangement, which is to be located above the hatchway of the vessel, provided with independently moving and downwardly extensible sections of framework, which may be extended a greater or less depth into the hold of the vessel, and which sliding sections of the framework are provided with glidies for, and are combined with, an endless carrier, to which the packages are slung, and by which they are raised or lowered and transported across the deek to or from the wharf.
4214. APPARATUS USED IN THE MANUFACTURE OF

Geck to or from the wharf.
4214. APPARATUS USED IN THE MANUFACTURE OF AMMONIACAL AND OTHER CHEMICAL SALTS, J. Forbes, Old Ford.--5th September, 1882. 6d.
This consists in the construction of apparatus for drying ammoniacal and other chemical salts.

4215. CARRIAGES, H. Mueller, Notting Hill.-5th September, 1882.-(Not proceeded with.) 2d. The object is to construct carriages, and specially cabs (four-wheel), so that the cab can be opened out or closed, and if either closed or half opened, the luggage or packages can be placed on the roof or the part of the roof of the cab. 4216. APPARATUS FOR ROLLING WIRE RODS, W. Morris,

4216. APPARATUS FOR ROLLING WIRE RODS, W. Morris, Oakengates, Salop. -5th September, 1882. 6d. The billet O, Fig. 2, is taken by hand and entered in the bolting rolls, through which it passes, and is returned by the attendant through the bottom rolls at 2, when it passes round the pipe C and returns through the upper rolls at 3, when it is again entered below 4, passing through and around the pipe D, through the top at 5, and back through the bottom at 6, and around the pipe E, and through the top at 7, then into the bottom rolls at 9, when it then leaves the bolting rolls; passing round the bent pipe G, it enters the telescopic pipe H; passing round in the direction of the arrows, it enters the next three high rolls at 9, which are

H

11 9 9 164.2 10 9 1753 9 1

commonly called the "first three high rolls;" it is then turned either by hand or tube round and through 10. It then passes along another tolescopic tube similar to H, and into the first pair of two high rolls until it is completed. In order that some idea may be formed of the reduction in the original shape, the inventor has shown in Fig. 3 the shape of the rod as it would come out of hole 11 in the first two high rolls. It would then pass through a hole which would be in the approximately that shown by Fig. 4. 4217, LyngucArons, H. J. Haddan, Kensington.—5th

4217. LUBRICATORS, H. J. Haddan, Kensington.-5th September, 1882.-(A communication from F. R. P. J. Duvernay, Cluny, France.)-(Not proceeded with.)

4219. DECORATING BRICKS, THES, &c., I. B. Shaw, Walstanton.-5th September, 1882. 4d. This consists in fixing metallic colours upon the bricks, &c., from the face of a size of gum tragacanth or other such suitable gum or vehicle.

or other such suitable gum or vehicle. 4221. APPARATUS FOR STEERING VESSELS, &c., W-Pepper, Kingston-upon-Hull.-5th September, 1882. -(Not proceeded with.) 2d. It is proposed to dispense with the slide valves and the controlling valves, and in lieu thereof to employ a circular valve, which is so constructed that it will admit steam as desired to the cylinders, of which there are two, such valve being controlled by the steersman.

4222. TRAM-CARS AND OMNIBUSES, &C., C. P. Evans, Birmingham. - 5th September, 1882.-(Not proceeded

with.) 2d. This consists of a covering or shelter over the c de seats, and which is capable of being folded by

4223. APPARATUS FOR ELEVATING GRAIN, &C., G. J. Howe, Poplar.—5th September, 1882.—(Not proceeded

with.) 2*d*. This consists in the arrangement of skip or bucket which may be worked from an ordinary derrick or

MANUFACTURE OF STARCH, W. R. Lake, London.
 -5th September, 1852.-(A communication from J. H. Ross, New York.) 6d.
 The object is to extract the starch from the liquid

H FIG.I.

FIG.2. C

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FIG.3

FIG 4

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holding it in suspension, and to separate the starch from the gluten and other accompanying impurities in a simple and expeditious manner. The invention comprises the employment of one or more centrifugal machines having imperforate baskets, against which the starch is driven by centrifugal force, and which are provided with a discharge tube having its muth located in the upper portion of the basket, so that the liquid is driven into the mouth of the tube and through the latter by centrifugal force, while the starch remains in the basket.

4225. PITCH CHAINS, S. Pitt, Sutton. - 5th September, 1882. - (A communication from J. M. Dodge, Chicago.)

The chains are made with oval links, and stocks of ast iron or malleable cast iron are inserted into the

4226 MANUFACTURE AND TREATMENT OF SOAPS, W. Green, St. Lawrence, Kent.-5th September, 1882. 4d. This relates to a process or processes whereby a large percentage of petroleum, shale oil, or other mineral oil, grease, or fat may be made to enter into the composition of soaps

of scaps 4227. FIRE ESCAPES, A. M. Clark, London -5th September, 1882 - (A communication from G. W. Smith, Harlansburgh, U.S.) 6d. This consists of a pair of hollow guide ways, made of metal tubes erected vertically in front of and projecting a little from the building, and coupled by an arch at the top, to each of which tubes a balcomy is fitted, so as to slide up and down, being connected through a slit with a suspending and operating rope within the tube, the two balconics balancing each other; so that persons in one or the other may command their own descent by means of a lever brake in the balcony. 42928. Supers Lancy Superson Machanism For Loove

4228. SHUTTLE-BOX SHIFTING MECHANISM FOR LOOMS, D. Anderson, Glosgow.-Gth September, 1882 Gd. This relates to the employment of a cam lever with its knife edge for the greatest shift, and with the smaller levers or bars jointed to it and to radius rods, and having knife edges for the smaller shifts.

4229 VENTILATING RAILWAY, TRAMWAY, AND OTHER WHEELED V+HICLES, J. Leather, Liverpool. - 6th Sep-tember, 1882. 6d. WHEELED VITICLES, J. Least, J. Des. Jose tember, 1882. 6d. This relates partly to ventilating railway and other coaches and vehicles by inward and upward currents. Other improvements are described.

4230. MANUFACTURE OF CIGARETTES, CIGARETTE TUBES, BRIAR WOOD PIPES, &c., E. L. Delaney, London.—6th. September, 1882.—(Provisional protec-tion not allowed.) 2d. This relates to the employment of a tube of pipeclay or other plastic substance.

4231. PROTECTING TREES AND SHRUBS, J. H. Johnson, London.—oich September, 1882.—(A communication from F. Kettinger and N. Ott, Vienna.—(Not pro-ceeded with.) 2d.

ceeded with.) 2d. Four upright posts are driven into the ground and provided with lateral webs or flanges presenting slots engaging with corresponding headed studs or catches at the edges of plates or panels. The connection between the four uprights or between the opposite sides of the parallelopipedon formed by the tree pro-tector, is effected by keying or screwing fast a trans-verse grating at the upper and lower part.

4282. APPARATUS FOR HOLDING AND RELEASING CORDS FOR VENETIAN AND ROLLER BLINDS, &C., J. Hudson, Bolton. - 6th September. 1882. 6d, This relates to the arrangement of a kedge and pullars pullevs

pulleys. 4233. MACHINES FOR PACKING, MOULDING, AND COMPRESSING FLOUE, TEx, &c., J. Joyce, Edmonton, -- 6th September, 1882.-(Complete) 1s. This consists in improvements in the general con-struction of the machine, part of the improvements being applicable for the manufacture of paper bags.

4236 METALLIC FENOING, R. J. George, Swansea.-6th September, 1882.-(Partly a communication from E. M. George, Sutna, India. 8d.) This relates to a metallic fencing, consisting in the combination of fixed (perforated or slotted) tubular standards having their ends bent and flattened or fitted in base plates, with separate wedges down such, and driven by a bar, rammer, or the like, to secure the wires.

WIRES.
4237. TACHYMETERS, H. J. Haddan, Kensington.-6th September, 1882.-(A communication from E. Lam-binet, Rochfort, France)-(Not proceeded with.) 2d. The apparatus is constructed of two principal parts, viz., First, a turbine or paddle-wheel moving in a closed chamber; and communicating with a closed air chamber; and secondly, a pressure indicator, which indicates at every moment the pressure of the air contained in the said air chamber.
4238 INCARDESCENT LANCE for W. Conclus E.B.S.

which indicates at every moment the pressure of the air contained in the said air chamber. 4238. INCANDESCENT LAMPS, &c., W. Crookes, F.R.S., London. - 6th September, 1882. 6d. This relates to improvements in the manufacture of incandescent lamps. The inventor stretches threads on a metal frame, and immerses the whole in a bath of cuprammonia to make them horn-like in texture. They are then dried, dipped in acid, and washed with water. After this they are removed from the frame and hung on glass rods with weights attached to them to allow them to dry and harden. Subsequently they are carbonised by a special process, and then immersed in benzol or similar liquid to displace occluded gas from the pores. Before being mounted in their globes the filaments are subjected to a special process, by which carbon is deposited on them until their resistances reach the proper standard, which process and the apparatus used forms part of the invention. Claims are also made for new methods of fixing the filaments in the globes, &c.

4239. HOLDERS FOR WIRE ROPE, T. Archer, jun., Gateshead. - 6th September, 1882. 6d. In the drawings an elevation and section of a non-revolving drum of cast iron or other convenient material is shown with a spiral groove cast in its periphery, in the convolutions of which spiral is coiled

the rope to be stopped. B is a lever with an excentric side as shown, so as when it is in an inclined position it is clear of the rope, and when it is in a vertical posi-tion it nips the rope to the extent desired; C is a catch to maintain it in its vertical position. 42441. PURIFYING STEAM BOILERS, FEFD-WATER HEATERS, &c., M. Coulson, Spennymoor.--Gik S-piember, 1882. 6d. The object is to cause a continuous movement of the water or liouid by avolving fire or heat to the holder or

water or liquid by applying fire or heat to the boiler or other vessel, and thus to force the water or other liquid upwards and through a tube or tubes into an inner vessel or collector placed inside of the boiler or outer vessel, and by this means causing the substances or

precipitate, deposit, and collect in the inner vessel. 4242. MANUFACTURE OF STRAINERS, &c., G. Tidcombe, jun., Watford. - 6th September, 1882. 4d. This consists, First, in the soldering under pressure of the crown plate of strainer plates to the strengthen-ing or supporting framework; Secondly, in the con-struction of double bottoms for brewers' vats or tuns, and for strainers generally with slitted strainer plates in combination with a perforated plate. 4242 Soura Sture W. Bearder Whittelle and G. F.

matter to separate from the water or liquids, and to precipitate, deposit, and collect in the inner vessel.

4243. SPRIT SAILS, W. Rowden, Whitstable, and C. E. Doughty, Margate.--6th September, 1882. 6d. The sail is divided into two parts, so that either one or both can be set or reefed at pleasure.

or both can be set or recifed at pleasure. 4244. DRVING AND CONDITIONING GRAIN AND OTHER CREALS IN BULK, &c., G. M. Copell, Passenham. --6th September, 1882. 6d. This consists of an apparatus contrived to pass atmospheric air, or air dried in a specially constructed heating stove, or through a chamber containing chemical substances to absorb moisture through grain in bulk, by means of the suction of an exhaust fan or by the fall of a column of water through a tube of larger diameter than the pipe which conveys the water to the centre of the tube exhausting the air. 4245. ROTARY ENGINES. W. R. Low Lowden - 6th

4245. ROTARY ENGINES, W. R. Lake, London.-6th September, 1882. - (A communication from J. Lojda, New York.) 6d. The inventor claims a wheel having projecting flanges and hinged valves arranged to be operated in opposite directions by means of levers, rods, and

stationary wheels or cams having grooves, in combina tion with a stationary casing enclosing the upper hal tion with a stationary casing enclosing the upper hal of the said wheel, and provided with abutments and passages or ports in the central abutment closed by a suitable valve.

ELECTRIC SIGNALLING APPARATUS, CHIF. 4246.

4240. ELECTRIC SIGNALLING APPARATUS, CHIFFLY, DESIDENE POR TELEPHONIC PURPOSES, W. R. Loke, London.—6th September, 1882.—(A communication from J. H. Cary, Boston, Mass, U S) 6d. This relates to that class of signalling apparatus known as "individual signals," arranged to be ope-rated from a central station, and to improvements whereby each signal in the circuit is operated posi-tively and accurately, also to devices for bringing all the signals to unison when desired. 4250. DYNAMO-MAGNETIC ELECTRIC MACHINES FO.

4250. DYNAMO-MAGNETIC ELECTRIC MACHINES, &c. T. Donnithorne, Gracechurch-street. -6th September

T. Donnithorne, Gracechurch-street. --Oth September, 1882. 4d. This relates to the construction of magnets for use in dynamo machines and for other purposes. The inventor makes them of soft iron tubes. Open at one end, and this he fills with magnetic oxide of iron, and stops the tube with a soft iron stopper.

Stops the tube with a sole from supper.
4251. OBTAINING AND APPLYING ELECTRIC CURRENTS, T. Slater, Notting-hill.—6th September, 1882.—(Not proceeded with) 2d.
This relates to improvements on the inventor's patent No. 2272, for the 3rd June, 1880, and consists in certain alterations in the details of the machine for generating electric currents therein described.

descrite currents therein described.
4254. VOLTAIC BATTERIES, F. W. Durham, New Barnet.—Tih September, 1882. 2d.
To prevent leakage in batteries through the bubbling of the cases evolved, the inventor pours a coating of parafin oil on the top of the exciting liquid, and shapes the cell so as to prevent the oil from spilling.
4266. STORING ELECTRICAL ENERGY, T. Slater. Notting-hill.—Tith September, 1882.—(Not proceeded with) 2d.
This relates to a secondary battery formed of perforated iron plates, one covered with sulphate of magnesia and caustic soda, and the other with a mixture of caustic soda and calcined magnesia.
4273. CASTING METALS OR ALLOYS OF METALS FOR THE

4273. CASTING METALS OR ALLOYS OF METALS FOR THE MANUFACTURE OF ELECTRODES FOR BATTERIES, &c., H. Woodward, Shephera's Bush.-Sth September, 1999.

MANUFACTURE OF ELECTRODES FOR BATTERIES, &c., H. Woodward, Shephera's Bush.—8th September, 1882. 4d. According to this invention porous or spongy metallic plates are formed by bringing the metal in a molten state into contact with granulated salt, so as to embed the latter in the metal; it is afterwards dissolved out. The inventor also claims the use of such spongy plates in the manufacture of whitelend. 1999. Arts. BLOCKS FOR CAMPAGES. R. Palmer, Man-

32. AXLE BLOCKS FOR CARRIAGES, R. Palmer, Man-chester.—4th September, 1882.—(Not proceeded with.) 4282.

2d. This consists in the construction and arrangement of an elastic axle block, which is interposed between the spring and the axle, with the object of still further softening or neutralising the shocks arising from the inequalities of the road.

4286. ELECTRIC BELL AND SIGNAL APPARATUS, T. R. Brailsord, London. - Sth September, 1882. 6d. This relates to means whereby one electro-magnet is made to ring a bell, and also to cause the indica-tor of the particular room from which the bell has been rung to drop, there being a number of indicators, all of which can be operated by this one electro-magnet. The object of the invention is to do away with the necessity for a separate electro-magnet for each indicator. each indicator.

4289. NEEDLE INSTRUMENTS FOR SPEAKING TELE-GRAPHS. E. J. Houghton, Peckham.—Sth September, 1882. 6d. This consists in attaching a piece of resonant mate-rial to the needle of telegraph instruments, so as to cause them to give out distinct sounds when the stop pegs are struck, these latter being of two different materials, to render the sounds distinctive. The inventor's object is to render needle instruments, capable of being read by sounds.

4303. ELECTRICAL STORAGE BATTERIES, E. Frank-land, F.R.S., Reigate Hill. -9th September. 1882, 4d. This relates to the construction of plates for secon-dary batteries. The inventor employs minium or red lead and applies it to the plates, either on their surface or in perforations in them; he then hardens this minium by applying to it or mixing with it sulphuric, phosphoric, or other acid, which forms an insoluble, or nearly so, salt of lead. The acid is very dilute.

dilute. 4361. UTILISING STEAM AND HEATED AIR AS MOTIVE POWERS, J. M. X. Terlinden, Brussels.-12th Sep-tember, 1882. 6d. The inventor claims, First, the process of returning to the boiler the exhaust steam of steam engines in order to restore to the said exhaust steam its initial pressure, and to render it fit for further use. Also the application of the said process to apparatus for heating air and caloric or hot air engines; Secondly, the combination of two boilers working at different pressures, and of the parts connected therewith.

4717. DISC DYNAMO AND MAGNETO-ELECTRIC MACHINES, &c., J. Gordon and J. Gray, New Broad-street —4th October, 1882. 6d. This relates to an electric generator consisting of two or more discs rotating on parallel axes and having their peripheries in contact, so that the one may drive the other by friction. This will be readily understood from the drawing, in which disc A drives disc B. The discs are made of thin sheets of copper or other con-ductor surrounded by a broad flange at the periphery.

The discs are divided into a number of sections insu-lated from each other, but not from the central boss. An electro, or permanent, magnet is placed over the discs so that its plop eleces shall cover two sections of each disc lying about the line of centres The current passes from the axis of one disc through their point of contact to the other disc. The magnet colls are con-nected in a shunt circuit to the bearings. The main external circuit is also connected to the bearings, from which the current can be taken. 5048. FASTENING UMBRELIAS, & G. H. H. Lake.

which the current can be taken.
5048. FASTENING UMBERLIAS, &c., H. H. Lake, London.-237d October, 1882.-(A communication from A. Jeul. France.)-(Complete.) 4d.
The runner of the umbrella is combined with a safety lock consisting of a series of rlugs which when twisted engage with pins on the runner, so as to lock it in position and prevent the umbrella being opened.
5051. ROLLING OR FORMING GROVES OR INDENTATIONS IN RAILWAY RAILS, &c., C. H. Halcomb, Sheffield.-18th November, 1881.-(Provisional protection not allowed.) 2d.
This relates to apparatus for forming a groove in the angle of the head and foot of the rail.
5089. MAN-HOLES AND MUD-HOLES IN STEAM BOLLERS, &c., A. Watkins, Greenwich.-25th October, 1882.-

Watkins, Greenwich.-25th October, 1882.-&c., A.

Coop. an Notice Actions, Greenwich.-25th October, 1882.-(Complete) 4d.
This relates to the mode of constructing and strengthening man-holes and mud-holes by turning or flanging the plates of steam boilers or other vessels for confining steam or gases or liquids.
CABLE TRACTION RAILWAYS AND TRAMWAYS, &c., J. Wright, Londom.-27th October, 1882.-(A commu-nication from C. F. Finaley, Chicago.) 8d.
The First part relates to apparatus for taking up the slack, and to regulate the tension upon a cable or cables in motion. Another part relates to the forms and arrangements of pulleys for guiding the cables. Another part relates to a method of raising a cable.
5144. COCKS OR VALVES, W. H. Moseley, Derby.-30th

Another part relates to a method of raising a caole. 5144. COCKS OR VALVES, W. H. Moseley, Derby.-30th October, 1882. 6d. The inventor claims the construction of stop valves with the valve proper (opening and closing the passage or passages) made of a metallic ring held by its own elasticity against the facing or bore of the shell in which it slides.

shell in which it slides.
5188. GAS MOTOR ENGINES, T. Ashbury, H. Sumner, W. Lees, and R. W. B. Sonderson, Manchester.--31st October, 1882.--(Complete.) 4d.
This relates to the combination of two or more gas motor engines with cranks equidistant, or at any con-venient angle in the circles of traverse.
5005

5235. INCREASING THE DRAUGHT IN CHIMNEYS, &c., P. A. Bayle, Paris.—2nd November, 1882. 6d. The sides of the chimney are lined with a series of vertical metal tubes of variable length.

vertical motal tubes of variable length. 5486 COMPOUND FOR RENDERING ANIMAL AND VEGE-TABLE FIBRES AND FABRICS WATER REFELLENT, &c. , C. B. Warner, London.—18th November, 1882.— (Complete.) 2d. The process consists in taking a solution of caout-chouc or other elastic gum, and solid parafine or other solid hydrocarbon in benzoline, petroleum, or coal tar, naphtha, or any other light hydrocarbon solvent. Into this solution is introduced hydrochloric acid gas or chlorine. The solution is then filtered, and the clear supernatent liquid is drawn off from that con-taining the impurities. This liquid is distilled and about nine-tenths of the liquid remaining in the still is then drawn off, which is free from acids, alkalies, or other impurities. impurities

Impurities. 5922. BRUSHES, S. Pitt, Sutton.-12th December, 1882. -(A communication from G. Imbach, New York.-(Complete.) 6d. This relates to means for facilitating the piercing of holes to receive the tufts in the stocks of brushes at an inclination to each other, and consists in the use of a swivelling holder and a back pattern and index, in combination with a drill carried by a revolving man-dril capable of sliding towards and away from the swivelling holder. 6055 Care CONFLINGS A. L. Eavilt London - 10th

6055. CAR COPLINGS, A. J. Boult, London.—19th December, 1882.—(A communication from C. E. Mark, Flint. U.S.)—(Complete.) 6d. The object is to provide for direct draft on the car, accuracy and positiveness in coupling, and the vibra-tion of the rear end of the draw bar to couple and uncouple.

6085. TELEPHONIC APPABATUS, W. R. Loke, South-ampton-buildings.—20th December, 1882.—(A com-munication from M. F. Tyler, New Haven, Conn., U.S. ad U.S.) 6d.

U.S.) 6d. The object of this invention is to construct a trans-mitter which shall obviate the necessity for speaking so loud as to be heard by other persons present in the same room as the talker. The apparatus consists of a box-like chamber outside the transmitter, having an opening formed to receive the mouth and checks of the speaker opposite the diaphragm, so that the voice will be confined to the said chamber.

be confined to the said chamber. 17. ELECTRIC LIGHTING AND POWER DISTRIBUTING SVETEMS, S. Pitt, Sutton, Surrey.—Ist January, 1883.—(A communication from E. T. Starr, Phita-delphia, and W. J. Peyton, Washington, U.S.) 6d. This invention relates to a system for the distribu-tion of electric energy on the following basis. A dynamo machine generates current which charges the main circuit From the main circuit are led shunts con-taining secondary batteries. These shunt circuits are each provided with a switch connected with a clock, and so arranged as to automatically throw the batteries in any particular shunt circuit into or out of the charging circuit, at predetermined times. For this purpose the switch is usually mounted on the clock face. The inventor proposes as above described in purpose the switch is usually mounted on surbed in face. The inventor proposes as above described in houses, the inhabitants drawing their current from the

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

274 427. INCANDESCENT LAMP HOLDER, Edward Weston, Newark, N.J.—Filed July 19th, 1882 Claum.—(1) The combination of a base or support and an incandescent lamp, connections from the base to the conductors of the lamp, and a spring acting to

force the lamp away from the base, whereby it is held in position, substantially as hereinbefore set forth. (2) The combination of a base or support and an incardescent lamp, wire connections between the conductors of the lamp and the base, and a spira

APRIL 27, 1883.

spring surrounding the connecting wires, and arranged to force the lamp away from the base, whereby it is held in position, as set forth. (3) The combination, with a base or support and hocked rods or wires, secured thereto, of an incandescent lamp having con-ducting wires provided with rings or eyes, and a coiled or spiral spring placed upon the base, and arranged to exert a pressure upon the lamp when in position, as described.

described. 274,530. CUT-OFF VALVE FOR STEAM ENGINES, John M. sweeney, Wheeling, W. Va.-Filed November 21st. 1882. Claim.-(1) The combination, with the cylinder and steam chest, of a puppet valve chamber P, located within the steam chest, and having an opening for the admission of steam above the valve seat, and a lower opening communicating with the interior of the steam chest, a slide valve T, and mechanism, sub-stantially as described, mounted upon the steam cylinder for operating the said slide and puppet valves, substantially as described. (2) The combinia-

tion of the cylinder K, the steam-chest S, the slide and puppet valves, with connected mechanism for operating both of such valves, mounted directly upon the cylinder, substantially as described. (3) The com-bination of the cylinder K, standards N¹ N² N³, rock shaft G. arms A B.D., lever R, lifter C, slide valves I, and puppet valves X, arranged substantially as herein shown, and for the purposes set forth.

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