VISIT OF THE INSTITUTION OF MECHANICAL ENGINEERS TO MARIEMONT AND BASCOUP COLLIERIES.

ON Saturday, the 28th July, the last day of the meeting, of the Institution of Mechanical Engineers at Liége, while some members went to Ghent to see the docks, Carels Frères' engine works, and various flax and cotton mills, the larger portion, including the president, proceeded to the Mariemont and Bascoup Collieries. These are situate about midway between Mons and Charleroi, in the middle of that part of the Belgian coal-field known as the Centre. In a succeeding impression we shall give a description of these collieries and their plant. Illustrations of a portion of this plant will be found here and on pages 184 and 185.

The members were received at the station by M. Briart, one of the administrators, or directors, of the Mariemont and Bascoup Companies, and inventor of the screening apparatus used at these collieries; by M. Weiler, the engineer-in-chief, and other officials, and were at once conducted to the Saint Arthur pit, immediately adjoining. The winding engines were admired, and it was noticed that a Manilla fibre rope, put in on August 17th, 1879, had lasted four years all but a fortnight, during which time it had raised 493,000 metrical tons of coal. The engine designed by M. Warocquè for letting down and bringing up the men, by a pair of moving rods with platforms for stepping from one to the other, caused a great deal of interest. We illustrate it on this page. It is a modification of the well-known Cornish man engine, fitted with two hydraulic balancing cylinders.

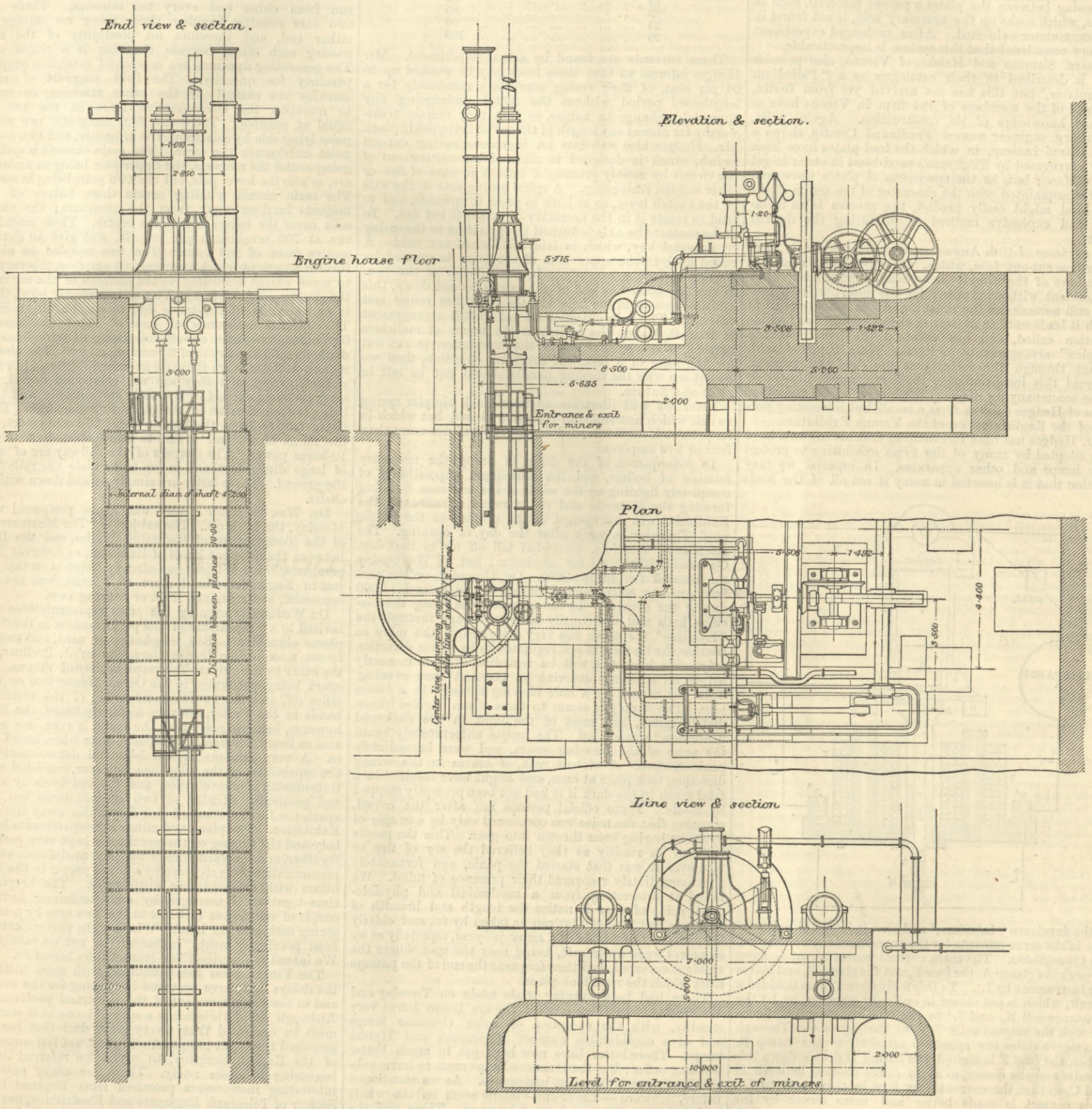
From the Saint Arthur pit the party walked through part of the Morlanwels Forest—the surroundings being very unlike those of a colliery in England—to the central screening station, whither the coal raised from several pits is brought by endless chain haulage, and there mixed and screened by apparatus designed by M. Briart. In this way a uniform quality of coal can be supplied.

At the luncheon in the Salle de Musique which followed, M. Van Volxem, another administrator, did the honours, in the regretted absence, through indisposition, of M. Guinotte, general manager and inventor of the variable expansion gear that bears his name.

M. Guibal, inventor of the ventilating fan so much used at English collieries, in replying to one of the toasts, observed that his fans were used in England because they exerted an action like that of the ventilating furnace, which it was at one time thought in England impossible to replace by any mechanical contrivance. He observed from the English technical press that there was a tendency to substitute small for large ventilators. Although this was perfectly correct in theory, he thought it would be admitted, when practical facts were taken into consideration, that collieries which require a large volume of air with but a slight variation of the pressure, which was the case with most collieries in England, must be provided with large ventilators.

After luncheon the party went by special train to No. 5 pit of the Bascoup Colliery, which is the last new pit, and is fitted up with the most modern appliances. The pumping engine, with its single steam cylinder, the pumps, with fixed rod down the shaft, and movable barrels, in three lifts, the beam winding engines, with their massive cast iron columns of hollow oval section, the latest development of the man engine, improved by the late M. Warocqué, and still further perfected by M. Guinotte, were all inspected in turn. On page 184 will be found a side elevation of this pumping engine. Both the ropes of this pit are of cast steel wire, 44 mm.—$\frac{3}{4}$in.—in diameter. One of them, which has been in use nearly $3\frac{1}{2}$ years, has raised 496,000 metrical tons, and the other, which has been put up $2\frac{3}{4}$ years, has brought up 413,000 metrical tons, the depth of the shaft being 244 m.—or 267 yards—deep.

Some of the party also inspected the Luhrig coal-washing apparatus, the Coppée coke ovens, the arrangements for illuminating the surface with the electric light, and the repair shops, and most of the members would have gladly remained longer, but that the special train was ready at the Bascoup-Chapelle station to convey them to Manage, a good starting-point for their several destinations.



MAN ENGINE, MARIEMONT COLLIERIES.

THE VIENNA ELECTRICAL EXHIBITION.

No. IV.

IN our last impression we mentioned most of the accumulators exhibited. A few remain for mention. The International Electric Company exhibits a battery of about 160 boxes, each containing 10 pairs of unperforated flat plates, measuring $10\frac{1}{2}$in. by 9in. by $\frac{1}{16}$in. thick. No minium is used; the cell is, in fact, identical with the original form of the Planté. The boxes are rectangular and are double, the outside box being of wood, and the inside of the intervening space being packed with wood chips. The plates are separated by wooden strips $\frac{1}{4}$in. thick. The leaden junction strips are $1\frac{1}{2}$in. wide by $\frac{1}{16}$in. thick. They are doubled over and clamped together by a couple of iron plates and bolts. Each such box contains about 40 lb. of lead. The electromotive force in discharging is a little over 2 volts, and the measured electrical efficiency is stated as from 67 to 70 per cent, but the electromotive force falls off considerably much before this proportion of the stored electric energy has been extracted. This size of box is rated at $\frac{1}{6}$-horse power hour.

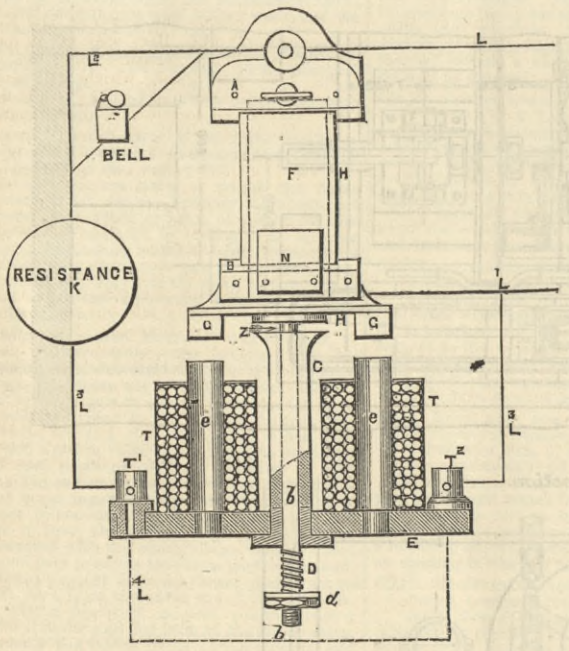
The only general remark we can make upon this Vienna Exhibition of accumulators is that it is astonishing that they should be so few in number. Two exhibitors appear in the catalogue who have not appeared on the ground. One is Dr. Böttcher, of Leipzig, who is said to make a zinc-lead secondary battery. The other is Herr Schulze, of Strassbourg, who uses lead and sublimated sulphur.

With the exception of these two, whose practical success must in their absence be guessed at from their non-appearance, practically no new departure has been made since the Faure accumulator. Considering the enormous variety of direct or ordinary galvanic batteries that have been invented, and considering the theoretical relations between direct and secondary batteries, it appears certain that a much larger variety of these latter than at present exist must be at least possible. Noticeable also is the strange differences between the statements of different makers regarding the electrical efficiency of their batteries. It will, therefore, be a matter of great interest and importance if the Scientific Commission makes accurate and authentic measurements of this and the other constants of the different secondary batteries exhibited. Evidently a great deal depends on good insulation, and upon the prompt using of the battery soon after it has been charged. It should also be observed that the plan so often tried of interposing between the plates a porous material, such as canvas, which soaks up the necessary acid, is not found in any accumulator exhibited. After prolonged experiment it is now considered that this system is impracticable.

Messrs. Siemens and Halske, of Vienna, also promise what is described in their catalogue as a "Palladium accumulator," but this has not arrived yet from Berlin, and none of the members of the firm in Vienna have as yet any knowledge of its construction. Again, a St. Petersburg engineer named Ferdinand Crestin shows a small Planté battery, in which the lead plates have been finely corrugated by Tilghman's sand-blast in order to get more surface; but, as the specimens of plates show, and as those acquainted with the character of the action of the sand-blast might easily predict, the process is an inefficient and expensive method of producing the desired result.

In our issue of 10th August we illustrated a simple form of Hedges cut-out fuse, which, while its duplex construction allows of the circuit being made immediately after the accident without waiting for the insertion of a new fuse, still necessitates the breaking of the whole circuit to which it leads until such time as the attendant has had his attention called, and has reversed the handle of the "duplex" arrangement. All the lights supplied with current through the instrument are thus extinguished. To avoid this inconvenience, the arrangement illustrated in the accompanying diagram is adopted. This and other forms of Hedges cut-out form a small but interesting portion of the English section of the Vienna Exhibition.

Mr. Hedges has been fortunate in that his cut-outs have been adopted by many of the firms exhibiting to protect their lamps and other apparatus. In especial we may mention that it is inserted in many if not all of the leads



to the furniture "interiors," and that it is used to some extent in the arrangements for the experiments by members of the Commission. The main current enters say at L, flows through the clamp A, the fuse F, and the clamp B, and leaves the instrument by L^1. To this main circuit there is added a circuit, which is not closed in ordinary working, by L^2 the resistance coil K, and L^3 to the binding screw T^1, thence through the magnet coils T T to the sleeve C. Through this sleeve slides the spindle *b* attached to the clamp B. When the fuse F is melted, the spring D draws down this spindle and the clamp, so as to make contact between H and C, so that the current may flow by this route to L^1. This contact is made better and more secure by the attraction of the electro-magnets T T on the armature G G, fastened to B. The circuit L^4, shown by a dotted line, is not ordinarily closed. The whole current now passes through the shunt, but the magnet coils T T are not endangered, being made of sufficient dimensions to withstand a current much higher than that fusing F. When the attendant comes to insert a new fuse F, in order to enable him to detach G G from *e e* for this purpose, a switch is provided, by which he throws the magnets out of circuit, and makes the connections by L^4. As soon as the main current is carried through the shunt, the resistance K adds to the resistance of the whole circuit supplied through the instrument in such a proportion as reduces the current below the dangerous limit. Thus the circuit is protected from danger without there being any extinction of the light. The resistance K must evidently be approximately proportioned to the resistance of the circuit supplied through the instrument, but no exact proportionment is needed because its theoretically proper amount depends on the dangerous increase of the difference of potentials at the terminals of the circuit, and this is a matter of accident—to be avoided as far as possible—and not one of calculation. Mr. Hedges fuses are made of the alloy of aluminium and tin, termed "albo."

The following is a list of the widths of foil used for different currents. The thickness is the same for all sizes. For greater currents than 100 ampères a double strip is used:—

Width of strip millimetres.	Fusing current, ampères.
10	30
11	34
12	38
13	42
14	46
15	50
16	54
17	58
18	62
19	66
20	70
21	75
22	80
23	85
24	90
25	100

These currents are found by actual experiment. Mr. Hedges informs us that these fuses may be worked up to 90 per cent. of their fusing currents continuously for a lengthened period without the metal undergoing any appreciable change in nature, so that they remain trustworthy for almost any length of time after being put in place. Mr. Hedges also exhibits an ingenious spring cut-out switch, which is designed to allow of the cutting out of the circuit by merely pressing a button in case of fire or other sudden emergency. A spiral spring acts on the axle of the switch lever, so as both to press it upwards, and to tend to rotate it in the necessary direction to cut out. To make contact the axle is turned in opposition to the spring by a special key, which is laid aside when not used. A round knob in the upper side of the lever is pressed by the spring into a catch-hole in the interior of the box. When the button or end of the axle is pressed down, this knob escapes from the hole, and the lever flies round and cuts out. The only objection we see to this arrangement is that it leaves the switch at the mercy of malicious persons, who may give way to the temptation to cut out for the sake of a lark. If this is no objection, then we do not see why the turning handle should not be left in place as a fixture.

Later we will illustrate another much simpler spring switch which accomplishes the same object, but which in its present form is intended for currents of not more than four or five ampères.

In consequence of the delay in fixing the necessary number of boilers, and the consequent impossibility of completely lighting up the whole of the immense building forming the Rotunda and its surrounding annexes, the Exhibition was not opened in the evening to the public until Thursday, a week after the day of opening. The attendance, therefore, somewhat fell off up to that day. On Sunday 8000 paid for admission; but on Wednesday the number fell below 3000. On Thursday, on the contrary, nearly 3000 entered during the day, and 11,000 during the evening. In the narrow aisles along the machine halls and the equally narrow passage through the "interiors" the crush was very disagreeable, the more so because the traffic was not regulated to be in one direction only. We hope this will be remedied, because it nearly led to an accident occurring on the first open evening. This was caused by a hole blowing through in a steam pipe. The supply of steam to three steam engines immediately failed, and most of the light in the darkened "interiors" was cut off. The people unfortunately heard the noise of the escaping steam, and were immediately panic-stricken. A violent rush, of course in the wrong direction, took place at once, and might have resulted in a fatal crush in the dark if it had not been promptly stopped by a—lie. Three official persons ran after the crowd, shouting that the noise was occasioned only by a couple of dynamos having been thrown into gear. This the people believed as readily as they believed the cry of fire or whatever it was that started the panic, and fortunately they immediately recovered their presence of mind. We found it interesting from a mechanical and physiological point of view to notice the length and breadth of the leaps and bounds that can be taken by fat and elderly Germans in the middle of a *sauve-qui-peut*, especially as we ourselves were quite safe, being near the spot where the accident occurred, and therefore near the end of the passage from which the rush took place.

There had been evening trials made on Tuesday and Wednesday. In these most of the arc lamps burnt very steadily, with the exception of some Gramme lamps and of a considerable number of Siemens and Halske lamps. These latter have now been got in much better working order; but the Gramme lamps seem to have subsided into nearly complete uselessness. As we mentioned before, Schwerd's—Carlsruhe—lamps seem on the whole to be the steadiest and most brilliant. These and the Pilsen lamps, by Piette and Krizik, take the lead among arc lamps, the Anglo-Austrian Brush lights giving a dull yellow light in comparison.

On Friday night, after the crowds had disappeared and the Exhibition closed, the first trial was made on the Siemens electric railway. Everything went successfully, and after further trials on Saturday morning a formal inspection and trial by the Scientific Commission took place. No mishap occurred, and the regular running began on Sunday. The line is nearly a mile long and has two curves in it of about 1300ft. radius. The current is generated by two machines fixed in the western machine gallery of the Rotunda and coupled in parallel. We may mention here that they are working under unfavourable conditions in the machine gallery. We do not know whose fault it is, but the foundations on which these machines are planted are entirely insufficient, and in spite of elaborate propping between the walls and machines by means of long pine battens—which by-the-bye are elegantly painted after handrail fashion—the machines shake "wie der teufel," as an engineer *not* belonging to any Siemens company expressed it. We must also remark that the side frames are not at all adapted to stand a heavy side belt pull. From these machines the current is led to the rails by cables composed of bundles of copper wire. It flows along one rail, through the wheel at one side of the car, through the electro-dynamo, down by the opposite wheel, and so back by the other rail. The rails are of iron, and it is easily observable that the section required is much in excess of that ordinarily used for similarly heavy traffic.* A carriage road crosses the line at the same level at two points. Here the rails are disconnected from the electric circuit, the conductors being led on underneath on account of the current passing by horses' hoofs. The objection to this is mutual—the horses do not like it, and the engineers do not care to be robbed of their current. The momentum of the car carries it over the crossing. The maximum speed run is eighteen miles per hour. The journey from the Rotunda to the Prater Strasse is accomplished in from three to three and a-half minutes, and it is intended to run from either end every ten minutes. There are two cars running together, there being no sidings at either end, and therefore no possibility of the cars passing each other, because the line is a single one. The generating dynamos are compound machines coupled parallely for quantity. The field magnets of each machine are excited by the other machine, in order to maintain the electro-motive force in the two as equal as possible. There are four magnets, two north poles lying side by side above the armature, and two south poles underneath the same. The main current is split in going round the magnets, the upper pair being in multiple arc, as also the lower pair, but the two pairs being in series. The main circuit winding covers those halves of the magnets furthest away from the armature; the shunt coils cover the halves nearer the centre. These machines run at 700 revolutions per minute, and give an electromotive force of 203 volts. The two coupled as above furnish a current which averages 180 ampères, this varying to some extent according to the distance of the car from the station. As the line at Vienna is perfectly level, there is no variation of resistance due to change of gradient. The internal resistance of one of these machines is 0·85 ohms, the main circuit coil being of wire 5 mm. in diameter, and the shunt of 2½ mm. diameter. The electromotors on the cars are the same as these in size and in every respect, except that they are not compound wound, the magnets being excited by the main current only, and there being fewer coils than in the generating machines. These latter receive from the engine about 20-horse power, and the motor on the car is said to utilise about half this, or 10-horse power. The sleepers of the railway are of wood of large dimensions, and serve to insulate the rails from the ground. These latter are simply spiked down without chairs.

Dr. Wm. Siemen's lecture was again postponed until Monday, the 27th ult. The subject is "The Measurement of the Temperature of Radiating Bodies, and the Ratio between the different kinds of Radiation at different Temperatures." Sir William has already lectured on this subject in England. His lecture at Vienna was not very successful, and contained little or nothing new.

On Wednesday evening the press representatives were invited to a "rehearsal" of the performances in the "telephone chambers." Bell telephones are used, and two different microphonic transmitters, one by J. Berliner, and the other by the Private Telegraph Society of Vienna. The opera being performed in the Opera House two or three miles off, and the instrumental music of the restaurant bands in the Prater, are very distinctly heard, the latter, however, being so noisy that the sound is even less agreeable as heard through the telephone than when heard close to. A very remarkable and beautiful demonstration of the capabilities of the telephone, however, consisted of the transmission of conversation and musical duets by a lady and gentleman situated at two stations some ten miles apart, the further station being fifty miles away from the Exhibition. The piano and zither accompaniments by the lady and the singing of the gentleman kept very perfectly together, and the variations of tone and modulation and the pronunciation were all heard by a dozen people in the Exhibition with extraordinary distinctness. The keeping in time together is managed by each performer having a couple of telephones fastened to the two ears by a sort of spring arch over the head. Whether the performance had been previously much "rehearsed" or not we cannot say. We intend to describe these transmitters hereafter.

The Vienna press has denounced with some bitterness the delays that have occurred in opening for the evening, and in the commencement of the theatrical performances. Although the Exhibition is a splendid one as it stands, it must be confessed that a very great deal that has been promised is not yet complete. There are at last some signs of the English company, to whom we referred before, beginning to make ready. There are many extremely interesting instruments promised from England by the Society of Telegraph Engineers and Electricians, but there are as yet no signs of them. We are convinced that English engineers have made a mistake in thus neglecting this opportunity. We find certain German firms already taking in tolerably large orders.

Steamer for the Upper Congo.—The King of the Belgians has intrusted Messrs. Yarrow and Co., of Poplar, with the construction of a very shallow-draught steamer for the navigation of the upper waters of the Congo in connection with "L'Association Internationale Africain," for the use of the expedition of which Mr. Stanley has charge. This vessel is of special and ingenious design. It will be propelled by a stern paddle-wheel, and the hull will be arranged in such a manner that it can be readily subdivided into a number of sections, each being buoyant, and provided with fittings for receiving four large wheels. These wheels can be attached to each section while afloat, so that it can be drawn out of the water for transport overland without difficulty. Each of the subdivisions of the hull forms, when fitted with the wheels, a complete wagon of itself, capable of carrying the machinery of the steamer, merchandise, stores, &c. It is to be completed by the end of this year, and will be tested afloat under steam on the Thames.

* They weigh 60 lb. per yard, are 4½in. deep, 2½in. wide on tread, and 4in. wide on bottom flange.

RAILWAY MATTERS.

THE railway accident at Steignitz, near Berlin, by which about forty people were run over at once, will perhaps persuade our German and French neighbours that railway platforms and overhead bridges are really useful.

ON the 4th inst. the new line of railway between Hayward's-heath and Horsted Keynes, connecting the main line of the Brighton Company with its system in other parts of Sussex, was opened. It is only four miles and a-half in length, but the connection is important, and when the Croydon and Oxted line is completed, which it is expected will be the case this year, the Horsted Keynes line will furnish a new route between Brighton and London, giving similar accommodation on the east to that given by the Horsham line on the west.

TWO cows strayed on the London, Chatham, and Dover Railway, near Rochester, on the 31st ult., and a passenger train ran into them. One of the animals was cut to pieces, and the other was so badly hurt that it had to be slaughtered. The train was partly thrown off the metals, and the line was blocked for two hours. A similar accident occurred on the railway between Loughborough and Nuneaton. While a train was travelling at a good rate of speed the engine came into collision with a cow which had strayed on the line. The animal was cut to pieces, and several coaches left the metals.

ON the evening of the 27th a passenger train on the Buffalo, New York, and Philadelphia road, near Machias, New York, struck the limb of a large tree which had blown down close to the track. The jagged edges of the limb reached just high enough to strike the lower half of the windows, and before the train could be stopped the limb had banged out nearly every pane of glass in one side of two coaches, and also done some damage to the sashes. There was much excitement in the car as the glass was cracking and hissing through the air. Two Italians received painful wounds in the arm, and one was taken home in a carriage, with his arm probably broken. Other people were cut in the face and hands, but none seriously injured.

A NEW mountain railway—Territet Montreux-Glion—has been constructed on the shores of the Lake of Geneva. No locomotive is used, but the weight of the descending carriage is used to bring the ascending vehicle up the incline. The necessary increase of weight required is provided for by water ballast. The line is only about 750 yards long, and the height attained is 327 yards above the spot where the railway commences. The lower portion of the line has a gradient of 300 in 1000, and the upper portion 570 in 1000. An automatic brake has been provided which acts in case a breakage of the rope takes place. The carriages are specially built in consideration of the gradients referred to, and are constructed to hold twenty persons each.

ON the 31st ult. the first step was formally taken in the construction of the new line of railway which is to place the town of Oldbury in direct communication with the Stourbridge Extension Railway—Great Western—at Langley-green. The new line, for which a local company has been formed, is intended to facilitate the passenger and goods traffic of the town of Oldbury by giving it direct communication with the Great Western Railway, and an extensive system of collecting basins, wharves, and warehouses will be erected at Oldbury and connected by a short line, as mentioned above, with the Langley-green station on the Great Western line. This line will be a mile and a quarter in length, and for its construction—which will be carried out by the Great Western Company—and the purposes of the company a capital of £80,000 will be required.

THE Great Northern Railway records a decrease in the past half-year of 31,000 in the first-class, of 70,000 in the second-class, and an increase of 38,000 in the third-class—that company's total being affected by the separation of the traffic over its and the Great Eastern's joint line. The North-Eastern Railway, which has a monopoly of a great manufacturing, mining, and shipping district, has as remarkable a decline and increase to record as that of the London and North-Western, as mentioned in our last impression. In the first half of last year the North-Eastern Railway carried 478,088 passengers, and that number fell to 459,266 for the first half-year of the present year. The second-class on the same line showed a decline of 48,000, and the third-class made up for these decreases, and gave a net increase of 950,000 in the six months. On the Great Western the first-class passengers fell off by 32,000 in the period referred to, the second-class showed the large decrease of 190,000, and the third-class counterbalanced these losses and made the total 700,000 more than in the first half of last year.

FALLING bridge jumping performances seem to be at a discount just now in the United States; but the baby-saving business is in full swing. The following paragraph is typical:—"John DeGerld, the fireman of engine No. 179, did a gallant deed on Wednesday morning on the run up to the junction. On reaching the curve this side of North Aurora a little child was noticed on the track only a short distance ahead. Brakes were called for, and at the sound of the whistle the little child started to run, but fell prostrate, and instantly realising that the train could not be stopped in time, John hastened over to the front of the engine, and climbing down upon the pilot, he clung to the shackle-bar with one hand, while with the other he was fortunate enough to seize the child, snatch it from the track and hold it out of danger until the train came to a stop. The occurrence was witnessed by both parents of the child and several other persons, none of whom, however, were near enough to attempt a rescue, and even John's prompt action barely saved the little one from a horrible death, as there was not an instant to spare." It will be noticed that in all the bridge cases it is the engineer who does the heroic part of the work; but children are invariably saved by firemen. It is only fair after all that renown should be equally distributed on the foot-plate; but we would like a little novelty in these stories just for a change. The cow, the bridge, and the baby are all about used up.

THE new railway bridge across the river Tees has now been fully brought into work, and there has been a commencement with the works of the new bridge to connect the Durham and Yorkshire towns on that river. The bridge is the outcome of a rather long agitation. It is one that will be costly, the contract being £38,000, exclusive of the land, the bulk of the cost being met by the Town Council of Stockton and the Local Board of South Stockton, contributions being given by the Tees Conservancy Commissioners and by the authorities of the two counties. The bridge will be of iron, the spans being three in number, two of 85ft. each, and the central one 110ft. long. The two piers will have foundations formed by deep sunk iron cylinders filled with concrete. On these granite blocks will rest, from which the masonry of the piers will ascend to meet the iron spans. The shore abutments will be of concrete, with arches to allow trains to pass. The roadway of the bridge will be 40ft. wide, and at each side a footpath 10ft. wide will be made. The engineers are Messrs. Hayter and Neate, of Westminster, and though the work has not been long commenced fair progress has been made, the foundations for the piers being in course of formation, and the shore abutments being in course of excavation; but it is expected that about eighteen months will elapse before the completion of the bridge. It is expected that with its completion, the communication between the two counties will be sufficient, though there still remains the task of forming a railway junction between the two counties lower down. Hitherto the attempts to provide bridge accommodation in that part have been defeated by a strong opposition, and the powers that were obtained for the making of a tunnel have been allowed to lapse, but as this will soon be the only link that is wanting to perfect the chain of coast communication from Hull to Berwick, it is to be hoped that there may be speedily some attempt to solve the difficulty either by the obtaining of revived powers, or by the project of a bridge that will not meet the objections that have hitherto been fatal to a lower bridge over the Tees.

NOTES AND MEMORANDA.

A LUMINOUS waterproof paper, the *Papierzeitung* says, may be made from a mixture 40 parts pulp, 10 parts phosphorescent powder, 1 of gelatine, 1 potassium bichromate, and 10 parts of water.

THE importation into the United States of tin-plate for the calendar year 1882 amounted to 240,000 tons, valued at £3,600,000 in dock at Liverpool; but by the time duties, freights, interest and importers' and jobbers' expenses and profits were added, these represented a cost to the American consumer of not less than £6,000,000.

IN America a company has been formed for the manufacture of soapstone fire-bricks. It is claimed that soapstone will not slag, and that it is impossible to flux the bricks. The capacity of soapstone to resist heat is well known to exceed that of most other minerals. They are proposed for use for furnace linings, open-hearth steel furnaces, Bessemer converters, steel holes, &c.

THEY have in the Southern states, in operation or in course of erection 191 cotton factories. This out-numbers by 27 all the cotton factories in New England outside of Massachusetts, and exceeds by 16 the number in that state. The figures speak for themselves, and give an outline of what the South is doing in the way of becoming her own producer, manufacturer, and consumer.

THE value of the *unit atmosphere*—abbreviated, atmo.—which has been adopted in the metric system and used by Regnault in his investigations to determine the relations between the temperature and pressure of gases, is the pressure of 760 millimetres (29·922in.) of the mercurial column at 0 deg. Cent. (32 deg. Fah.) at Paris; which amounts, in that latitude, to 1·0333 kilogrammes on the square centimetre, or 14·6967 lb. on the square inch.

THE want of a deep-water harbour on the west coast of France has resulted in the construction now being carried on of the new port of La Pallice, three miles west of La Rochelle, where the largest ships, with the exception of, perhaps, some monster ironclads, will be able to enter at any state of the tide. The levellings and excavations for the docks of the new port have already made great progress since their commencement two years ago.

TO make rope to stand specially heavy strains it should be borne in mind that the bending of the strands over the sheave causes an internal friction among the fibres of the rope, grinding them into powder, because they have a cutting action on each other. By laying up the strands with plumbago, selecting long fibres, in order to compensate for the decreased holding power of the slippery fibres, the rope is made much more durable. This is, we believe, the idea of Mr. C. W. Hunt, of New York, who makes such ropes for his coal hoisting apparatus.

FROM statistics recently published, it appears that there are in the world no fewer than 3985 paper mills, producing every year 959,000 tons of paper from all kinds of substances, including rags, straw, and alfalfa. About one-half is printed upon, and of these 476,000 tons of paper, nearly 300,000 tons are used by newspapers. The various Governments consume in official business 100,000 tons; schools, 90,000 tons; commerce, 120,000 tons; industry, 90,000 tons; and private correspondence another 90,000 tons. Including women and children, the paper trade employs 192,000 hands.

NOTHING under the sun is new, *e.g.*, in *Bell's Weekly Messenger* for August 26, 1798, occurs the following:—"A man has invented a machine that will stamp or cut 200 horseshoes and nails for him in an hour." The same paper has also reference to the proposed Gravesend and Tilbury tunnel. Eighty-five years have passed since 1798. Steam has succeeded sails, and electricity threatens to eclipse steam; but if the luckless passenger at Tilbury misses the railway company's ferry steamer, he has to cross the Thames in much the same fashion as his woad-painted ancestor had to do before the late Julius Cæsar troubled us with civilisation.

THE following rules for reckoning postage have been sent to a contemporary:—Book post: Find the number of ounces. Take the first even number not less than this and halve it. This gives the cost in half-pence. Letter post: A letter not over 1 oz. costs 1d. Otherwise use last rule and add 1d. Parcel post: Find the number of pounds and add one. Take the first even number not less than this and halve it. This gives the cost in threepenny-pieces. A book must not be over 5 lb. nor a parcel over 7 lb. A letter over 12 oz. is charged 1d. an ounce, beginning with the first ounce. Examples: For a book of 5½ oz., say "5½ = say 6 = 3 half-pence." For a letter of 5½ oz., say "5½, 6, 3 half-pence; and a penny makes 2½d." For a parcel of 5½ lb., say "5½, 6½, 8, 4 threepenny-pieces make 1s."

IN cleansing old paintings that have become dingy with soot and coal-dust, substances are frequently employed that injure the painting by acting on the lighter and more delicate tints and shades. Von Bibra has discovered a method which, according to Wieck's *Gewerbe Zeitung*, is both safe and rapid. The painting is first removed from the frame, and the dust and smoke brushed off with a pencil or feather. After this it is washed with a sponge dipped in well water. It is next covered with a thick layer of soap; shaving soap is the best for the purpose, because it remains moist and does not dry on. After the soap has been on eight or ten minutes it is all washed off with a strong brush or pencil, adding a little water if necessary. The soap that still adheres is rinsed off sufficiently with water, and the picture left to dry. When completely dry it is further cleansed with nitro-benzol—also known as nitro-benzine, artificial oil of bitter almonds, essence of mirbane. It is a yellowish, oily, poisonous liquid, with a powerful smell of bitter almonds. It is formed when coal-tar benzol is mixed with fuming or concentrated nitric acid under suitable precautions. The nitro-benzol is poured into a dish, and a clean linen rag dipped in it, and passed over the painting. This quickly removes all the adherent dirt. This linen rag must be frequently exchanged for a clean one. When the rag remains clean after going over it repeatedly the cleansing is finished. If the colours look dull after going over it the last time and letting it dry, it is given a thin coat of the finest olive oil, and after a while must be varnished with a good, quickly-drying varnish.

PROFESSOR COLLADON has for some time observed the effect of lightning on different sorts of trees in Switzerland, where thunder storms are so frequent—on an average two a week—as to afford ample opportunity for such observations. He has ascertained that when lightning strikes a tree it leaves very few marks of its passage on the upper part and middle of the trunk, a peculiarity which he ascribes to the fact of those parts being more impregnated with sugar, a good conductor, than the lower part. As the electric fluid descends to the neighbourhood of the heavier branches, where there is less saccharine matter, it tears open the bark, and in many instances shivers the tree. It is no uncommon thing to find the lower part of a tree literally cut by the lightning, while the upper portion and the higher branches seem to have suffered hardly at all. Oaks, however, would appear to present an exception to this rule, for they are often found with tops quite blasted and the passage of the lightning lower down marked by a gouge-like furrow. These furrows sometimes go completely round the tree like a screw, the reason of which, says Professor Colladon, is that the lightning follows the cells of which the bark is composed lengthwise, and in certain sorts of wood these cells are disposed spirally. A curious effect of lightning on vines is that it invariably strikes a great many vine stocks at the same time over a space, for the most part circular, from 8 metres to 25 metres in diameter, and containing, therefore, several hundred vines. The plants most affected are those in the centre of the circle, and the number of burnt and yellowed leaves diminish in proportion to their distance from that point. In July two vineyards in one canton were struck by lightning, and the first idea of their proprietors, on seeing their shrivelled vines, was that a still more dreaded foe, phylloxera, had been at work, but when the professor was called in, he speedily enlightened them as to the true cause of the mischief, and, in proof of his diagnosis, pointed out that the ground in the centre of the circle was strewn with torn leaves and freshly-broken twigs.

MISCELLANEA.

MESSRS. J. HAMBLET AND CO., of West Bromwich, have been awarded a gold medal at the Amsterdam Exhibition for iron metallic paving.

THE Cagliari International Exhibition will be opened on the 4th of November next. This is positively the last announcement, at least so it is said.

MR. E. J. LOWE, F.R.S., proposes to form, and endow with his instruments and library, a permanent meteorological observatory for the Bristol Channel.

MESSRS. SAMPSON AND CO., leather belting manufacturers, Manchester and Stroud, have been awarded a gold medal at the Amsterdam Exhibition for their main driving belts without cross joints.

THE French ironclads of the first-class that are now complete for sea are three, the Amiral Duperre, the Tonnant, and Devastation, each carrying 48-ton guns, the first with armour of 22in., the others with 18in. and 16½in. respectively. The English ironclads in the same category are the Inflexible, with 80-ton guns and 24in. armour; and the Conquerer, with 43-ton guns and 12in. armour.

THE Rural Sanitary Authority of the district of Petersfield, Hants, at their meeting on the 30th ult., approved plans prepared by Mr. W. Barns Kinsey, M. Inst. C.E., Southwark-street, London, for the sewerage and water supply of the town of Petersfield and portions of the adjoining parishes of Sheet and Buriton. The sewerage works will be on the separate system, the existing drains and brooks being used for storm and surface water.

TUBE wells for furnishing additional supply of water to Brooklyn have been put in operation. Fifty 2½in. pipe wells are connected with a central receiver, from which a 16in. suction leads to a Knowles's steam pump, which lifts the water into the conduit. The wells are driven 40ft. into the "main spring." Another gang of fifty wells is nearly ready at Baisley's Pond. From these two stations it is expected that an additional supply of 5,000,000 gallons daily can be procured from the water which lies below the level of the conduit leading to the Ridgewood Pumping Station.

DURING the past fortnight five accidents with hydraulic lifts have occurred in the City, and four persons have lost their lives. On Saturday last a lad, in the employ of Messrs. Cassell and Co., was ascending from the basement of their establishment in Ludgate-hill by means of a hydraulic lift, when some portion of the machinery gave way, and he fell a distance of over 60ft. The same day the death occurred of a lad, aged fifteen, a van boy in the service of the Great Northern Railway Company, who had, a few days previously at Messrs. Clark and Wright's warehouse, Fore-street, City, accidentally fallen down a lift hole which had been left open.

A SINGULAR accident happened a few days ago at Zell, Canton Zurich. A new iron bridge over the Joess had just been completed, and in order to test its stability three wagons laden with cotton were drawn across it, a number of the local authorities being on the spot watching the proceedings. As the wagons started the bridge yielded slightly to their weight, and they had hardly reached the middle when the entire structure collapsed, and wagons, horses, and spectators were precipitated into the stream. Herr Ott, Mayor of Zell, was killed, and Herr Winkler, a member of the Great Council, and two other persons, one of them the engineer, were so badly hurt that they are not expected to recover. The breakdown is ascribed to the indifferent quality of the iron of which the bridge was constructed.

THE dials on the clock bracket outside the tower of the New Royal Courts of Justice, opposite Temple Bar, will be at once removed and replaced by dials which measure 8ft. 6in. in diameter, and are made up with opal glass, which will show white by day and will be plainly visible by night. The hands will be black, as will also be the figures and minutes, while the rings and mouldings will be gilt. The clock will be illuminated by gas for the present, but it is expected that eventually the electric light will be used. It will be fitted with a remontoir escapement, by which the long hands will only move once every minute. The hours will be struck on a 3½ ton bell, the quarters being given by smaller bells. The task of erecting the machinery has been placed in the hands of Messrs. Gillett and Co., Croydon.

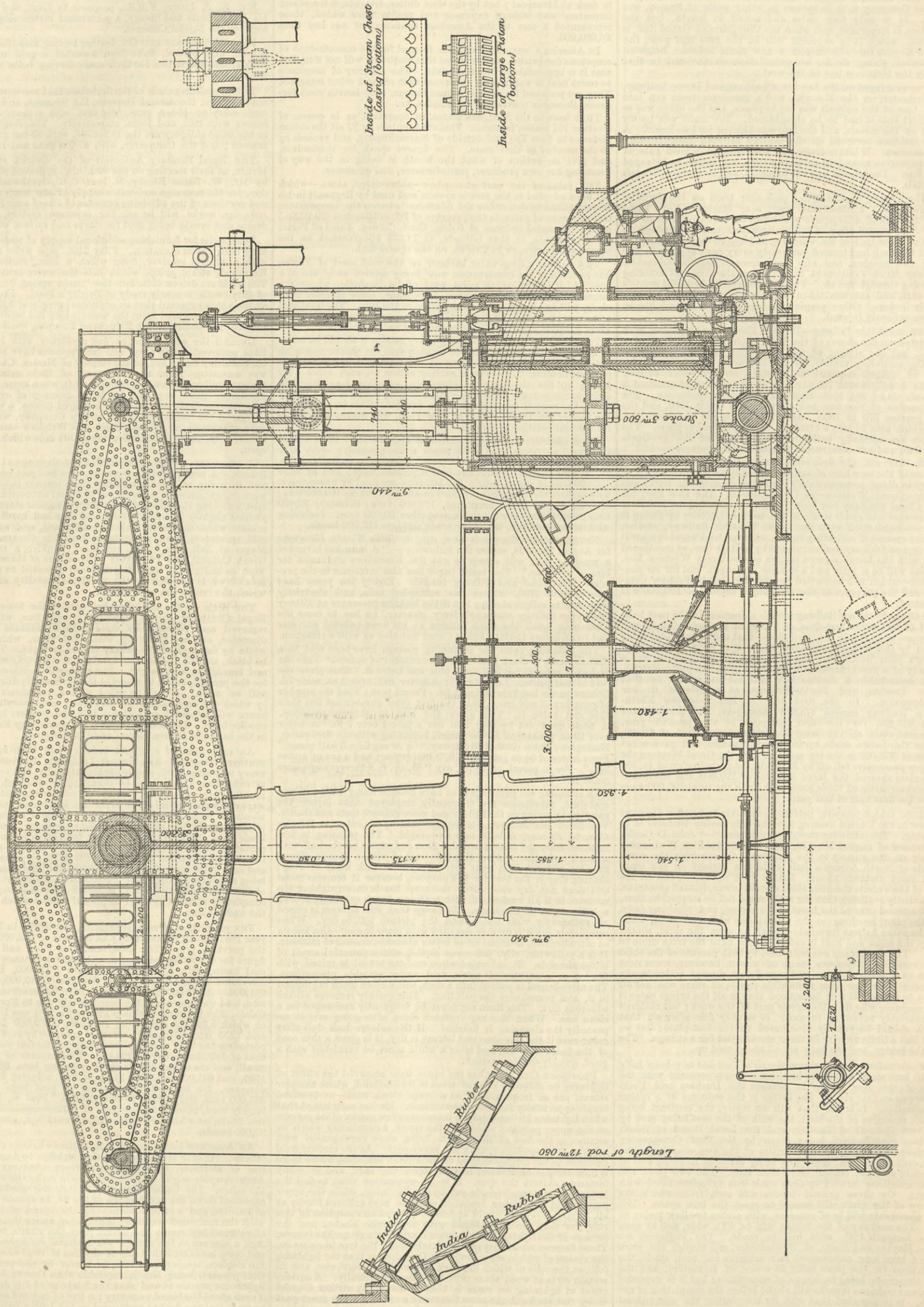
AN exposition of arts and industry has been opened in the southern states of America, at Louisville, Kentucky. It is in every way successful, and the space originally laid out for the use of exhibitors required to be considerably enlarged. For several months before the opening of the exposition applications for space were daily pouring in. The exposition is divided into five departments, as follows:—The first for the display of natural products—mineral, vegetable, and animal; the second for machinery of all kinds; the third for manufactures; the fourth for means of transportation of goods, showing four separate groups—animal, wind, steam, and electrical power; and the fifth for music, literature, and art. The aim of the projectors of the enterprise has been to bring about an exhibition of the products, manufactures, and arts of the whole country, and it is stated that this object has been completely fulfilled by the exceptional success which has attended the undertaking.

THE production of coal, anthracite, and lignite in France for the year 1881 was 19,766,000 tons; an increase of 582,000 over that of the previous year. The departments of Nord and Pas-de-Calais figure for 8,992,000, followed at a respectful distance by the Loire coal basin, with 3,516,000, Gard with 1,933,000, Burgundy and Nivernais 1,552,000, Tarn and Aveyron 1,080,000, Bourbonnais 961,000. All these minor coalfields have fallen off in their production, and the increase of the year is solely due to Nord and Pas-de-Calais. The import of fuel into France for 1881 was 10,221,000 tons, of which 5,396,000 came from Belgium, 3,569,000 from England, and 1255 from Germany. It is a noteworthy fact that coal importation has been steadily increasing for several years in France, that of 1872 being only 7,709,000. The exports of coal are very small, and are as steadily decreasing, having been 603,000 tons in 1880, and 601,000 in 1881. The peat fuel industry is also on the decrease, for in 1872 the working of peat bogs amounted to 325,000 tons, and in 1881 to but 233,000. Peat is, however, still largely used, there being upwards of 1073 recognised peat beds in the State, on which are 8400 separate workings, employing about 26,000 hands.

AN American journal revives, in a somewhat novel form, an old scheme. It is to make Ireland a thoroughfare to America. A new line of steamers, starting at first from whatever port on the American side might be preferred, would make Galway its port on the other. The Canadian system of railroads would require to be extended down the north shore of the St. Lawrence to the Straits of Bellisle, and a tunnel connecting the island of Newfoundland with the mainland would be constructed under the straits; a line of railroad laid across the island from the straits to St. John in such a manner as to develope the material resources of the island and open lands on either side of the line of road to actual settlers, the climate, tempered as it is in winter by the proximity of the Gulf Stream, being less inhospitable than that of Manitoba; the lighthouse service at and near the harbour of St. John improved, if such should be found necessary; a line of railroad as direct as may be from Galway laid to such point on the Irish Channel as may be found most eligible for reaching the opposite shore of Scotland; finally, a tunnel under the Channel constructed and the connection of the road from Galway made by means of it with the British system of railroads. It will be seen that our contemporary contemplates giving plenty of employment to engineers. The extension of the Canadian system of railways is feasible and desirable. But in the face of the fact that the passage to New York now occupies little more than a week, it is, to say the least, doubtful if the rest of the scheme would be worth carrying out, even if it were certain that it could be.

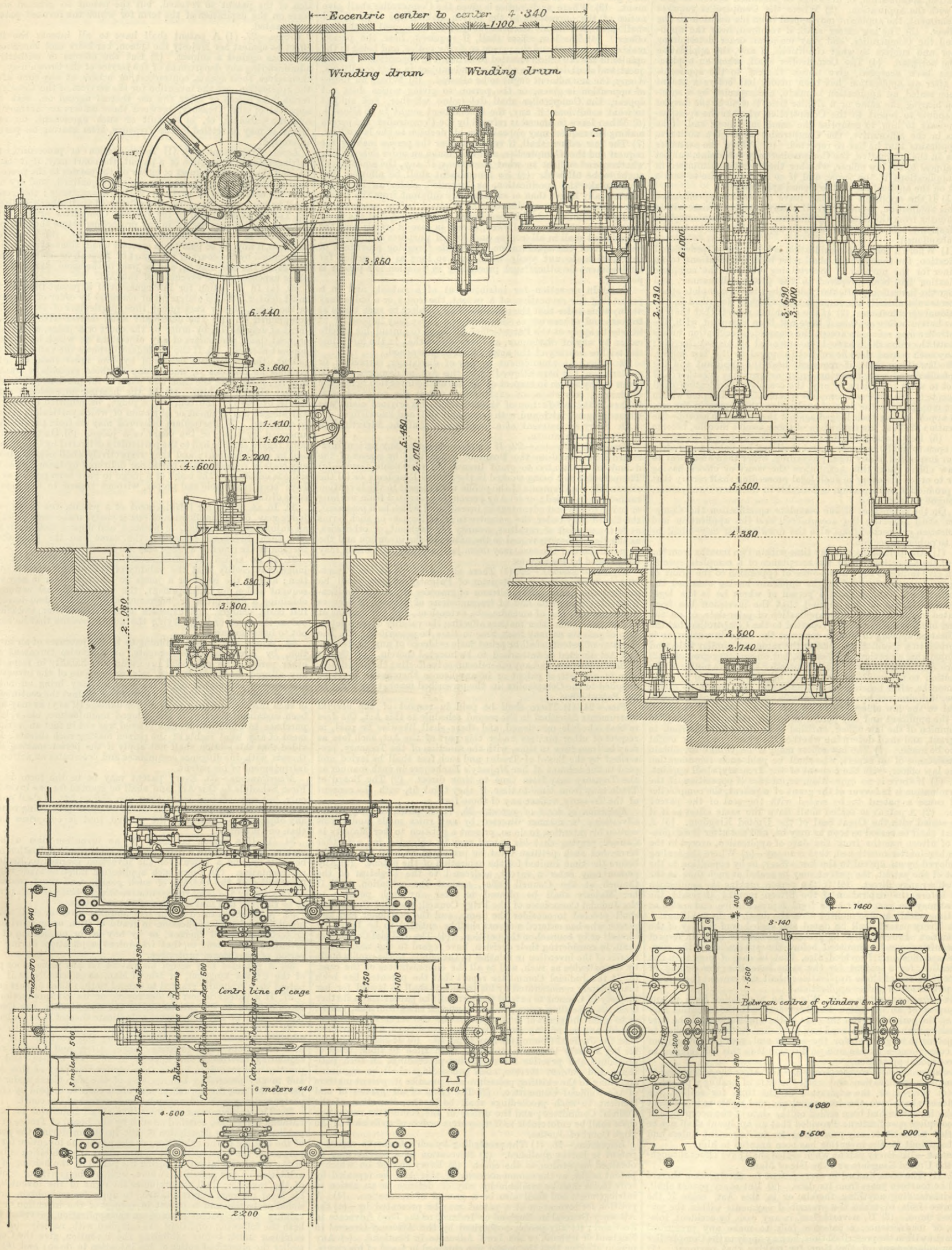
PUMPING ENGINE, BASCOUP COLLIERIES.

(For description see page 181.)



WINDING ENGINE, MARIEMONT COLLIERIES.

(For description see page 181.)



THE NEW PATENT ACT.

THE Patent Act was published on Saturday. In compliance with the request of a great many of our readers, we print that portion of the text which possesses most interest, omitting the introductory sections, which are little more than an index to the Act. The Act is divided into three parts—I., Preliminary; II., Patents; III., Designs; IV., Trade-marks; V., General. We begin with

PART II.—PATENTS.

Application for and grant of patent.—4. (1) Any person, whether a British subject or not, may make an application for a patent, (2) Two or more persons may make a joint application for a patent, and a patent may be granted to them jointly.

5. (1) An application for a patent must be made in the form set forth in the first Schedule to this Act, or in such other form as may be from time to time prescribed; and must be left at, or sent by post to, the Patent-office in the prescribed manner. (2) An application must contain a declaration to the effect that the applicant is in possession of an invention, whereof he, or in the case of a joint application, one or more of the applicants, claims or claim to be the true and first inventor or inventors, and for which he or they desires or desire to obtain a patent; and must be accompanied by either a provisional or complete specification. (3) A provisional specification must describe the nature of the invention, and be accompanied by drawings, if required. (4) A complete specification, whether left on application or subsequently, must particularly describe and ascertain the nature of the invention, and in what manner it is to be performed, and must be accompanied by drawings, if required. (5) A specification, whether provisional or complete, must commence with the title, and in the case of a complete specification must end with a distinct statement of the invention claimed.

6. The Comptroller shall refer every application to an examiner, who shall ascertain and report to the Comptroller whether the nature of the invention has been fairly described, and the application, specification, and drawings, if any, have been prepared in the prescribed manner, and the title sufficiently indicates the subject matter of the invention.

7. (1) If the examiner reports that the nature of the invention

is not fairly described, or that the application, specification, or drawings has not or have not been prepared in the prescribed manner, or that the title does not sufficiently indicate the subject matter of the invention, the Comptroller may require that the application, specification, or drawings be amended before he proceeds with the application. (2) Where the Comptroller requires an amendment, the applicant may appeal from his decision to the law officer. (3) The law officer shall, if required, hear the applicant and the Comptroller, and may make an order determining whether and subject to what conditions, if any, the application shall be accepted. (4) The Comptroller shall, when an application has been accepted, give notice thereof to the applicant. (5) If after an application has been made, but before a patent has been sealed, an application is made, accompanied by a specification bearing the same or a similar title, it shall be the duty of the examiner to report to the Comptroller whether the specification appears to him to comprise the same invention; and, if he reports in the affirmative, the Comptroller shall give notice to the applicants that he has so reported. (6) Where the examiner reports in the affirmative, the Comptroller may determine, subject to an appeal to the law officer, whether the invention comprised in both applications is the same, and if so he may refuse to seal a patent on the application of the second applicant.

8. (1) If the applicant does not leave a complete specification with his application, he may leave it at any subsequent time within nine months from the date of application. (2) Unless a complete specification is left within that time the application shall be deemed to be abandoned.

9. (1) Where a complete specification is left after a provisional specification, the Comptroller shall refer both specifications to an examiner for the purpose of ascertaining whether the complete specification has been prepared in the prescribed manner, and whether the invention particularly described in the complete specification is substantially the same as that which is described in the provisional specification. (2) If the examiner reports that the conditions herein-before contained have not been complied with, the Comptroller may refuse to accept the complete specification unless and until the same shall have been amended to his satisfaction: but any such refusal shall be subject to appeal to the law officer. (3) The law officer shall, if required, hear the applicant and the Comptroller, and may make an order determining whether and subject to what conditions, if any, the complete specification shall be accepted. (4) Unless a complete specification is accepted within twelve months from the date of application, then—save in the case of an appeal having been lodged against the refusal to accept—the application shall, at the expiration of those twelve months, become void. (5) Reports of examiners shall not in any case be published or be open to public inspection, and shall not be liable to production or inspection in any legal proceeding, other than an appeal to the law officer under this Act, unless the court or officer having power to order discovery in such legal proceeding shall certify that such production or inspection is desirable in the interests of justice, and ought to be allowed.

10. On the acceptance of the complete specification the Comptroller shall advertise the acceptance; and the application and specification or specifications with the drawings—if any—shall be open to public inspection.

11. (1) Any person may at any time within two months from the date of the advertisement of the acceptance of a complete specification give notice at the Patent-office of opposition to the grant of the patent, on the ground of the applicant having obtained the invention from him, or from a person of whom he is the legal representative, or on the ground that the invention has been patented in this country on an application of prior date, or on the ground of an examiner having reported to the Comptroller that the specification appears to him to comprise the same invention as is comprised in a specification bearing the same or a similar title, and accompanying a previous application, but on no other ground. (2) Where such notice is given the Comptroller shall give notice of the opposition to the applicant, and shall, on the expiration of those two months, after hearing the applicant and the person so giving notice, if desirous of being heard, decide on the case, but subject to appeal to the law officer. (3) The law officer shall, if required, hear the applicant and any person so giving notice and being, in the opinion of the law officer, entitled to be heard in opposition to the grant, and shall determine whether the grant ought or ought not to be made. (4) The law officer may, if he thinks fit, obtain the assistance of an expert, who shall be paid such remuneration as the law officer, with the consent of the Treasury, shall appoint.

12. (1) If there is no opposition, or, in case of opposition, if the determination is in favour of the grant of a patent, the comptroller shall cause a patent to be sealed with the seal of the patent office. (2) A patent so sealed shall have the same effect as if it were sealed with the Great Seal of the United Kingdom. (3) A patent shall be sealed as soon as may be, and not after the expiration of fifteen months from the date of application, except in the cases hereinafter mentioned, that is to say—(*a*) Where the sealing is delayed by an appeal to the law officer, or by opposition to the grant of the patent, the patent may be sealed at such time as the law officer may direct. (*b*) If the person making the application dies before the expiration of the fifteen months aforesaid, the patent may be granted to his legal representative and sealed at any time within twelve months after the death of the applicant.

13. Every patent shall be dated and sealed as of the day of the application: Provided that no proceedings shall be taken in respect of an infringement committed before the publication of the complete specification: Provided also, that in case of more than one application for a patent for the same invention, the sealing of a patent on one of those applications shall not prevent the sealing of a patent on an earlier application.

Provisional protection.—14. Where an application for a patent in respect of an invention has been accepted, the invention may during the period between the date of the application and the date of sealing such patent be used and published without prejudice to the patent to be granted for the same; and such protection from the consequences of use and publication is in this Act referred to as provisional protection.

Protection by complete specification.—15. After the acceptance of a complete specification and until the date of sealing a patent in respect thereof, or the expiration of the time for sealing, the applicant shall have the like privileges and rights as if a patent for the invention had been sealed on the date of the acceptance of the complete specification: Provided that an applicant shall not be entitled to institute any proceeding for infringement unless and until a patent for the invention has been granted to him.

Patent.—16. Every patent when sealed shall have effect throughout the United Kingdom and the Isle of Man.

17. (1) The term limited in every patent for the duration thereof shall be fourteen years from its date. (2) But every patent shall, notwithstanding anything therein or in this Act, cease if the patentee fails to make the prescribed payments within the prescribed times. (3) If, nevertheless, in any case, by accident, mistake, or inadvertence, a patentee fails to make any prescribed payment within the prescribed time, he may apply to the Comptroller for an enlargement of the time for making that payment. (4) Thereupon the Comptroller shall, if satisfied that the failure has arisen from any of the above-mentioned causes, on receipt of the prescribed fee for enlargement, not exceeding ten pounds, enlarge the time accordingly, subject to the following conditions:—(*a*) The time for making any payment shall not in any case be enlarged for more than three months. (*b*) If any proceeding shall be taken in respect of an infringement of the patent committed after a failure to make any payment within the prescribed time, and before the enlargement thereof, the Court before which the proceeding is proposed to be taken may, if it shall think fit, refuse to award or give any damages in respect of such infringement.

Amendment of specification.—18. (1) An applicant or a patentee may, from time to time, by request in writing left at the Patent-office, seek leave to amend his specification, including drawings forming part thereof, by way of disclaimer, correction, or explanation, stating the nature of such amendment, and his reasons for the same. (2) The request and the nature of such proposed amendment shall be advertised in the prescribed manner; and at any time within one month from its first advertisement any person may give notice at the Patent-office of opposition to the amendment. (3) Where such notice is given the Comptroller shall give notice of the opposition to the person making the request, and shall hear and decide the case subject to an appeal to the law officer. (4) The law officer shall, if required, hear the person making the request and the person so giving notice, and being in the opinion of the law officer entitled to be heard in opposition to the request, and shall determine whether, and subject to what conditions, if any, the amendment ought to be allowed. (5) Where no notice of opposition is given, or the person so giving notice does not appear, the Comptroller shall determine whether, and subject to what conditions, if any, the amendment ought to be allowed. (6) When leave to amend is refused by the Comptroller, the person making the request may appeal from his decision to the law officer. (7) The law officer shall, if required, hear the person making the request and the Comptroller, and may make an order determining whether, and subject to what conditions, if any, the amendment ought to be allowed. (8) No amendment shall be allowed that would make the specification, as amended, claim an invention substantially larger than or substantially different from the invention claimed by the specification as it stood before amendment. (9) Leave to amend shall be conclusive as to the right of the party to make the amendment allowed, except in case of fraud; and the amendment shall in all courts and for all purposes be deemed to form part of the specification. (10) The foregoing provisions of this section do not apply when and so long as any action for infringement or other legal proceeding in relation to a patent is pending.

19. (1) In an action for infringement of a patent, and in a proceeding for revocation of a patent, the court or a judge may at any time order that the patentee shall, subject to such terms as to costs and otherwise as the court or a judge may impose, be at liberty to apply at the Patent-office for leave to amend his specification by way of disclaimer, and may direct that in the meantime the trial or hearing of the action shall be postponed.

20. Where an amendment by way of disclaimer, correction, or explanation, has been allowed under this Act, no damages shall be given in any action in respect of the use of the invention before the disclaimer, correction, or explanation, unless the patentee establishes to the satisfaction of the court that his original claim was framed in good faith and with reasonable skill and knowledge.

21. Every amendment of a specification shall be advertised in the prescribed manner.

Compulsory licenses.—22. If on the petition of any person interested it is proved to the Board of Trade that by reason of the default of a patentee to grant licenses on reasonable terms—(*a*) The patent is not being worked in the United Kingdom; or (*b*) the reasonable requirements of the public with respect to the invention cannot be supplied; or (*c*) Any person is prevented from working or using to the best advantage an invention of which he is possessed, the Board may order the patentee to grant licenses on such terms as to the amount of royalties, security for payment, or otherwise, as the Board, having regard to the nature of the invention and the circumstances of the case, may deem just, and any such order may be enforced by mandamus.

Register of patents.—23. (1) There shall be kept at the Patent-office a book called the Register of Patents, wherein shall be entered the names and addresses of grantees of patents, notifications of assignments and of transmissions of patents, of licenses under patents, and of amendments, extensions, and revocations of patents, and such other matters affecting the validity or proprietorship of patents as may from time to time be prescribed. (2) The Register of patents shall be prima facie evidence of any matters by this Act directed or authorised to be inserted therein. (3) Copies of deeds, licenses, and any other documents affecting the proprietorship in any letters patent or in any license thereunder, must be supplied to the Comptroller in the prescribed manner for filing in the Patent-office.

Fees.—24. (1) There shall be paid in respect of the several instruments described in the second schedule to this Act, the fees in that schedule mentioned, and there shall likewise be paid, in respect of other matters under this part of the Act, such fees as may be from time to time, with the sanction of the Treasury, prescribed by the Board of Trade; and such fees shall be levied and paid to the account of her Majesty's Exchequer in such manner as the Treasury may from time to time direct. (2) The Board of Trade may from time to time, if they think fit, with the consent of the Treasury, reduce any of those fees.

Extension of term of patent.—25. (1) A patentee may, after advertising in manner directed by any rules made under this section his intention to do so, present a petition to her Majesty in Council, praying that his patent may be extended for a further term; but such petition must be presented at least six months before the time limited for the expiration of the patent. (2) Any person may enter a caveat, addressed to the Registrar of the Council at the Council Office, against the extension. (3) If her Majesty shall be pleased to refer any such petition to the Judicial Committee of the Privy Council, the said Committee shall proceed to consider the same, and the petitioner and any person who has entered a caveat shall be entitled to be heard by himself or by counsel on the petition. (4) The Judicial Committee shall, in considering their decision, have regard to the nature and merits of the invention in relation to the public, to the profits made by the patentee as such, and to all the circumstances of the case. (5) If the Judicial Committee report that the patentee has been inadequately remunerated by his patent, it shall be lawful for her Majesty in Council to extend the term of the patent for a further term not exceeding seven, or in exceptional cases fourteen, years; or to order the grant of a new patent for the term therein mentioned, and containing any restrictions, conditions, and provisions that the Judicial Committee may think fit. (6) It shall be lawful for her Majesty in Council to make, from time to time, rules of procedure and practice for regulating proceedings on such petitions, and subject thereto, such proceedings shall be regulated according to the existing procedure and practice in patent matters of the Judicial Committee. (7) The costs of all parties of and incident to such proceedings shall be in the discretion of the Judicial Committee; and the orders of the committee respecting costs shall be enforceable as if they were orders of a division of the High Court of Justice.

Revocation.—26. (1) The proceeding by scire facias to repeal a patent is hereby abolished. (2) Revocation of a patent may be obtained on petition to the court. (3) Every ground on which a patent might, at the commencement of this Act, be repealed by scire facias shall be available by way of defence to an action of infringement, and shall also be a ground of revocation. (4) A petition for revocation of a patent may be presented by—(*a*) the Attorney-General in England or Ireland, or the Lord Advocate in Scotland; (*b*) any person authorised by the Attorney-General in England or Ireland, or the Lord Advocate in Scotland. (*c*) Any person alleging that the patent was obtained in fraud of his rights, or of the rights of any person under or through whom he claims; (*d*) Any person alleging that he, or any person under or through whom he claims, was the true inventor of any invention included in the claim of the patentee; (*e*) any person alleging that he, or any person under or through whom he claims an interest in any trade, business, or manufacture, had publicly manufactured, used, or sold, within this realm, before the date of the patent, anything claimed by the patentee as his invention. (5) The plaintiff must deliver with his petition particulars of the objections on which he means to rely, and no evidence shall, except by leave of the court or a judge, be admitted in proof of any objection of which particulars are not so delivered. (6) Particulars delivered may be from time to time amended by leave of the court or a judge. (7) The defendant shall be entitled to begin, and give evidence in support of the patent, and if the plaintiff gives evidence impeaching the validity of the patent the defendant shall be entitled to reply. (8) Where a patent has been revoked on the ground of fraud, the Comptroller may, on the application of the true inventor made in accordance with the provisions of this Act, grant to him a patent in lieu of and bearing the same date as the date of revocation of the patent so revoked, but the patent so granted shall cease on the expiration of the term for which the revoked patent was granted.

Crown.—27. (1) A patent shall have to all intents the like effect as against her Majesty the Queen, her heirs and successors, as it has against a subject. (2) But the officers or authorities administering any department of the service of the Crown may, by themselves, their agents, contractors, or others, at any time after the application, use the invention for the services of the Crown on terms to be before or after the use thereof agreed on, with the approval of the Treasury, between those officers or authorities and the patentee, or, in default of such agreement, on such terms as may be settled by the Treasury, after hearing all parties interested.

Legal Proceedings.—28. (1) In an action or proceeding for infringement or revocation of a patent, the court may, if it thinks fit, and shall on the request of either of the parties to the proceeding, call in the aid of an assessor specially qualified, and try and hear the case wholly or partially with his assistance; the action shall be tried without a jury unless the court shall otherwise direct. (2) The Court of Appeal or the Judicial Committee of the Privy Council may, if they see fit, in any proceeding before them respectively, call in the aid of an assessor as aforesaid. (3) The remuneration, if any, to be paid to an assessor under this section shall be determined by the court or the Court of Appeal, or Judicial Committee, as the case may be, and be paid in the same manner as the other expenses of the execution of this Act.

29. (1) In an action for infringement of a patent the plaintiff must deliver with his statement of claim, or by order of the court or the judge, at any subsequent time, particulars of the breaches complained of. (2) The defendant must deliver with his statement of defence, or, by order of the court or a judge, at any subsequent time, particulars of any objections on which he relies in support thereof. (3) If the defendant disputes the validity of the patent, the particulars delivered by him must state on what grounds he disputes it, and if one of those grounds is want of novelty, must state the time and place of the previous publication or user alleged by him. (4) At the hearing no evidence shall, except by leave of the court or a judge, be admitted in proof of any alleged infringement or objection of which particulars are not so delivered. (5) Particulars delivered may be from time to time amended, by leave of the court or a judge. (6) On taxation of costs regard shall be had to the particulars delivered by the plaintiff and by the defendant; and they respectively shall not be allowed any costs in respect of any particular delivered by them unless the same is certified by the court or a judge to have been proven or to have been reasonable and proper, without regard to the general costs of the case.

30. In an action for infringement of a patent, the court or a judge may, on the application of either party, make such order for an injunction, inspection, or account, and impose such terms and give such directions respecting the same and the proceedings thereon as the court or a judge may see fit.

31. In an action for infringement of a patent, the court or a judge may certify that the validity of the patent came in question; and if the court or a judge so certifies, then in any subsequent action for infringement, the plaintiff in that action, on obtaining a final order or judgment in his favour, shall have his full costs, charges, and expenses as between solicitor and client, unless the court or judge trying the action certifies that he ought not to have the same.

32. Where any person claiming to be the patentee of an invention, by circulars, advertisements, or otherwise threatens any other person with any legal proceedings or liability in respect of any alleged manufacture, use, sale, or purchase of the invention, any persons or persons aggrieved thereby may bring an action against him, and may obtain an injunction against the continuance of such threats, and may recover such damage (if any) as may have been sustained thereby, if the alleged manufacture, use, sale, or purchase to which the threats related was not in fact an infringement of any legal rights of the person making such threats: Provided that this section shall not apply if the person making such threats with due diligence commences and prosecutes an action for infringement of his patent.

Miscellaneous.—33. Every patent may be in the form in the First Schedule to this Act, and shall be granted for one invention only, but may contain more than one claim; but it shall not be competent for any person in an action or other proceeding to take any objection to a patent on the ground that it comprises more than one invention.

34. (1) If a person possessed of an invention dies without making application for a patent for the invention, application may be made by, and a patent for the invention granted to, his legal representative. (2) Every such application must be made within six months of the decease of such person, and must contain a declaration by the legal representative that he believes such person to be the true and first inventor of the invention.

35. A patent granted to the true and first inventor shall not be invalidiated by an application in fraud of him, or by provisional protection obtained thereon, or by any use or publication of the invention subsequent to that fraudulent application during the period of provisional protection.

36. A patentee may assign his patent for any place in or part of the United kingdom, or Isle of Man, as effectually as if the patent were originally granted to extend to that place or part only.

37. If a patent is lost or destroyed, or its non-production is accounted for to the satisfaction of the Comptroller, the Comptroller may, at any time, cause a duplicate thereof to be sealed.

38. The law officers may examine witnesses on oath and administer oaths for that purpose under this part of this Act, and may from time to time make, alter, and rescind rules regulating references and appeals to the law officers, and the practice and precedure before them under this part of this Act; and in any proceeding before either of the law officers under this part of this Act, the law officer may order costs to be paid by either party, and any such order may be made a rule of the court.

39. The exhibition of an invention at an industrial or international exhibition, certified as such by the Board of Trade, or the publication of any description of the invention during the period of the holding of the exhibition, or the use of the invention for the purpose of the exhibition in the place where the exhibition is held, or the use of the invention during the period of the holding of the exhibition by any person elsewhere, without the privity or consent of the inventor, shall not prejudice the right of the inventor, or his legal personal representative, to apply for and obtain provisional protection and a patent in respect of the invention or the validity of any patent granted on the application, provided that both the following conditions are complied with, namely—(*a*) The exhibitor must, before exhibiting the invention, give the Comptroller the prescribed notice of his intention to do so; and (*b*) the application for a patent must be made before or within six months from the date of the opening of the exhibition.

40. (1) The Comptroller shall cause to be issued periodically an illustrated journal of patented inventions, as well as reports of patent cases decided by courts of law, and any other information that the Comptroller may deem generally useful or important. (2) Provision shall be made by the Comptroller for keeping on sale copies of such journal, and also of all complete specifications of patents for the time being in force, with their accompanying drawings, if any. (3) The Comptroller shall continue, in such form as he may deem expedient, the indexes and abridgments of specifications hitherto published, and shall from time to time prepare and publish such other indexes, abridgments of specifications, catalogues, and other works relating to inventions, as he may see fit.

41. The control and management of the existing Patent Museum

and its contents shall, from and after the commencement of this Act, be transferred to and vested in the Department of Science and Art, subject to such directions as her Majesty in Council may see fit to give.

42. The Department of Science and Art may at any time require a patentee to furnish them with a model of his invention on payment to the patentee of the cost of the manufacture of the model; the amount to be settled, in case of dispute, by the Board of Trade.

43. (1) A patent shall not prevent the use of an invention for the purposes of the navigation of a foreign vessel within the jurisdiction of any of her Majesty's Courts in the United Kingdom or Isle of Man, or the use of an invention in a foreign vessel within that jurisdiction, provided it is not used therein for or in connection with the manufacture or preparation of anything intended to be sold in or exported from the United Kingdom or Isle of Man. (2) But this section shall not extend to vessels of any foreign State of which the laws authorise subjects of such foreign State, having patents or like privileges for the exclusive use or exercise of inventions within its territories, to prevent or interfere with the use of such inventions in British vessels while in the ports of such foreign State, or in the waters within the jurisdiction of its courts, where such inventions are not so used for the manufacture or preparation of anything intended to be sold in or exported from the territories of such foreign State.

44. (1) The inventor of any improvement in instruments or munitions of war, his executors, administrators, or assigns (who are in this section comprised in the expression the inventor), may (either for or without valuable consideration) assign to her Majesty's Principal Secretary of State for the War Department (hereinafter referred to as the Secretary of State), on behalf of her Majesty, all the benefit of the invention and of any patent obtained or to be obtained for the same; and the Secretary of State may be a party to the assignment. (2) The assignment shall effectually vest the benefit of the invention and patent in the Secretary of State for the time being on behalf of her Majesty, and all covenants and agreements therein contained for keeping the invention secret and otherwise shall be valid and effectual, notwithstanding any want of valuable consideration, and may be enforced accordingly by the Secretary of State for the time being. (3) Where any such assignment has been made to the Secretary of State, he may at any time before the application for a patent for the invention, or before publication of the specification or specifications, certify to the Comptroller his opinion that, in the interest of the public service, the particulars of the invention and of the manner in which it is to be performed should be kept secret. (4) If the Secretary of State so certifies, the application and specification or specifications, with the drawings, if any, and any amendment of the specification or specifications, and any copies of such documents and drawings, shall, instead of being left in the ordinary manner at the Patent-office, be delivered to the Comptroller in a packet sealed by authority of the Secretary of State. (5) Such packet shall, until the expiration of the term or extended term during which a patent for the invention may be in force, be kept sealed by the Comptroller, and shall not be opened save under the authority of an order of the Secretary of State, or of the law officers. (6) Such sealed packet shall be delivered at any time during the continuance of the patent to any person authorised by writing under the hand of the Secretary of State to receive the same, and shall if returned to the Comptroller be again kept sealed by him. (7) On the expiration of the term or extended term of the patent, such sealed packet shall be delivered to any person authorised by writing under the hand of the Secretary of State to receive it. (8) Where the Secretary of State certifies as aforesaid, after an application for a patent has been left at the Patent-office, but before the publication of the specification or specifications, the application specification or specifications, with the drawings—if any—shall be forthwith placed in a packet sealed by authority of the Comptroller, and such packet shall be subject to the foregoing provisions respecting a packet sealed by authority of the Secretary of State. (9) No proceeding by petition or otherwise shall lie for revocation of a patent granted for an invention in relation to which the Secretary of State has certified as aforesaid. (10) No copy of any specification or other document or drawing, by this section required to be placed in a sealed packet, shall in any manner whatever be published or open to the inspection of the public, but save as in this section otherwise directed, the provisions of this part of this Act shall apply in respect of any such invention and patent as aforesaid. (11) The Secretary of State may, at any time by writing under his hand, waive the benefit of this section with respect to any particular invention, and the specifications, documents, and drawings, shall be thenceforth kept and dealt with in the ordinary way. (12) The communication of any invention for any improvement in instruments or munitions of war to the Secretary of State, or to any person or persons authorised by him to investigate the same or the merits thereof, shall not, nor shall anything done for the purposes of the investigation, be deemed use or publication of such invention so as to prejudice the grant or validity of any patent for the same.

Existing patents.—45 (1) The provisions of this Act relating to applications for patents and proceedings thereon shall have effect in respect only of applications made after the commencement of this Act. (2) Every patent granted before the commencement of this Act, or on an application then pending, shall remain unaffected by the provisions of this Act relating to patents binding the Crown, and to compulsory licenses. (3) In all other respects—including the amount and time of payment of fees—this Act shall extend to all patents granted before the commencement of this Act, or on applications then pending, in substitution for such enactments as would have applied thereto if this Act had not been passed. (4) All instruments relating to patents granted before the commencement of this Act required to be left or filed in the Great Seal Patent-office shall be deemed to be so left or filed if left or filed before or after the commencement of this Act in the Patent-office.

Definitions.—46. In and for the purposes of this Act, "patent" means letters patent for an invention; "patentee" means the person for the time being entitled to the benefit of a patent; "invention" means any manner of new manufacture the subject of letters patent and grant of privilege within section six of the Statute of Monopolies—that is, the Act of the twenty-first year of the reign of King James the First, chapter three, intituled "An Act concerning monopolies and dispensations with penal laws and the forfeiture thereof"—and includes an alleged invention. In Scotland "injunction" means "interdict."

(*To be continued.*)

SCREW PROPULSION.—Mr. Isherwood, in a report on the steam yacht Siesta, thus divides the work done by the engines, which are compound, 10½in. and 18in. by 18in. stroke :—

	Horse-power.	Per cent. of the net H.P.
Indicated horses-power developed by the engine	140·336508	—
Horses-power expended in working the engine, *per se*	11·943764	—
Net horses-power applied to the crank pin ..	128·329744	100·00
Horses-power absorbed by the friction of the load	9·629456	7·50
Horses-power expended in overcoming the resistance of the water to the surface of the screw blades..	11·055100	8·61
Horses-power expended in the slip of the screw	30·188774	23·51
Horses-power expended in the propulsion of a vessel	77·519414	60·38
Totals..	128·392744	100·00

LETTERS TO THE EDITOR.

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

THE STABILITY OF SHIPS.

SIR,—I see nothing to complain of in Mr. J. C. Spence's letter in your last number except that it seems to imply that the question of the thwartship position of the centre of gravity escaped my notice in the Daphne inquiry. This was not the case; I duly investigated the matter, and said in my report—or rather in a foot-note thereto—"It has been suggested that the weight of the engines largely preponderated to the port side. As a matter of fact they were almost evenly balanced." It was unnecessary to discuss the point at greater length because the want of balance was very small when viewed in relation to the probable distribution of the loose and other weights on board that did not enter into the structure of the ship, and could not be ascertained with precision.

I am at a loss to see the novelty of the suggestions made in the letter of Mr. Andrews. The curves of the metacentres and centres of buoyancy, combined with the scale of displacement for the Daphne, are given in Fig. 16 of the report, and were repeatedly used during my investigations in the manner which he describes.

Broadway Chambers, Westminster, E. J. REED.
August 31st.

SIR,—In THE ENGINEER for last week I notice a letter giving a diagram and explanation of the author's method of getting a vessel's launching stability. It is simply the ordinary metacentric diagram made in the offices of many large shipyards, and I should be sorry to believe that it is not generally known and tolerably generally used. I think, however, that Mr. Andrews does not quite grasp the whole of the requirements of the case. Sir E. J. Reed points out that such a diagram may in many instances be misleading. Taking this view of the matter, I should like to ask such of your readers as are interested in the subject for their opinion as to what is exactly required. My own opinion is that the metacentric diagram should be made for every ship, large or small: not, as now frequently done, only for vessels of either unusual size or form. With this a calculation of the vessel's centre of gravity in several conditions should be made, or it could be approximated to from data previously obtained, from heeling experiments, &c. In both cases a percentage to be added to the height so got to allow for errors, the percentage to be larger when the height has been got by indirect means. If when the points have been plotted it is found that the height of the metacentre above the centre of gravity is small compared with other ships, then a curve of stability should be made for the condition of the ship which appears defective. This when made may disclose serious dangers, such as small range, &c., as Sir E. J. Reed points out. From this curve the range and character of the curves in other conditions can be easily got. The builder will then have all the information necessary to insure a safe launch, &c. If, on the other hand, the diagram showed a good height in all the calculated conditions, then the curve of stability may be temporarily dispensed with. I say temporarily, because if made afterwards, when there is leisure, it will be a great aid to future designing. From my acquaintance with ship draughtsmen I believe that a curve of stability is generally considered by them to be a work of great difficulty, and only to be undertaken by specialists. In reply I refer such persons to the paper on "The Curves of Stability of some Mail Steamers" in the "Trans. Inst. Naval Architects," 1882, wherein they will see that the most laborious part of the work can now be done rapidly by an instrument—Amsler's integrator—and that this does not require the exercise of any unusual genius to manipulate. Even if this instrument did not exist, I may state that the ordinary method of calculation, if tedious, does not present any difficulties that patience and ordinary arithmetic cannot surmount. The price of the instrument is, I believe, £20 or less, and cannot be considered prohibitive. As to the time occupied, some particulars are given in Mr. Biles's paper, but we may assume that frequent practice would much reduce it; and even allowing that it would be perhaps safer to put such calculations into the hands of a draughtsman than into those of a lad, as suggested by Mr. Biles, the total cost of the curve would be trifling. These curves would have another good effect besides their ostensible object; they would show so clearly the defects of our present type of merchant steamer that the type would soon cease to exist, except in a very modified form. In conclusion, I beg to suggest to shipyard managers that these curves, and other similar data, would give very useful employment to their draughtsmen in slack times. The prevailing idea at present in the managerial mind seems to be that if you cannot on a few minutes' reflection think of suitable employment for a draughtsman, that you had better "sack" him at once. The objection which might be made to my suggestion is that many ship draughtsmen do not understand even the simplest calculations, and that it would be difficult to get them to learn. My answer to this is that if the advice I give were generally acted upon, the number of these ignorant individuals would rapidly diminish. We frequently hear wails about the ignorance of shipyard office staffs; is not this almost entirely due to the absence of encouragement to learn? The most obvious mode of curing the evil would be to give the required encouragement, and I think that my suggestion would do this in a very marked manner, and at the same time supply shipbuilders with the data which they now very generally lack. METACENTRE.

Jarrow-on-Tyne, September 5th.

THE DEFINITION OF FORCE.

SIR,—Referring to the two letters on this subject in your last issue, may I express a hope that Professor Smith will give us in your columns the explanation of "how to reconcile the motion-balance of bodies under opposing forces with the idea that these forces or actions are still continuously in activity as transmissions of momentum." As his definition of force involves the word momentum, or the product of mass and velocity, will he also kindly explain how he defines and measures mass without reference to force, which, of course, he must do, as force is yet to be defined.

With regard to Φ. Π., I should like to say that I am not at all so anxious to know what force is in itself—as to which, I can well imagine there may be differences of opinion—but I do want to know what sense I am to attach to the word force—or kaglenko, if your correspondent prefers that term—when I find it in a text-book. Similarly, if I am beginning to study electricity, it is essential I should know what the word implies when I find it in my text-book; but what electricity is in itself I cannot be told, for the simple reason that nobody even professes to know. I should, therefore, be satisfied with the sense of kaglenko given by Φ. Π., but as he is not, will he not give us his own, only let it be something more definite than can be gleaned from a popular dictionary.

I trust your correspondents will consider these suggestions favourably, even for their own sakes, in order that others may be able to judge of their claims. As it stands, the case would seem to be thus :—Since Tait gives two definitions and Herbert Spencer none, we may leave them out of account. We have, therefore, Newton, Whewell, Moseley, Rankine, Goodwin, Navier, Morin, and Sir Wm. Thomson—to whom I may add, from my own knowledge, Clerk-Maxwell, Clausius, Todhunter, and Everett—on the one side, and Professor R. H. Smith and Φ. Π. on the other. As Mr. Homer Wilbur puts it, "I would by no means deny the eminent respectability of these gentlemen, but I confess that in such a wrestling match I cannot help having my fears for them."

London, September 4th. STUDENT.

THE EFFECT OF PRESSURE ON ANIMAL LIFE.

SIR,—Some years ago I made a careful examination of the Falls of Niagara, including the rapids and whirlpool. When Captain Webb's death was announced in the papers, I expressed an opinion that the pressure of water due to the velocity of the current was the cause of this sad fatality, and this view was subsequently taken by the press. It would be interesting to know if any experiments have been made with a view of finding what pressure of water animal life in various forms can bear. As a preliminary experiment, I took three new laid eggs and placed them separately in an hydraulic cylinder to be tested. Two of these eggs had a diameter of 1⅝in. and a length of 2$\frac{5}{16}$in. On the pressure being applied by a force pump, they both broke at 750 lb. per square inch, giving a total pressure on their surface of about 7500 lb. to each egg. The third egg was 2½in. long by 1⅝in. diameter, and only stood a pressure of 600 lb., giving about 6300 lb. pressure over the total area. The breakages occurred circumferentially, that is about the smallest diameter. These eggs could, therefore, be lowered to a depth of over 1500ft. below the surface of the sea without fracture. These results would, of course, be influenced by the shells being more or less well filled by the contents, but in any case it is curious that an article so proverbially fragile as an egg should withstand such a great pressure. It would be interesting to make similar experiments with various kinds of fish, frogs, water rats, &c., but I am afraid the scientific results would not justify the cruelty, and the Anti-vivisection Society might have something to say on the subject. It would be possible to calculate approximately the pressure of the water at the outlet of the whirlpool at Niagara, and if anyone should be foolhardy enough to wish to repeat Captain Webb's venture, he would do well to place himself in an hydraulic cylinder with a neck bush and gland, and apply the force pump to the calculated pressure before starting. C. R. PARKES.

East Ferry-road Works, Millwall, E.
September 4th.

THE EFFICIENCY OF MARINE BOILERS.

SIR,—In order to show more fully the defects of the modern marine boiler, I enclose the indications I have lately taken on a three hours full-speed trial at sea, in one of the first-class war ships, in which the coal consumption was from five to six tons per hour. As everything was new and clean, the coals of the best description, and the furnaces worked by skilled stokers, the results, as will be seen, are far from being satisfactory. I have a large number of indications of various ships, giving results of a similar kind; so that this table will serve as an illustration of what takes place on a large scale :—

Description of coal	Nixon's navigation.
Area of fire grate	20·31 sup. feet.
Coal consumed per hour per furnace	401 lb.
" " per sup. feet of grate bar.. ..	19·74 lb.
Mean velocity of air passing into ashpit per minute	584·33
Area of ashpit mouth	302ft.
Supply of air per furnace per minute	1764·67 cubic feet.
" " lb. of coal	264
" " sup. feet of grate bar	86·83
Water evaporated per lb. of coal	8 333 at tem. of feed.
Mean force of furnace draught indicated in front of fire with door open	651·3ft. per minute.
Average temperature of boiler room forward ..	105 deg.
" " " aft	124 deg.
" " in furnace	1900 deg.
" " in middle row of tubes 18in. down at smoke-box end..	700 deg.
" " bottom row in the middle of smoke-box end ..	442 deg.
" " in the funnel between decks	800 deg.
Number of furnaces..	30
Description of doors and fire bars	Ordinary bars in 3 lengths.
Duration of trial	3 hours.

Remarks.—The temperature in the tubes varies to a very great extent, the highest rows having the best position and draught, carry the highest temperature. The bottom rows suffer most from interruption, and are the first to get stopped up with soot and dust. The same regularity of temperature does not exist in the tubes of marine boilers as in locomotives, which have a command of draught and use thicker fires. One of the faults of marine boilers is that the highest temperature is toward the surface of the water; all below the line of fire bars is out of the influence of heat. If steam be raised from all cold water, the bottom water will remain lukewarm for many hours after and never reach the boiling-point.

I trust that some of your correspondents will give us the figures of their indications, as I know of no better place than the columns of THE ENGINEER to discuss such important subjects.

Pocock-street, Blackfriars-road, W. A. MARTIN.
August 28th.

SIEMENS' REGENERATIVE FURNACES IN GAS-WORKS.

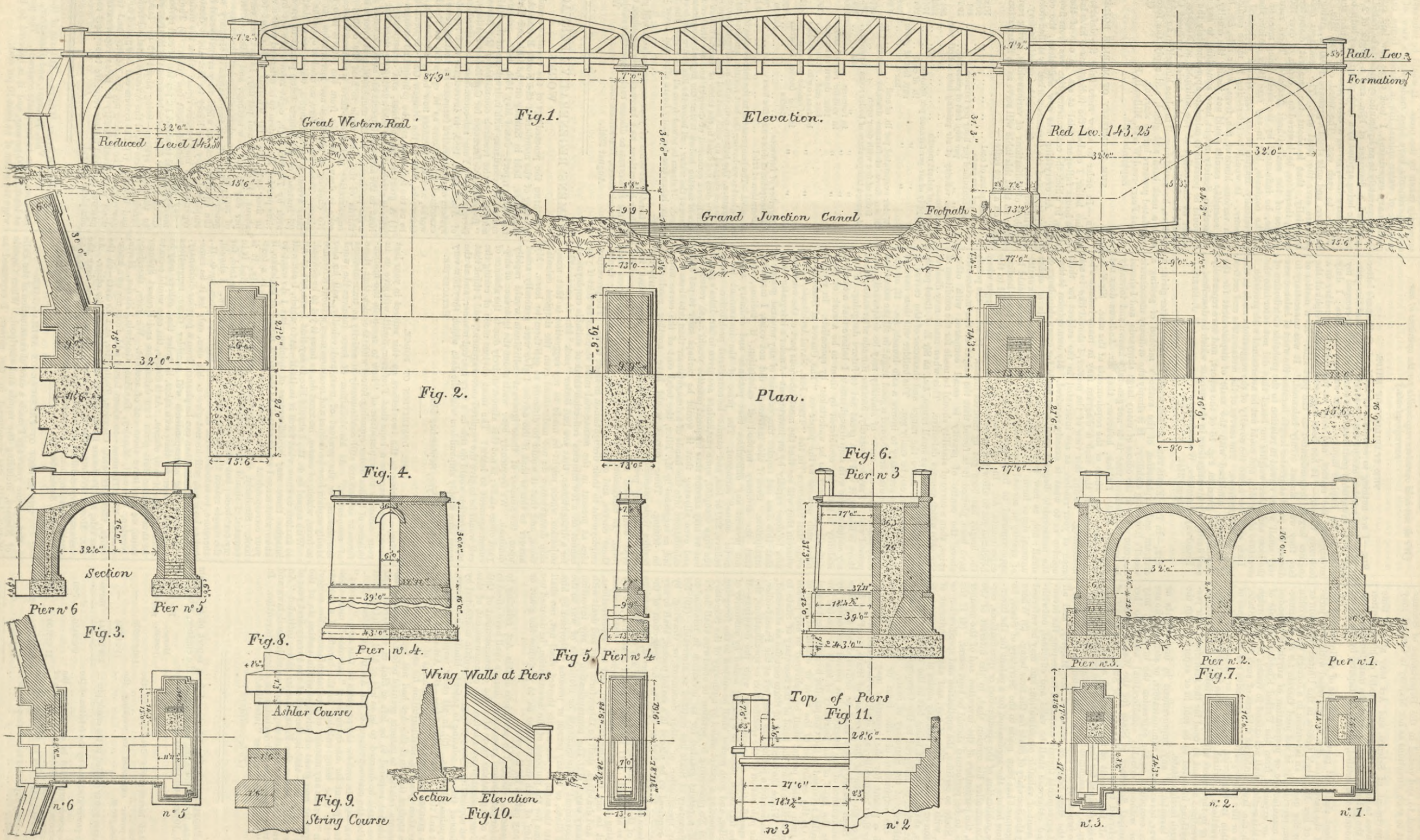
DURING the proceedings of the twenty-second annual general meeting of the members of the North British Association of Gas Managers, held in Stirling on the 19th and 20th July, 1883, the following report—dated May 15th, 1883—prepared by a sub-committee in accordance with instructions of the 10th April, 1883, and adopted by the research committee of the Association, relative to "Regenerative Furnaces for Gas Retort Settings," was read by the secretary :—"Your sub-committee, in accordance with the remit of April 10th, 1883, to investigate and report on the Siemens system of regenerative furnaces for heating retorts, have carefully examined the process as in operation at the Dalmarnock Gas-works, and the furnaces now being constructed at the Dawsholm Gasworks, both of the Glasgow Gas Corporation; and it appears to us the following are the principal advantages of the system :—(1) A great saving of heat, and consequently a saving of fuel. This is attained by so constructing the flues that they give up their heat to the air, which meets the carbonic oxide gas admitted from a gas producer. In the usual setting of retorts it takes about two-thirds of the coke made to heat the ovens; whereas with the regenerative system one-third is all that is necessary, and the hot coke is drawn directly from the retorts into the producer. (2) No choking of the flues nor incrustation on the retorts takes place. There is, therefore, no need to open the oven for cleaning; thus avoiding cold draughts, which are so destructive to retorts. (3) Instead of six retorts being placed in an oven with an 8ft. arch by 7ft. 6in. high, eight retorts are set in the same space; thus proving the system to be attended with a very great economy in floor area, &c. (4) Whereas each retort formerly carbonised about 14½ cwt. of coal per day, 18 cwt. are carbonised per retort per day in the new settings, and with no increase in the number of men, as less work is required at the furnaces, &c. (5) Retorts generally last about two seasons in ordinary working; but, from the equable heat to which they are subjected by the gaseous fuel employed, they are likely to last about double this time. The regenerators may require repair when the main arches are rebuilt—say at periods of about ten years. (6) The gain by the above means is equal to about 1s. per ton of coal carbonised. The saving effected is the difference between the interest on outlay chargeable to the new system—being about £5 per mouthpiece on a new bench of retorts—and the revenue obtained from the saving in fuel and labour. (7) The system can be applied to any moderate sized gasworks. The heating up, the resting, and the letting down are done with great facility in these regenerative furnaces, as the gaseous fuel and the air requisite to support combustion are under complete control.

THE WELSH STEEL WORKS.—At three of the great Welsh steel works, Ebbw Vale, Tredegar, and Blaenavon, notice of a month has been given to terminate contracts. The proceedings will affect at least 10,000 persons, and it is believed to be preliminary to a wage reduction of at least 10 per cent.

BRENT VIADUCT, HOUNSLOW AND METROPOLITAN RAILWAY.

MESSRS. WELLS-OWEN, AND ELWES, WESTMINSTER, ENGINEERS.

(For description see page 192.)



Sprague & Cº, 22, Martins Lane. Cannon St., E.C.

HOUNSLOW & METROPOLITAN RAILWAY, BRENT VIADUCT.

MESSRS WELLS-OWEN, & ELWES, WESTMINSTER, ENGINEERS.

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TO CORRESPONDENTS.

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

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

T. T.—*There is no book describing the Woolwich Arsenal, with its tools and appliances; but numerous detached articles on the subject have appeared in* THE ENGINEER *and various other publications.*

W. H. H.—*Your patent drawing will not be available to us for six months. We fear that you are only wasting your money, as there is not the least chance that a railway company will adopt a carriage designed by an outsider.*

J. R. E.—*There is no hot air engine which we could recommend, sufficiently powerful to drive such a pump as you speak of save at a very slow speed. As you have plenty of petroleum available, why not use a petroleum gas engine?*

BOMBAZEEN.—*Galvanised tanks are quite safe for household purposes. Indeed they are, when properly made, the very best and safest tanks that can be used. They do not favour the growth of vegetable matter as slate does, and water may be allowed to stand in them with perfect safety.*

R. W. D. (Cardiff).—*We do not know of any books from which you will get full information on the practice in the design and construction of the machinery. Besides the books mentioned, you may refer to the "Traité Complet Theorique et Pratique de la Fabrication de la Sucre, Guide Fabricant," par Charles Stammier.*

JOHN.—*The best way to set out a valve is to make a cardboard longitudinal section of it, and work it on a drawing board on which you have sketched the port face in section, and the excentric and crank shaft. The formula you send means: Multiply half the travel of the slide valve by the square root of the stroke of the piston, minus the distance travelled by the piston before the steam is cut off, divided by the stroke. From the result deduct one-half the lead; the remainder is the lap in inches, the travel of the valve equals twice the lap and twice the width of the port.*

PORTABLE ELECTRIC LAMPS.

(To the Editor of The Engineer.)

SIR,—Can any reader give me the address of a maker of portable electric lamps for the reading table? LUX.
London, September 5th.

PUNCH AND SCREW STOCKS.

(To the Editor of The Engineer.)

SIR,—I shall be obliged for the address of makers of Adams' cast steel, saddler's punch, and the patent Paragon screw stocks. A. S.
Milan, August 31st.

BORING MACHINERY.

(To the Editor of The Engineer.)

SIR,—Will any of your readers say if a boring machine can be had which will drive a tunnel 5ft. 6in. or 6ft. diameter through limestone and marl beds lying at various angles? J. H.
Burslem, September 4th.

TESTING LINSEED OIL.

(To the Editor of The Engineer.)

SIR,—Can any correspondent tell me the best way to test raw linseed oil so as to ascertain when it is mixed with other oils, and what they are, or can they recommend me a book upon this subject? DELTA.
Kingsland, September 5th.

NOISY GEARING.

(To the Editor of The Engineer.)

SIR,—In reply to your correspondent in a recent impression, I would say that sundry causes produce this effect. Among others, those enumerated may possibly be the cause:—(1) The imaginary pitch circles are far from being true circles; (2) the relative diameters of the pitch circles are not properly proportioned the one to the other; (3) the teeth of the wheels are not of the same pitch; (4) the teeth are not equally pitched, therefore are not uniform distances; (5) the curves of the teeth are incorrectly formed. Either of these faults may be the cause of the noise complained of. Supposing, for instance, that $\frac{1}{16}$th of the pitch was the inaccuracy, this would equal ·0375in.—a very sensible difference—which would cause violent shocks and vibrations beside unpleasant noise. The angular velocity of the pitch circles is about 35·25ft. per second, and is rather high for wheels with teeth of iron working against iron, unless such wheels are very accurately made, and well hung upon their shafts. The smaller of the two wheels—the pinion—would be much better if geared with wood cogs for running at that velocity. The force transmitted by the teeth is about 4370 lb., and the pressure upon each inch of the breadth of teeth is 485 lb. Gear wheels with teeth of 3in. pitch by 12in. broad, or 3½in. pitch by 11in. broad, would have been more suitable and worked much smoother. TUBAL CAIN.
August 28th.

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DEATH.

On the 2nd inst., at his residence, Cromwell House, Bexley-heath, unexpectedly, CROMWELL FLEETWOOD VARLEY, F.R.S., M.I.C.E.

THE ENGINEER.

SEPTEMBER 7, 1883.

FOREIGN COMPETITION.

IN Great Britain for some time past, it seems that a strike is always in progress, or just terminated, or about to begin. Now we hear that the men have turned out in one district, now in another. At one season of the year the bricklayers are "out," at another it is the millmen, anon the colliers strike. It might, we think, be safely said that in this country strikes are like the poor, always with us. It may be urged that there is nothing novel in this state of affairs. We admit this up to a certain point, and no further. Within the last few months a chronic national disease has assumed an aspect of extreme severity, and symptoms which long lay dormant have acquired a dangerous energy. It may be that the fever will subside, and that we shall have quiet times again; but we fear that the date of real amendment is not in the immediate future. The worst symptom is that the men appear to have lost much of that honourable spirit which at one time ruled them; they have even turned their backs on their own leaders. The sliding scale movement affords a case in point. The ironworkers bound themselves by a solemn agreement to take wages fixed by the price at which iron was sold. So long as they got augmented wages under the new system they were well content. The moment the market drooped and prices declined, they refused to be bound by the terms of their own agreement. Their proper course was to give due notice that they would terminate the agreement; instead, they proposed to tear it up. It is true that wiser and more honest counsel was accepted in some degree, but the ugly fact remains that the working man refuses to "stick to his word"

It is right that the full bearing of such an event should be understood; and both masters and men will do well to realise the true nature of the evil with which they have now to contend. A strike does a great deal of mischief no matter which side wins, and as we have already shown more than once in these pages, it is worse in all cases for the men than it is for the masters. Thus we have instances in which men, earning on the average 30s. a week, have struck for another shilling. They have remained out ten weeks, and won at the end of that time. They lost by enforced idleness 300 shillings, or £15 each, which they could not repay themselves by the rise in less than 300 weeks, or, say, about six years. This is always the way in strikes; the men always lose more than the sum in dispute many times over. The strike of miners in North Staffordshire is now practically at an end. It is calculated that it has cost £150,000. How is this to be repaid? We cite it as one recent instance out of many. The doubt and uncertainty which surround the manufacturer tell heavily against him in his business. This is indeed one of the most serious of all the bad influences exerted by strikes. Its nature, bearing, and effects have so often been pointed out that we need do no more than allude to them here; and we do this because the relations of master and man, capitalist and worker, are in this country very different from those which obtain in those countries with which we have to compete. During their recent visit to Liége, the members of the Institution of Mechanical Engineers had thrown open to them all the establishments in a great manufacturing district; and nothing struck them more than the difference which exists between the practice of the working man in Belgium and in this country. Nothing is known of a nine hour day there. Twelve hours are a regular day; fourteen hours are not unknown in some trades; and the result of careful inquiry went to show that the Belgian working man is sober, thrifty, economical, steady, patient, and trustworthy. One of the papers read was on the manufacture of zinc in Belgium. One of the largest zinc works in the world is that of Vieille Montagne, not far from Liége, and the paper in question referred particularly to that place. One of the speakers, a Belgian, said that he had been asked why it was that the Vieille Montagne Company manifested no objection to throw its works open to possible rivals, and replied that the Company did not fear any rivalry in England, because the zinc manufacture could not be made to pay there. The profits are very small in any case, and lacking men of the proper type, willing to work at small wages the zinc industry could not exist. At Vieille Montagne are to be found men who have worked there for over forty years; many of these men toil for fourteen hours a day. The great mass of the employés are old servants who have, we had almost said, grown grey in the service of the firm. They work for wages very much lower than any Englishman would accept; and they are able to do this perhaps because they have no beer bills to pay. Much the same state of affairs exists at Cockerill's at Seraing—low wages, long hours, extreme steadiness of application to work, and continuous service extending over many years. Even in the coal pits and among the colliers we find nearly the same relations between employer and employed. The contrast between all this and the relations that obtain now-a-days in Great Britain between capital and labour is very startling; it is all the more startling because we have as a nation to compete with Belgium, to say nothing of other countries working on the same plans. We do not say that long hours and low wages are good in themselves; very far from it. But we have not the least hesitation in saying that they are very much better than no work and no wages at all. And whether they are good or not, the fact remains that they exist, and that we have to compete with men who are satisfied to accept them.

We do not propose here to assert that the country is going to the dogs because Englishmen work short hours, demand high wages, and strike often. Such statements have often been made, yet we still enjoy national life. We would put the point in a somewhat different light, and say that the country has already gone to the dogs. Ruin and prosperity are relative terms. We once heard of a banker who failed, and applied to a wealthy relative for aid, stating in a pathetic and heartrending letter that he and his family were reduced "to living on offal." The wealthy one hurried to his assistance, and found him at dinner. The soup just gone, salmon before him, and lamb to follow. Yet the banker was quite sincere. In the same way £100 a year paid regularly might represent extreme prosperity to another man. It does not follow that England is reduced to penury because her men have not been and are not what they ought to be. But we do not hesitate to assert on the other hand that England would be a great deal better off now, and that less poverty and infinitely better trade would exist within her shores if her working population were more given to work steadily and less prone to striking. It is a very difficult thing to argue now that Great Britain is really prosperous. We can scarcely name a trade which is not depressed. Some, such as the silk trade, have been totally ruined by foreign competition. It is well known that we cannot grow nearly enough corn or meat to feed our population. We have to buy these things, but it is impossible to buy them if we do not work. Each strike represents a loss of so much purchasing power. If, now, wages were a little lower, and it was quite certain that men would work steadily for a few years, foreign competition would lose half its terrors; new industries would spring into existence; old industries would be revived and extended, and the country would be much more prosperous than it is. On this point we do not think there is any difference of opinion.

It is admitted by the men that a reduction in wages would extend trade. It may be asked, Why they do not act on the fact? The answer is, that in the first place they do not, as a body, care to see any extension of trade which would lead to more hands taking it up, because they argue that the larger the supply of skilled labour the lower will wages be. In the second place, they hold that the reduction in price which would augment consumption should come, not from the men, but from the masters. Our own experience, however, goes to show that neither of these opinions is the principal force in operation; this is ignorance of what is going on around them. Foreign competition is to the average English fitter, founder, shipwright, or blacksmith an empty phrase. He in no sense or way realises what it means. He holds that he is at least as good as any two men to be met with abroad. The exceptions to this rule are very few. The best possible way to deal with foreign competition is to make the working man understand what it is, and this can only be done by taking him abroad. There are certain difficulties in the way, which, however, may all be overcome by a little tact. At, say, a considerable outlay, it would be possible for every employer of labour to send half a dozen, thirty, fifty, a hundred, of his hands for a fortnight's tour in France or Belgium, or Germany. The more intelligent of the men should be selected. They could not help seeing much that would open their eyes, and put the difficulties of the employer in a new light. They would learn that there are as good workmen in the world as any that England can turn out. They would see that it is possible for a man to live and do well without beer. They would come to understand that when strikes are not of frequent occurrence, and the relations between labour and capital are steady, trade expands and flourishes. They would see, finally, that nothing but the enormous natural advantages and great wealth of Great Britain enables us now to maintain our place against foreign competition; and they would perhaps learn that if we did a little more as the foreigner, our rival, does, we should be infinitely better off in every respect than we are. Even, moreover, if all this did not follow, a sufficient return would be had for the outlay. If the excursionists returned with distinct ideas of what foreign competition means, they would quickly make their views known to their shop-mates. This is the excursion season, and it is not yet too late to act on the suggestion we have thrown out. More than once the experiment has been tried with success. We trust to see it tried yet again, on such an adequate scale as will render it not only successful, but far-reaching in its benign influence.

STEAM TRAMWAYS FOR IRELAND.

GOVERNMENT has voted a considerable sum for the construction of steam tramways in Ireland. Of course the theory is that this money is a loan, but with this we need not concern ourselves. It is right, however, that both in this country and in Ireland people should understand what the whole affair means; but it is not quite easy to arrive at any very precise facts concerning the scheme. The prominent idea put forward is that it will be a good thing for Ireland to construct steam tramways; but no one seems to have the smallest idea where the tramways in question are to be laid down, or who is to work them, or how they are to be managed. It may be argued with some point, that until the good people of Ireland were sure that they could obtain funds to make the tramways, it was quite useless to get out any definite plans. But it might be argued with equal force that it was useless and even irregular to lend money for the carrying out of utterly inchoate projects. We presume that in a little time definite schemes will be put forward; and already we have heard some expressions of Irish opinion as to what should be done with the money. The term "steam tramway" has, rightly or wrongly, come to be applied to a line of railway laid on a highway or street, and worked by engines which are suffered to emit neither steam nor smoke. But it appears

that the steam tramways to be made in Ireland are not precisely this. It is contemplated to construct light, narrow gauge, railways worked by locomotives more or less of the ordinary type. These railways will, it is stated, in some cases be laid on the high road, but in others they will take to the fields like any other lines.

We do not suppose that much thought will be given as to whether these lines will pay or not. Indeed, we may predict with perfect safety that they will not, at least in the present generation. It is more to the purpose to consider how far they will be useful. Their construction will give some employment for a time; but it is to be supposed that a better return than this is anticipated from the outlay of much money. Now it is not too much to say that a steam tramway pure and simple will be of no service whatever outside any of the large towns, such as Belfast, Dublin, or Cork. On a steam tramway we have one, or at most two, passenger cars hauled by a locomotive; such a train would be utterly useless in any of the country parts of Ireland. The number of passengers would be small out of all proportion to the means which must be provided for carrying them. It has recently been suggested that in the wild west such lines would be useful for carrying tourists, who would do Ireland good. In this way some traffic might be obtained for a couple of summer months. During the remainder of the year the lines would be closed. Surely in this case the game would not be worth the candle. Let us, therefore, reject at once the steam tramway theory; call spades spades, and not agricultural implements, and say that it is intended to construct certain light railways in Ireland. Such roads are capable of conveying not only passengers, but grain, cattle, sheep, pigs, manure, roots, and dairy produce. But it is quite clear that such lines cannot to any extent utilize the high roads. In the first place, they would practically render the roads useless for other purposes; and in the second the roads would be found, as a rule, far too steep and too crooked for the intended object. Consequently the railways would have, as we have said, to take to the fields; but if this is done, the land will have to be paid for. In Ireland, of all places under the sun, it is most difficult to get land for such a purpose without paying a long price for it. Now if the land has to be bought, we shall be under the mark if we say that a light railway properly equipped will not cost less than £4000 per mile, and this being the case, the sum available can do little or nothing towards extending facilities for intercommunication.

The value of the proposed railways seems to us to depend wholly on the service they can render to the peasantry, and this will again depend on the multiplicity of lines. That is to say, that unless the light railways are formed in every district—we had almost said in every parish—they cannot really prove of much permanent benefit. But it is clear that to provide railways of any kind in such abundance would require an outlay of a great many millions. It remains to be proved that the construction of a few lines can confer any permanent benefit whatever on the country. It is evident that to a very considerable extent the existing railways might be made to give some of the advantages which the proposed lines are intended to secure. Thus, for example, the distance between Kildare and Athy, on the Great Southern and Western Railway of Ireland, is about fifteen miles. Athy is an excellent market town, in which, besides, important fairs are held. The farmers, however, living on a strip of ground, say, six miles wide and fifteen miles long, traversed up the middle by the railway, derive no advantage from it whatever. Thus we have 90 square miles of country in close proximity to a railway which is entirely useless to it. Now, if the stations were made on this line at distances of three miles apart, then it is evident that any farmer who did not live more than three miles away from the railway in a direct line would always be within four miles of a station, and could then avail himself of the trains to transmit himself or his produce to either Athy or Kildare. The same statement holds good of the whole line. Let stations be constructed on it in sufficient abundance, and we should at once have a strip of territory representing hundreds of square miles blessed with all the advantages which a railway can possibly confer. It may be said that this could not be done; that a train stopping at all these stations would interfere with the traffic. Those who know what the traffic is on Irish railways will laugh at this notion. Let the suggestion that stations be multiplied, be made to the directors of the Great Southern and Western or the Midland Great Western of Ireland, and they will reply that it would be absurd to open such stations because no one would use them; and it is to be taken for granted that these gentlemen know pretty well what they are about. It will be found in Ireland essential to the success of a railway that it must carry at a very cheap rate. We do not mean to measure its success by dividends. Such light railroads as the friends of Ireland wish to see constructed can only prove successful if they are used. But a very moderate tariff will suffice in a poor country to render a railway or other mode of transport wholly unpopular. The railways of the United States serve a comparatively rich country and a wealthy peasantry. But it is well known that they are compelled to carry grain at absurdly low rates or they would not get any business. Furthermore, the agricultural produce of the country would not bear a high tariff, and unless the railways could rest content with a low one, the wilderness would never have been cleared, populated, and civilised as it has been. In Ireland little or no importance has ever been attached to time, and the average peasant would much rather trudge six or eight miles beside his horse hauling a ton of grain behind him, than pay a couple of shillings for the conveyance of the same weight by rail. The light railways of Ireland to be of service must be "poor men's roads." If they are aught else they will be dismal failures.

The most important point for discussion at the present moment is the locality or localities in which the first of the light railroads are to be constructed. If these should prove successful there can be little doubt that Parliament would provide additional funds—in short, any money that might be wanted to make others. But it will be far more difficult to decide the point than may appear at first sight. There will be thousands of applicants for the money. There is not a parish in Ireland which would not be glad to have a line or even twenty lines made in it, wholly regardless of the future; but it is to be supposed that some sort of judgment will be exercised, and that a selection will have to be made. Nothing can be more troublesome than such a task. If the neighbourhood of a large town be selected, then no fair trial will be given to the scheme. If, on the other hand, a country district be taken, then transshipment of goods on to a main line railway will be necessary. Time must be left to develope matters; meanwhile we may be permitted to question whether Ireland really wants such light railways at all. To put it in another way, can such railways do a country, already well provided with roads and main trunk lines of rail, any good? We fear that the answer must be in the negative. Save in opening up new countries, quite unprovided with roads, light railways have not been usually successful, or even moderately satisfactory. It is doubtful if small scale railways can ever be made to provide adequately for the wants of any country, advanced beyond the very first elements of civilisation. If they succeed in adding materially to the wealth and prosperity of Ireland, they will do more than they have ever done before. We are, however, far from deprecating the carrying out of the idea. The money has been made available, and thus the means are provided for trying a very interesting experiment. It will be a great pity, however, if the experiment is deprived of every chance of success by the incompetence of those entrusted with the spending of the money. The greatest care must be taken to make the new means of intercommunication extremely popular; and this can only be done by consulting the wishes of the agriculturists themselves. Under no circumstances will it do to entrust the laying out of routes to engineers alone. These gentlemen, in their desire to do what is constructively right may do what is politically wrong. It must not be forgotten for a moment that the proposed lines must not be expected to pay. That is wholly a secondary consideration. They are to get traffic, no matter how. If they do not get traffic they will be as utterly useless as were miles and miles of highways and thousands of acres of drainage works carried out in 1847-8 and '9, to provide employment and improve the country. It remains to be seen whether men can be found who will really administer the fund to advantage. They will have almost inconceivable difficulties to contend with. It is not easy to make a thing popular which no one particularly wants.

THE WATER SUPPLY OF NEW YORK CITY.

NEW YORK, confident that the Croton aqueduct would meet every demand that would be made upon it, learned at an early period that economy in the use of water was unnecessary. The growth of the demand has, however, become greater than the supply could keep pace with, and for some time back New York has wanted water. Various schemes for augmenting the supply have been discussed; that which at present meets with most favour has been prepared by Mr. Isaac Newton, chief engineer to the Croton works. It contemplates the promotion of a new reservoir by the construction of a dam at the lowest point in the Croton Valley at "Quaker Bridge," the reservoir to have an area of 3635 acres, the water level to be nearly 34ft. above that of the present Croton dam. The additional watershed thus utilised would be twenty-three square miles, and the estimated daily increase of water over the present supply would be about 20,000,000 gallons, making a minimum supply for the city of 250,000,000 gallons. The total cost of the dam, land damages, and the new aqueduct, 31·89 miles long, circular, and 12ft. diameter, will be as estimated about £2,900,000; but other outside estimates put the cost at £6,000,000, and it is asserted that its construction will be attended with serious danger; that its success is problematical; that the only sure thing about it is the enormous load of debt which it will entail upon a city now overloaded with indebtedness; and that any one of the other suggested plans would be better, far cheaper, quicker in furnishing the required water supply, and equally effective for permanent use. The other plans contemplate the building of a dam and the formation of a reservoir at the lowest available point on the Croton River, and in the Croton Valley. A second proposition is to dam the east branch of the Croton at Brewster's Station. The third plan is the construction of two aqueducts, one below the present Croton dam and another above the dam, the object being to add to the present means of delivering the present storage supply, and to increase the supply from sources not now utilised. What may be considered a fourth proposition was made by a member of the Board, who suggested the building of a temporary flume of wood, 4ft. in cross section, from the present Croton dam to the city. One of the principal existing difficulties is that the Croton aqueduct will not carry enough water, so that in effect the total available supply is not utilised. Energetic efforts have from time to time been made to induce the inhabitants of New York to practise economy in the use of water; hitherto without avail.

THE IRON TRADE AND THE WIRE-GAUGE.

THE new standard wire gauge adopted by the Board of Trade—particulars of which will be found on another page—and legalised by the recent Order in Council, is strongly condemned by those ironmasters who are largely engaged in the making of sheets. Their singles, doubles, and trebles mean various thicknesses, determined mainly by the Birmingham wire gauge. Worked out with a view to their application to the iron trade, the new denominations of standards set forth in the schedule appended to the Order in Council place the sheet-makers at a disadvantage to the extent of, speaking broadly, one gauge in the scales by which the foregoing thicknesses are severally determined. What would be 20-gauge under the new standard is nearly 21 under the old; 24 is thinner than the existing 25; 27 is the present 28; and 28 is the subsisting 29 (bare). The orthodox difference in price between singles, doubles, and trebles is 30s. in each case; but modern competition has made the rule of but exceptional observance. Nevertheless the difference of one gauge should, even now, by turning a double into a single, or a treble into a double, prejudice the sheet maker to the extent of from 10s. to 30s. per ton; and that which is true of the sheet maker is true likewise of the galvaniser, who in his turn sells the galvanised sheet by a like varying scale. It is too much to suppose that when, in March next, the new standard comes into enforced observance, buyers of ungalvanised and of galvanised sheets alike will not demand all the benefit of the new denominations of standards. In anticipation of this the sheet makers who were assembled upon 'Change in Wolverhampton on Wednesday advised that concurrently with the coming into operation of the new scale, it shall be the custom of the iron trade to determine the sheet scales by the weight of the sheet per superficial inch. The sheet would then, as now, be higher or lower in price, according as the iron was thinner or thicker, and the threatened loss might be averted. There is no maker of sheet iron at the Board of Trade.

DEEPENING RIVERS.

IT is well known that the Mississippi River gives a great deal of trouble, and it would appear that the losses and dangers incurred by floods are augmenting. We have long since pointed out in these pages that the proper way to prevent floods from doing harm is to lower the beds of the rivers instead of building embankments. American engineers begin at last to realise the fact that this theory is sound, and a scheme for lowering the bed of the great river is now being discussed. Mr. Erkson proposes the use of barges or deep-water boats from 500ft. to 600ft. long, so constructed as to be capable of being sunk and anchored to the bottom of the river, so as to create strong currents, and thus cut away bars or cut off bends, and give a uniformity of current to the stream. The upper portion of the barges deflects the top or surface current of the river, and assists it in carrying off the obstructive matter which is raised. The barges can be taken up, it is said, and removed in two hours to some other place, or their positions can be entirely changed in a much shorter space of time, and by their use Mr. Erkson holds that rivers and bars can be ploughed to a depth of 30ft. According to an American contemporary, this scheme has met with the approval of the United States Corps of Engineers. The idea is very ingenious, how far it is practicable must depend mainly on the river. There are, however, many places in which the use of movable obstructions would no doubt prove useful in causing the automatic modifications of river beds, and we commend Mr. Erkson's scheme to the attention of our readers without claiming more for it than that it is worth consideration and investigation. As regards the Mississippi, something must be done very soon. It is stated by the ablest and best informed engineers, that in a comparatively short space of time the Crescent City will be practically stranded, high and dry, thirty miles from the river, by its breaking through into Lake Ponchartrain; and Vicksburgh and Greenville will each be twenty miles distant from the river bank. From Greenville to Memphis, the majority, if not all, of the plantations and villages will within twenty years be ruined. Within a shorter time Fort Randolph is in danger of being left fifteen miles from the river bank. The towns and plantations in the vicinage of Island No. 10 are in great danger of being destroyed, and Cairo, some engineers tell us, will shortly become a town on the Ohio River, twenty miles from the Mississippi. Even St. Louis, strange as it may seem, is in no little danger.

BRIDGING OVER THE STRAITS OF MESSINA.

ATTENTION is called by the *Rheinisch Westfälische Zeitung* to a proposal of Signor A. Giambastiani for erecting a bridge over the Straits of Messina, instead of piercing the tunnel which has been for some time under discussion in Italy. His experience in designing bridges of extensive span has been, it is said, of a varied character, and he was chief engineer in the construction of the Italian approaches to the St. Gothard Tunnel. He proposes to have five openings, the three middle to be each 1100 yards in length, and the two side openings to be each half that length. The pillars are to be of granite, and the openings will be spanned by arched girders of steel, the rise of which is designed to be one-tenth of the width of the arch. Signor Giambastiani intends, it is said, to perfect his design in accordance with the detailed local investigations he proposes to make, and then to place it before the Italian Minister of Public Works. With reference to this scheme, Herr Cottrau, director of the "*Impresa Industriale Italiana*," has called attention to the fact that the idea is not new, as he made studies for the same purpose in 1866. He had proposed openings of 650 to 875 yards, but after careful examination had arrived at the conclusion that the secure placing in position of solid pillars in the Straits of Messina was either impossible, or only practicable by means of an expenditure out of proportion with the results to be obtained. He founded this opinion on his investigations respecting the depth of the channel and the force of the current, and it was for this reason that the matter was then abandoned.

LITERATURE.

A Practical Treatise on the Strength of Materials, including their Elasticity and Resistance to Impact. By THOS. BOX. 8vo., 525 pp. London: E. and F. N. Spon. 1883.

BY the publication of this book Mr. Box has laid engineers under another obligation. They are already indebted to him for his treatises on heat, on mill gearing, and on hydraulics, and there is no writer who so thoroughly deserves to be allowed to style his books "practical," for he completely realises the requirements of the engineer daily engaged in the design and execution of work. His books are essentially practical because they deal theoretically with questions as they occur in practice, with a directness and simplicity which appeal to those practically engaged. This new book before us is in reality much more than its title declares it to be, for it is on the strength of materials and the stresses thrown upon them in their applications. Thus, for example, in the case of girders, the strength of the materials usually employed in such structures is given, accompanied by clearly-worded descriptions of the simplest methods of finding the stresses on their different parts. With other applications the same treatment is observed.

The book is divided into twenty-three chapters and an appendix, which have respectively the following titles:—Tensile Strain, Rivetted Joints, Cohesion Applied to Pipes, Strength of Chain, Ropes, &c., Shearing Strain, Crushing Strain, Strength of Pillars, Connection of Pillars with Transverse Strains, Wrinkling Strain, Transverse Strain, On Similar Beams, Connection of Transverse and other Strains, Roofs, Torsional Strain, Extension and Compression, Deflection of Beams, Torsional Elasticity, Modulus of Elasticity, Permanent Set, Impact, Collapse of Tubes, Factor of Safety, and Fatigue of Materials. This enumeration gives some idea of the scope of the book. In dealing with the effect of stress of the different kinds, the author's descriptions are illustrated by clearly executed litho-

graph diagrams. These, as well as all the diagrams employed, are placed on sheets at the end of the book, an arrangement which affords considerable facility of making up for the printer and publisher, but which is not so convenient for the reader as when the diagrams are placed near the text dealing with them. This arrangement has, however, been adopted in all Mr. Box's books, from which it may be concluded that he has some grounds for choice in this matter. It is noticeable that the sources of most of the experimental data on the strength and behaviour of iron and steel under stress, used by the author, are the published records of the experiments of Hodgkinson, E. Clarke, Fairbairn, and Kirkaldy, while the more recent experiments carried out by Professor Kennedy under the auspices of the Institution of Mechanical Engineers, and reduced by Professor Unwin, are little referred to. There may, perhaps, be nothing to choose between the experimental data obtained by Mr. Kirkaldy and Professor Kennedy, but the results carefully extracted from experiments with the most modern testing apparatus, and with the modern materials, would probably commend themselves to engineers in preference to those obtained by Hodgkinson with less perfect apparatus, especially as relates to the very minute quantities involved in a discussion of the question of permanent set.

In dealing with rivetted joints Mr. Box makes special reference to the difference in the proper diameters of rivets for boiler and girder work, and shows that as the pitch in boiler work must bear a relation to the steam pressure to be employed, the diameter of the rivets must be reduced as the pressure is increased. Mr. Box is, however, not quite right here, close pitching is used to make tight joints, but in best workmanship it is unnecessary. Thus, Mr. Stroudley has recently augmented and increased the pitch of his rivets in locomotive boiler work, and has succeeded in getting a strength of 82 per cent. in double rivetted plates, instead of the more usual 76 per cent. With reference to the size of rivets it is noticeable that from practice both Mr. Box and Professor Unwin give simple rules for the diameter of rivets, the diameter, according to Mr. Box's rule for iron plates—namely, $d = (t \times 1{\cdot}25) + {\cdot}1875$ being for a plate 0·375in. in thickness—is 0·656in., while from Professor Unwin's rule $d = 1{\cdot}2\sqrt{t}$, the diameter is 0·73. The tables given by both authors differ to the same extent, and both refer to boilers, Mr. Box to boilers under about 50 lb. pressure. On the strength of girders, beams, roof trusses, and similar structures, Mr. Box has expended a good deal of labour, in order to reduce to the simplest possible form the calculations necessary to arrive at the required sectional areas. He never uses a dozen words when six will suffice, and hence the reader finds it necessary to follow him with close attention.

In his experimental data on permanent set and deflection, Mr. Box refers extensively to Hodgkinson and Fairbairn, and gives some original figures, and we should have been glad to have seen some more from the source of the last mentioned. On deflection the older experiments may be allowed to afford satisfactory information, but on permanent set he should have looked for some of the measurements taken by means of modern first-class rigid testing machines, by which alone such minute quantities as the $\frac{4}{1000000}$ of length of a test piece can be measured. Hodgkinson's experiments showed, indeed, what has been much more accurately observed of late, namely, that the lower strains were attended with considerable set, but his means of measuring such small quantities were not sufficiently exact to permit the measurement with rigid accuracy, and hence the sets he obtained under the smaller strains were far from uniform, and appeared anomalous. Practically it may remain true that these very small sets which take place within what becomes, after the test piece has been most severely tested, the limit of elastic extension, are quite unimportant, but if they are to be referred to at all, the most trustworthy measurements should form the basis of their consideration.

The chapter on impact is characterised by Mr. Box's essentially utilitarian mode of treating any theoretical problem. He first surveys the problem, conceives its solution to depend on certain bases, builds a formula on these, then tests it by practical application. The chapter is a useful one, and though some of our readers may quarrel with the way in which the author uses the word force, engineers will find in it something which many have looked for in vain elsewhere, though Whewell, Mosely, and Willis have well treated the subject. In the chapter on collapse of tubes the author does not get beyond Fairbairn, though he makes new use of some of his experimental data, and especially with respect to oval flues; but all his readers will not agree with him in his approbation of the flat ring for strengthening a flue tube, the ring being bent edgeways, so that its width is in a radial plane instead of forming part of a cylinder. Reference is more especially made to it as applied to a flue made slightly oval; but in practice this form of support is not found to prevent collapse. There is a great deal in this book which it would be interesting to dwell upon; but its subjects are so numerous that we must refer our readers to the volume itself, with which we may with confidence say they will be well satisfied.

BOOKS RECEIVED.

Donaldson's Poncelet Turbine and Water-pressure Engine and Pump; prefaced by a short Treatise on the Impulsive Action of Inelastic Fluids. By William Donaldson, M.I.C.E. London: E. and F. N. Spon. 1883.

The Modern Applications of Electricity. By E. Hospitalier. Translated and enlarged by Julius Maier, Ph.D. Second Edition; revised. Vol. i. London: Kegan Paul and Co. 1883.

Philipp Reis, Inventor of the Telephone; a Biographical Sketch. By Sylvanus P. Thompson, B.A., D.Sc. London: E. and F. N. Spon. 1883.

Principles of Mechanics. By T. M. Goodeve, M.A. New edition; re-written and enlarged. London: Longmans, Green, and Co. 1883.

Accented Five-figure Logarithms of Numbers, from 1 to 99,999, without References. Arranged and accented by Lowis D'A. Jackson. London: W. H. Allen and Co. 1883.

Royal Cornwall Polytechnic Society. Fiftieth and Jubilee Report for 1882. Falmouth: Lake and Co.

CROMWELL FLEETWOOD VARLEY.

CROMWELL FLEETWOOD VARLEY, the electrician, died last Sunday night at his residence at Bexley Heath, Kent, from general exhaustion of the system. He has left a great mark in the development of the electric telegraph, and in various other branches of science. On his mother's side of his family he was related to Oliver Cromwell, through Cromwell's daughter who married General Fleetwood, and his family are among the nearest surviving relatives of the Protector. He was born at Westminster on the 6th of April, 1828. His father, the late Cornelius Varley, also a man of science and an artist, was a chief pioneer of the school of water-colour painting in this country, and the actual originator of the Old Water-colour Society; he likewise invented the graphic telescope, ground the first diamond lens, and was noted for his improvements in and researches with the microscope. Cornelius Varley was well known in the London scientific world; he worked actively in the management of the Society of Arts, was one of the founders of the Microscopic Society, and delivered one of the first Friday evening lectures at the Royal Institution. John Varley, the uncle of Cromwell Varley, worked with his brother as a pioneer of English water-colour painting, and was a close friend of Blake, the painter; he would sit for hours with Blake listening to his descriptions of his waking visions, in which he had great faith, and exerting himself to place them graphically upon paper. Gilchrist's life of Blake contains interesting particulars in relation to this matter. Inventive genius runs in the family. Cromwell Varley's brother Frederick invented the flexible carbons for arc lights recently described in these pages, and another brother, Mr. S. A. Varley, has done his share in developing the dynamo machine, as recently narrated by Professor Tyndall at the Royal Institution.

In his younger days Cromwell Varley led an active life; he was of strong frame, and excelled in swimming, which enabled him to save two or three lives, for which the Royal Humane Society gave him a testimonial. In the early days of telegraphy he began to devote his life to the engineering branch of that science, and one of his first original feats was to devise a method of locating distant faults in land wires, which attracted the special attention of the directors, among whom were William Fothergill Cook, Robert Stephenson, and General Wyld. One discovery after another was made by him, until he finally became chief engineer and electrician to the Electric and International Telegraph Company, in which position he remained until the telegraphs were taken over by the Government. His inventions and discoveries have been so numerous that but a few can be mentioned here. His patents date from August, 1854, to the present year. Prominent among his early inventions was an apparatus for transmitting electrical signals, the chief points of which were a double current key and a polarised relay, the negative current being employed for the first time not only to discharge the line, but acting on a polarised relay instead of a spring, increased the sensitiveness and trustworthiness of the relay so much that it became practicable for the first time to work from London to Edinburgh direct, a feat previously impossible in the then existing conditions of insulation. Polarised relays and double current keys of modified form are in use to this day. Extending his researches further, the system of using a negative current to eliminate the absorbed charge in submarine cables enabled a higher rate of signalling to be obtained, and communication between London and continental towns by relaying the current was established for the first time. This system forms the groundwork of all modern methods of signalling through submarine cables.

Cromwell Varley was associated with Robert Stephenson, Sir William Fairbairn, and others in devising the first successful Atlantic cable, the earliest one having failed from faults both in construction and design. He read a paper before the Institute of Civil Engineers, in which he gave the dimensions of the copper core and the gutta-percha dielectric, from which he calculated that a speed of fifteen words a minute would be obtainable; he was able to do this in consequence of having constructed an artificial line, consisting of a series of fine German silver resistances, to which at regular distances were attached induction plates or condensers made of alternate sheets of varnished paper and tinfoil, whereby he reproduced the phenomena of the inductive absorption and retardation of any projected cable the electrical properties of which it was desired to know beforehand. With this apparatus, during the time of the construction of the actual Atlantic cable, he was continually experimenting. This apparatus he exhibited at work one evening in public during his lecture at the Royal Institution on submarine telegraphy; he arranged it as a submarine cable from England to South Australia, putting in reflecting galvanometers at imaginary stations at the distances of Gibraltar, Suez, Aden, Bombay, Point de Galle, and so on. The galvanometers were placed in front of the lecture table one above the other, so that when at rest they threw a vertical row of spots upon the screen behind, a feat requiring in itself no mean skill in adjustment; in fact it was a delicate experiment to attempt to perform at all before an audience. When the current was sent, Gibraltar received it almost instantly, Suez shortly after, but it was a long time in reaching Australia, and then produced but a slight deflection, thus powerfully disabusing the minds of non-technical observers of preconceived ideas as to the speed of electricity. He took occasion to remark that the speed of electricity varies with the inductive condition of every wire used, and that Wheatstone's solitary experiment as to the speed of electricity, so often quoted in school-books and text-books of the last generation, is altogether untrustworthy. One evening during a walk from Beckenham to Bromley he conceived the idea that under certain conditions an infinitely small charge of electricity might be increased to an infinitely large one, and on his return, by means of two insulated kitchen saucepans and an intermediate carrier, he succeeded in getting a strong spark from an original feeble charge produced by rubbing a stick of sealing-wax. The details were published in these pages some years ago. This led to his construction of a machine which was exhibited in the great Exhibition of 1861, the simple rotation of which machine produced powerful electrical effects. Sir William Thomson afterwards used this principle in his "multiplier," which has been found useful in various electrical instruments, and it is the foundation of the now popular Holtz's electrical machine. One of his inventions of more philosophical than practical use, partly because of out-of-doors conditions of insulation, was a kind of singing or humming telegraph; an iron wire about 4ft. long was strained over a kind of fiddle case, and near its centre was surrounded by an insulated coil of wire which did not touch it; the sending instrument was a vibrating tuning-fork, which threw as many pulsations of electricity into the line wire per second as corresponded with rate of harmonic vibration of the stretched wire in the receiving instrument, which therefore set up a humming noise when the current passed. Other receiving and sending instruments had other rates of vibration, so that when all were connected with one line wire, each receiving instrument would respond to its own sending instrument and no other, and in his experiments at Fleetwood House, Beckenham, which was built by him, the instruments were humming away like humble bees possessed of deep rich bass voices. He managed to get five or six messages through one wire at the same time with his apparatus. He and Sir William Thomson invented the curb key for sending impulses through long cables, and leaving the cable in a neutral state after the first impulse had produced the desired signal on Sir William Thomson's reflecting galvanometer at the other end. This was done by sending five or six positive and negative impulses into the cable, most of which subsequently neutralised each other, and left the cable ready for the reception of a new signal. In his evidence before the House of Commons Committee on Submarine Telegraphs, Sir William Thomson bore testimony to the perfection to which he had brought cable testing by the aid of the use of good resistance coils, the want of which had been felt by Sir William during the part he took on board one of the ships in the first Atlantic telegraphic venture. Mr. Latimer Clark was the first to lay down pneumatic pipes for the conveyance of written messages over short distances in the City; Mr. Varley improved and expanded the system, adding to it some ingenious apparatus by which the carrier would open the door and let itself out at the end of the journey, instead of leaving this to be done by the assistant in charge, whose time and attention were to that extent liberated.

Cromwell Varley never wrote a book, although he had one in hand consisting of tables of figures, the result of elaborate calculation, for the use of electricians. Edward Fournier, one of his assistants who was versed in mathematics, helped him in the routine work; but he also has departed this life, so whether the work is far enough advanced for the scientific world to reap the benefit is a question. Also, during the latter part of his life, Mr. Varley from ill health was only able to attend intermittently to scientific pursuits, and unfinished pieces of apparatus are in existence, to the meaning of which perhaps only the more developed telegraphy of the future may be able to furnish the key. His own records of his discoveries will be found chiefly in the Patent-office, in the "Philosophical Transactions" of the Royal Society, and in the proceedings of various other scientific bodies. His health had been failing for a long time. During the autumn of last year he was travelling in Switzerland and southern Europe, and returned strengthened somewhat in health, but afterwards gradually declined, and never again left his home at Bexley Heath for any lengthened period. His death was unexpected, for he was out of doors last Saturday, and had been much as usual throughout Sunday. At night, however, he was too feeble to walk to his bed, and while temporarily supported before the fire on cushions he quietly and peacefully breathed his last, apparently without pain. He leaves behind him a widow and two sons and two daughters to mourn his loss. His funeral was appointed for yesterday at the church at Bexley Heath, consequently before these lines reach the public eye the interment of his remains will have taken place.

THE NEW STANDARD WIRE GAUGE.

THE following is the recent Order in Council legalising the new standard wire gauge. It was given at the Court at Osborne House, Isle of Wight, on the 23rd ult.:—"Whereas, by 'the Weights and Measures Act, 1878,' it is—among other things—provided that the Board of Trade shall from time to time cause such new denominations of Standards, being either equivalent to or multiples or aliquot parts of the imperial weights and measures ascertained by the said Act, as appear to them to be required in addition to those mentioned in the Second Schedule to the said Act, to be made and duly verified, and that those new denominations of Standards, when approved by her Majesty in Council, shall be Board of Trade Standards in like manner as if they were mentioned in the said Schedule:

"And whereas it has been made to appear to the Board of Trade that the new denominations of Standards set forth in the Schedule hereto, being equivalent to or multiples or aliquot parts of the imperial measure of an inch ascertained by the said Act, are required, in addition to the denominations of Standards mentioned in the Second Schedule to the said Act:

"And whereas they have caused the said new denominations of Standards to be made and duly verified:

"Now, therefore, her Majesty, by virtue of the power vested in her by the said Act, by and with the advice of her Privy Council, is pleased to approve the several denominations of Standards set forth in the Schedule hereto as new denominations of standards, and doth direct that the same, on and after the first day of March, 1884, be Board of Trade Standards in like manner as if they were mentioned in the Second Schedule to 'the Weights and Measures Act, 1878.'" C. L. PEEL.

SCHEDULE.

Denominations of Standards.

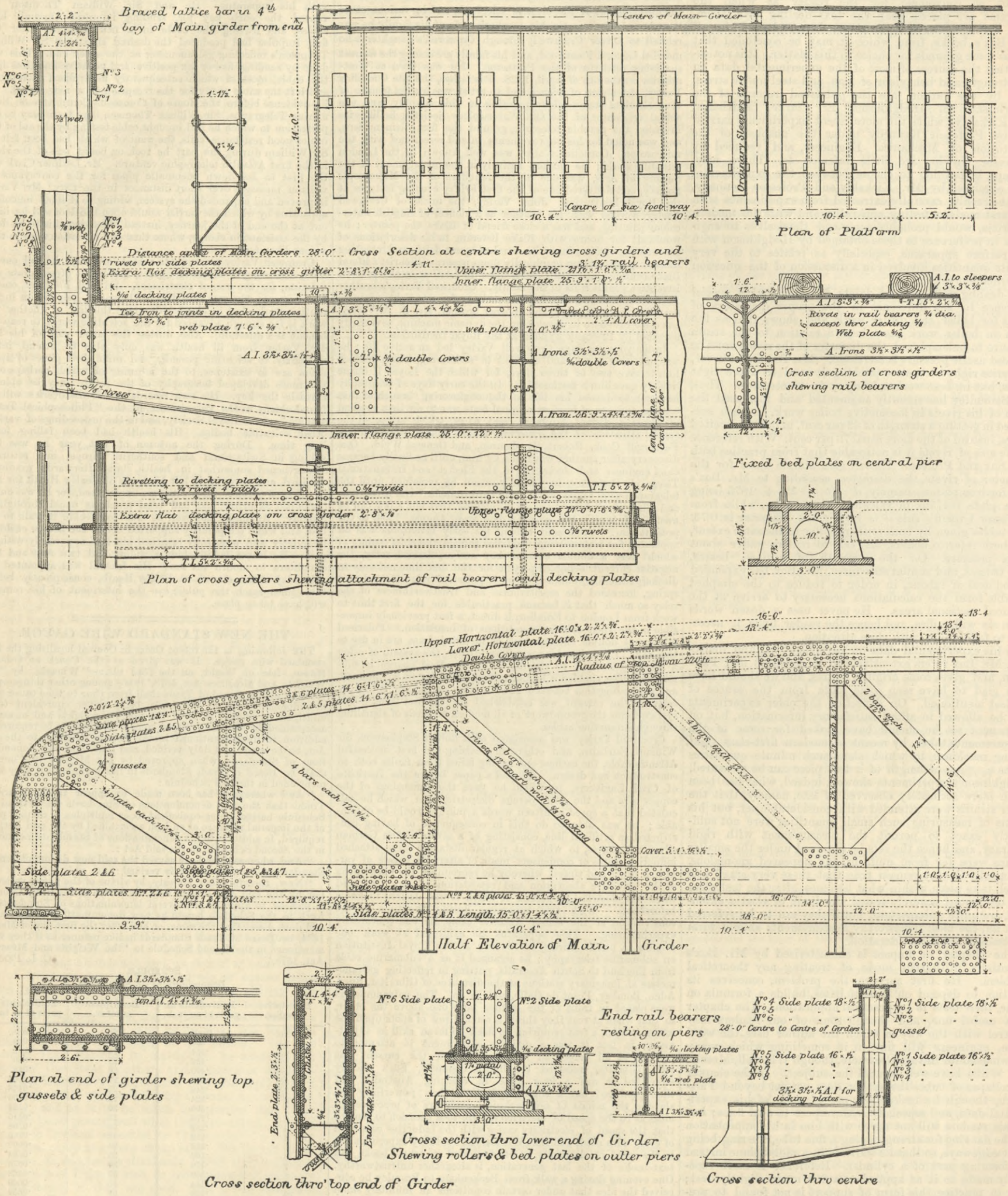
Descriptive number.	Equivalents in parts of an inch.	Descriptive number.	Equivalents in parts of an inch.
No.	Inch.	No.	Inch.
7/0	·500	23	·024
6/0	·464	24	·022
5/0	·432	25	·020
4/0	·400	26	·018
3/0	·372	27	·0164
2/0	·348	28	·0148
0	·324	29	·0136
1	·300	30	·0124
2	·276	31	·0116
3	·252	32	·0108
4	·232	33	·0100
5	·212	34	·0092
6	·192	35	·0084
7	·176	36	·0076
8	·160	37	·0068
9	·144	38	·0060
10	·128	39	·0052
11	·116	40	·0048
12	·104	41	·0044
13	·092	42	·0040
14	·080	43	·0036
15	·072	44	·0032
16	·064	45	·0028
17	·056	46	·0024
18	·048	47	·0020
19	·040	48	·0016
20	·036	49	·0012
21	·032	50	·0010
22	·028		

The *British Trade Journal* points out that on and after March 1st next no other wire gauge can therefore be used in trade in this country—that is to say, no contracts or dealings can be legally enforced which are made by any other sizes than those above given. All wire drawers and users of the Birmingham wire gauge would do well, therefore, to provide themselves with gauge plates corresponding to the above sizes.

A TESTIMONIAL was presented to Mr. G. J. Snelus, general manager of the West Cumberland Iron and Steel Works, on Saturday, the 25th August, by the departmental managers, clerks, and workmen. In the course of the speech which he made in returning thanks, he suggested the construction of a line of railway direct from the coke-producing district of Durham to West Cumberland.

BRENT VIADUCT, HOUNSLOW AND METROPOLITAN RAILWAY.

MESSRS. WELLS-OWEN AND ELWES, WESTMINSTER, ENGINEERS.



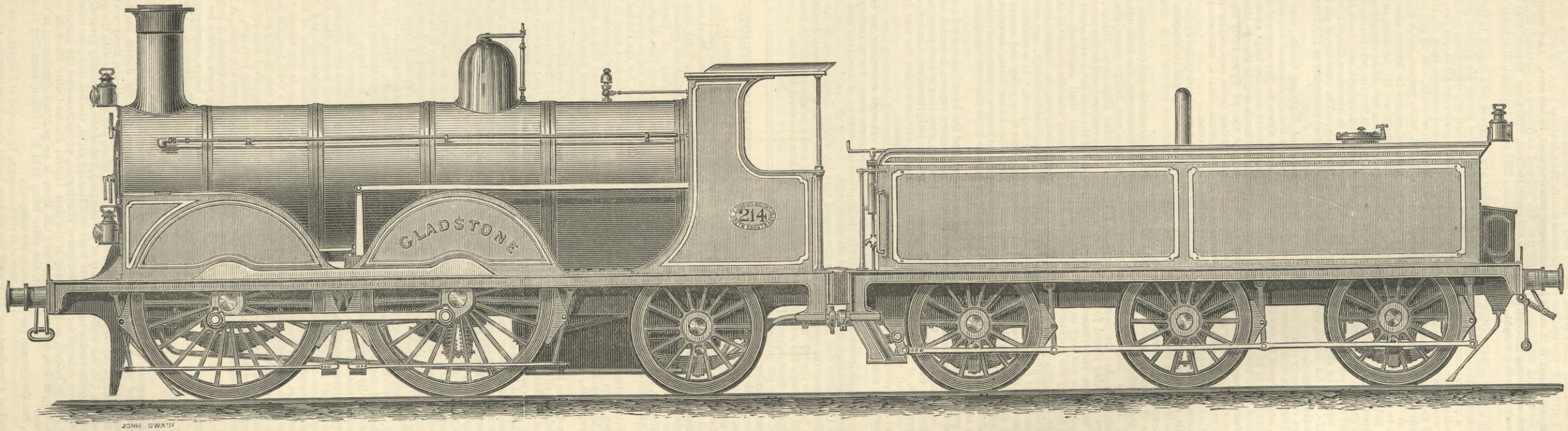
In our impression of April 27th last we mentioned that the new Hounslow and Metropolitan line had been inspected by Col. Yolland, C.B., on the 23rd of that month. We also briefly described the course of the line. The railway was opened for traffic on the 1st May, and is worked by the District Company, thus carrying them another step forward in the direction denoted by their name. We now give some views showing the viaduct which carries the line over the Brent Valley, and the Brentford branch of the Great Western Railway. Our engravings comprise all details, and are so full of particulars that they explain themselves, and our supplemental perspective view from a photograph gives a good idea of the character of the work and of the scenery near. We have only to add that the ironwork was constructed and erected by Messrs. Handyside, of Derby, for the contractors of the line, Messrs. Eckersley and Bayliss, of Westminster. The viaduct was highly commended by the Government inspector, and is a very neat and substantial piece of work.

IRRIGATION OF THE NILE DELTA.—A report has been made by Colonel Scott Moncrieff on the irrigation of the Delta. The *Times* correspondent says: "He insists on the necessity of coming to an early decision on the vital point of how the water can be most certainly and economically diverted from the river into the canals, and discusses the alternative systems of the *barrage*, controlling the water, or of machinery raising the water from the river. The *barrage* has hitherto failed solely owing to its defective construction. Mr. Fowler estimates that the cost of repairing the *barrage* will amount to one million sterling. The Ministry of Public Works considers this estimate too low, raises other objections, and prefers the second system. The report declares in favour of the *barrage*, believing it to be quite possible to rebuild it, and to irrigate Lower Egypt at a less cost than would be entailed by the system of pumps which Rousseau Pasha, a French engineer, estimates will cost nearly a quarter of a million every year. Colonel Moncrieff contests Rousseau Pasha's theory that the *barrage* requires entire reconstruction. He considers that it may be made efficient at half the cost of a wholly new work. He also contests the necessity for maintaining the level at 4½ metres, the level accepted by Mr. Fowler, who consequently designed the foundations to be 18 metres, deep and considers a 3 metres level sufficient, and that foundations 7 metres deep only are necessary. Accepting Mr. Fowler's figures with these alterations, he estimates that the cost would be under £700,000. Colonel Moncrieff comments in strong terms on the present defective system of admitting the water into the canals at high Nile; of maintaining the high level of the water by closing the exits, and thus causing a precipitation of mud, which is afterwards removed at an immense expenditure of unpaid labour. It would be better, he holds, to employ the *corvée* in pumping the water up to the level; and still better to employ steam power, but neither is necessary. It should be a first principle that the flow of water, when it has once entered, should never be arrested. The two main branches should be strengthened to resist any possible flood, and the other canals, regulated by water-tight sluices, should receive only the amount of water which is actually required.

DECAYING INDUSTRIES.—There are some local industries on which the exertions of the Blue Ribbon Army and the consequent change in the drinking habits of the people are producing something like a revolution. For example, there is a great falling off in the sale of pewter drinking cups and public house measures, which at one time formed a conspicuous item in Birmingham's minor products. These goods are still manufactured here, but there is hardly a tithe of the trade being done in them compared with the demand a few years back. The neighbouring town of Bewdley, too, finds its trade in drinking horns materially abridged from the same cause. The manufacture of hornware has been carried on there for centuries, and was one of the chief staple trades of the place up to a very recent period. The trade in horn combs is still carried on in the little Worcestershire borough, but not to its former extent, there being now several small masters instead of one or two large ones, and the consequence has been a keen competition, tending to scatter and depress the trade.—*Martineau and Smith's Hardware Trade Journal.*

EXPRESS PASSENGER LOCOMOTIVE, LONDON, BRIGHTON, AND SOUTH COAST RAILWAY.

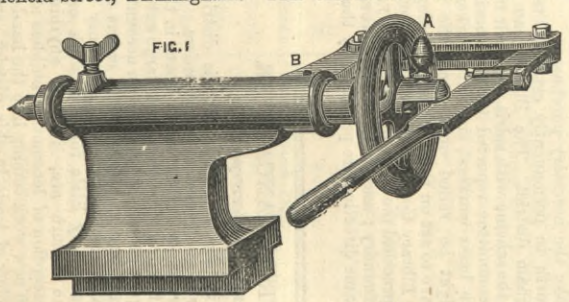
MR. W. STROUDLEY, M.I.C.E., ENGINEER.



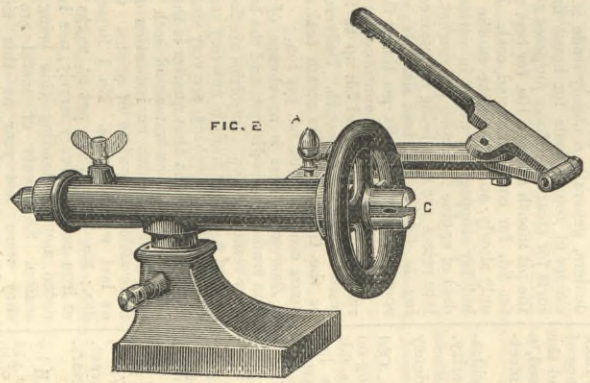
WE illustrate above a new type of locomotive designed by Mr. W. Stroudley, locomotive superintendent of the London, Brighton, and South Coast Railway, for working heavy express trains. This is the first engine of the kind built. It has many peculiar features, and its performance during the six months which it has been at work has been eminently satisfactory. It has cylinders 18½in. diameter by 26in. stroke, with the valve chests underneath the cylinders, and is, so far as we know, the most powerful engine for its weight, 38 tons, in existence. It has been carefully indicated, and has exerted over 1000-horse power at fifty miles an hour. Many of the results obtained are curious and interesting. It will be seen that Mr. Stroudley does not hold the opinion that small leading wheels are essential. In an early impression we shall publish complete sectional drawings, with diagrams and a detailed account of the performance of this engine, which marks a new departure in many respects in English locomotive practice.

BARKER'S PATENT LATHE CENTRE.

THE accompanying engravings illustrate a combined wheel and lever lathe centre now being introduced by Messrs. T. B. Barker and Co., Scholefield-street, Birmingham. This combination has been invented



to prevent the loss of time, expense, and trouble experienced by workmen in substituting a wheel centre for a lever centre, or the reverse, the necessity for which, in all classes of work, is daily, in some trades hourly, experienced. The result has been obtained without resorting to any complications of mechanism, and the following advantages are claimed for it:—No additional cost, though double the convenience of two centres; it is equally effective either with lever or wheel; no time is wasted in substituting one form for the other, and it can be used as a self-acting gauge, ensuring accuracy in work. To use the back centre with a wheel it is only necessary to place the loose pin A in the hole B, and throw the lever back out of the way; to use the back centre with



lever, place the loose pin A in the hole C, thus securing the lever in place. Either change can be effected in two seconds.

THE IRON AND STEEL INSTITUTE.

THE following programme of the Middlesbrough meeting, to be held on September 18th, 19th, 20th, and 21st, 1883, has been issued:—The papers and subjects for discussion are:—Adjourned discussions: (1) "On the Tin-plate Industry," by Mr. E. Trubshaw, Llanelly; (2) "On the Coal-washing Machinery used by the Bochumer Verein," by M. F. Baare, Bochum; (3) "On the Manufacture of Anthracite Pig Iron," by Mr. J. Hartman, Philadelphia, U.S.A. New papers will be read:—(4) "On the Manufacture of Coke on the Simon-Carvès System," by Mr. R. Dixon, Pease's West, Durham; (5) "On the Jameson System of Coke Manufacture," by Mr. J. Jameson, Newcastle-on-Tyne; (6) "On the Use of Raw Coal in the Blast Furnace," by Mr. I. L. Bell, F.R.S., Clarence Ironworks, Middlesbrough—Past-President; (7) "On Recent Results with the Cowper Hot Blast Fire-brick Stove," by Mr. E. A. Cowper, M.I.C.E., Westminster; (8) "On a New Form of Hydraulic Crane for Bessemer Steel Works," by Mr. T. Wrightson, M.I.C.E., Stockton-on-Tees; (9) "On Different Systems of Hydraulic Cranes for Bessemer Steel Works," by Mr. R. M. Daelen, Düsseldorf; (10 "On Recent Results with Gas Puddling Furnaces," by Mr. R. Smith-Casson, Brierley-hill; (11) "On a New Form of Gas Sampler," by Mr. J. E. Stead, F.C.S., Middlesbrough.

The first excursion will be made on Tuesday, September 18th:—9.20 a.m., special train from Saltburn and Redcar, arriving at Middlesbrough at 9.50. 10 a.m., general meeting in the Oddfellows' Hall, for the reading and discussion of papers. 1.30 p.m., Luncheon, on the invitation of the local iron trade, in the Rifle Volunteers' Drill Hall. 3 p.m., excursion by special train from Middlesbrough station, to visit the steel works and blast furnaces of Messrs. Bolckow, Vaughan, and Co., Limited, at Eston. 5 p.m., special train from Eston to Redcar and Saltburn. Members travelling to Middlesbrough will proceed by ordinary train at 5.4 p.m.

Wednesday, September 19th:—9.20 a.m., special train from Saltburn, arriving at Middlesbrough at 9.50. 10 a.m., general meeting in the Oddfellows' Hall, for the reading and discussion of papers. 1.30 p.m., luncheon, on the invitation of the local iron trade, in Rifle Volunteers' Drill Hall. As alternative excursions:—3 p.m., (A) visit the works of the Anderston Foundry Company, and the blast furnaces and salt works of Messrs. Bell Bros., Limited; (B) visit the North-Eastern Steel Works and other Middlesbrough works in their immediate vicinity. 6.45 for 7, annual dinner of the Institute in the Exchange Hall; tickets, 15s. each, not including wine, to be had on application to the secretary, either before or at the meeting; members may bring friends with them on paying for their tickets. 10 p.m., special train to Stockton and Welbury. 10.15 p.m., special train to Redcar and Saltburn.

Thursday, September 20th:—9.20 a.m., special train from Saltburn, arriving at Middlesbrough at 9.50. 10 a.m., general meeting in the Oddfellows' Hall, for the reading and discussion of papers. 1 p.m., leave for Stockton by special train. 1.30 p.m., luncheon in the Exchange at Stockton, on the invitation of the local iron trade. 3 p.m., visit ironworks, &c., in Stockton. 5 p.m., launch at one of the Stockton shipbuilding yards.* 6 p.m., depart by special train from Stockton for Middlesbrough, Redcar, and Saltburn. 7.40 p.m., special train from Stockton to Saltburn, stopping at Middlesbrough and Redcar. 8.30 p.m., *fête* and display of fireworks in the gardens of the Saltburn Improvement Commissioners. 10.15 p.m., special train from Saltburn to Stockton.

Friday, September 21st:—9.20 a.m., special train from Saltburn, arriving at Middlesbrough at 9.50. Three alternative excursions have been arranged for this day, viz.:—No. 1, leave Middlesbrough Dock entrance at 10.45, in steamer provided by the North-Eastern Railway Company, to visit the river works; luncheon at the fifth buoy, on the invitation of the Tees Conservancy Commissioners. No. 2, leave Middlesbrough by special train, at 9.55 a.m., for Crook—on the arrival of special from Saltburn, reaching Crook about 11.10 a.m.—where the new plant of coke ovens on the Simon-Carvès system will be seen at Messrs. Pease and Partners' collieries; special train from Crook at 1 p.m. for Darlington, where members will be entertained at luncheon, on the invitation of the local iron trade; the North-Eastern Railway Company's engine shops will afterwards be visited; members who do not wish to visit the coke ovens at Crook can occupy the morning in visiting the works of the Darlington Steel and Iron Company and the Darlington Forge Company, joining the Crook party at luncheon, about 1.30 p.m. No. 3, visit the ironstone mines in the Cleveland district, leaving Middlesbrough by special train at 10 a.m., and returning to Saltburn about 3.30; lunch at Lofthouse, on the invitation of the local iron trade.

* Further particulars will appear in final programme, to be circulated at the meeting

AN ERRATIC FLASH OF LIGHTNING.—The official report by Captain Cundill on the explosion in June last at the Bassinghyll Gunpowder Mills, near Kendal, has been issued. The explosion appears to have been caused by a flash of lightning, and the storm to have burst so suddenly that the men employed had no opportunity of complying with the special rule which directs them to clear out of the buildings on the approach of a thunderstorm. Only two men were employed on the premises at the time, one of whom was severely burned about the head and arms, but escaped other injury, while the other would have got away quite unscathed had he not been struck and bruised by a falling fragment. The accident is, therefore, declared to have been absolutely unavoidable "under the circumstances as they existed." The mills were not provided with lightning conductors, and Captain Cunhill observes that had they been so provided it is very probable that the induced or direct current would have passed harmlessly away. The lightning seems to have first struck a fine ash tree adjoining a low dry stone wall 114 yards from the factory. It then appears to have struck the stone wall at the base of the tree, and thence to have penetrated the ground at the base of the wall. It then seems to have crossed the road, and to have struck the earth on the other side of a wall bounding the enclosure in which the factory itself stands, and, after tearing up about eight feet of loose potato ground, to have plunged vertically into the soil for some depth. It next emerged from a stone retaining wall on the opposite side of the strip of potato ground, tearing off a piece of hard limestone. A little further on, along a gravel waik, another hole was made, and a stone coping, along which runs a light iron fence, was then reached. Running for 30 yards along this to a point, where the railing was broken, it again took to earth, and, after tearing up a furrow for four yards, found the other broken end of the railing, and continued its course for 36 yards further towards the factory. At this point there is a sharp bend in the railing, and a portion of the current leaped forward in the original direction to another ash tree and went definitely to earth. The other portion of the current continued its course along the railing to the extremity, where the bars enter the ground. From this point, about six yards from the mill, it went on to the mill-bed, which is of iron, and so reached the gunpowder, and terminated what Captain Cundhill rightly speaks of as "its strangely erratic course." The extraordinary fact that the flash did not finally "go to earth" over and over again in its course, but apparently leaped out again, much after the manner of a stone flung by a boy so as to "skim" the surface of a sheet of water, is attributed to the abnormal dryness of the ground consequent on long-continued drought. The desirableness of avoiding sharp bends in conductors and embedding them in permanently damp soil is thus clearly demonstrated.

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

(*From our own Correspondent.*)

Yesterday in Wolverhampton, and to-day—Thursday—in Birmingham, the ironmasters reported general activity, with a disposition by buyers to purchase at old rates.

Bars ranged from £6 5s. up to £7 10s. and on; Monmoor, £7 5s.; Wright, £6 15s.; Round Oak, £8 2s. 6d. for ordinary flats, rounds, and squares; £9 10s. for single best, £11 for double best, and £13 for treble best. T iron of ordinary quality, not exceeding eight united inches, was £9 2s. 6d.; rivet and T iron, single best, £10 10s.; double best, £12; and treble best, £14 per ton. Angles and also strips and hoops of 14 to 19 g. were £8 12s. 6d., £10, £11 10s., and £13 10s., according to quality.

For hoops and strips generally there was a good home demand. Coopers' hoops, £7 at the works; bedstead strip, £6 17s. 6d. delivered at the works of Birmingham customers; tube strip, £6 7s. 6d.; nail strip, £6 5s. Nail sheets for Canada are being made in one order to the extent of 1500 tons. Steel strip for nail making is in growing request at prices largely determined by the rates at which the steel slabs can be secured. These have recently shown weakness and the steel sheet as well as the strip makers were to-day able to secure supplies at less money than ever before.

Galvanisers were to-day buying sheets of iron for corrugating. They were mostly able to obtain them at lower rates, yet when immediate delivery was imperative £9 10s. had occasionally to be given for trebles. Most sheet makers reported themselves well supplied with orders. It is only the great supply, lately augmented, which prevents the sheet market from preceptibly advancing. A light demand has aforetime run up prices 10s. per ton.

Pigs have sold somewhat freely in the past few days. Yesterday and to-day there was less disposition to yield by vendors. Staffordshire and Worcestershire all-mines were quoted at from 65s. up to 70s.; Shropshires were procurable at the lower figure. Part-mines were variously named at from 55s. down to 45s., whilst cinder qualities were procurable at from 42s. 6d. down to 38s. 3d. The Wellingborough brand was strong at 50s., and Derbyshire qualities mostly ruled at 47s. 6d. The rates at which hematites might be bought were determined by the demand at the furnaces for Bessemer qualities.

Coal was somewhat stronger. High-class furnace and mill descriptions are realising colliery owners' terms, and such pits are mostly busy. The uncertainty overhanging the action of the colliers in relation to the new Wages' Board tightened prices in Birmingham and Wolverhampton. This Board met in Wolverhampton on Tuesday to consider a fresh scheme for the regulation of colliers' wages throughout South Staffordshire and East Worcestershire in place of the agreement which terminated at the beginning of August. The masters proposed that wages should be regulated not as heretofore by the quotations of Earl Dudley's furnace qualities, but by an average selling price of all kinds of coal ascertained by a quarterly inspection of the books of twelve firms, six selected by the masters and six by the men. To arrive at datum line for this purpose they propose to learn the average selling price of all descriptions of Earl Dudley's coals at a period when his lordship's furnace quality is selling at 10s. a ton. Upon this average, whatever it may be, the thick coalmen will be entitled to 3s. per day or stint. The average of the twelve firms will then be compared quarterly with his lordship's average. When the comparison shows a rise of 1s. a ton, thick coal miners' wages will rise 4d. a day, and when there is a drop of 1s. the same wages will recede 3d. a day. The operative section of the Wages Board refused these terms, and held out for a minimum of 3s. 8d. per day or stint on thick coal seams, 2s. 10d. for thin coal seams east of Dudley, and 2s. 7d. for thin coal seams on the west of Dudley. These demands mean an advance of 8d. per day or stint upon present wages. The decision was left in the hands of the arbitrator, who promised to issue his award with as little delay as possible.

On Monday next the Iron Trade Wages Board will meet in Wolverhampton to discuss the notice which has been lodged by the operative section for an alteration in the basis. Amongst the rank and file of the ironworkers represented there is some difference of opinion whether the scale should not be wholly abandoned, and the rate of wages settled from time to time by arbitration. Indeed, a decision in favour of such an arrangement was come to at a meeting of ironworkers at Greatbridge on Monday last.

In the North Staffordshire finished iron trade sufficient specifications are coming in to keep the mills running with fair regularity. The home trade is unaltered on the week, and the shipping business does not exhibit much improvement. Prices have a slight tendency towards greater strength.

The operative chain makers engaged in the Cradley Heath, Old Hill, Quarry Bank, and Dudley districts held a general meeting on Monday, and resolved to adhere to their demand for the 4s. 6d. list for common dollied chain and country work, and the 4s. list for hammered work. It was also resolved to request operatives who were working at under these rates to come out on strike at once.

Sir Daniel Gooch, M.P., chairman of the Great Western Railway Company, has turned the first sod of a new line constructed for the Oldbury Railway Company. The line begins at the Furnace Yard estate, under Warley Hills, and terminates at the Langley Green Station of the Great Western Railway. It is only a mile and a quarter long, yet it will cross the canal four times by bridges, besides having two bridges under and three over various roads. There will be a goods station in Furnace Yard, and a passenger station between Park-lane and Halesowen-street. The cost is estimated at between £80,000 and £90,000. Messrs. Holme and King, of Liverpool, have the work in hand.

The evidence that the purchase of the gasworks in Walsall by the Corporation was a good speculation is increasing. The gas sold to private consumers for the quarter ended June 25th realised £3812, or more by £374 than in the corresponding quarter of the previous year. At Willenhall, three miles distant, the inhabitants are also desirous that the gasworks should be in the hands of the local authorities, and with this view they are memorialising them to make the necessary purchase.

Efforts are being put forth to permanently establish technical education in the Birmingham district. The Birmingham trades council have entered into the scheme with spirit. At their monthly meeting on Saturday, a committee reported that a considerable number of pupils from the brass workers', tin-plate workers', and glassmakers' societies might be relied upon; and the council granted the committee leave to act on their recommendations. At Wolverhampton the Free Library Committee are endeavouring to procure the services of a practical modeller in brassfoundry, silversmiths' work, and in ironfoundry; and if the venture prove a success further steps in the same direction are promised by the chairman of the committee.

NOTES FROM LANCASHIRE.

(*From our own Correspondents.*)

Manchester.—Business in the iron trade of this district still comes forward very slowly in small hand-to-mouth orders. Works, for the most part, are kept pretty fully employed both in the production of pig and manufactured iron, but to a large extent the deliveries which are being made of pig iron are on account of old contracts, whilst in finished iron the bulk of the orders are for prompt completion, so that whilst makers are fairly busy for the present, they have comparatively little forward work on their books. Prospects for the future are, indeed, anything but encouraging. With the exception of locomotive builders and tool makers, there is but little new work coming into the hands of the general engineering branches of trade in this district, and, as I have pointed out in previous reports, the Lancashire cotton machine is getting exceedingly quiet. In shipbuilding, which has contributed so largely of late to activity in other branches of the iron trade, there are also unmistakeable indications of falling off. With an outlook such as this consumers are naturally chary about buying far ahead to any large extent, and although the market remains fairly steady, it can scarcely be said that it is on a healthy basis; the present position is in fact being maintained chiefly on the strength of old orders which are being gradually worked off without being replaced by any corresponding weight of new business.

At Manchester on Tuesday there was but a very quiet market. The business reported in pig iron was little more than of a retail character, and in finished iron there is only a moderate trade doing for prompt delivery. The leading makers continue firm at late rates, but there is a perceptible tendency towards weakness in the market which is resulting in underselling here and there to secure orders. Lancashire makers of pig iron, who are still sending away large deliveries against old contracts, are firm at 45s. for forge and 45s. 6d. for foundry less 2½ delivered equal to Machester, and for Lincolnshire iron quotations remain at 44s. 10d. to 45s. 10d. less 2½ for forge and foundry qualities delivered here. There are a few low offers in the market, and in some cases district brands of pig iron are reported to have been sold at 1s. to 1s. 6d. per ton under the above figures. For finished iron prices remain on the basis of £6 2s. 6d. to £6 5s. for ordinary bars, £6 12s. 6d. for hoops, and £8 5s. to £8 7s. 6d. for sheets delivered into this district.

The business doing in hematites continues extremely small, but makers do not seem inclined to accept the low offers which buyers in some cases have been putting forward, and for good brands of foundry 59s., less 2½ per cent., delivered here, appear to be about the minimum basis on which they are prepared to do business.

The reference I have made to the unsatisfactory prospects in the engineering branches of trade is fully borne out by the report issued this month to the members of the Steam Engine Makers' Society. It is stated by the secretary that there is no improvement in the branch returns, but in several instances a decline appears to have set in, which, if it continues, will seriously affect the society's employed list for the future. This is specially noticeable in several districts where the members of the society are numerous, whilst the complaints in the cotton trade of Lancashire are so very loud that a material effect upon the engineering trade from this direction may be expected before long. The shipping trade is also making complaint as to the low rate of freights, and as a result, fewer orders are being placed for new steamers, which in the long run will tell upon the artisans employed in the above class of work. Such is the not very encouraging summary of the state of the trade given by the secretary of the Steam Engine Makers' Society. He does not, however, anticipate a serious decline in trade equal to that of 1878-79, as the general trade of the country is moderately good; but from present appearances he is forced to the conclusion that for a time there will be quietness in the labour market, and that employment will not be so plentiful as it has been for the last two years. Wages disputes in various parts of the country, including the continued strikes in the North of England, are keeping men on the books of the society, but in addition to this, the general returns as to employment show a tendency to decline and the applications for workmen throughout the country are less numerous than they have been of late. Roughly speaking, it may be said that the returns this month show about 1½ per cent. of the members in receipt of out-of-work donation, as compared with 1 per cent. last month, and although I have not got the returns of other societies, I have reason to know that they will also show an increasing number of men out of work.

The upward movement in the price of coal which came into operation with the commencement of the month, although it has not been adopted generally throughout the Lancashire coal field, seems likely to be fairly well maintained. Throughout the South-West Lancashire district it has been put in force to the extent of 6d. to 1s. per ton upon last month's prices, and although the action of the leading Manchester firms who have advanced their delivered rates to consumers but have not altered their pit prices to merchants and large buyers, is causing some difficulty with the dealers, generally a steady trade is being done both in the better classes of round coals for house fire purpose and in the common sorts for steam and forge purposes at the advanced rates, which at the pit mouth average 10s. for best coal, 8s. for seconds, and 6s. to 6s. 6d. for common round coal. Burgy and slack still move off only slowly, and the strike in the cotton trade with the recent holiday stoppages of works in various districts has thrown a good deal of engine fuel upon the market. For the above classes of fuel late prices are only being maintained with difficulty, burgy averaging 4s. 6d. to 5s., best slack 4s, ordinary qualities 3s. 6d., and common sorts about 3s. per ton at the pit.

The shipping trade continues brisk and better prices are being realised to the extent of 3d. up to 9d. per ton upon those which were being got last month. Delivered at the high level, Liverpool, or the Garston Docks steam coal now averages 8s., and seconds house coal 9s. to 9s. 6d. per ton.

Barrow.—There is no change of any note in the hematite pig iron trade of this district, and the business doing is slight and not very remunerative. Inquiries are few, and on all hands the outlook of a brisker trade is not very reassuring. American demands, comparatively speaking, are very small, but the worst feature about the inquiries from that quarter is that they are getting less. The amount of business transacted both on home and colonial account is very slight, with no indication of any immediate chance of a more satisfactory state of affairs. Quotations remain practically at last week's prices. No. 1 Bessemer, 50s.; No. 2, 49s.; No. 3, 48s.; No. 3 forge, 47s. net at works for prompt delivery. Stocks of iron are held very largely, nor is there any diminution to be noted notwithstanding this being the height of the shipping season. Shipments of metal are nothing like so heavy as they were last year at this time, nor as large as might reasonably be expected. It is anticipated, however, that a large tonnage will be shipped before the close of the shipping season. Steel-makers are fairly employed, especially in the rail departments. Prices for heavy sections of steel rails are £4 15s. to £5 per ton. These prices, however, are very unremunerative, and steel workers are not very profitably employed at the present time. An important attempt is being made by makers on the west coast to bring about a reduction of carriage rates for coal and coke, especially the latter, from the fields on the east coast. It is freely stated that if the railway companies refuse to agree to a considerably lessened charge of rates, the capitalists of the district will consider the advisability of making a line from the Durham coke grounds to West Cumberland. Iron ore selling at from 9s. to 11s. per ton at the mines; the demand is slow. Coke and coal steady. Shipping in quieter work.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

At the Cleveland iron market held at Middlesbrough on Tuesday last the demand for pig iron was quiet; but quoted prices were, nevertheless, firm. No. 3, g.m.b., is still scarce, and as much as 39s. 6d. per ton was paid for special brands for prompt delivery; but merchants were willing to accept 39s. and 39s. 1½d. for ordinary brands. Two or three of the producers were quite unable to to supply No. 3, and vessels have been in some cases delayed for want of it. There is an abundance of forge iron to be had, and consequently it was offered at 37s. 6d. to 37s. 9d. per ton, whilst No. 4 foundry could be purchased at 38s. per ton.

There are buyers of warrants at 39s. per ton, but the demand for them is not great.

During the week ending Monday last the stock of Cleveland pig iron in Messrs. Connal's stores at Middlesbrough declined 500 tons, the quantity being reduced to 71,491 tons. In their Glasgow store they hold 585,245 tons, being an increase of 349 tons for the week.

The shipments for August were better than generally contemplated. The quantities exported were as follows:—Pig iron, 88,485 tons; and manufactured iron and steel, 29,156 tons. In the previous month the quantities were, pig iron, 85,217 tons; and manufactured iron and steel, 34,540 tons. Last month the bulk of the pig iron was shipped as follows:—Scotland, 23,270 tons; Germany, 20,859 tons; Holland, 9785 tons; France, 5845 tons; Russia, 5685 tons; Belgium, 2935 tons; Portugal, 2120 tons; and America, 1500 tons.

There is nothing new to report with regard to the finished iron trade. A few small orders for immediate delivery are being given out, but buyers do not yet show any disposition to buy in quantity for forward delivery. Ship plates are £6 5s. per ton; shipbuilding angles, £5 12s. 6d. per ton; and common bars, £5 17s. 6d. per ton—all free on trucks at makers' works, less 2½ per cent. discount. For deferred delivery, 2s. 6d. to 5s. per ton less is offered.

The Cleveland ironmasters' returns for August were issued on the 4th inst., and show that there are 117 furnaces in blast, 83 of which are making Cleveland iron and 34 hematite and basic iron. The make of Cleveland pig iron for the whole district amounted to 156,523 tons, and of hematite, spiegel, and basic iron to 77,108 tons. The total make of iron is therefore 233,631 tons, being an increase of 2417 tons over July. The quantity of pig iron in stocks and stores at the end of August amounted to 275,198 tons, being a net increase of 4957 tons.

The two blast furnaces at Fighting Cocks, near Darlington, which are being worked by the executors of the late Mr. George Wythes, are to be damped down in the course of two or three weeks, until the trade improves and the large stock of iron now held is reduced. About 100 hands will be thrown idle.

Messrs. Gavin, Smith, and Co., of Tyne Dock and Cardiff, are about to construct large graving docks and engineering works at Jarrow-on-Tyne. It is expected that a commencement will be made with the first dock at once.

There is still no prospect of terminating the engineers' strike at Sunderland. The men, at a meeting held on Tuesday last, decided by a vote of 39 to 1 not to submit the matter in dispute to arbitration.

A joint committee of the Newcastle and Gateshead Town Councils at a meeting held on Wednesday, the 29th ult., resolved to recommend the erection of a new bridge across the Tyne. The site proposed is to the east of the High Level Bridge and not far from the Swing-bridge. The roadway will be the same height from the water as the footroad of the high level and about 50ft. broad. It is proposed that Newcastle shall contribute two-thirds and Gateshead one-third of the cost, which is estimated at £250,000.

The three blast furnaces belonging to Messrs. Jones, Dunning, and Co., of Normanby, near Middlesbrough, are damped down, owing to a strike among the workmen. It is understood that the men would now willingly alter their policy and return to work on their employers' terms. The latter have, however, taken the opportunity to commence extensive repairs and alterations, and will not recommence to blow until these are complete, which may occupy some weeks.

Messrs. Norman, Long, and Co. have just started a pair of 48in. cylinder by 54in. stroke reversing engines, intended to work direct on to a new 30in. angle iron train they contemplate putting down. The engines are by Messrs. Davy Brothers, Limited, of Sheffield. At present they are running idle, as neither the new train nor the requisite new boilers are in place.

Mr. Isaac Lowthian Bell has unfortunately been suffering from a severe attack of illness. Though recovering, he is still weak, and will need extra care for some time. He will not be able to take any part in the approaching meeting of the Iron and Steel Institute at Middlesbrough.

It is announced that Mr. Walter Johnson, son-in-law of Mr. I. L. Bell, has entered the firm of Bell Brothers, Limited, Middlesbrough. Mr. Johnson is acting as secretary to the local committee for the reception of the Iron and Steel Institute.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

An important order for armour-plates has just been received by Messrs. John Brown and Co., Limited, Atlas Steel and Ironworks, from her Majesty's Government. It is for 1600 tons of "Ellis" steel-faced plates for the side and bulkhead armour of the ships Camperdown and Howe, now building at Portsmouth and Pembroke. The armour will be 18in. and 16in. thick. The Atlas and Cyclops Works have each an order for an experimental plate on the "Ellis" and "Wilson" systems, for the United States and for Denmark, where further trials are to take place in November.

Messrs. Ward and Payne, with the view of stimulating high-class workmanship in sheep shears, have offered £50, in three prizes of £25, £15, and £10, to the three workmen who shall have excelled during the ensuing twelve months in grinding and finishing shears.

The prospect of fresh agitation in the coalfield increases. Several of the coalowners in the Sheffield and Chesterfield districts have again put up prices another 6d. per ton; and this will have the effect of precipitating the demand of the miners' officials for an early rise in wages. It is noteworthy, however, that these increases in value are not general. The three great colliery companies who send the largest tonnage to London have not advanced their quotations for local consumption, though all coal for the metropolitan market has been raised. Summer quotations are still in force for local consumers at many of the leading collieries in the South Yorkshire field. A disagreeable change in the weather, however, has set in, and this may cause the winter rates to be general before October, the usual date for making advances on household coal.

Steam coal is in brisk demand for shipment from the Humber ports. The Barnsley and district pits supply a large weight of steam coal for Hull and similar ports. From the Wombwell, Wath, and neighbouring collieries a large tonnage is being sent to Grimsby and Goole. There is also a fair trade in coke, the output being considerably larger in consequence of fully 100 additional ovens having been started during the past two months.

The Rotherham people are anxiously hoping that the reported find of iron ore in the vicinity of Conisborough and Micklebeing may prove all that has been sanguinely spoken of it. It would mean a saving of something like 3s. to 4s. per ton on the carriage of the raw material, which would be a little towards the retention of the rail trade in the district. In this locality an improvement is reported in the demand for spring steel and other merchant kinds, especially in billets for wire-making purposes. Engineering forgings and axles for railway wagons are also brisk. A Rotherham house in the stove-grate trade has just booked a large order for Australia. The wagon works are busy upon orders for London, as well as for Lancashire and Scotland. Large shipments of wheels and axles have been made to South America. The American demand for hoop iron has fallen off very seriously.

Mr. George Barnsley, steel and file, &c., merchant and manufacturer, Cornish-street, Sheffield, has this week succeeded to the office of Master-Cutler, the retiring Master being Mr. A. A. Jowitt, of the Scotia Steel Works, Attercliffe. Mr. Jowitt has been one of the ablest and most accomplished of all the many worthy gentlemen who have filled the office, and he retires with the good wishes, not only of the company, but of the community generally. At the Cutlers' feast on Thursday night, the 6th inst., the chief guest was the Marquis of Hartington, who represented the Government. Mr. Barnsley is the first Liberal Master-Cutler Sheffield has had for many years; but there is no political significance in the appointment, the office being held in rotation, according to seniority of station in the company.

A new coal-pit is about to be opened at Lidgett, near Sheffield, a thin seam having been leased there by gentlemen of Sheffield and the district from Earl Fitzwilliam. There are 1400 acres, and the capital is only some £10,000.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE warrant market has again been very dull this week, and prices are lower even than they were a week ago, in consequence of some holders having resolved to sell out a part of their iron. But while the speculative department of the pig iron trade is in an unsatisfactory condition, there has been a good business done in shipping brands, and the shipments of the past week are a full average. The demand for future delivery to places abroad is, however, not quite so good as could be desired. In the warrant stores the addition to stocks is small, and the former rate of production is maintained.

Business was done in the warrant market on Friday forenoon at 46s. 11d. to 47s. cash, and 47s. 1½d. to 47s. 3d. one month; while in the afternoon the quotations were 47s. 0½d. to 46s. 11½d. cash, and 46s. 11½d. to 47s. 2d. one month. On Monday forenoon transactions took place at 46s. 11½d. to 46s. 11d. cash, and 47s. 2d. to 47s. 1½d. one month; the prices in the afternoon being 46s. 11d. to 46s. 10d. cash, and 47s. 1½d. to 47s. one month. Tuesday's market was dull at from 46s. 10d. to 46s. 9½d. cash, and 46s. 11½d. one month. Business took place on Wednesday at 46s. 9d. down to 46s. 6½d. cash, and at 46s. 11d. to 46s. 9d. one month. Transactions occurred to-day at 46s. 7½d. to 46s. 6d. cash.

The quotations of makers' iron are:—Gartsherrie f.o.b. at Glasgow, per ton, No. 1, 56s. 6d.; No. 3, 52s. 6d.; Coltness, 59s. 6d. and 52s. 9d.; Langloan, 59s. 6d. and 52s. 6d.; Summerlee, 57s. 3d. and 51s.; Chapelhall, 57s. and 54s.; Calder, 57s. 6d. and 50s.; Carnbroe, 55s. and 49s.; Clyde, 50s. 3d. and 48s. 3d.; Monkland, 48s. and 46s.; Quarter, 47s. 6d. and 45s. 6d.; Govan, at Broomielaw, 48s. and 46s.; Shotts, at Leith, 59s. and 54s. 6d.; Carron, at Grangemouth, 48s. 6d. (specially selected, 54s. 6d.) and 47s.; Kinneil, at Bo'ness, 49s. and 47s. 6d.; Glengarnock, at Ardrossan, 55s. and 47s. 6d.; Eglinton, 48s. 6d. and 45s. 6d.; Dalmellington, 49s. and 48s.

The manufactured iron trade continues in a satisfactory condition, there being steady employment at all the works. There is no change in prices.

There is no abatement in the amount of business done in the coal trade of Lanarkshire. For household qualities the late rainy weather has improved the demand, and the inquiries for shipment are quite satisfactory. At Glasgow the shipments have been fair, and the orders in hand promise better results by the end of this week. Prices are well maintained in Fife and Clackmannan, where shipping trade in coal is extensive.

The miners' leaders are doing their utmost to ensure the success of the agitation now going on for an advance of wages. They are but poorly supported by the men generally. In the course of next month, if the trade turns out well, and prices improve, the coalmasters will be quite ready to increase the wages, but it is doubtful if the ironmasters will be in a position to do so.

There were twenty-five new vessels, with an aggregate tonnage of 34,003 launched from the Clyde shipbuilding yards in the past month, as compared with twenty-six vessels of 36,800 tons in August, 1882.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

NOTICE has been issued at Cyfarthfa, Dowlais, Tredegar, Ebbw Vale, Blaenavon, and other works, of a cessation of contract after the termination of the present month, as regards all ironworkers and labourers employed above ground. This is understood to mean a 5 per cent. reduction at least from October the 1st, and is not unexpected. Steel rails have been dull of late and prices anything but of a paying character, and advices from America which were expected to be favourable have been otherwise. Hence the notice. For some time lowering prices have foreshadowed this. Some little ferment in one or two districts has ensued. This is not expected to affect colliers who are in full drive in all parts of the colliery districts. The gales have somewhat interfered with the despatch of coal, still the exports have been large, and from Cardiff alone 150,000 tons have been sent foreign and coastwise. The whole taken in combination with the large quantities sent from the Aberdare Valley to London, and from Monmouthshire to Manchester, represent an employment of labour and an investment of capital unparalleled at any previous time in the annals of the principality.

The colliers are bent upon establishing a scholarship in connection with the National College to be founded at Cardiff. They propose to subscribe a farthing a week; and 50,000 farthings per week in the course of a few years will form a good round sum, and aid practically in the higher education of the few amongst the people who aspire to something different to the common lot.

Messrs. De Bergues' works near Cardiff are to be brought to the hammer.

Foreign ores are being offered as low as 13s. 3d. in Swansea, but there is little business done. Trade there in coal and patent fuel is good, and tin-plate is also improving. Advices from Liverpool are encouraging, upward prices being maintained, and best brands are in good request.

The coal mining reports of 1882, now issued, show that thirty-five accidents have occurred in coal mines from explosion, causing 250 deaths; 458 accidents by roofs and sides falling, attended with 468 deaths; 101 shaft accidents and 116 deaths, 197 miscellaneous and 208 deaths, 84 miscellaneous surface accidents and 84 deaths, or a grand total of 876 accidents and 1126 deaths for the whole colliery communities of England and Wales. Out of this South Wales shows 136 fatal accidents, and a loss of 144 lives, or an increase of 8 accidents and 11 lives as compared with 1881.

Prices for best coal and seconds are firm. Abercannaird Colliery, the new rewinning by Plymouth Colliery Company, has been inspected with a view of laying down new machinery. A large addition of colliers is to be made at Cwmpennar, where the 4ft. and 6ft. seams have been won lately.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

28th August, 1883.

4135. DRESSING BAGS, O. Seefels, London.
4136. ELECTRIC RAILWAYS, S. Pitt.—*(L. Daft, U.S.)*
4137. ELECTRIC RAILWAYS, S. Pitt.—*(L. Daft, U.S.)*
4138. PRODUCING GAS for HEATING, &c., W. Arthur.—*(J. P. Gill, New York)*
4139. TREATING IRON, &c., W. Arthur.—*(J. P. Gill, New York.)*
4140. TREATMENT, &c., of IRON ORES, W. Arthur.—*(J. P. Gill, New York.)*
4141. MACHINE for PRINTING PAPER, C. P. Huntington, Darwen.
4142. ELASTIC TRIMMING for DRESSES, G. Dean, Derby.
4143. CARDING MACHINES, W. Gawthorp, J. Reddihough, and S. Wade, Bradford.
4144. PLASTIC COMPOUNDS, H. H. Lake.—*(Bonsilate Company, Limited, New York)*
4145. CLEANING, &c., COTTON, H. H. Lake.—*(W. S. Archer, New York.)*
4146. TREATING STARCH-YIELDING MATERIALS, J. H. S. Wildsmith, London.
4147. WINDING, &c., MACHINES, A. C. Henderson.—*(E. Essers, Germany.)*
4148. ELECTROLYTIC TREATMENT of SACCHARINE SOLUTIONS, L. H. Despeissis, Paris.
4149. HEATING WATER, M. Steel, Gosforth.
4150. WINDOW VENTILATORS, G. Connell, Newcastle-upon-Tyne.
4151. TREATMENT of HOPS, J. H. Johnson.—*(L. Boulé, Paris.)*
4152. PRODUCING PRINTS of PHOTOGRAPHS, E. de Zuccato, London.
4153. PRODUCING PRINTS of PHOTOGRAPHS, E. de Zuccato, London.
4154. PRODUCING PRINTS of PHOTOGRAPHS, E. de Zuccato, London.
4155. TRICYCLES, G. Singer, Coventry.
4156. HOLDING LUCIFER MATCHES, E. Edwards.—*(P. Gillaut, Belgium.)*
4157. VELOCIPEDES, &c., J. F. Smith, Leicester.
4158. CHECKING TIME of ENTRY of WORKMEN into an ESTABLISHMENT, N. C. Firth, Chester.
4159. SEWING MACHINES, H. Grellier, Brixton.
4160. SOLITAIRES, &c., E. E. Ashing, London.
4161. INJECTORS, &c., Lieutenant Zotoff and Captain Afonasieff, Cronstadt.
4162. CATTING SHIPS' ANCHORS, A. M. Clark.—*(J. N. Purdy, Canada.)*
4163. SIGNALLING for RAILWAYS, J. Enright, London.

29th August, 1883.

4164. JACQUARD MACHINERY, R. Scott, Nottingham.
4165. UTILISING GAS ENGINES for LOCOMOTION, T. F. McNay and F. J. Harrison, London.
4166. ARTIFICIAL MANURE, F. W. Martino, Sheffield.
4167. SECURING RAILS of PERMANENT WAY, T. Reading, Barrow-in-Furness.
4168. SCREW PRESSES, J. Cadbury, Birmingham.
4169. BICYCLES, J. Watkins, Saltley.
4170. DRYING PROVISIONS, J. Wetter.—*(E. Passbourg, Russia.)*
4171. ELECTRICAL INSULATORS, J. H. Johnson.—*(G. Westinghouse, jun., U.S)*
4172. FEEDING YOUNG DOGS, J. Cunningham, Bristol.
4173. MEASURING LENGTHS, C. A. Weckbecker and L. Schwabe, Manchester.
4174. SHUTTLES of LOOMS, J. Wilkinson, Little Horton.
4175. CONNECTING BRAKE PIPES of TRAINS, J. Imray.—*(G. Westinghouse, jun., U.S)*
4176. SPOKE-SHAVING TOOL, J. Matthews, Sheffield.
4177. DYNAMO-ELECTRIC MACHINES, H. H. Lake.—*(G. W. Fuller, U.S.)*
4178. CIRCULATION of WATER in STEAM BOILERS, J. Rankine, North Shields.
4179. LAMPS, J. F. Shallis & T. C. J. Thomas, London.
4180. AUTOMATICALLY OPENING, &c., ELECTRIC CIRCUITS, F. C. Phillips, London.

30th August, 1883.

4181. PROPELLING VEHICLES, A. L. Ségond, Paris.
4182. TAPPING BEER BARRELS, J. Walker and A. Howell, Birmingham.
4183. STEAM GENERATORS, L. Hill, Glasgow.
4184. SHUTTLES for LOOMS, W. E. Gedge.—*(J. P. Thompson, U.S.)*
4185. RAILS for PERMANENT WAY, R. Howarth, Wolverhampton.
4186. SEPARATING METALS from MINERALS, J. Bell and G. J. Davis.—*(J. P. Kagenbusch, Westphalia)*
4187. PROPELLING VESSELS, W. Kish, Sunderland.
4188. GUN CARRIAGE, W. Gardner, St. Leonards.
4189. SHAPING WOOD, J. Wetters.—*(A. Fischer and J. C. Schmidt, Saxony.)*
4190. TRICYCLES, E. Weidlich & H. Mitchell, London.
4191. PROPELLING VESSELS, J. A. Wade and J. Cherry, Kingston-on-Thames.
4192. DYNAMO-ELECTRIC MACHINES, H. H. Lake.—*(G. W. Fuller, U.S.)*
4193. OIL GAS ENGINES, F. W. Rachholz, Dresden.
4194. TOBACCO PIPES, J. Koppel, Leytonstone.
4195. COLOURING METALS, H. H. Lake.—*(La Société A. Trélat et Cie., Paris.)*
4196. MAKING DISINFECTANTS, F. H. Atkins, London.
4197. SECONDARY BATTERIES, D. G. Fitz-Gerald and T. J. Jones, London.

31st August, 1883.

4198. CARTRIDGE MAGAZINES, &c., H. H. Lake.—*(N. de Loutkowsky, St. Petersburg.)*
4199. SEPARATING WOOL from SHEEPSKINS, P. H. Picard-Goulet, Paris.
4200. BALANCE GEAR for TRICYCLES, J. Derry, Aston.
4201. ANÆSTHETICS, J. Wetter.—*(U. K. Mayo, U.S.)*
4 202. FINISHING, &c., LACE, J. M. Cryer and W. O. Matheson, Bolton.
4203. PANS for BOILING TALLOW, J. & D. Bell, Bolton.
4204. WOOLLEN YARNS, A. R. Donisthorpe, Knighton House.
4205. PIPE COUPLINGS for RAILWAY BRAKE, J. Imray.—*(L. B. Regray, Paris.)*
4206. JOINTING for RAILWAY BRAKE, J. Imray.—*(A. C. Benoit-Duportail, Paris.)*
4207. PRODUCING NEW SOLID BASE, J. Imray.—*(Actien Gesellschaft für Anilin-Fabrikation, Berlin.)*
4208. CHEQUES, J. Auty, Liversedge.
4209. BREAKING-UP ROADS, A. A. Dixon, London.
4210. BOTTLES, J. Thompson, London.
4211. METAL TUBES, G. H. Fox, Boston, U.S.
4212. SHIPS' LOGS, A. Clark.—*(L. M. Garland, Havre.)*

1st September, 1883.

4213. TILE HEARTHS, S. B. Sutcliffe, Manchester.
4214. HORSESHOES, T. Morgan.—*(Messrs. Brandle, Sarre, Beyerhaus, and Hitzig, Berlin.)*
4215. BAKING OVENS, W. F. A. Weighorst, Hamburg.
4216. METAL HEELS for BOOTS, J. W. Jones and E. K. Bridger, London.
4217. GASALIERS, T. Ford, Birmingham.
4218. SAD IRONS, &c., S. Siddaway and A. E. W. Clayton, West Bromwich.
4219. VOLTAIC PILES, E. Edwards.—*(A. Schroeder, Germany.)*
4220. TRANSMITTING SIGNALS, A. F. St. George and C. A. McEvoy, London.
4221. CIGARS, &c., J. McGovern, Liverpool.
4222. VELOCIPEDES, S. J. Tucker, Liverpool.
4223. JOINTS for EARTHENWARE PIPES, H. Doulton, Lambeth.
4224. GRINDING VALVES to their SEATS, A. M. Clark.—*(A. W. Case, U.S)*
4225. INTERMITTENT COCKS, B. H. Chameroy, France.

3rd September, 1883.

4226. CONSUMING SMOKE, J. Newsome and B. Hustler, Bradford.
4227. DECORATION for WALLS, T. J. Palmer, Carshalton.
4228. SPRING BALANCES, G. Salter and J. Hughes, West Bromwich.
4229. STEAM BOILERS, S. Fox, Leeds.
4230. SPINDLES, W. Aston, Manchester.
4231. DRESSING HEMP, L. Gooder, Thornes, and H. W. Whitehead, Leeds.
4232. ROTARY ENGINE, H. J. Haddan.—*(V. H. F. von Swaine, Germany.)*
4233. SANITARY BLUE COLOURING MATTERS, J. Ellis, Hull.
4234. STAMPING CORRUGATED IRON, R. Baillie, Isle of Dogs.
4235. PRESSES, G. Davis, Aberystwith.
4236. DRIVING GEAR, D. Carter, Stratford-on-Avon.
4237. RAKES, &c., A. M. Clark.—*(A. Holden, New South Wales)*
4238. MILK CANS, R. Stroud, Wolverhampton.
4239. COKE OVENS, H. Simon.—*(F. Carves France.)*
4240. CHRONOGRAPH WATCHES. A. Aubert, Switzerland.
4241. ELEVATING WATER, F. O'C. Prince, Brighton.
4242. GAS ENGINES, J. H. Ladd.—*(J. A. Serrell, U.S)*
4243. GALVANIC BATTERIES, A. Gutensohn, London.
4244. PREVENTING COLLISION of SHIPS, J. H. Grell, Germany.
4245. OBTAINING MOTIVE POWER, H. J. Johnson.—*(E. J. Delaurier, Paris.)*
4246. MORTISE LATCH LOCKS, A. M. Clark.—*(Messieurs Gollot, Bros, Paris.)*

Inventions Protected for Six Months on Deposit of Complete Specifications.

4123. CRUSHING COAL, &c., C. Sheppard, Bridgend.—*25th August*, 1883.
4131. IRONING MACHINES, C. A. Allison, Southampton-buildings, London.—A communication from G. W. Cottingham, Louisville, Kentucky, U.S.—*27th August*, 1883.
4136. ELECTRIC RAILWAYS, S. Pitt, Sutton.—A communication from L. Daft, Greenville, U.S.—*28th August*, 1883.
4137. ELECTRIC RAILWAYS, S. Pitt, Sutton.—A communication from L. Daft, Greenville, U.S.—*28th August*, 1883.
4145. CLEANING, &c., COTTON, H. H. Lake, Southampton-buildings, London.—A communication from W. S. Archer, New York, U.S.—*28th August*, 1883.
4177. DYNAMO-ELECTRIC MACHINES, H. H. Lake, Southampton-buildings. London.—A communication from G. W. Fuller, Norwich, Connecticut, U.S.—*29th August*, 1883.
4189. SHAPING WOOD, J. Wetter, Wimbledon.—A communication from A. Fischer and J. C. Schmidt, Saxony.—*30th August*, 1883.
4192. DYNAMO-ELECTRIC MACHINES, H. H. Lake, Southampton-buildings, London.—A communication from G. W. Fuller, Norwich, Connecticut, U.S.—*30th August*, 1883.
4211. METAL TUBES, G. H. Fox, Boston, U.S.—*31st August*, 1883.

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

3741. SEPARATING FERROCYANIDES of IRON from LIQUIDS, W., T., and J. Chadwick, Manchester, and J. W. Kynaston, Liverpool.—*27th August*, 1880.
3542. DRYING GRAIN, W. Davidson, Mintlaw.—*1st September*, 1880.
3666. METAL FENCING, D. Ross, Hilton Farm.—*9th September*, 1880.
3927. HAULING FISH NETS, G. Howard, Hull.—*28th September*, 1880.
3514. CYLINDERS, &c., of STEAM ENGINES, W. Payton and A. Wilson, London.—*30th August*, 1880.
3523. MAKING CIGARETTES, W. R. Lake, London.—*31st August*, 1880.
3539. TREATING LIQUIDS, J. Storer, Glasgow.—*1st September*, 1880.
3566. ROOF COVERINGS, J. H. Johnson, London.—*2nd September*, 1880.
3544. HORSESHOE NAILS, W. W. Clark and J. Priestley, Bolton-le-Moors.—*1st September*, 1880.
3693. PECKS, &c., G. R. Postlethwaite, Aston.—*10th September*, 1880.
3534. TAWING, F. Wirth, Frankfort-on-Main.—*31st August*, 1880.
1704. ELECTRIC LAMPS, H. J. Haddan, London.—*1st September*, 1880.
3547. PRINTING upon WOODEN PACKING CASES, W. R. Lake, London.—*1st September*, 1880.
3548. TRIMMING WOOD BOXES, W. R. Lake, London.—*1st September*, 1880.
3555. WOODEN PACKING BOXES, W. R. Lake, London.—*1st September*, 1880.
3564. CONTRACTING SIGNAL WIRES, C. Gaunt, York.—*2nd September*, 1880.
3603. DISCHARGING GRAIN, P. G. B. Westmacott, Newcastle-upon-Tyne.—*4th September*, 1880.
3673. FURNACES for CONSUMING SMOKE, A. C. Engert, Bromley-by-Bow.—*10th September*, 1880.

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

3412. SHIPS' LOGS, J. E. Massey, London.—*30th August*, 1876.
3452. NAVIGATIONABLE DEEP-SEA SOUNDINGS, Sir W. Thomson, Glasgow.—*1st September*, 1876.
3463. GRINDING MILL, A. Anderson and D. Thirsk, Aberdeen.—*2nd September*, 1876.
3429. ELEVATING GRAIN, W. Poulsom, Liverpool.—*31st August*, 1876.

Notices of Intention to Proceed with Applications.

(Last day for filing opposition, 21st September, 1883.)

1886. CUSHIONING of VALVES, W. P. Thompson, London.—A communication from J. Flower.—*13th April*, 1883.
2108. ELECTRO-MOTOR APPARATUS, M. Kotyra, Cardiff.—*26th April*, 1883.
2130. MAKING STRAW WRAPPERS for BOTTLES, &c, O. Wölff, Dresden.—A communication from Brothers Giese and Co.—*27th April*, 1883.
2132. WASHING MACHINES, E. K. Heaps, Ferrybridge.—*27th April*, 1883.
2135. CUTTING PATTERNS on TEXTILE FABRICS, &c., H. Pataky, Berlin.—A communication from M. Heimann.—*27th April*, 1883.
2138. CUTTING the TEETH of WHEELS, H. H. Grierson and T. O'Maher, Manchester.—*27th April*, 1883.
2147. GENERATION, &c., of ELECTRICITY, J. S. Williams, Riverton, New Jersey, U.S.—*27th April*, 1883.
2148. GENERATION, &c., of ELECTRICITY, J. S. Williams, Riverton, New Jersey, U.S.—*27th April*, 1883.
2150. MAKING BRUSSELS CARPETS, &c., J. W. Walker, Kidderminster.—*28th April*, 1883.
2153. STEAM COOKING APPARATUS, E. A. Brydges, Berlin.—A communication from D. Grove.—*28th April*, 1883.
2161. SMALL BORE RIFLE TUBES, R. Morris, Blackheath.—*28th April*, 1883.
2164. CHECKING CASH RECEIPTS in PUBLIC VEHICLES, &c., H. Lyon, London.—*28th April*, 1883.
2173. FULLING MACHINES, P. Legrand, Paris.—*30th April*, 1883.
2180. FASTENING NECKTIES, V. Vyse, London.—A communication from F. Smiley.—*30th April*, 1883.
2192. GAS ENGINES, P. M. Justice, London.—A communication from W. E. Hale.—*1st May*, 1883.
2195. ELECTRIC WAYS or CONDUCTORS, B. J. B. Mills, London.—A communication from E. M. Bentley and W. H. Knight.—*1st May*, 1883.
2213. STEAM ROAD ENGINE TRACTION WHEELS, A. J. Boult, London.—A communication from J. Enright.—*1st May*, 1883.
2214. ELECTRICAL ACCUMULATORS, C. A. A. Capito, Blackheath.—*1st May*, 1883.
2229. REFINING, &c., OILS, A. C. Tichenor, Alameda, California, U.S.—*2nd May*, 1883.
2244. SWORD-HILT GUARDS or BASKETS, N. W. Wallace, Southsea.—*2nd May*, 1883.
2268. MEASURING the STRENGTH of ELECTRIC CURRENTS, F. V. Andersen, London.—*4th May*, 1883.
2278. PIPE COUPLINGS, W. R. Lake, London.—A communication from E. R. Williams.—*4th May*, 1883.
2286 SELF-ACTING POINTS on TRAMWAYS, R. F. Edbrooke, Liverpool.—*5th May*, 1883.
2299. CONVERTING ANTHRAQUINONE into a MONOSULPHOACID of ANTHRAQUINONE, I. Levinstein, Manchester.—*7th May*, 1883.
2300. ALPHA and BETA NAPHTOL, I. Levinstein, Manchester.—*7th May*, 1883.
2334. MAKING VEGETABLE OILS, C. F. Stollmeyer, London.—*8th May*, 1883.
2508. GAITERS, C. M. A. de G. du Mont, Paris.—*19th May*, 1883.
2574. CONVERTING RECIPROCATING into ROTARY MOTION, H. Burt, Southampton.—*23rd May*, 1883.
3149. LUBRICATING COMPOUNDS, T. Colgan, Brooklyn, New York, U.S.—*26th June*, 1883.
3404. LOADING VESSELS from LIGHTERS, T. E. Heath, Northlands.—*10th July*, 1883.
3526. MARINE DRAGS, W. Clark, London.—A communication from A. J. Clarke.—*17th July*, 1883.
3553. ELECTRIC METERS, G. Hammersley and C. H. Worsey, London.—*19th July*, 1883.
3561. MOTIVE POWER ENGINES, H. E. Newton, London.—Com. from G Sweanor.—*19th July*, 1883.
3573. MANUFACTURING SLABS, &c., in HYDRAULIC MOSAIC MARBLE, L. A. Groth, London.—A communication from S. Paul.—*20th July*, 1883.
3703. GAS ENGINES, J. Pickering, Stockton-on-Tees.—*28th July* 1883.
3822. TREATING DRAWINGS or DESIGNS PRINTED upon PAPER, &c, G. Rydill, London.—*4th August*, 1883.
4131. IRONING MACHINES, C. A. Allison, London.—Com. from G. W. Cottingen.—*27th August*, 1883.

(Last day for filing opposition, 25th September, 1883.)

2170. CARRIAGE DOOR FASTENINGS, J. Edwards, London.—*30th April*, 1883.
2171. BOTTLE STOPPERS, J. Jackson, jun., London.—*30th April*, 1883.
2172. NAVIGABLE VESSELS, J. Taylor, Birkenhead.—*30th April*, 1883.
2189. ELECTRIC TELEPHONES, H. J. Allison, London.—Com. from J. H. Robertson.—*1st May*, 1883.
2191. SADDLE for VELOCIPEDES, E. Burstow, Horsham.—*1st May*, 1883.
2207. APPARATUS for PREVENTING HORSES from GETTING SHY, G. W. von Nawrocki, Berlin.—A communication from G. Wille.—*1st May*, 1883.
2219. PULLEYS for TRANSMITTING MOTION, W. R. Lake, London.—A communication from H. H. Fulton and O. R. Olsen.—*1st May*, 1883.
2227. MAKING MALLEABLE IRON, &c., W. M. Murdock, Gilwern.—*2nd May*, 1883.
2228. CARTRIDGE POUCHES, T. H. Kinvig, Castletown.—*2nd May*, 1883.
2233. LOOMS for WEAVING, F. Leeming and R. Wilkinson, Bradford.—*2nd May*, 1883.
2236. COACH and CARRIAGE AXLES, J. Rigby and I. M. Morgan, Walsall.—*2nd May*, 1883.
2238. DOMESTIC FIRE-ESCAPE, G. Nobes, London.—*2nd May*, 1883.
2239. COUPLING BUFFERS for RAILWAY VEHICLES, H. H. Lake, London.—A communication from F. F. von Ainbach.—*2nd May*, 1883.
2247. DRAW BARS, &c., for RAILWAY WAGONS, S. Keeton, Lenton.—*3rd May*, 1883.
2248. CARD STANDS, &c., P. Ruffani, Dresden.—*3rd May*, 1883.
2252. TREATING BLAST FURNACE SLAG, E. G. Colton, London.—Com. from A. D. Elbers.—*3rd May*, 1883.
2265. ORNAMENTATION of DESIGNS on GLASS, J. T. King, Liverpool.—A communication from H. Schulze-Berge.—*4th May*, 1883.
2266. DECORATION of DESIGNS on GLASS, J. T. King, Liverpool.—A communication from H. Schulze-Berge.—*4th May*, 1883.
2283. CLEANERS for TUBES of FEEDING-BOTTLES, F. Cook, London.—*4th May*, 1883.
2312. ILLUMINATING GAS, H. C. Bull, Brooklyn, New York, U.S.—*7th May*, 1883.
2382. CUPOLA, &c., FURNACES, A. Stewart, Bradford.—*10th May*, 1883.
2412. CONSTRUCTION of SHIPS of WAR, E. J. Reed, London.—*12th May*, 1883.
2430. VELOCIPEDES, H. H. Lake, London.—A communication from W., J., and G. Ahlert.—*14th May*, 1883.
2441. MANUFACTURING LACE, &c., F. E. A. Büsche, Schwelm, Germany.—*15th May*, 1883.
2512. STOPPERS, &c., for BOTTLES, A. B. Vanes, Uitenhage, Cape of Good Hope.—*19th May*, 1883.
2518. COMPOUND STEAM ENGINES, C. Pieper, Berlin.—A communication from E. Ongley and Dr. Proell and Scharowsky.—*21st May*, 1883.
2562. MANUFACTURE of GAS, A. M. Clark, London.—A communication from M. Gross.—*22nd May*, 1883.
2564. BALLING HEADS of GILL BOXES, &c., P. Smith jun., S. Ambler, and J. Lund, Keighley.—*22nd May*, 1883.
2324. WATCHES, W. H. Spence, London.—A communication from A. Droz et fils.—*26th May*, 1883.
2727. APPARATUS for RECEIVING and DISCHARGING NIGHT-SOIL, A. M. Clark, London.—Com. from La Compagnie Générale de Salubrité.—*1st June*, 1883.
2879. PROPELLERS, J. Betteley, London.—*9th June*, 1883.
2946. CONSUMING SMOKE, C. Mace and J. Brewster, Sunderland.—*13th June*, 1883.
3578. SYNCHRONISING MECHANISM for CLOCKS, W. S. Harrison, London.—*20th July*, 1883.
3787. PLAITING MACHINES, L. J. Pirie, Birkenhead, and H. Findlay, London.—*2nd August*, 1883.
4136. ELECTRIC RAILWAYS, &c., S. Pitt, Sutton.—A communication from L. Daft.—*28th August*, 1883.
4137. ELECTRIC RAILWAYS, &c., S. Pitt, Sutton.—A communication from L. Daft.—*28th August*, 1883.
4145. CLEANING, &c., COTTON, H. H. Lake, London.—Com. from W. S. Archer.—*23th August*, 1883.
4177. DYNAMO-ELECTRIC MACHINES, H. H. Lake, London.—Com. from G. W. Fuller.—*29th August*, 1883.
4192. DYNAMO-ELECTRIC MACHINES, H. H. Lake, London.—Com. from G. W. Fuller.—*30th August*, 1883.

Patents Sealed.

(List of Letters Patent which passed the Great Seal on the 31st August, 1883.)

1125. STAMPING, &c., RELIEF ENVELOPES, E. Sturge, London.—*2nd March*, 1883.
1128. SHARPENING LEAD PENCILS, B. S. Cohen, London.—*2nd March*, 1883.
1129. VELOCIPEDES, J. D. Ellson, Coventry.—*2nd March*, 1883.
1130. METAL ROLLERS for PRINTING FABRICS, C. J. Appleton, Salford.—*2nd March*, 1883.
1132. TOOLS for CUTTING OFF METAL PIPES, W. and J. Maiden and E. F. Cowley, Chester.—*2nd March*, 1883.
1137. BREAK-DOWN GUNS, W. Nobbs, London.—*2nd March*, 1883.
1141. BRACELET FASTENINGS, J. Hirst, London.—*3rd March*, 1883.
1148. DRESSING STIFF NET, &c., G. Marwitz, Penge.—*3rd March*, 1883.
1152. GENERATING MOTIVE POWER, R. Hallewell, Blackburn.—*3rd March*, 1883.
1157. STEEL-MAKING FURNACES, F. W. Dick and J. Riley, Glasgow.—*5th March*, 1883.
1162. BICYCLES, J. H. Adams, London.—*5th March*, 1883.

1169. PURIFYING, &c., WATER in STEAM BOILERS, T. Lishman, West Hartlepool.—*5th March*, 1883.
1173. HEATING STEAM, &c., BOILERS, W. H. Thompson, L. Hardaker, and J. M. Porter, Leeds.—*5th March*, 1883.
1177. COAST LIFEBOATS, &c., W. M. F. Schneider, London.—*5th March*, 1883.
1178. TEA BOXES, &c., C. Cheswright, London.—*5th March*, 1883.
1186. GOVERNORS, W. Mellor, Oldham.—*6th March*, 1883.
1189. RUNNERS of UMBRELLAS, J. Imray, London.—*6th March*, 1883.
1190. SECONDARY BATTERIES, T. Rowan, London.—*6th March*, 1883.
1208. GALVANIC BATTERIES, T. Slater, London.—*6th March*, 1883.
1253. HEATED or DRYING ROLLERS, J. Horrocks, Worsley.—*8th March*, 1883.
1266. SUPPORTING the BODY in case of INJURY to the SPINE, J. W. Guilmette, Manchester.—*9th March*, 1883.
1300. HACKLING MACHINES, J. C. Mewburn, London.—*12th March*, 1883.
1316. CUTTING BEANS, &c., G. Clayforth, St. John's.—*12th March*, 1883.
1344. PRICKING CARDS for JACQUARD LOOMS, P. Ambjorn, Paris.—*13th March*, 1883.
1346. AIR PUMPS, F. Wirth, Germany.—*13th March*, 1883.
1362. MAKING COLOURING MATTERS, &c, C. D. Abel, London.—*14th March*, 1883.
1400. STUD for FASTENING the ENDS of METAL BALE-BANDS, R. Benwell, Egypt.—*16th March*, 1883.
1418. FINISHING LACE, L. Lindley, Nottingham.—*17th March*, 1883.
1478. LAWN-TENNIS BOOTS, W. H. Stevens, Leicester.—*21st March*, 1883.
1515. BREECH-LOADING SMALL-ARMS, H. Tolley, Birmingham.—*22nd March*, 1883.
1770. BOTTLE STOPPERS, W. R. Lake, London.—*7th April*, 1883.
1900. TEMPERING SEWING NEEDLES, V. Milward, Redditch.—*14th April*, 1883.
2307. SELF-ACTING APPARATUS for REGULATING the FEED or SUPPLY of WATER into STEAM BOILERS, W. White, London.—*7th May*, 1883.
2332. SHEDS, T. Colby, Pembroke.—*8th May*, 1883.
2638 SCREWS for WOOD, H. J. G. Hallström, Köping.—*28th May*, 1883.
2755. GLASS SYRINGES, E. C. Williams, London.—*2nd June*, 1883.
2818. MOULDING CORSETS, A. Grant, Landport.—*6th June*, 1883.
2878. HYDRAULIC CRANKS, J. C. Müller, Paris.—*9th June*, 1883.
2887. ATTACHING LAMPS to CARRIAGES, N. Stretton, Birmingham.—*9th June*, 1883.
3066. GAS-MOTOR ENGINES, C. H. Andrew, Stockport.—*20th June*, 1883
3068. PURIFYING FEED-WATER for STEAM BOILERS, W. Baragwanath, Chicago, U.S.—*20th June*, 1883.
3299. PRESERVING FOOD for CATTLE, W. R. Lake, London.—*3rd July*, 1883.
3401. LOCK-NUTS, A. M. Clark, London.—*10th July*, 1883.

(*List of Letters Patent which passed the Great Seal on the 4th September*, 1883.)

1170. STITCHING BOOKS, G. W. von Nawrocki, Berlin.—*5th March*, 1883.
1223. DYEING LOOSE COTTON BLACK, G. W. von Nawrocki, Berlin.—*7th March*, 1883.
1237. LOCOMOTIVE STEAM ENGINES, J. H. Johnson,—*7th March*, 1883.
1238. TELEPHONIC APPARATUS, S. P. Thompson, Bristol.—*7th March*, 1883.
1241. MULTITUBULAR STEAM BOILERS, E. Edwards, London.—*7th March*, 1883.
1242. PREVENTING DEPOSIT of SAND in RIVERS, &c., W. R. Lake, London.—*7th March*, 1883.
1243. HURDLES, A. E. Maudslay, Littlebourne.—*7th March*, 1883.
1261. STEEL OPEN SOCKET SHOVELS, T. Sidaway, Stafford.—*8th March*, 1883.
1276. REFLECTING APPLIANCES for LIGHTING VEHICLES, H. J. Haddan, London.—*10th March*, 1883.
1277. ATMOSPHERIC AIR MOTOR, H. J. Haddan, London.—*10th March*, 1883.
1286. BOOKS for ADVERTISING PURPOSES, R. Ripley, Liverpool.—*10th March*, 1883.
1290. TELEPHONIC APPARATUS, G. H. Bassano, A. E. Slater, and F. T. Hollins, Derby.—*10th March*, 1883.
1317. HANDLE of a VALVE for PREVENTING WASTE of WATER, J. Harsant, London.—*13th March*, 1883.
1329. RAILWAY FROGS, H. J. Haddan, London.—*13th March*, 1883.
1349. PRODUCING SULPHUROUS ACIDS, &c., I. S. McDougall, Chadderton.—*13th March*, 1883.
1372. GLAZED STRUCTURES, J. E. and F. B. Rendle, London.—*14th March*, 1883.
1405. SHEARING ROPES, P. M. von Swyndregt, Kralingen, Rotterdam.—*16th March*, 1883.
1421. GAS STOVES, W. T. Sugg, London.—*17th March*, 1883.
1449. IRONING MACHINE, B. J. B. Mills, London.—*19th March*, 1883.
1485. COMPRESSING or COOLING AIR, O. J. Ellis, Derby.—*21st March*, 1883.
1510. ASCERTAINING the TEMPERATURE within CLOSED VESSELS, H. Stopes and W. Crockford, London.—*22nd March*, 1883.
1572. FULLING MACHINES, A. Roger, Paris.—*28th March*, 1883.
1594. OIL LAMPS, A. Chamberlain and G. Hookham, Birmingham.—*29th March*, 1883.
1842. PRODUCTION of AMMONIA, R. Tervet, Clippens, N.B.—*12th April*, 1883.
1868. ROTARY PUMPS or MOTORS, J. H. Johnson, London.—*12th April*, 1883.
1922. FORKS for AGRICULTURAL PURPOSES, G. Pickhardt, Hagen, Germany.—*16th April*, 1883.
2063. FURNACES, D. Jones, London.—*24th April*, 1883.
2096. LOOMS for WEAVING, R. Bond, Bury.—*25th April*, 1883.
2119. MANUFACTURE of SALICYLIC ACID, W. L. Wise, London.—*26th April*, 1883.
2157. LONGITUDINAL JOINT for METAL PIPES, E. Quadling, London.—*28th April*, 1883.
2410. TREATING WOOD, J. B. Blythe, Bordeaux.—*12th May*, 1883.
2746. LUBRICATOR, J. Imray, London.—*2nd June*, 1883.
2853. METAL HANDLES for KNIVES, C. D. Abel, London.—*7th June*, 1883.
2914. RAILWAY WHEELS, A. Longsdon, London.—*12th June*, 1883.
2939. COLOUR-BOXES, C. Davis, London.—*13th June*, 1883.
2992. PLATE ROLLING MILLS for TRANSFERRING INGOTS from one SET of ROLLS to ANOTHER, C. Davy, Sheffield.—*15th June*, 1883.
2995. METALLIC ALLOYS, G. Selve, Altena, Prussia.—*16th June*, 1883.

List of Specifications published during the week ending September 1st, 1883.

4732, 4d.; 5817, 2d.; 5905, 2d.; 5910, 2d.; 5915, 2d.; 5938, 6d.; 5946, 2d.; 6010, 6d.; 6034, 2d.; 6073, 2d.; 6074, 2d.; 6087, 2d.; 6182, 4d.; 6189, 2d.; 6229, 2d.; 6240, 1s.; 20, 6d.; 23, 4d.; 28, 6d.; 40, 6d.; 45, 6d.; 56, 6d.; 60, 6d.; 69, 6d; 70, 6d.; 72, 6d.; 73, 2d; 74, 6d.; 76, 6d; 77, 2d.; 79, 4d; 82, 2d.; 83, 2d.; 87, 6d.; 88, 6d.; 89, 2d.; 90, 6d; 93, 6d; 94, 6d.; 95, 6d.; 96, 4d.; 98, 2d; 99, 2d.; 100, 2d.; 102, 6d; 104, 6d; 107, 6d.; 108, 6d.; 110, 2d.; 111, 4d.; 112, 2d.; 113, 2d.; 114, 6d.; 115, 2d.; 117, 8d.; 118, 6d.; 119, 4d.; 120, 2d.; 121, 2d.; 123, 8d.; 124, 2d.; 125, 6d.; 126, 2d.; 128, 2d.; 130, 6d.; 131, 6d.; 132, 10d.; 133, 2d.; 135, 6d.; 136, 2d.; 137, 2d.; 139, 2d.; 140, 2d.; 141, 2d.; 144, 6d.; 145, 6d.; 146, 6d.; 147, 2d.; 148, 2d.; 151, 8d.; 152, 4d.; 153, 6d.; 154, 6d.; 155, 6d.; 157, 2d.; 158, 2d.; 159, 4d.; 160, 6d.; 161, 6d.; 162, 6d.; 163, 2d.; 164, 2d.; 165, 2d.; 166, 2d.; 167, 6d.; 168, 6d.; 172, 2d.; 173, 6d.; 174, 8d.; 175, 10d.; 176, 6d; 178, 6d.; 180, 6d.; 181, 6d.; 182, 6d.; 183, 8d; 185, 6d.; 186, 2d; 188, 6d.; 189, 4d.; 190, 6d.; 191, 2d.; 193, 6d.; 194, 2d.; 195, 4d; 198, 2d.; 199, 2d.; 201, 6d.; 202, 2d.; 203, 2d; 206, 2d; 207, 6d.; 212, 6d; 213, 4d.; 214, 6d.; 219, 6d.; 220, 6d; 221, 6d.; 226, 2d; 233, 6d.; 237, 6d.; 238, 8d.; 241, 4d; 243, 6d.; 246, 6d.; 257, 4d.; 264, 6d.; 390, 6d.; 425, 8d.; 470, 6d.; 566, 6d.; 580, 10d; 2070, 4d.; 2074, 6d.; 2084, 6d.; 2110, 6d.; 2204, 6d.; 2118, 6d; 2242, 4d.; 2255, 4d; 2290, 4d; 2314, 8d.; 2322, 6d.; 2341, 6d.; 2351, 2d.; 2475, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

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

4732. LUMINOUS PAINTS or COLOURS, *H. J. Haddan, Kensington.—4th October*, 1882.—(*A communication from G. Schatte, Dresden.*) 4*d.*

15 parts Zanzibar or Cowrie copal is melted over a charcoal and mixed with 60 parts French turpentine, and when filtered 25 parts of pure linseed oil, which has been boiled and allowed to cool a little, is added. The lake varnish so produced is mixed with basic sulphate and calcic sulphide in a luminous condition, and suitable colouring matters to produce a luminous paint of any desired colour.

5817. APPARATUS EMPLOYED in MILLING, &c., *J. H. Carter, London.—6th December*, 1882.—(*Void.*) 2*d.*

This relates to means for purifying semolina, the product of earlier processes, by causing it to descend by gravity through channels crossed by air currents, and it consists in providing as usual for each separation a passage communicating with a trunk, in connection with a fan, and a current of air is drawn into the trunk through the passage. The separating passages have sides parallel for a considerable distance, so that the air in passing through them is brought to a uniform speed and direction. The passage is inclined and the semolina descends by gravity and meets the air current, which carries off the light particles. At the lower end of the passage the semolina falls through a narrow mouth and by a widening conducting passage to the second separating passage. The sides of the passages are adjustable, and valves are provided where they open into the trunk, so as to regulate the air currents.

5905. TRICYCLE, *E. de Pass, London.—11th December*, 1882.—(*A communication from G. Milczewski and L. Maschmann, Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to an arrangement of levers actuated by the weight of the rider and used in combination with treadles connected to cranks to propel the tricycle

5910. ELECTRIC LAMPS, *F. H. F. Engel, Hamburg.—11th December*, 1882.—(*A communication from F. Küppermann, Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to means for regulating the distance between the electrodes of arc lamps. The two holders are arranged partly side by side, and are moved in opposite directions by an axle with two different sized pinions, each gearing with a rack attached to the corresponding holder. A third wheel on the axle gears with a pinion, the axle of which carries a ratchet wheel governed by a pawl forming a double armed lever, one end engaging with the ratchet and the other forming the armature of an electro-magnet in the lamp circuit. When the current is reduced by the combustion of the carbons the magnet releases the armature and the pawl is disengaged from the ratchet when a weight turns the axle.

5915. PROTECTING BUILDINGS AGAINST FIRE, *J. M. Hooker, Sevenoaks.—11th December*, 1882.—(*Not proceeded with.*) 2*d.*

The girders of buildings are made hollow, and those on each floor communicate with each other, and are connected with a water main, so that they can be supplied with water in case of fire, and which will flow out of holes formed near the top of the girders and descend on the burning material below. The columns used may be similarly constructed.

5938. BOXES and SAFES and MANUFACTURE of FIREPROOF MATERIALS to BE USED IN THE CONSTRUCTION OF SAME, &c., *W. R. Lake, London.—12th December*, 1882.—(*A communication from M. Merrill and J. H. Nolan, Boston, U.S.*) 6*d.*

A box is made of a metal shell formed of sheets lap-jointed at the edges, and the upper edges of the plates forming the sides and ends being folded inward horizontally to form a reinforcing and covering portion. The box and its cover are lined with a fireproof material composed of vegetable or mineral fibre, or both, and clay and magnesia, lime, talc, or other heat-resisting material.

5946. MARKING INKS, *H. W. Langbeck, Whitechapel.—13th December*, 1882.—(*Not proceeded with.*) 2*d.*

The object is to produce marking inks of various colours, and it consists in adding suitable colours and albumen to a liquid composition, consisting of 4 grains salicylic acid, 10 drops oil of turpentine, 1 drachm spirits of wine, 6 drachms glycerine, and 1 oz. water.

6010. PROTECTIVE SHEATHING for WIRE ROPE, &c., *E. A. Brydges, Berlin.—16th December*, 1882.—(*A communication from C. Klauxe, Germany.*) 6*d.*

The spaces between the strands of wire are first filled out by winding tarred or other twine therein, and the whole surface is then covered with coils of moderately thin wire drawn tight round the cable. A machine is described for winding on the coils of wire on the cable or rope.

6190. MACHINE for KNEADING DOUGH, *R. Alexander, Glasgow.—28th December*, 1882.—(*Not proceeded with.*) 2*d.*

At each side of the lower end of the piston of a steam hammer is a horizontal stud passing through a frame pivotted at its rear end upon a short shaft carried at the back of the body of the hammer. The frame at its pivotted part is slotted to allow of a backward and forward motion as the piston is raised and lowered. At the front part of the frame is fitted a block corrugated on its underside, and which kneads the dough contained in a travelling trough beneath. Two ploughs turn the dough over in the trough.

6191. STEAM BOILERS, *S. Thackeray, Huddersfield.—28th December*, 1882.—(*Not proceeded with.*) 2*d.*

The object is to construct circular flues of steam boilers so as to prevent them forcing out the ends of the boiler when they expand, and it consists in forming a channel-shaped expansion groove upon each end of the flue ring.

6192 BRUSHING HAIR, *F. S. Willoughby, Heaton Norris, Lancashire.—28th December*, 1882. 6*d.*

This relates to mechanism for actuating rotary brushes, such mechanism being secured to the chair in which the person whose hair is to be brushed is seated.

6193. INCANDESCING ELECTRIC LAMPS, *T. J. Handford, London.—28th December*, 1882.—(*A communication from T. A. Edison, New Jersey, U.S.*) 6*d.*

This relates to incandescing lamps with flexible carbon filaments enclosed in hermetically-sealed glass chambers, the object being to increase the duration of such lamps by diminishing the electrical carrying between the filament and the enclosing chamber or the metallic terminals of the filament within the lamp, and incidentally to increase the resistance of the lamp, so as to reduce the investment required for conductors. The filament is secured to the leading-in wires, which are sealed in one glass part of the lamp, and this part is fused to the glass globe as usual. The lamp is connected with a Sprengel pump, and the globe exhausted, the filament during the latter part of the operation being gradually raised to an incandescence higher than that at which it is be used. An inert gas is then allowed to pass into the globe, the filament being kept incandescent, and the pressure increased to the proper stage, when the lamp is sealed, the pressure depending on the nature of the residual gas. With nitrogen the pressure may be when a mercury column connected with the lamp stands at the height of about 20in.

6194. DROP-DOWN GUNS, *J. H. Hannay, London.—28th December*, 1882. 6*d*

The catch which holds the barrel in position is arranged so that when pressure is applied to the barrels in the required direction they will drop without having to draw back the catch, if the gun is not on cock, but if it is the barrels cannot drop.

6198 COVERS of CARDING ENGINES, &c., *W. Hurst, Rochdale. 28th December*, 1882. 6*d.*

This relates to apparatus for supporting covers of carding engines and other machines when in an elevated position. Brackets are attached to opposite sides of the frame and carry bolts capable of sliding therein. The cover is hinged to the frame, and when raised forces back the bolts, which, when the cover has passed them, are shot forward by springs and support the cover in the raised position. Arms upon a cross shaft can be caused to act on the bolts and force them back when desired to lower the cover.

6199. DISTRIBUTION of ELECTRICAL ENERGY for LIGHT, POWER, AND OTHER PURPOSES, *T. J. Handford, London.—28th December*, 1882.—(*A communication from T. A. Edison, New Jersey, U.S.*) 6*d.*

The object is to provide a system in which currents of high tension can be used, while at the same time each translating device (lamp, for example) is entirely independent of all the others. According to one method the lamps are arranged in multiple series, and as many dynamo or magneto-electric machines employed as there are lamps in series in any circuit which extend across between the main conductors, each series being correspondingly divided by a central or intermediate compensating conductor connected between the electric machines and also between the translating devices. An adjustable resistance is provided in each main conductor, so that in case the drop in electro-motive force is greater on one main conductor than on the other the resistance may be adjusted to compensate for such inequality. According to another mode a single dynamo or magneto-electric machine is employed, and its commutator provided with an extra brush or brushes placed between the main brushes, and from which the compensating conductor or conductor run, and are connected with the multiple arc circuits between the translating devices.

6201. OBTAINING CELLULOSE from WOOD, STRAW, AND OTHER VEGETABLE SUBSTANCES, *W. R. Lake, London.—28th December*, 1882.—(*A communication from the Austrian Chemical and Metallurgical Products Manufacturing Association, Bohemia.*)—(*Not proceeded with.*) 2*d*

The wood or other substance is boiled in solutions of such compounds of sulphur with alkaloids or basic earths as will, by the addition of acids thereto, precipitate sulphur or liberate sulphuretted hydrogen, or both.

6202. COUPLING APPARATUS for RAILWAY VEHICLES, *W. G. Thresher, near Salisbury.—28th December*, 1882.—(*Not proceeded with.*) 2*d.*

The coupling is effected by the use in conjunction with a double T-shaped draw hook attached to one vehicle, of an upper and a lower link or bent bar, each carried by a transverse horizontal shaft at the end of the other vehicle, and arranged so that by partially rotating one of the shafts the free ends of the two links may be caused to approach one another or move apart like jaws, and so embrace or release the T-shaped draw bar.

6203. FELT or FELTED FABRICS, *A. J. Boult, London.—28th December*, 1882.—(*A communication from T. Jegler and J. Offermann, Bavaria.*) 6*d.*

The object is to enable felt to be combined mechanically without the use of adhesives with woven, knitted, worsted, or other textile fabrics, in such a manner that the two parts form a single piece, or whereby two similar or dissimilar fabrics may be combined without the employment of felt. The fabric is steamed and led from a roller, the wool, fleece, or nap to be combined with it being laid therein by a cloth wound on another roller, the two then passing between pressing rollers and through a bath of alkaline soap. The excess of moisture is removed by rollers and the ends of the fabric being joined it is passed through pressure rollers for from one to four hours.

6204. VELOCIPEDES or HAND CARS for USE on RAILWAYS or TRAMWAYS, *W. P. Thompson, London.—28th December*, 1882.—(*A communication from S. H. Wals, Michigan, U.S.*) 6*d.*

This relates to a railway velocipede, and it consists, First, in making the wheels adjustable on their revolving shafts; Secondly, in a truss tubular frame for such velocipedes; Thirdly, in making the wheel shaft which spans the rail of two tubular parts, one sliding within the other, so as to adapt it for any gauge of track; Fourthly, in the arrangement of levers and seat motions, so that the weight of the operator as well as his strength is used for propelling; Fifthly, the employment of sprocket wheels and chain, and device for producing tension in the chain; and Sixthly, in a device for adjusting the rear wheels to any desired angle with the track.

6205. WASHING MACHINES, *J. Proudley, Manchester.—29th December*, 1882. 6*d.*

This relates to machines in which the linen is placed in a cylinder revolving in a vessel containing a small quantity of water kept boiling by gas or a fire beneath, and it consists in forming the cylinder with internal shelves to lift the articles and then let them fall to the bottom. Openings in the ends of the cylinder allow the boiling water to enter and leave, and cups inside raise the water and throw it inwards as the cylinder revolves. The cylinder can be readily removed from the outer vessel, which is fitted with a false bottom, corrugated to accelerate the boiling of the water and facilitate its circulation and the formation of steam.

6206. INCANDESCING CONDUCTORS for ELECTRIC LAMPS, &c., *T. J. Handford, London.—29th December*, 1882.—(*A communication from T. A. Edison, New Jersey, U.S.*) 6*d.*

The object is to produce carbon filaments of high resistance, and even resistance throughout their length, and have great flexibility, and it consists in forming them of a number of fine continuous flexible carbon filaments massed together so as to be in close contact through the whole length, and having their ends secured, the separate filaments being capable of independent expansion and contraction. Several long and very fine fibres (such as Ramie, flax, and other similar vegetable substances) of the same length are twisted tightly together to form a thread, and the ends secured by a plastic carbonisable substance, such as a compound of carbon and sugar. The filament is then carbonised under strain or pressure, and the ends are then attached to the leading-in wires sealed in the stem of the lamp, and are preferably electro-plated to such wires, the filaments being first again twisted tightly so as to bring them all in contact throughout their length. A mould may be used to hold the filaments during carbonisation, and prevent the threads untwisting.

6209. CARRIAGE BRAKE BLOCKS, *W. E. Cary, Manchester.—29th December*, 1882.—(*Not proceeded with.*) 2*d.*

The wood block is cut so that the end of the grain is brought into contact with the wheel, and it is held in a holder of box form, into which it is tightly driven.

6208. COMPOUNDS TO BE USED AS SUBSTITUTES FOR "BARM" IN MAKING UNFERMENTED BREAD, &c., *A. Esilman, Manchester, and H. Esilman, Glasgow.—29th December*, 1882. 4*d.*

This consists, First, in the use of phosphoric acid in conjunction with alkaline or earthy carbonates or bicarbonates; and Secondly, in the use of phosphates of ammonia in conjunction with alkaline or earthy carbonates or bicarbonates, as substitutes for barm used for making unfermented bread, biscuits, and similar food.

6210. REPEATING or HAMMER ACTIONS for PIANOFORTES, &c., *E. A. Brydges, Berlin.—29th December*, 1882.—(*A communication from A. Lexow, Berlin.*) 6*d.*

The guide pin is attached direct to the setting-off lever and the escapement stud at the lower end of the jack or hopper, for which purpose a lever is provided with a regulating pin capable of adjustment and arranged to throw the jack back after each stroke. The damper mechanism is arranged so that the damper as well as the damper lever wire is as near the fulcrum of the lever as possible, so that even when the stroke of the lever is small the damper will be moved a sufficient distance.

6212. BOOTS AND SHOES, *T. Laycock, Northampton.—29th December*, 1882. 6*d.*

The object is to provide a water-tight boot or shoe, either "lace-up" or "button," and which will be more comfortable than the ordinary watertight boot or shoe. In one arrangement the quarters are made to overlap and are provided with a folding gore or tongue.

6213. MATCH BOXES, *J. Darling and J. J. Long, Glasgow.—29th December*, 1882. 6*d.*

The box consists of a drawer sliding in an outer casing closed at one end and formed with an aperture for lighting a cigar, the top or side perforated to admit air, and one side formed with a roughened igniting surface and a barbed slot to hold the match when lit. The casing is formed of a single piece of sheet metal.

6214. GAS ENGINES, *W. Watson, Leeds.—29th December*, 1882. 6*d.*

A trunk or plunger is used instead of the ordinary piston, and the piston rings and stuffing-boxes are abolished. To preserve the plunger tight a split ring is applied to the outer end of the cylinder and fits the plunger closely by the external pressure of an elastic ring, the pressure of which can be regulated by set screws, and to make the joint perfect at the opening in the split ring an adjustable piece is fitted in contact therewith but between it and the cylinder end, and is also in close contact with the plunger piston and is retained in such position by springs and set screws.

6218. CONTROLLING THE CURRENT IN ELECTRIC CIRCUITS BY SWITCHES, RESISTANCES, AND SIMILAR APPARATUS, *J. Jamieson, Oldham.—29th December*, 1882. 4*d.*

The object is to provide more convenient means for varying or diminishing the strength of current in electric circuits, and to prevent or diminish the formation of a dangerous or destructive arc when the circuit is broken by means of a switch or other similar device. To vary the current resistances are removed from or inserted in the circuit, such resistances consisting of a tube of non-conducting material filled with thin discs of oxidised metals, and at the ends of which electrodes or discs of copper are placed in contact with the external oxidised discs, and the circuit wires being attached thereto. If necessary a quantity of metallic oxide in a powdered state may be interposed between the discs. To prevent the formation of a dangerous arc on breaking the circuit by means of a switch, two or more fixed contact plates or studs are arranged close to each other, so that the movable contact shall touch the second before leaving the first contact. Between each pair of fixed contacts one of the special resistances described is interposed.

6219. PURIFYING OIL AND FATTY MATTERS, *W. R. Lake, London.—29th December*, 1882.—(*A communication from E. S. Dangivillé, Paris.*) 4*d.*

This consists in the process of purifying oil and fatty matters by the employment of an alkaline solution combined with a continuous liberation of steam at a low temperature in a vacuum, in order to dissolve the foreign matters and volatilize the essential odorous oils, and thus improve the quality and value of the oil or fatty matter.

6220. LOOMS for WEAVING, *W. Smith, Heywood, Lancashire.—29th December*, 1882.—(*Not proceeded with.*) 2*d.*

The object is to simplify the jacquard motion, and to dispense with the springs. Treadles in the form of angle levers are pivotted on the treadle stud, and the top and bottom jacks coupled to the long end, and the double hooks rest at the top end of the angle part. These hooks are acted upon by the chain of pulleys driven by a peg and star wheel. The grifes are pivotted on the treadle stud, and actuated by an excentric stud on a pinion keyed to the crank shaft connected with a slotted angle lever working on the treadle stud. The slot in the upper part of this lever moves a stud on which two links are secured, each of which is connected to one of the grifes. The chain of pulleys acts on the front part of the double hooks, and holds them on to the front grife until the next change, when as the pulleys leave the hooks the weighted end of the hooks cause them to fall and be caught and held by the back grife.

6221. BUSHES or CONNECTIONS for CASKS, &c., *J. W. Lowe and F. West, Southampton.—29th December*, 1882.—(*Not proceeded with.*) 2*d.*

This consists of a tubular piece closed at its inner end, and having holes at a certain part of its length, such tubular piece screwing through a bush into the interior of the cask as the tap is screwed into position.

6223. SPINNING MACHINERY, *N. Macbeth and R. N. Cottrill, Bolton-le-Moors.—30th December*, 1882. 6*d.*

This relates to continuous spinning machinery in which the yarn is spun and wound upon the bare spindle or upon a tube or bobbin, and, in the first place, to the arrangement for acting upon the yarn in its passage from the draw rollers to the spindle to effect the winding. In place of the ordinary ring and traveller, a flyer works between two plates or rings, one of which may project from the rising and falling rail. In each plate is a circular hole, and the plates are separated by a space in which the flyer works. The body of the flyer encircles the spindle, and it is provided with a thread arm extending up through the upper plate, and with a drag arm projecting between the plates. The outer end of the thread arm projects over the upper plate, and is hooked or twisted to receive the yarn from the guide eye above the centre of the spindle. Provision is made for varying the frictional hold of the yarn upon the yarn by means of eye or hooks. Upon the drag arm is a drag washer or brake piece, which by centrifugal force is caused to bear against the sides of the holes in the plates.

6224. SPINNING AND TWISTING FRAMES for JUTE, FLAX, HEMP, TOW, &c., *A. Freir, Dundee.—30th December*, 1882. 6*d.*

This consists in dispensing with the neck or step rails, and substituting brackets or pockets, in which the neck and step bearings are inserted. The upper or neck bearing is carried in a gland piece attached to the upper part of the bracket or pocket, and the bearing is conical, the largest part being at the bottom. The step bearing is formed in the upper part of a screw plug fitting the bottom of the pocket, and is adjustable, a check nut fixing it when adjusted. The pockets are carried on a flat bar extending across the frame, and each pocket forms a receptacle for a lubricant. The wharve is attached to the spindle as closely as possible above the neck bearing.

6225. GLASS BOTTLES, *J. S. Davison, Sunderland.—30th December*, 1882. 4*d.*

This consists in the manufacture of "black" bottles in moulds in which they are blown, such moulds having the particular formation of the neck and mouth, and by means of which the bottles are finished at one operation by the blower, and only require to be groun round the mouth. One form of bottle is formed wit a square mouth to receive square corks.

6227. FIRE-GRATES, *J. Moore, Surrey.*—*30th December*, 1882.—(*Not proceeded with.*) 2*d.*

In the back plate is an opening or grid provided with doors or shutters, through which part of the smoke passes, the rest being drawn down through the bars and up through a flue at the back into which the grid also opens. An ash pan closes in the grate leaving room for the passage of the products of combustion. Divisions in the flue abstract the heat from the products of combustion, such heat being utilised to heat air in a chamber communicating with the room.

6230. TRACTION ENGINES FOR TRAM, RAIL, AND OTHER ROADS, *W. Wilkinson, Wigan.*—*30th December*, 1882.—(*Not proceeded with.*) 2*d.*

The objects are to prevent the emission of visible steam and sparks from engines, to reduce the noise of the exhaust, and to provide geared driving connection which will allow of side cant to the carrying wheels and axle. The exhaust is led by a series of concentric rings to a superheating chamber suspended in the furnace.

6231. STEAM TRAPS AND APPARATUS FOR REGULATING THE FLOW OF FLUIDS, &c., *J. J. Royle, Manchester.*—*30th December*, 1882. 8*d.*

An open-bottomed float works in a reservoir of water with an outlet at bottom, but rising above the water level. The float is connected to a lever operating a valve discharging into the reservoir. Modifications are described. In steam traps constructed on the expansion principle an outer tube of brass or copper contains an inner core of earthenware, and terminates in a valve box fitted with a ball valve held off its seat by the core. The expansion of the outer tube permits the valve to fall to its seat when heated by the steam. A diminishing valve for regulating the flow of fluids consists of an open-bottomed inverted float working in a case and connected to a valve, an additional fixed vessel of thin metal isolating the float vessel from the outer casing. The steam has free access to the space between the additional vessel and outer casing. The float vessel dips into a dish containing water, from the centre of which a pipe rises and acts as a guide for a rod depending from the float vessel and passing to a lever which actuates a valve in a chamber below the dish. A dead weight escape valve is situated on top of the casing and communicates with the space between the float vessel and the isolating vessel. A screw clamp is described for regulating the flow of liquids through flexible tubing.

6232. TREATMENT OF INDIA-RUBBER, GUTTA-PERCHA, &c., *H. Gerner, Westminster.*—*30th December*, 1882. 6*d.*

This relates to improvements on patent No. 47, A.D. 1880, in which camphor was incorporated with caoutchouc and analogous gums and with sulphur, and the compound exposed to heat to vulcanise it, and it consists principally in the introduction of gum kauri in such mixtures of caoutchouc, camphor, and sulphur.

6233. ORNAMENTING OR LETTERING ARTICLES IN GLASS, *W. B. Fitch, Deptford.*—*30th December*, 1882. 4*d.*

This relates to the production of enamelled designs on glass articles while in a hot state. The article with the design raised thereon passes in a heated state under a roller of asbestos, to which a suitable enamelling material is supplied, after which the article is annealed.

6234. FURNACES FOR MELTING GLASS AND CRUCIBLES EMPLOYED THEREWITH, *W. B. Fitch, Deptford.*—*30th December*. 1882. 6*d.*

A perforated slab of refractory material is placed over or near the top of the tank. In place of the ordinary "working out ring" a number of tubes are placed at an angle and extend nearly to the bottom of the tank. Suitable retorts are placed so that their mouths can discharge on to the slab, and are heated by the furnace, such retorts being provided with doors or slides. To strengthen the crucibles employed in glass melting, bands of asbestos paper are placed round them, or they may be lined with it. The tanks are provided with tubes passing through them from the fires whereby the metal is melted more rapidly, and crucibles need not be employed.

6235. ELECTRIC ARC LIGHTS OR LAMPS, *W. B. Fitch, Deptford.*—*30th December*, 1882. 2*d.*

This consists in the application to arc lamps of a perforated disc, a ring, or a bulb of suitable refractory material suspended between the carbons, so as to become heated and increase the intensity of the light. The disc, ring, or bulb may be made of asbestos, or the material used in the manufacture of plumbago crucibles.

6236. MANUFACTURE OF SCREWS, *W. R. Lake, London.*—*30th December*, 1882.—(*A communication from A. Faugier, Lyons.*) 4*d.*

This consists in applying to rollers used for manufacturing screws by pressure, a ring or washer acted upon by two friction rollers so as to prevent the rollers separating. Wedges are used to maintain the bearings of the pressure rollers rigidly in position.

6237. ELECTRIC LAMPS OR LIGHTING APPARATUS, *W. R. Lake, London.*—*30th December*, 1882.—(*A communication from R. Mondos, Paris.*) 6*d.*

This relates to improvements on patent No. 5490, A.D. 1881, in which the carbons have two successive movements—one sudden, and which causes the formation of the arc, while the other regulates and maintains the length of the arc. The movement of the carbons is caused by a single electro-magnet which actuates two levers connected by links acted upon by a counterweight. In one arrangement the rod carrying the upper carbon holder passes into a tube with a plate at its lower end to abut against a screw, such tube passing through the eye of a lever oscillating on a pivot, and carrying at one end an armature and at the other a counterweight. To the lever two links are pivotted, and abut against a lever oscillating upon an arm fixed to the tube, and carrying the brake to arrest the rod of the carbon holders through an aperture in the tube. When the carbons are too far apart the current passes partly through a shunt circuit including an electro-magnet, whereby the armature is attracted, the eye clamps the tube passing through it and causes it to descend until the plate comes in contact with the screw. The links then pulling the lever cause the brake to release the rod carrying the upper carbon holders, and the upper carbons descend until the current can pass from one to the other. The current no longer passing through the magnet, the counterweight raises the parts to their normal position.

6238. DISCHARGING FIRE-ARMS AND ORDNANCE, *N. G. Green, New York.*—*30th December*, 1882.—(*Partly a communication from J. L. Galt and J. P. Freeman, New York.*)—(*Not proceeded with.*) 2*d.*

This relates to the discharge of small-arms and ordnance by electricity, and it consists in the use of a battery placed in the stock of the gun and connected to plates in the lock mechanism, and which are brought into contact with wires leading through the base of the cartridge into the explosive material. A push button completes the circuit.

1. DYNAMO-ELECTRIC MACHINES, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 6*d.*

This consists of an armature the core of which consists of a series of iron rings fitted one outside the other, and fastened together by screws or pins, the rings being then cut from the outside and inside, so that the ends of one section overlap the ends of its contiguous section, the two forming a lap joint which is secured by pins. A set of cast iron bobbins are wound with the usual wire on a lathe and slipped on the two sections of the core, the ends of which are then brought together and connected. The bobbins are equidistant, and the intervening spaces filled with U-shaped clamps and insulating rings that embrace the core on three sides, and butt against the inside face of the wheel to which they are screwed. The bobbins and clamps thus embrace the entire surface of the core excepting the points of contact between the ends of the clamps and the inside face of the wheel, covering all the pins that unite the sections of the core and keeping them from working loose. The field magnets are placed three above and three below, and one end of each is bolted to a frame, the magnets projecting towards the wheel The other ends are bolted to check pieces grooved to form a U-section, and which embrace the armature on three sides. The commutator consists of a series of sectors united at their outer and inner ends to form a disc rotating upon a vertical plane. The outer ends are united by two insulating rings, one on each side of the disc, secured by screws passing from ring to ring through the sectors, each of which is insulated. The inner ends of the sectors are secured to an insulating ring bushed with a metal ring secured to the shaft. The brush holders are U-shaped and embrace the disc, a stud on each end of one rising to the periphery of the disc, and passing down to the lower periphery from each end of the other, such studs receiving the brushes, of which there are four, two on each side of the disc. The brackets are secured to a crosshead bolted to the same. The coils of the armatures are wound in same direction, and are connected as in the Paccinotti ring, forming a continuous closed coil of wire round the ring. The upper field magnets are of one polarity, and the lower ones of the opposite polarity.

2. STORAGE BATTERIES FOR ACCUMULATING ELECTRICITY, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 6*d.*

The object is to expose to chemical and electrical action a larger proportion of lead surface, both metallic and oxide, and thus obtain a more powerful battery action. Two or more electrodes, each composed of alternate plates of lead and oxide piled one upon the other are used, each beginning and ending with a plate of metallic lead, and all connected and combined into a battery. The lead plates are rectangular, and have a rectangular hole in the centre, and a circular hole in each end, and the oxide plates are similarly formed, the whole of the plates being held together by lead rods passing through the holes and rivetted over. The vessel to receive the electrodes has a false wooden bottom in which holes are cut to receive the electrodes, and a skeleton cover fits over the tops of same. The electrodes are connected by conductors, and the vessel charged with acidulated water, and closed with a tight cover to prevent evaporation.

3. SYSTEM OR COMBINATION OF ELECTRICAL APPARATUS AND CONDUCTORS TO BE USED IN THE APPLICATION OF ELECTRICITY TO PRACTICAL USE, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 10*d.*

This relates to a special combination of a generator, a storage battery, and a translating device connected by conductors, and governed by switches and other regulators, the invention being especially applicable as a system of domestic lighting. The generator is so combined with the storage battery and the lamps and suitable switches, that when the storage battery circuit is closed, and the lamp circuit broken, and the storage battery connected in multiple arc, the generator will charge the battery to its maximum. If the battery circuit be then broken and the lamp circuit closed, the battery being connected in series, the stored force in the battery will energise the lamp or other translating devices in the circuit. By these means a very weak current can be made available to operate an electro-translating device requiring a current of high electro-motive force.

4. ELECTRIC LAMPS OF THE ARC TYPE, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 6*d.*

Two electro-magnets are mounted on a frame, one divided into four sections each, coiled full of wire wound in the same way, the inside ends of all the coils being joined together, and also all the outside ends, making the quantitive magnet of Professor Henry, which when combined with the lighting circuit of a lamp to work its machinery, enables a much smaller magnet to be used, and a greater magnetic force obtained, and the resistance of the circuit materially decreased. The other magnet is wound with very fine wire, and the two magnets are connected so that a differential action is set up, the magnetism of one pulling against that of the other, and the two so connected in circuit that about 1 per cent. of the current passes through the latter magnet, and the rest through the other. A rocking lever is connected at its ends to the movable magnet cores by pins passing through oblong holes in the lever, which is pivotted to the frame, and its ends embrace the cores, while through it passes a rod carrying the upper carbon holder. To this lever a clutch lever is pivotted, and its end carries a receptacle supplied with mercury, and is prevented from rising above the main lever by a stop. The receptacle abuts against a set screw when the lamp is not in action, the object being to release the rod from the clutch lever when the circuit is disrupted. By these means the upper carbon is operated. In the top of the case a tube is inserted, and from a ring in the top the lamp is suspended. Inside the tube is a weight embracing the rod, and counterbalancing its weight. The frame carrying the magnets is secured to a second frame. A catch hook engages with a bracket, and keeps the carbons separate when the rod is pushed up. The lower carbon can be adjusted to centre on the upper one.

5. ELECTRIC LAMPS OR LIGHTS OF THE ARC TYPE, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 6*d.*

This relates to the method of combining, adjusting, and operating the illuminating conductors of an arc lamp. There are two plates of carbon, the sides of which are placed together in actual contact from end to end, and by causing them to make and break such contact the arc is formed or extinguished at their ends, the plates always remaining parallel to each other. An iron armature carrying one carbon is supported above a magnet by a pair of links pivotted to both, and set at an inclination, the weight of the armature and carbon being supported upon springs and by counterweights. The magnet is supported on an insulating plate, to which the holder for the other carbon is secured. A branch circuit of high resistance is placed round the lamps, and a lever actuated by the magnet acts to introduce the resistance into the circuit when the lamp is in operation, and to cut it out when not in operation. When the magnet is energised it lifts the lever and introduces the resistance, and at the same time attracts the armature, and so separates the carbons. If the light is extinguished through a temporary disruption of the current, the spring and counterweights force the carbons together.

6. INCANDESCENT ELECTRIC LAMPS, *F. J. Cheesbrough, Liverpool.*—*1st January*, 1883.—(*A communication from E. R. Knowles, Brooklyn, U.S.*) 6*d.*

This relates, First, to the method of sealing the illuminating chamber; and Secondly, to the method of making the electrical connections. The chamber is of glass and the conductor of carbon, the latter being supported by small carbon cylinders with holes to receive the ends, round which a cement is placed composed of bichloride of potassium, platinum black, or platinum sponge and water. The ends of the conductor thus fitted to the cylinder are connected to cups formed on the ends of the electrodes, which are held in position by an insulating brace. The cups have slits in which the ends of the carbon are gripped firmly. The electrodes pass through the dome of an inverted glass cup, and are sealed therein, the edges of such cup being themselves sealed in a suitable cement contained in a second cup, which also receives the lower edges of the illuminating chamber, and when the cement has set the latter is exhausted through a tube which is then closed by fusing. To make electrical connection between the lighting circuit and the lamp, a fixture is faced with an insulating disc with which metal sectors are set, to which the conductors are connected. The lamp is set on the fixture, and held by a pivot bolt secured at bottom by a screw, so that the lamp can turn and place the contacts in or out of circuit.

7. FEEDING PAPER OR OTHER MATERIAL TO PRINTING AND OTHER MACHINES, &c., *F. Hoyer, Liverpool.*—*1st January*, 1883. 10*d.*

This relates to improvements on patents No. 2855, A.D. 1880, and No. 2457 and No. 5241, A.D. 1881, and it consists in mechanism for feeding sheets from a pile to printing machines, raising and lowering the pile to and from a suction and delivering device as the paper is withdrawn sheet by sheet. The vacuum caused when the top sheet is lifted by suction is utilised to draw off any second sheet which may adhere to the top sheet. A strip of wood has bosses at intervals which rise above the tapes and raise the tail of the sheet so as to prevent it curling over by the action of the tapes. Two part circles of wire revolve and prevent any buckling of the edge of the sheet under the action of the rubber. A perpendicular rack lifts the suction chamber, to which a partial rotary motion may also be imparted. Various other improvements are described.

8. SECURING RAPID, EFFECTIVE, AND ECONOMICAL COMBUSTION OF FUEL IN FURNACES FOR HEATING, MELTING, &c., *J. Howden, Glasgow.*—*1st January*, 1883. 6*d.*

This relates principally to means for regulating the quantity of air supplied above or below the fuel or at other parts of the furnace, and consists in suitable channels provided with regulating valves, the air entering being first caused to pass through a series of pipes exposed to the heat of the escaping products of combustion.

9. SMELTING AND MELTING FURNACES FOR ORES AND METALS, *J. Swain, Oldham.*—*1st January*, 1883.—(*Not proceeded with.*) 2*d.*

As applied to a cupola for melting iron, steam superheated in pipes arranged in the flues is discharged into passages or chambers, and mingling with the heated gases from the furnace effect their decomposition.

10. TRICYCLES, &c., *J. Cameron, Lauriston, Perth.*—*1st January*, 1883.—(*Not proceeded with.*) 2*d.*

On the driving shaft is a chain pinion driven from a larger wheel on a shaft fitted with two ratchet wheels actuated by spring pawls pivoted to treadles, which are returned to their normal position by springs or weights.

11. UMBRELLA FURNITURE, *E. J. James, Kilburn.*—*1st January*, 1883. 6*d.*

This relates, First, to the formation of the joint ends of ribs and stretchers; Secondly, to forming the stops with grooves to receive the ribs; Thirdly, constructing the stop and runner so that when the latter is raised it locks with the stop; Fourthly, constructing the runner and stick so that the former is engaged and released from the stop by a partial turn; Fifthly, constructing the stick with spring sided recesses to receive projects on the "gats;" Sixthly, constructing the stretchers and hinging them to the ribs so that they interlock when closed; and Seventhly, the application to ordinary lock stretchers made to receive the rib within the trough of a forked joint, and to connect the same to the runner.

14. SECONDARY OR STORAGE BATTERIES, *T. Rowan, Westminster.*—*1st January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to reduce the weight, diminish the cost, and increase the efficiency of storage batteries. The surfaces of the plates or vessels are covered with grains of lead mixed with peroxide of lead, which is secured thereon by an adhesive preparation, such as a solution of rubber. The plates may be of paper, cloth, thin sheet metal, or other suitable material.

15. SUSPENSION DEVICES FOR HEAVY BELLS, *A. J. Boult, London.*—*1st January*, 1883.—(*A communication from H. Roy, France*)—(*Not proceeded with.*) 2*d.*

The bell is attached to a cross bar with a journal at each end and a pinion beyond. The journals rest on smooth surfaces in the form of a segment of a circle, and the pinions gear with segmental racks.

16. CALCULATING MACHINE, *J. Edmondson, Halifax.*—*1st January*, 1883. 1*s.*

The machine consists of a circular plate free to revolve on a stud, and having round its face aporture, under which numbers are seen on their respective discs, which are mounted on spindles. A bevel wheel has teeth on its upper and under faces, the former gearing with and operated by a pinion on the operating handle, and the latter actuating through bevel pinions the calculating stepped drivers. On the several shafts of the driver are stepped stops. Each driver actuates a pinion on a tube sliding on a shaft, and carrying a star wheel gearing with the stepped stop, for the purpose of locking its shaft except when actuated by the driver, the said shaft carrying gear to work the number disc. By an additional driver the multiplier and the product, also the dividend and quotient, appear in the one line of number discs, and the quotient is in position to be operated with as a multiplier. The changes from multiplying to dividing and from adding to subtracting are effected by a series of cam slots in a circular plate free to work round the boss supporting the vertical spindle.

18. MECHANISM AND APPLIANCES IN CONNECTION WITH LOCOMOTIVE ENGINES AND RAILWAYS FOR INCREASING THE TRACTION POWER OF THE ENGINE, *H. Simon, Manchester.*—*1st January*, 1883.—(*A communication from C. Hagans, Germany.*) 8*d.*

In engines provided with toothed gear auxiliary wheels on auxiliary shafts are carried by a frame, and operate in combination with auxiliary rails and a toothed rack at any desired point of the line. The auxiliary rails are placed somewhat higher than the usual one, and so lift the ordinary wheels, while a toothed wheel on the axle of the latter gears with the rack.

21. GAS MOTOR ENGINES, *J. R. Woodhead, Leeds.*—*1st January*, 1883. 6*d.*

This relates to gas engines with two working cylinders, and consists in using in combination therewith a third cylinder serving as a pump to supply the explosive charge alternately to the working cylinders at proper intervals and under pressure, a suitable valve arrangement and mechanism for working the same being provided. Each working cylinder has a piston connected to a crank, the centres of which are in line, so that the pistons make their respective inward and outward strokes simultaneously. The pump is actuated from the crank shaft by a crank or excentric. A charge of air is admitted to each cylinder to clear the same, and is expelled with the products of combustion through suitable valves.

22. INDICATING AND RECORDING APPARATUS FOR PUBLIC VEHICLES, *W. L. Wise, London.*—*1st January*, 1883.—(*A communication from C. de Cuyper, Belgium*) 6*d.*

A time-keeper has a disc which revolves once in twenty-four hours, against which a divided paper disc is held, so that a pencil bearing against it will mark thereon, such pencil being capable of being shifted so as to bear in one of three concentric spaces on the disc representing time at rest, time engaged, and time disengaged respectively. The mechanism which shifts the pencil also causes indicators showing if the vehicle is engaged or not to be exhibited.

25. RAILWAY VEHICLES AND BRAKE APPARATUS THEREFOR, *H. H. Lake, London.*—*1st January*, 1883.—(*A communication from T. Hersee, New York.*)—(*Not proceeded with.*) 4*d.*

The floor is constructed of rolled iron cross beams, to which the flooring is bolted lengthwise, the beams being connected by longitudinal stringer plates and lateral diagonal braces. The sides and ends of the vehicle consist of sheet iron with a wood lining. Each wheel is connected to a separate axle. The brake is actuated by the backward movement of the drawhead, when the speed of the locomotive is reduced.

26. SPINNING AND WINDING, *F. Jenkin, Edinburgh.*—*2nd January*, 1883.—(*Partly a communication from J. A. Ewing, Japan.*) 6*d.*

This consists in making each spindle of spinning and winding machines the revolving armature of an electro-motor, so that they are driven without intermediate gearing, suitable means being provided to prevent the speed of rotation from varying through more than a permissible range. For this purpose the spindles may be geared together, or a centrifugal governor may be applied to each and connected to the commutator brushes.

27. COMBS, PRONGS, OR PINS FOR LADIES' WEAR, *L. Birnstingl, London.*—*2nd January*, 1883.—(*A communication from M. Birnstingl, Paris.*)—(*Not proceeded with.*) 2*d.*

The head of the comb has connected to it two links maintained in place by a spring. The outer link is provided with a tube, to which the ornament is fixed.

29. UTILISING THE WASTE HEAT ESCAPING FROM THE FLUES OF STEAM BOILERS, *W. Hall, Cardiff.*—*2nd January*, 1883. 6*d.*

This consists in arranging flat iron chambers at the back end of the steam boilers or between the boilers and the chimney stack, such chambers having a series of partitions arranged within them, so as to leave a space alternately at the top and bottom, and through which the water or other material to be heated is caused to flow.

30. REFRACTORY OR FIRE-BRICKS, TILES, BLOCKS, PIPES, TUYERES, &c., *J. Williams, Liverpool.*—*2nd January*, 1883. 2*d.*

This consists in manufacturing bricks, tiles, &c., of granular or pulverulent silica and carbonaceous matter, the silica being ground and mixed with a thick liquid hydrocarbon, and then pressed into the desired form and dried in a stove.

32. LAMPS FOR DENTAL, SURGICAL, AND OTHER PURPOSES, *G. W. von Nawrocki, Berlin.*—*2nd January*, 1883.—(*A communication from Dr. R. Telschow, Berlin.*—(*Not proceeded with.*) 2*d.*

This consists of a conical telescope or lense tube with an inner lense having its flat side to the burner, and with an outer convex side and an outer bi-convex lense, and is connected to a reflector clamped to the lamp case so as to be capable of turning on a pivot in any desired direction. The lense part is provided with a shade and the flame is between the inner half convex lense and the reflector.

33. MANUFACTURING IMITATED IVORY, *S. Hahn, Berlin.*—*2nd January*, 1883. 4*d.*

The article to be coated is immersed in a mixture of collodion and gum-sandrach, or shellac dissolved in spirit, and is left therein until a deposit is formed, when it is removed quickly and preferably vertically.

34. ELECTRIC LAMPS OR LIGHTING APPARATUS, *W. R. Lake, London.*—*2nd January*, 1883.—(*A communication from C. A. Hussey and A. S. Dodd, New York.*) 6*d.*

The carbons are both secured in metal holders, near the lower end of which is a globe carrier. The top holder is connected to a metal rod extending up through a metal case, and the lamp is suspended by metal rods, to which the line wires are fastened, such rods being insulated from the case and secured to metal plugs extending through the top of the case. The lower holder is supported by two rods extending down from the case but insulated from it. Within the case is a solenoid, and a wire extends from the metal plug of one supporting rod to one end of the solenoid wire, and a second wire leads from the other end to the outer case, the circuit extending thence to the upper carbon, the lower carbon, one of the rods supporting the holder of the latter, and along a wire to the plug of the other supporting rod. The core of the solenoid consists of an annular piece fitting within it, and a little lower is a second solenoid, whose coil is of higher resistance, and which carries the core of the upper solenoid upon its outside, its own coil inside, and a connecting piece over its upper end. Both cores are tubular. One end of the coil of the second solenoid is connected with a wire connected to the first solenoid, and the other end by another wire, also with the first solenoid, so that the second is in a shunt circuit. Springs tend to force the core of the first solenoid upwards. Two clamps of segmental form, adapted to grip the upper carbon rod, are pivotted to arms which at their outer ends are pivotted to the cores of the solenoids. When a current passes the first solenoid raises the cores of both, and the arms cause the clamping pieces to grip upper carbon rod. When the resistance in the main circuit increases by the consumption of the carbons the first solenoid is weakened, and a greater current flows through the other, and the cores descend, and with them the upper carbon rod. The inner ends of the arms move through arc-shaped paths and release the rod, which descends with the upper carbon. The current passing through the first solenoid is thus increased, and the cores again move upwards, whereby the upper carbon rod is again gripped.

35. REEL FOR COILING WIRE ROPES ON BOARD SHIP, *W. H. Harfield, London.*—*2nd January*, 1883. 4*d.*

A flanged drum is mounted loosely on an axis fixed to an A-shaped frame at each end, connected near the base by cross-bars. An annular wheel is fixed on the side of the drum flange, and with it gears a pinion carried by an upward extension of the frame, and driven by a crank handle. A brake band acts upon the outer circumference of the annular wheel.

36. APPARATUS FOR THE GENERATION AND UTILISATION OF ELECTRIC CURRENTS, *S. Z. de Ferranti, Shepherd's-bush.*—*2nd January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to utilise an alternating or varying current, coupled with motion to produce a current always flowing in one direction without using a commutator, one method of effecting this consisting in coupling the armature of an alternating current machine with the armature of a similar machine driven in unison with the first. The current generated from the first armature passes into the second, which, in rotating, induces a current in a stationary conductor.

37. CHRONOGRAPH, *A. G. Golay, Switzerland.*—*2nd January*, 1883. 6*d.*

The object is to obtain the utmost precision in starting and stopping the hands of a chronograph when the push piece is acted upon, and it consists in a special arrangement of the brake of the chronograph hand and of the intermediate wheel which transmits the motion of the larger hand to that of the minute indicator. A brake bears against the barrel of the hand and carries a small spring, which bears upon the top of a pin fixed to a lever which carries the intermediate wheel, which transmits the motion by means of another wheel to the centre wheel. When the lever is lifted the spring throws the intermediate wheel out of gear, and at the same time increases the tension of the spring, and consequently the pressure of the brake upon the barrel of the hand.

38. VESSELS FOR HOLDING MINERAL OR OTHER OILS OR OTHER LIQUIDS, *G. A. J. Schott, Bradford.*—*2nd January*, 1883. 6*d.*

This relates to improvements on patent No. 3449, A.D. 1880. The top is formed with a flange, and its surface slopes so as to prevent overflow. A loose well with a perforated strainer is provided, the former to allow of ready access to the interior of the vessel, and the latter to filter dirty liquids. The sectional delivery pipe is secured so that the upper section can be removed. The pump and discharge pipe are placed side by side and enclosed by a vertical perforated tube forming a filter. The loose well is fitted with a syphon tube to prevent danger of combustion. A float indicator is provided. The discharge pipe is in sections connected by swivel joints. Means are provided for preventing the surreptitious withdrawal of the contents of the vessel.

39. CARBONS FOR INCANDESCENT LAMPS, *J. Wavish, Forest-gate, and J. Warner, Whitechapel.*—*2nd January*, 1883. 4*d.*

The carbons are formed of a short rod with thickened ends, a central hole passing lengthwise through the rod, and transverse perforations or long slots through

the reduced central part. The terminal wires may be connected to the ends, and the carbon used in an exhausted globe.

41. WINDOW-SASH AND OTHER FASTENINGS, *J. Buller, Birkenhead.—3rd January*, 1883.—(*Not proceeded with.*) 2*d*.

A metal bolt works in a tubular guide, and has a tapered point to enter the catch. At the point is a lip, which, when shot and the bolt partly turned, draws the sashes tight together.

42. VENTILATING RAILWAY CARRIAGES, *J. Livesey, Westminster.—3rd January*, 1883.—(*Not proceeded with*.) 2*d*.

On either or both sides of the carriage a casing is fixed and projects, its front and rear sides being perforated. Within it are valves arranged so as that whatever the direction of motion the front side is open to admit air. From the casing an air channel extends to a space below the floor with water at the bottom and several porous screens across it, and from this space channels lead to openings in convenient parts of the carriage.

46. INCANDESCENT ELECTRIC LAMPS, *J. R. H. Williamson and E. Böhm, London.—3rd January*, 1883. 6*d*.

This relates to means for mounting platinum wires or terminals in the globe, and of securing the carbon filament to the wires. The wires are secured by twisting the two arms of the head of a ⊥-shaped piece of glass round their ends. To secure the upper parts of the wires and to seal the neck of the globe so as to avoid leakage due to unequal contraction and expansion of the glass and metal, a bar or disc is formed on the upper end of the ⊥ piece, and the wire is connected thereto by melting a portion of the bar or disc and twisting it round the wires. The carbon is then secured to the wires and inserted in the globe, the bar or disc being secured to the neck by blowing. The ends of the carbon are preferably inserted through holes in a flat part of the wire and secured by a suitable cement.

47. MARINERS' COMPASSES, &c., *S. Heimann, Germany. 3rd January*, 1883 —(*Not proceeded with.*) 2*d*.

This consists in combining a mariners compass with automatic registering devices, so that every deviation in the ship's course is recorded on suitable sheets of paper caused to revolve by clockwork movement, so that the time the variations occur is also registered.

48. SAFETY GEAR FOR STARTING OR TURNING ENGINES, *J. Musgrave and R. Gregory, jun., Bolton.—3rd January*, 1883. 6*d*.

A small pinion can slide on a shaft and is in gear with the driving wheel of a larger engine. On the end of the pinion is one half of the coupling, so that when the pinion is shifted to engage with the other part of the coupling fixed to the pinion shaft, and such shaft caused to revolve, the driving wheel of the large engine will be actuated and the engine started. The clutch has saw teeth, and a weight is provided on the lever which slides the pinion, so that the pinion will be immediately caused to slide out of gear when the large engine starts. For engines requiring to be driven in either direction an arrangement of two sliding pinions and clutches is employed.

49. DYNAMO-ELECTRIC MACHINES AND ELECTRIC MOTORS, *T. Rowan, Westminster, and S. Williams, Newport, Monmouth.—3rd January*, 1883. 4*d*.

The object is to provide and combine an intense field, a very light conductor, and great velocity. On the insides of two upright frame plates a series of coils are arranged, having their poles opposed to each other and their cores united at the back, as required, by a series of permanent magnets. The two opposite sets are placed in close proximity, and between them rotates the armature, consisting of a thin flat disc formed of a series of thin plates of iron or copper insulated from each other. A number of such sets of plates are fixed in the form of wheel spokes, and the alternate ends connected so that they form a continuous electrical circuit with the coils of the field magnets by means of a suitably arranged commutator.

50. APPARATUS FOR SEIZING, HOLDING, DETACHING, AND REMOVING LIGHT OBJECTS, *A. M. Clark, London.—3rd January*, 1883.—(*A communication from A. Dubois, Paris.*) 6*d*.

This relates to appliances suitable for supporting articles in shop windows, and for seizing and detaching them when out of reach, and consists of various arrangements for actuating a nipper or clip.

51. AUTOMATIC APPARATUS FOR FEEDING HORSES, *J. P. Milbourne, Manchester.—4th January*, 1883. 6*d*.

This relates to apparatus which can be charged with food, and will at a fixed time discharge it into the feeding trough, such apparatus being actuated by suitable adjustable mechanism connected with a clock movement.

52. CHURNING APPARATUS, &c., *B. Buckland, Strand.—4th January*, 1883.—(*Not proceeded with.*) 2*d*.

Within a vessel having at its base an internally stationary cone, slides a hollow perforated cone adapted to fit over the fixed cone and actuated by rods and cranks or wheels.

53. TREATMENT OF VEGETABLE FIBRES IN THEIR BLEACHING, MORDANTING, DYEING, AND TRANSFORMATION INTO THREADS OR FABRICS HAVING THE APPEARANCE OF SILK, *W. E. Gedge, London.—4th January*, 1883.—(*A communication from L. Aubert, France.*) 4*d*.

The fibre is steeped for four hours in a bath of caustic soda at about 12 deg. Beaumé, steam being admitted to keep the temperature at 80 deg. Cent. The gummy and extractive matters dissolved in the above treatment are removed by immersion in a solution of lukewarm chlorhydric acid at 6 deg. Beaumé, after which it is freely washed, and then treated with a solution of hypochlorite of sodium until all colour is removed. The material, after being dried, is left in a hot solution of glucose for four or five hours, and then dried. It is then peroxidised by steeping in a mixture of non-hydrated azotic and sulphuric acids. After rinsing the fibre is plunged into a bath of boiling soap, and again washed. It is then left for five hours in a hot solution of tannic acid, and then immersed in a cold solution of double tarbrate of antimony and of potash, so that in the dyeing operation mixed with silk the vegetable fibre yields to the animal fibre a certain quantity of antimony, which will lessen its porous and attractive properties. The fibre is then fit for carding either pure or mixed with silk. It is moistened with a preparation of pure water, pure olive oil soap, glycerine, and virgin wax from the comb of young bees. The carding engine is fitted with a carding roller or urchin, which returns the material to a fleecing or lap machine, which delivers it to a horizontal automatic feeder.

54. SEWING MACHINES, *W. E. Gedge, London.—4th January*, 1883.—(*A communication from C. Guy, Paris.*) 4*d*.

The needle works in a pressure tube and the bobbin or spool is placed upon a sleeve, coupling-box, or clutch concentric with the needle bar, and having a flange, upon which the bobbin rests, and which is fitted with a thread carrier receiving the thread from the bobbin by a guide; also serving to give the tension. The bobbin is driven by an endless band from the driving shaft.

57. LUBRICATORS, *T. Duff, Upton.—4th January*, 1883. 6*d*.

A syphon tube is arranged in an oil cup so that one end extends to near the bottom and the other extends through the same and terminates in a cone perforated at the sides. A female cone screws over such cone and its apex is perforated and supplies the oil to the bearing. By adjusting the outer cone the quantity of oil which passes may be regulated as desired.

55. CUTTING AND DRESSING STONE AND APPARATUS THEREFOR, *M. Kellow, Penrhyndeudraeth.—4th January*, 1883 6*d*.

This relates particularly to the treatment of stone of a laminable nature, such as slate. It consists of a rotary tool holder carrying a series of chisel shaped cutters on its periphery, arranged at an oblique angle to the radius of the holder and pointing forwards. They are also slightly inclined laterally, their cutting ends projecting outwards relatively to the plane of rotation of the holder, and preferably on alternate sides thereof. The cutters are adjustable and detachable, and are so applied to the material as to operate in a direction closely coinciding with that of the cleavage.

58 OIL CANS, *I. Webster, near Leeds.—4th January*, 1883.—(*Not proceeded with.*) 2*d*.

The can is of ordinary construction and the lid is hinged and forms a perfectly tight joint when closed. A spring acts upon the lid to keep it either open or closed.

59. ROAD TRACTION OR SELF-PROPELLING ENGINES, *M. Shillito, Leeds.—4th January*, 1883. 6*d*.

This relates to means for enabling all the wheels on the ground to be used for steering. Differential or compensating gear is used so as to allow the wheels on one side to revolve at a different speed to those on the other side in travelling round curves. The steering is effected by applying two brakes, one of them on each bevel wheel of the differential gear, thus forcibly retarding either side of the engine as required. Or by driving the wheels on each side by a separate motor.

61. REGENERATIVE GAS HEATING ARRANGEMENTS FOR HEATING WATER OR AIR, &c., *E. A. Brydges, Berlin.—4th January*, 1883.—(*A communication from D. Grove, Berlin.*) 6*d*.

The gases produced in the generator pass through a pipe into a flue, and through narrow orifices in the burner into a combustion chamber, where they come in contact with warm air. The mixture is ignited by a gas jet, and the burning gases stream through serpentine canals, and then enter the chimney. The air for combustion is heated in canals or chambers. The gas generator is also described.

62. POINTS AND CROSSINGS FOR TRAMWAYS, &c., *A. H. Rowan, Westminster.—4th January*, 1883. 6*d*.

This relates to crossings in which the portions of the two lines intersecting are formed in one solid piece, and it consists in making the tongue or point of such piece separate from the main part, so that it can be renewed when worn.

63. ADJUSTABLE SPANNERS, *J. Malin, Sheffield.—4th January*, 1883. 4*d*.

This relates to the "Clyburn" spanner, and consists in forming the sliding jaw with a recess in its under side to receive the edge of a nut working on screws secured in an oblong opening in the fixed head. By turning the nut it works along the screw, and so moves the sliding jaw.

64. ASSISTING THE STARTING AND STOPPING OF TRAMCARS, &c., *B. F. Cocker, Sheffield.—4th January*, 1883. 6*d*.

This relates to improvements on patent No. 724, A.D. 1880, and consists in suitable means whereby when the brake is applied the motion of the car is caused to compress a spring, which when the brake is taken off again assists in starting the car. On the axle a ratchet wheel is fixed, the pawl being carried by a lever working on the axle, and connected by a rod to a helical spring. Close to the wheel is a combined winding barrel and internally-geared wheel connected to the spring by a chain. A pinion with one less tooth gears with the wheel, and revolves on an excentric collar on the axle. The pinion has lugs fitting grooves in a clutch plate revolving on an axle, and provided with a brake strap by which its motion can be arrested.

65. MOTIVE-POWER ENGINES, *C. Ingrey, Fulham, and W. Adlam, Clifton.—4th January*, 1883. 10*d*.

This relates to caloric engines, and consists of a generator with a vertical boiler, a water casing surrounding the furnace, and a central vertical pipe with valve arrangement provided to feed the fuel. Above or below, or both above and below, the bars are air inlets. Below the valve in the feed tube is a lateral opening, whence a pipe leads to the steam space, and at its upper end is provided with a valve, so that when the pressure in the generator exceeds that in the boiler the products of combustion pass into the steam space, the combined steam and products then passing by a pipe to the working cylinder of the engine. To prevent clinker forming on the bars agitators are provided. A pump or blower actuated by the engine supplies the generator with air, causing it to pass into a chamber in a cylinder with openings communicating with the spaces above and below the bars. The inner chamber is connected to the engine governor, so as to regulate the openings for the passage of air. A cylindrical valve is described for distributing the motive fluid to the working cylinder, and a curved cut-off valve actuated by the governor works over it.

67. GOVERNORS FOR STEAM ENGINES, &c., *R. E. B. Crompton, London, and J. W. Kempster, Chelmsford.—4th January*, 1883. 6*d*.

This relates especially to the part of engine governors in which the too violent movements of the regulating apparatus are controlled by a piston traversing in a cylinder, such contrivance being known as a "dash pot," and it consists in making the piston to fit the cylinder closely, and the passage for the fluid being through holes closed with valves so balanced that when the piston slow traverses the cylinder inwards or outwards they do not close, and the speed of traverse is regulated by the flow of the fluid through the holes quite independently of the valves themselves; but any tendency to cause the piston to traverse the cylinder more rapidly than is desired causes the valves to close the holes and arrest almost entirely the traversing motion of the piston.

68. MOWING, REAPING, AND SHEAF BINDING MACHINERY, *J. E. Phillips, London.—4th January*, 1883. 6*d*.

This consists, First, in attaching the draught pole of mowing and reaping machines to the main frame at a point in advance of the axle, so as to lighten the friction of the cutter bar upon the land; Secondly, the adaptation of self-binding mechanism to two-wheeled machines by connecting the axis of one of the rollers of the elevator to the joint of the cutter bar; Thirdly, the employment of chains and chain wheels to form elevator for delivering the cut crop to the self-binding mechanism; Fourthly, in the construction of aprons of self-binding mechanism, of the employment of transverse bars, the ends of which are connected to their respective links of the pitch chains; and Fifthly, in the elevator of self-binding mechanism where transverse bars are used the employment of twine, turmoil, or webbing threaded or attached at right angles thereto to prevent loose straws falling through the open work.

75. APPARATUS FOR OILING CRANK PINS, &c., *W. P. Thompson, Liverpool.—5th January*, 1883.—(*A communication from C. H. Parshall, Detroit, U.S.*) 6*d*.

An oil reservoir is connected by a flexible metallic tube to the crank pin, a water chamber being interposed between the crank pin and the reservoir, so that the oil passing through the water in visible drops will indicate the rate of feed. A valve regulates the feed. The tube may consist of a telescopic arrangement, or of an elbow joint straightening as the crank recedes and doubling up as it advances.

92. CARPET LOOMS, *G. W. Grosvenor and J. Bedford, Kidderminster.—6th January*, 1883. 6*d*.

The object is to produce new arrangements and combinations of materials in carpet fabrics. Extra gear shafts are worked by cams to cause alternate warp threads, or alternate series of warp threads, drawn through these gear shafts to remain below alternate back weft threads or series of back weft threads. These warp threads are "stuffing" threads, and by lying below alternate back weft threads protect the weft from contact with the floor, and so render the carpet more durable.

94. DRILLING MACHINES, *W. Cooke, Dundee.—8th January*, 1883. 6*d*.

The movable parts of the machine are carried on a vertical pillar 4, the base-plate of which is bolted to the foundation. The upper part is of reduced diameter, and is turned externally to receive a tubular piece 7, which can slide thereon when actuated by a hand wheel 13 with a worm on its spindle gearing with a wheel on a screw spindle 8 held in a bracket on the tubular piece, and engaging with a nut on the pillar 4. When adjusted to the proper height the tubular piece is fixed by screw 14. The top of the tubular piece carries a circular head 15 secured by ring 16 made in halves and fixed by screws so as to engage under a

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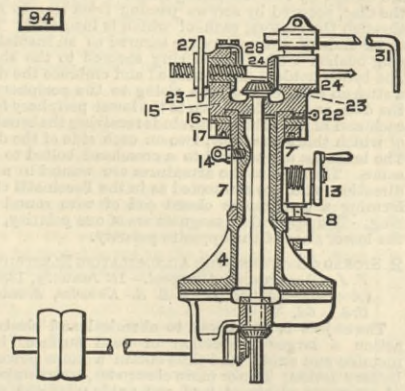

flange at top, and below the ring is a spur wheel 17, also in halves, and fixed on the tubular piece, and serving to turn the head when actuated by a pinion, the spindle of which is fitted with a hand wheel, and turns in a bearing formed on the head. A screw 22 secures the head when adjusted. The head has bearings 23 for the drilling spindle 24, adjustable by hand wheel 27, but being prevented from turning by a guide finger 28 entering a groove. The claw-bar 31 holds the work to the drill, which is driven by bevil gearing as shown.

118. SURFACE-CONDENSING ENGINES, *J. Chapman, Leith.—9th January*, 1883. 6*d*.

This relates to an arrangement of pump valves and connections for creating and maintaining a vacuum in the condenser. The pump A is double-acting, the part below the piston B acting as the air pump, and the part above it as the feed pump. In the up-stroke the part below the piston draws off the air and water from condenser C through pipe D and valve E, and in its down stroke forces the air and water through valve F and up pipe G, the air rising to

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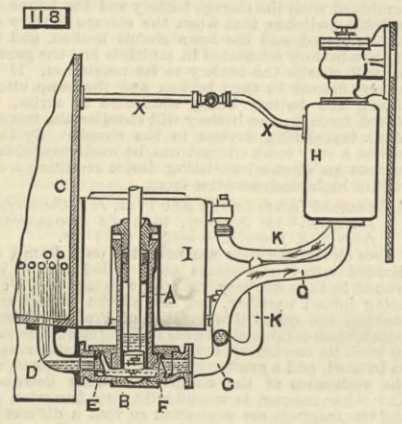

receiver H, which may be the hot-well of the engine. From receiver H the air is drawn off by circulating pump I through pipe K. The part above piston B in its down stroke draws off the water from receiver H, and its up stroke forces it into the boiler. A pipe X with stop cock is provided between the hot-well and condenser, in case the air pump or part below piston B fails to act, in order to give to the condenser the hot-well vacuum.

130. GAS MOTOR ENGINES, *F. J. Odling, Derby.—9th January*, 1883. 6*d*.

The object is to avoid the explosive shock from too rapid combustion of the charge by retarding its combustion in the cylinder, and to utilise the heat of combustion or increasing the pressure and volume of incombustible fluid, such as air, within the cylinder. The front part of cylinder A operates as a charging pump, drawing the air and gas through slide B and valve C during the outstroke, and sending the charge past check valve D into the cylinder under piston E, as this piston, which is connected as a trunk to the charging piston, makes its instroke. F is a discharge outlet, by which a portion of the exhaust escapes, and G is the exhaust valve, worked by an excentric, and kept open during a portion of the instroke. At the

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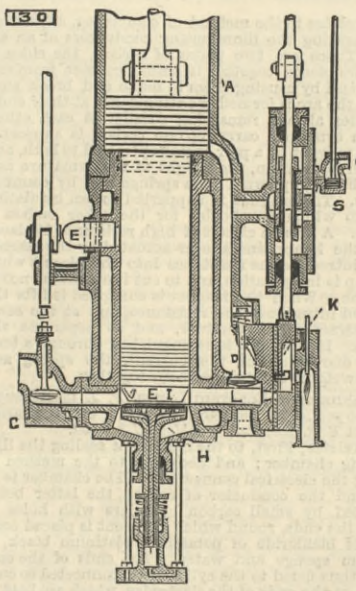

end of the cylinder is a cavity H, loosely fitted with a hollow piston I, containing a loosely-fitting perforated piston J, covered with wire gauze. The stems of these pistons are both acted upon by springs. K is the ignition slide. At the end of the instroke the cavity H contains mostly air, but the hollow of J and the passage L, having received from cylinder A the last part of its charge, contain a combustible mixture, which, when ignited, increases the pressure and propels piston E, and forces back piston I and J. The combustible mixture, passing through the perforations of J, prolongs its combustion, and the air entering at H is heated.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

281,749. HYDRAULIC RAM, *George Yellott, Towson, Md.—Filed September 11th*, 1882.

Claim.—(1) In a hydraulic ram, the valve around which the water passes in its escape, and which is closed by the movement of the escaping water, combined with an air compressing valve and an air chamber, the said air compressing valve operating to form an elastic cushion for the outflow valve, and

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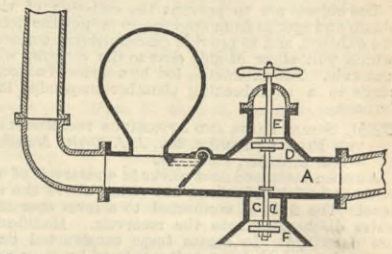

thereby preventing shock or jar in the operation of the ram, substantially as specified. (2) In combination with the chamber A, the outlet pipe or cylinder E, and compressed air chamber G, the valves D and F, connected by the stem *a*, and adapted to operate substantially as specified.

281,950. ANTI-FRICTION BEARING, *Henry G. Yates Philadelphia, Pa.—Filed June 2nd*, 1883.

Claim.—The within-described anti-friction device, in which two sets of cylindrical anti-friction rollers—those of one set being larger in diameter than and alternating with those of the other set—are combined with and interposed between a hub or shaft D, and a

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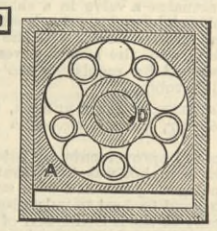

box A, provided with bevelled flanges, which, bearing continuously against the bevelled ends of the small rollers, prevent their outward displacement, and maintain the whole of the rollers in the same unvarying relation to each other, substantially as set forth.

281,978. ROLLING MILL, *Alfred Crandell, Pine Plains, N.Y.—Filed July 27th*, 1882.

Claim.—(1) The rolls of a rolling mill, constructed and having their surfaces joined to form a reducing passage, substantially as described, said rollers being hollow and having communication with each other, whereby a continuous current of cold water is maintained through the rolls to prevent the undue heating thereof when in use, as shown and described. (2) The combination, with the rollers of a rolling mill having hollow shafts and journal bearings arranged in the

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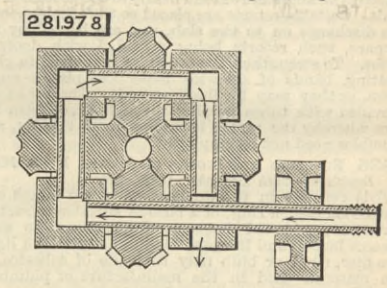

same plane, of housings provided with chambers, into which the journal bearings open, whereby a continuous flow of cold water is maintained through the rolls to prevent the undue heating thereof, as described, and for the purpose specified. (3) The four rolls, constructed and joined to form a reducing passage, geared directly with each other, and having hollow shafts communicating to form a continuous passage through them, substantially as described, for the purpose specified.

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