THE INSTITUTION OF MECHANICAL ENGINEERS.—MEETING AT LIEGE.

THE annual excursion of the Institution of Mechanical Engineers is made this year, as we have already announced, to Liége, a fine town, and the centre of Belgian industry. At 7.30 on Monday evening, nearly 200 members of the Institution assembled at the Town Hall, Liége, in the Salle des Pas-perdus, where they were received by M. L. Trasenster and the members of the Reception Committee. M. Trasenster having addressed a few words of welcome to the party, they were conducted to the Salle des Mariages and presented to the Burgomaster. M. Mottard thanked the Institute for having selected Liége as the locality for their annual excursion. The president, Mr. Westmacott, made an appropriate reply, and asked permission to read an opening address, which being conceded he read an able address in which he complimented Belgian engineers on their skill and their taste, and went on to indicate at some length the work done and the part played in the world by the mechanical engineer. The principal text on which he dwelt is set forth in the following passage :—"Engineering brings all other sciences into play. Chemical or physical discoveries, such as those of Faraday, would be of little practical use if engineers were not ready with mechanical appliances to carry them out, and make them commercially successful in the way best suited to each. One of the latest instances of this, perhaps, is the application of electricity to the lighting and working of mines. The result of all this is a continual race, as it were, between the engineers of the same country, and also between the engineers of different countries, in the invention of new and the improvement of existing appliances. The keen and continued attention thus bestowed upon the work to be done, and the means of doing it, has led engineers in general to regard speed of production as one of the first elements of success. There is indeed a proverb, 'more haste less speed,' but this, though true of human labour, which ceases to be accurate when forced beyond a certain rate, does not hold good of mechanical processes. Generally it may be said that rapidity of working not only reduces cost, but improves the result, and also confers great benefits from the way in which it brings out and perfects the highest qualities of the engineer. To be able to do a thing leisurely and quietly, simply requires the rudest materials and the rudest wormanship; but if work is to be done quickly, or the appliances made to move quickly, the case alters. Mechanical energy increases as the square of the speed; and so it may be said that the mental energy and skill required to carry on work increase also at something like the square of the speed with which that work is done." The president went on to remark that he might be pardoned if he reviewed with some degree of pride the position now attained by the engineer. "For if the inventive skill of the engineer had not provided those appliances on which all trades are dependent for cheap and rapid production, what, may I ask, would have been the result of the great increase in population which has taken place in recent times? The nations of Europe would be like the hordes of barbarians in the early ages of Christianity, who were compelled to overrun neighbouring countries with fire and sword, in order to provide an outlet for their own population. But the advances of commerce and industry, consequent upon the invention of mehanical processes and appliances, have enabled nations both to find work for their population at home, and to send their children cheaply and readily to unoccupied countries, where they are at once able to utilise and to subsist upon the boundless resources which those countries contain. A great debt is therefore due to the engineer. It may well be questioned whether the world does not owe more to George Stephenson as the founder of the modern system of speedy transport than to any of the great public men she has produced. Nor is the advantage one which relates to money only; it is a question of peace and prosperity, for the more people are occupied in peaceful industries, the less risk there is that they will be inclined to engage in devastating wars.

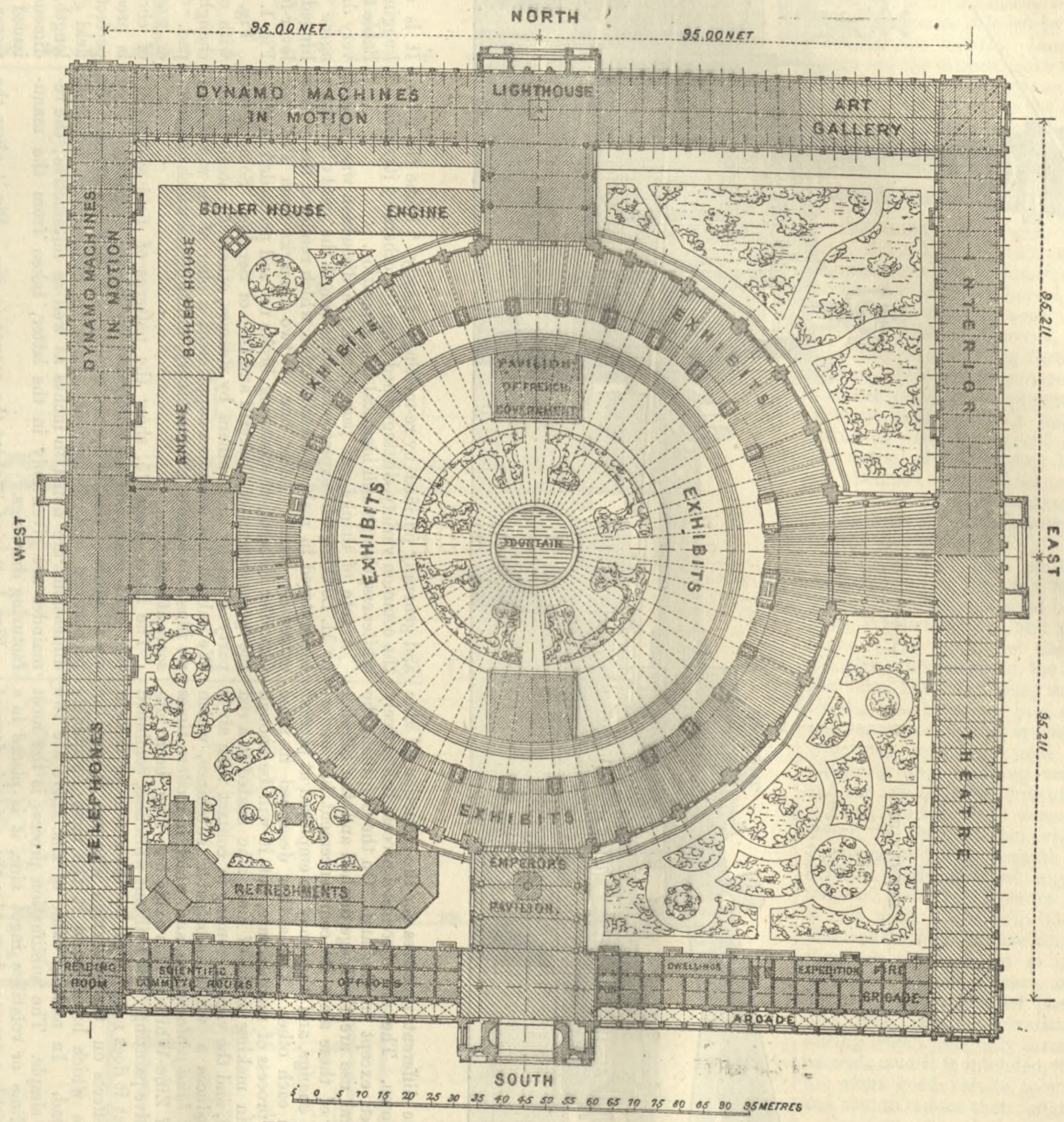
"There are other advantages following in the train of that immense extension of engineering progress which has taken place all over the world. Among these may be mentioned the impetus given thereby to education. Whilst the mere tilling of the land can be followed out by a man totally devoid of education, this becomes impossible if he has to exercise arts requiring skilful training. Belgium has been especially ready to recognise this fact, and the institutions she has established for the education of the working classes are justly considered a model for the rest of Europe."

M. Trasenster proposed a vote of thanks to the speaker, which was cordially passed. It was seconded by Mr. Crampton in a humorous speech, highly applauded, and winding up with a wish to see Belgian engineers in England.

On Tuesday morning the members met in the fine hall of the Société d'Emulation. The proceedings began by the president, Mr. Westmacott, announcing that the Council of the Institution had elected M. Trasenster honorary member. M. Trasenster is Rector of the University, and president of the Association of Engineers, by whom the members of the Institution have been invited to Liége. The announcement was received with cheers. M. Trasenster responded in suitable terms, and after some routine business had been transacted, M. E. de Laveleye read his paper "On the History of the Iron and Coal Industries in Belgium." The author made a quite needless apology for his English. The paper is so admirably put together, and contains so much interesting information concerning the doings of our able competitors, that we commence its publication in full this week. No discussion followed, but a cordial vote of thanks was passed to M. Lavaleye. A paper was then read by M. St. Paul De Sinçay, of Chênée, "On the Manufacture of Zinc in Belgium." We can only give an abstract here. The author began by saying that at the epoch of the Roman invasion the Belgians were already distinguished for their skill in the working of metals. Under the reign of Charlemagne they understood their artistic treatment; and by the tenth century they had acquired great skill in the casting and chasing of goldsmith's work, as is shown by the numerous and remarkable specimens preserved to this day. There is therefore nothing astonishing in their having been the first nation of Western Europe to understand and practise the manufacture of zinc.

The continual communication which, from a very remote epoch, they kept up with the East by way of Germany, introduced into their country a new metal of a fine yellow colour, and having the qualities of copper. This metal the Greeks distinguished by the name of Orichalcum; it had been produced from a remote period in Asia Minor, and in the Isles of the Archipelago. The Belgians soon learned that it was made by alloying copper with a mysterious substance contained in calamine rock. This rock was probably known throughout a large part of Belgium, because both in the strata of the Devonian formation and in those of the carboniferous era it formed numerous superficial deposits near the banks of the Meuse between Givet and Liége. Again, in a corner of the Duchy of Limbourg, not far from the Liége district and from the frontiers of Germany, there existed a bed of this mineral having an exceptional richness and extent. This great bed was subsequently named, from the territory containing it, the Moresnet Bed. It is generally admitted that here was the seat of the first working of calamine—carbonate of zinc; it is at least certain that at a very distant epoch this mineral was mined there, but the actual date when the working was begun has not hitherto been exactly determined. Ancient documents relate that calamine was raised in the neighbourhood of Moresnet at the beginning of the seventh century. Under the date of July 5th, 1435, mention is made of the concession of a zinc mine accorded by the Duke of Limbourg. In a record of 1439, a notice occurs of the calamine mountain "which the men of Aix were accustomed to work." This working, at that time abandoned, must have dated from a very distant period. From this circumstance the calamine bed where it existed received afterwards the name of Vieille Montagne, or Altenberg. In 1454 the working of this mine was recommenced, according to a concession made by Philippe le Bon to the Sieur Arnold Van Zevel.

After further recounting the history of the metal, the author referred to the discovery of Daniel Dony, of Liége. The Government imposed on their lessee, Dony, an obligation to make "such experiments as might be judged useful, in order, by the aid of suitable furnaces, to reduce calamine to a metallic state." Dony accepted these conditions, and set resolutely to work. The task was a difficult one. It required long effort, great expense, and numerous attempts; but the original and persevering genius of Dony overcame all difficulties. On the 7th December, 1809, he demanded a patent for fifteen years, "for the construction of a furnace suitable to extract zinc from calamine, and for the processes employed in this operation." This patent was accorded to him by Imperial decree on the 19th January, 1810. The Liége method of reducing zinc ores was now discovered, and Dony had given his country a new industry which was destined to have a vast development. The small establishment which he had founded at Liége in the Faubourg St. Léonard, in order to carry out his researches, became the first zinc works of Belgium. The second furnace was started on the 28th January, 1810.



THE VIENNA ELECTRICAL EXHIBITION—PLAN OF BUILDING.

The discovery of Dony had cost the inventor considerable sums required for his experiments. He was recompensed by the protection of the authorities and by the praises of scientific men; but this was not sufficient to restore his broken fortunes. Metallic zinc was at that time applied to very few purposes. Dony hoped to find a market for his metal with the brassfounders, but these, influenced by routine, preferred to treat their copper by means of calamine, as their fathers had done before them. This failure imposed upon Dony further efforts, and a second task still more arduous than the first. After having discovered the method of producing zinc on an industrial scale, it was now become necessary to find applications for it, and to promote its use. In one word, the newly-obtained metal had to find its place in the ranks of ordinary and necessary materials.

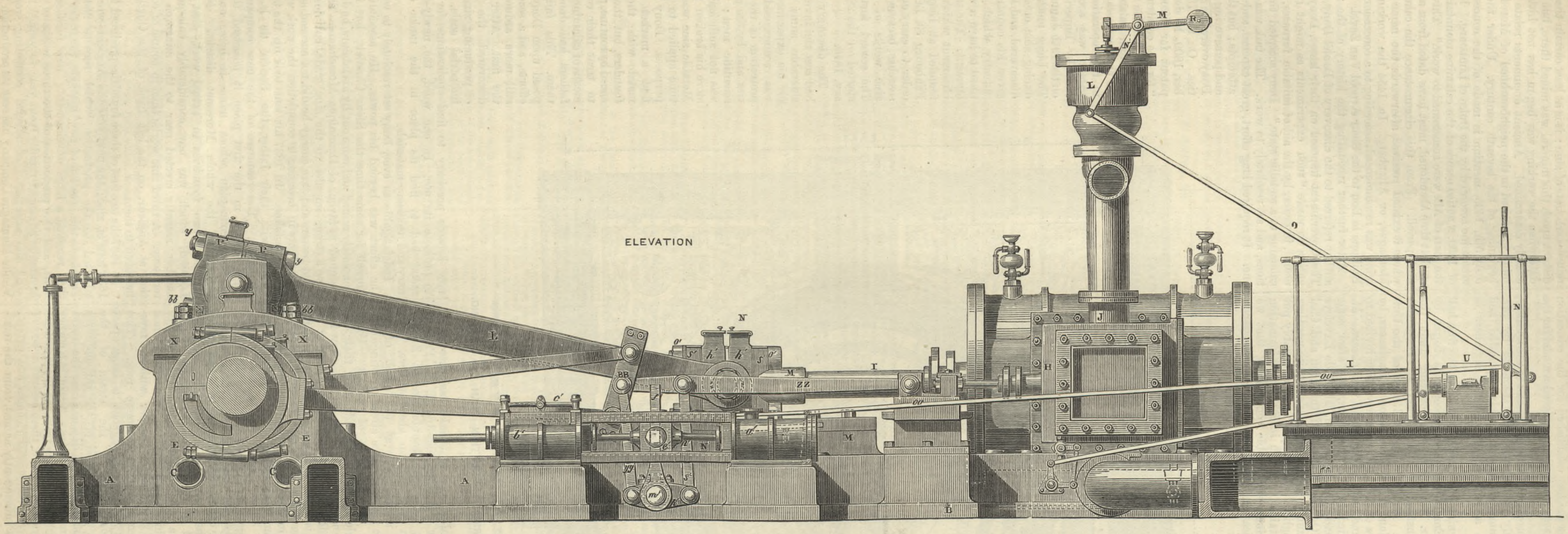
Indefatigable as ever, Dony set resolutely to work, but the effort was beyond his power. He associated with himself for some time the Sieur Chaulet; but in 1818, completely ruined and worn out by his labours, he definitely resigned in favour of Dominique Mosselman. The latter gave a strong impulse to the zinc trade, but despite his great powers and rare energy he did not succeed any more than Dony in bringing to completion the work which he had undertaken. In 1837 his sons took up the task, and formed with their father the Société de la Vieille Montagne. The resources of the new company were considerable; in the first place it possessed the great calamine concession whose name it bore, and comprehending the whole Moresnet district. Next, it possessed two foundries in actual work—that of St. Léonard, which was now considerably enlarged, and another recently erected near to the mines on neutral territory. A third zinc works then in course of construction at Angleur, on the left bank of the Ourthe, also belonged to them.

In 1837 the two first of these foundries produced together 1833 tons of zinc; the next year the Angleur works contributed to the production, which rose to 2540 tons. Thanks to the creation of new markets, the make of zinc then received a large development; new furnaces were built, and the production of the three works of Vieille-Montagne advanced rapidly from year to year.

By the annexation of several competing works the Vieille-Montagne Company has seen its production increase from year to year, until in 1882 it reached a total of

REVERSING ROLLING MILL ENGINE, SERAING WORKS, BELGIUM.

MESSRS. F. COCKERILL AND CO., SERAING, ENGINEERS.



39,000 tons of raw zinc, 36,000 tons of which were made in Belgium. The author then told his hearers something of the other establishments for zinc working founded in Belgium.

On the whole it appears that Belgium now possesses eleven works for reducing zinc ores, and all in a state of high activity. Their capacity has developed gradually, and in 1882 they were able to turn out 71,565 tons of raw zinc. This total figure represents about one-third of the whole production of Europe, but will probably be considerably surpassed in 1883. In so active a state of trade it is not to be wondered at that the annual amount of ore consumed is considerable; it is, in fact, about 200,000 tons, only a part of which is furnished by the mines of the country.

It is well known that for the manufacture of zinc, as for many others, the question of refractory materials is of very high importance. The Belgian works obtain from large beds in the Ardennes a refractory clay, with which they manufacture articles of an excellent quality, and of long-established reputation. But the special strength of these works lies in the fact of their possessing a class of workmen, strong, intelligent, experienced, active, well disciplined, fond of their trade, and deeply penetrated with feelings of duty. Amongst this industrial population, which, without counting labourers, numbers some 7000 workmen, there are many who have saved enough to buy the houses which they inhabit, and the gardens which, after the rough labours of the shop, they find time to cultivate themselves. The workmen at the Valentin Cocq works belonging to the Vieille Montagne Company, are distinguished in this respect, since at least half of them are proprietors. This love of property and care for the future is nothing surprising. For a long time past the company has done its best to inspire this feeling by creating institutions of thrift intended to insure the material, moral, and intellectual good of the working classes.

The author next proceeded to deal at length with the metallurgy of zinc. The different processes for the reduction of zinc ores are well known. The *per descensum* process has scarcely ever been practised except in England. On the Continent the methods in general use are the Liége method and the Silesian method. Neither of these since its commencement has undergone any essential change, and they may be employed at present side by side with each other. The author described in some detail the whole process of manufacture, but it will be enough to say here, that in making oxide of zinc, zinc heated to a red heat is evaporated, and the vapour coming in contact with air is oxidised and produces a white impalpable substance, which alchemists named *lana philosophica*, and which in modern times bears the name of Zinc-White. This oxide has long been employed for decorative painting. Its brilliant whiteness, combined with the fact that it does not change by the action of the air, and has no ill effects on the workmen who use it, are the principal qualities which have made it the most formidable rival to white lead. In making oxide of zinc there are two processes equally simple. The sublimation process is the most ancient. To sublime or volatilise ingot zinc, it is placed in a series of retorts within a common furnace; the oxide is formed in an exhaust chimney, and then passes through a long series of passages and condensing chambers. It is deposited in large tanks of sheet iron or cloth, which are ranged all along the path pursued by the vapours. At certain hours in the day the oxide is collected into casks, and then, after the quality has been tested, it is compressed into barrels carefully made, and is ready for delivery. According to the purity of the metal subjected to the process, the zinc-white is obtained varying in colour and brilliancy. "Blanc de neige" is a product of the finest quality, and can only be made with zinc from the ores of the Moresnet beds. "Blanc No. 1" is the more common variety. It requires for its manufacture zinc coming from selected ores, and generally purified by re-melting. Lastly, "Blanc No. 2" is the common variety, distinguished from the others by its shade of whiteness, though still identical in composition.

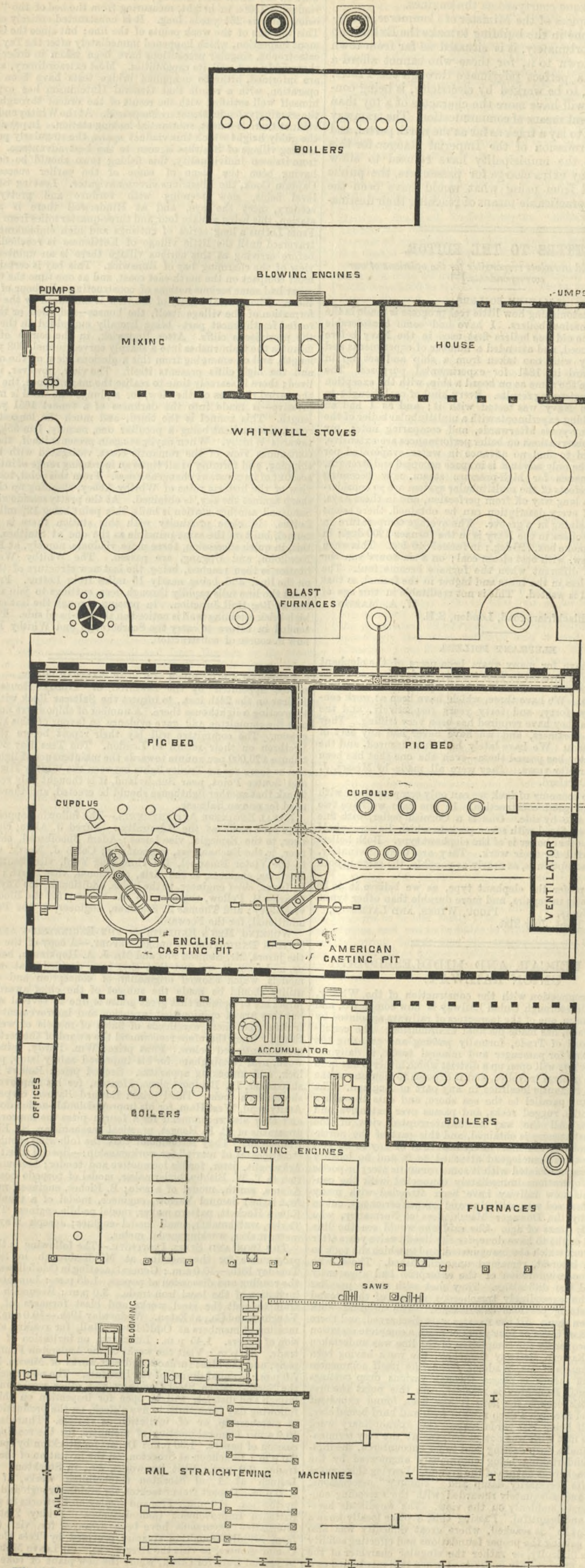
A vote of thanks was passed, and the discussion was opened by M. Le Cour, who explained at some length the great difficulties encountered in making metallic zinc which rendered the profits extremely small. After one or two remarks from Professor Chandler Roberts, the meeting broke up, and proceeded to view the great works of Cockerill and Co., of Seraing. Some of the party went by train, others by steamer, others by steam tram. We publish this week as a supplement a plan of the works, and we illustrate some of the machinery, and two guns which attracted some attention.

The latter, page 75, show the patterns of field and mountain guns made and recommended by Messrs. Cockerill. They are all made of steel of special quality. On this fact depends the proportions and dimensions given to them. The principal dimensions are noted in inches as well as millimetres; the remainder are given only in the latter, taken from the manufacturing drawings.

Figs. 1, 2, and 3 show the mountain gun. Fig. 1 gives the proportions and exterior; Fig. 2 the section showing breech arrangement; Fig. 3 is view of breech end. The gun is a light one; its calibre is only 2·5in., and its total length, exclusive of projecting breech fittings, is under 4ft. Our last steel mountain gun, known as mark IV., excluding the one which is carried in two halves and screwed together, is a steel gun of 3in. calibre and 38·9in. length; the bore is thus only 12 calibres long, being, of course, a feeble gun designed to fire a comparatively large shell like a howitzer at low velocities. The bore of the gun before us is 19 calibres long. It would, of course, be a better shooting gun than the English one with which we have compared it. The length in our service is limited by considerations of transit. It is sometimes necessary for mules to climb a narrow path hugging the face of a cliff, when a gun laid across the saddle is liable to strike the rock if not very short, which is, of course, very dangerous. The breech-loading arrangements very closely agree with those recently adopted in our own service. The hinged breech and interrupted screw is seen in Fig. 2, and the lever-folding down when the breech is closed is shown at D in Fig. 1.

Fig. 2 also shows a gas check, mentioned by us in connection with our own guns—*vide* THE ENGINEER, May 18th last, &c.—though not illustrated by a figure, namely, Dubange's asbestos pad. The steel mushroom head A has round its spindle C rings or washers, holding between them an annular pad, made up of chopped-up asbestos fibre, which by the force of discharge is pressed close to the bore, and forms the most simple and perfect kind of gas check yet known. Figs. 4 and 5 show the field gun; calibre, 3·38in.; diameter of chamber, 4·02in.; total length, 6ft. 10·68in.; length of bore, about 23 calibres. These dimensions may be compared with those of our 13pr. gun now issued to many field batteries, in which the calibre is 3in.; diameter of chamber, 3·15in.; total length, 7ft. 3·96in.; length of bore, 28 calibres. From this it will be seen that the gun before us is shorter, but has a larger bore, and a chamber larger comparatively than our own. The breech fittings very closely resemble those of Krupp. In Fig. 4, A shows the form of wedge, B B the vent, C C the Broadwell ring, also shown in Fig. 5, as well as the slow motion screw E, for forcing the wedge home by means of the lever F. These guns are each made of two cylinders of steel, inner and outer, in which respect the mountain gun differs from our own. In both guns the breech is supported by resting against the outer cylinder or jacket, which therefore receives the longitudinal strain, leaving the inner tube in this respect free. This principle is advocated by Vavasseur, but is not followed in Krupp or Elswick guns, or those of our own service guns generally.

THE SERAING STEEL WORKS OF MESSRS. COCKERILL AND CO.



The birdseye view which we publish as a supplement is taken from a hill on the left side of the Meuse, immediately behind the house of the engineer-in-chief, Herr Kraft. To the right is seen the suspension bridge thrown across the river by the company a few years ago. A little to the left of the further extremity of the bridge is the old Abbey of Seraing, that now serves as the parish church. Then, in the same direction, comes the château of the Bishop Princes of Liége, bought in 1817 by John Cockerill, and which now does duty for the offices, as well as for the residence of the general manager, M. E. Sadoine, whose garden is seen still more to the left. Behind the château and gardens come, in turn, the ironworks, the large and small foundry, the four new circular and the three old square blast furnaces, and the steel works, while behind all is the Seraing Station of the Chemin de fer du Nord Belge, affording direct communication between the works and the principal centres of Europe. Quite in the background are seen the surface works of the Collard Colliery, the new pit gear and engines of which have been carefully designed.

Returning now to the Meuse, it will be seen that a canal leads from it almost to the middle of the works; this was formerly used much more than it is at present, but it still serves for the transport of limestone, flux, and native ore. The new landing stage on the river's bank receives the Spanish ore direct from the companies' mines brought in their own steamers, built at the Hoboken Shipyard, near Antwerp. The ore is raised by a lift, and run along by locomotives up a railway winding round the slag heap, seen behind, whence it is led by an easy downward gradient to the furnace mouth. Immediately behind the landing stage are the Appold coke ovens, and between these latter and the Marie Colliery, on the right, is ample space for stocking rails, &c. To the left of the view, and facing the river, are the large workmen's barracks, where three rooms are let for about a shilling a week. Behind these *maisons ouvrières*, as they are called, is the Caroline Colliery, and to the right of it in the far background is the workmen's hospital.

The works, which were begun in 1817, now cover an area of 108 hectares—267 acres. The total motive power supplied by the two hundred and eighty odd engines nearly equals that of 12,000 horses, the daily consumption of coal exceeding a thousand tons. There are 5 collieries in active working, 306 coke ovens, 7 blast furnaces, 40 double puddling and welding furnaces, 21 rolling mills, 4 converters, 18 heating furnaces, and 80 smiths' fires. The number of hands at present employed is 11,000, and the amount paid yearly in wages is about £400,000. The value of work turned out amounts to about £1,600,000, the capital of the company being fifteen millions of francs, or £600,000. The works are capable of producing yearly 100 locomotives, 70 stationary engines, 1500 machines, 10,000 tons of bridge, girder, and boiler work, and 15 steel or iron steam-vessels.

The annexed plan of the steel works, shows the arrangement of the row of boilers fired by the waste gases of the four full-sized blast furnaces, with the mixing floor, Whitwell stoves, and three blowing engines between them. The mouths of the blast furnaces are closed by a happy combination of the cup and cone with the central gas tube, the joint being made good with a water seal. Of the two Bessemer pits, one is on the ordinary system, and serves for making special steel, while the other, on the American model, is used exclusively for rails. The blooming and finishing trains, the finishing machines, and the rail beds take up the rest of the space.

There are four large furnaces on the Bicheroux system, shown in the annexed views. The length inside is 7 metres, and the breadth 4½ metres, sufficient to take a bloom and an ingot together, while there is a clear space of about half a metre between them and the crown of the arch. The principle is the same as that of the Siemens furnace, but the combustion is not so perfect, and therefore the heat not so intense. The gas generators form part of the furnace, and the gas meets the heated air entering by parallel passages. Some Gjers soaking pits have been in operation during the last fortnight, during which time only three of these furnaces have been needed; and it is intended, if the process continues to give the same good results, to work with only three furnaces, and also to reduce their length.

The first idea of the direct-acting reversing engine for rail mill was suggested to M. Greiner, the iron and steel works manager, by the late Mr. Menelaus, of Dowlais. M. Greiner thought of putting up a Ramsbottom reversing engine, to work on to a shaft with toothed pinion, but calculated that the production would not equal that of a three-high mill. Mr. Menelaus said that, in such a case, he would try "something else," though he did not say what. Accordingly M. Greiner cudgelled his brains to discover Mr. Menelaus's meaning, and the result is the engine shown in plan and elevation at pages 62 and 70, which is the first of its kind made. The diameter of the cylinders is 1 m. (3ft. 3⅜in.), and the stroke 1·20 m. (4ft.), the separate condenser being always in operation. The engine is fitted with double-beat steam valves, and Gooch's straight links, carefully balanced. The rail is made from the bloom in thirteen passes, some of the grooves being passed through twice.

It is quite impossible to give here more than a vague and general idea of what the visitors, who were most hospitably received by M. Sadoine, saw. We reproduce *verbatim* the programme placed in the hands of the visitors, to give an idea of what they saw, and the programme was faithfully carried out.

Arrival by tramway, Seraing Bridge	11.45
Reception by the Director-General ... ... } Lunch, Great Hall of the Castle ... ... }	12.00 to 12.40
Principal court (ordnance and library)	12.45 to 1.00
Mechanical Engineer's office (photography) ...	1.00 to 1.15
Pattern-makers' shop	1.15 to 1.25
Director's office... ... ... } Secretary's, cash, and other offices ... ... }	1.25 to 1.30
Engine works, Nos. 1 to 7 (bolt-making shop included)...	1.30 to 2.00
Canal forwarding departments and general warehouse	2.00 to 2.10
Marie Coal Pit (coke ovens)	2.10 to 2.25
Smithy and forges (refectory)	2.25 to 2.45

Boiler works and bridge shop	2.45 to 3.00
Three blast furnaces (horizontal blowing engine)	3.00 to 3.15
Steel Works:	
Four blast furnaces (vertical blowing engines and Whitwell stoves)	3.15 to 3.30
American Bessemer foundry (vertical blowing engines)	3.30 to 3.45
Rail rolling mills, reversing engines ... } Gjers soaking pits... ... ... }	3.45 to 4.00
Spring shops, crucible shops	4.00 to 4.10
Tire rolling mills (horizontal and vertical) ...	4.10 to 4.20
Martin-Siemens steel foundry	4.20 to 4.30
Foundry (cast iron and hard brass)	4.30 to 4.45
Ironworks (plate and girder rolling mills)	4.45 to 5.00
During the journey by tramway we see on the left:	
1. Locomotive shed ... ... } 2. Timber store and steam sawmill ... } 3. Workmen's houses ... ... } 4. Caroline Coal Pit (coke ovens)... ... }	5.00 to 5.15
Colard Colliery...	5.15 to 5.45
Plateau (iron ores coming by Cockerill's steamers from Spain and Algeria; ore house).	5.45 to 6.00
Return to the Castle.—On the river side: ore hoists; rail and girder depôt	6.00 to 6.05
Cockerill's statue	6.10
Departure in steamer	6.15
Arrival at Liége	6.50

In the evening the annual dinner of the Institution took place, and was a great success.

INTERNATIONAL ELECTRICAL EXHIBITION IN VIENNA, 1883.

No. I.

SINCE the great Exhibition of 1873, no display of an international character has been held in the building in the Prater. Shorn of its vast proportions, its picturesque gardens, and numerous kiosks and pavilions, nothing remains to remind one of the stately edifice but the Rotunda and the quadrilateral group of galleries surrounding it, and these have been retained rather on account of the expenses of demolition than for any other purpose, as hitherto the annual shows of horses, cattle, milling machinery, &c., have barely been sufficient to cover the expenses of maintenance and rates.

The Exhibition, however, of electrical appliances to be opened on the 1st August will, we hope, bear more profitable fruit. A finer building for the purpose could hardly be found. The vast proportions of the Rotunda and its circular form afford a most favourable opportunity for a luminous display; and judging from the programme of the committee, every point of vantage has been seized to enhance the effect. To form some idea we append a plan of the building, with a general description of the installation, and a few dimensions of the main space to be lighted.

The diameter of the Rotunda between the walls is 425ft.; its height to the lantern 215ft. The area of the floor is 42,500 square feet, and the cubic space 1,310,000 cubic feet. The proposed method of illumination is as follows:—The lantern at a height of 215ft. will be illuminated by an arc lamp of 25,000-candle power with deflected rays. The upper gallery, about 160ft. above the floor, will bear a wreath of 28 arc lamps requiring a current of from 25 to 30 ampères. The lower gallery at a height of about 80ft. will carry 112 arc lamps of less brilliancy requiring a current of 10 ampères. The arches on which the Rotunda is supported will be lighted by 56 arc lamps, and 36 arc lamps will be grouped in the centre of the building. Thus, the Rotunda will be illuminated by about 233 arc lamps with, in round figures, 250,000-candle power.

About 450 arc and 3000 incandescent lamps will be required for the remainder of the Exhibition, offices, &c. &c. The south approach will be illuminated with incandescent lamps only, and the space in front of the north portal by an arc lamp on a high mast. The space under the Rotunda itself, as will be seen from the plan, is devoted entirely to scientific instruments, telegraphic apparatus, telephone stations, electro-therapeutical appliances, and machines, not in motion, classified according to their art and nationality. The east wing of the northern gallery will be filled with pictures, stationery, &c., and partly fitted up as studios, to illustrate the effect of the electric light on objects of art, and for the purpose of drawing, painting, &c. The north wing of the eastern gallery will be converted into a series of interiors of dwelling-houses of every description, from saloons down to the modest apartment of a modern citizen's residence, and will be entirely lighted with incandescent lamps supplied from accumulators, to familiarise the public with this method of procuring light. The southern wing of the eastern gallery will be arranged as a theatre, lecture-room, and hall for scientific demonstrations. The theatre will be illuminated on alternate days by arc and incandescent lamps, to enable a perfect comparison to be made between the two systems for this purpose, in regard to effect, cost, and general results. The southern wing of the west gallery will be fitted up with telephones in connection with different places of amusement, and for the reproduction of concerts, &c., for the benefit of those frequenting the Exhibition. The corner pavilion of the western gallery will be arranged as a reading room, where all the literature referring directly or indirectly to electricity and its appliances will be placed gratis at the disposal of visitors.

The offices for scientific committees and experiments are placed under the southern arcade, as far away as possible from any machinery in motion, or otherwise, that might affect the sensitive instruments required in conducting such experiments as are intended.

The two adjoining wings of the northern and western galleries will be devoted entirely to dynamo-machines in motion, of which there will be about 140, varying in power from $\frac{1}{10}$-horse power to 60-horse power. The power required to drive these is estimated at 1200-horse power, which will be supplied by twenty stationary engines erected in the north-west courtyard. These engines are of a most varied and interesting description, comprising rotary engines, compounds with three and four cylinders, eight gas engines of a total of 80-horse power—amongst them one of 40-horse power—two hot air engines, and divers small hydraulic motors, worked direct from the water mains. The steam required will be provided by thirteen fixed and twenty-one portable engine boilers standing in the same courtyard as the engines.

Under the auspices of the Minister of Commerce, everything is being done in the building to make the Exhibition a success. Unfortunately, it is situated so far from town that a journey down to it, for those who cannot afford a carriage, entails a perfect pilgrimage through the Prater. A small railway, to be worked by electricity, is being constructed, but it will have more the character of a toy than of a really sufficient means of communication. The tramway company offered to lay a track as far as the north portal, and obtained the permission of the Imperial Ranger for this purpose, but as the municipality have refused to allow them to make any extra charge for passengers, the public will be debarred from using what would have been the only cheap and practicable means of reaching their destination.

LETTERS TO THE EDITOR.

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

MARINE BOILERS.

SIR,—It seems astonishing how little real progress is made in the performance of marine boilers. I have had some considerable experience with the old flue boilers first used in the Navy before tubes were introduced, and attended a number of experiments and testings, especially with one taken from a ship and set up in Woolwich Dockyard in 1841 for experimental purposes. The arrangements were the same as on board a ship, with the exception of appliances for registering results. Every kind of coal thought to be suited for the Navy was tested with it; and as I had an opportunity of making experiments with a multitubular boiler of the modern class many years afterwards, and comparing notes, my recollections and observations on boiler performances are extensive, and I am surprised to find no advance in water evaporated per pound of coal. The only advance is in space occupied and strength, to meet the demands for high-pressure steam, now becoming universal. The defects of the multitubular system are so considerable that we are a long way off from perfection, and in these days, when materials of every description can be obtained, there seems no excuse for remaining in a groove. The average temperature in some of the best boilers in the Navy is in the furnace 1900 deg.; in tubes, 736 deg.; smoke box, 720 deg.; in funnel 810 deg. This when all is clean and new, with best steam coal; on a six hours' run the results would be different when the furnace became foul. The temperature gets less in the tubes and higher in the funnel, so that a-third of the coal is wasted. This is not creditable in this age of engineering skill.

W. A. MARTIN.

Pocock-street, Blackfriars-road, London, S.E.

ELEPHANT BOILERS.

SIR,—As we have for many years been users of the elephant boilers, it may be of interest to your readers, with reference to the correspondence in your columns on the subject, to have our experience of them. We have three, which have been at work continually for fifty, forty, and forty years respectively, and the amount of repairs they have required has been very trifling. They are very steady steamers, and we have never had any sort of accident with them. We have lately had them insured, and the company's inspector has passed them—even the one that has been at work for over fifty years. They were all made by Messrs. J. and E. Hall, of Dartford.

With regard to economy of fuel, we can only compare them with Cornish boilers of good construction. In one case we have two boilers working side by side. One is a Cornish boiler, with flue 2ft. 10in. diameter, fitted with seven pockets which lie across half the flue, and the other boiler is of the elephant type. Both boilers are amply powerful for their work. They are used alternately, and the fuel consumption is, as nearly as possible, the same in both cases.

We certainly prefer the elephant type, as we believe it to be safer and less costly in repairs, and more durable than other types.

Gunpowder Works, Dartford, Kent, July 21st.

PIGOU, WILKS, AND LAURENCE,

WHITBY, REDCAR, AND MIDDLESBROUGH UNION RAILWAY.

THE work in connection with the construction of the Whitby, Redcar, and Middlesbrough Union Railway is now completed, and General Hutchinson, one of the inspectors of railways appointed by the Board of Trade, has made his final examination. The certificate of the Board of Trade, formally passing and granting the opening of the line for passenger and mineral traffic, is daily expected. The new line will open up a district which hitherto has been unknown to the general traveller, and it exposes to view one of the most lovely and romantic localities in any part of England. The line literally runs parallel to the sea shore, and cuts through a series of high hills, rugged rocks, and passes over extensive and charming glens. All the way an uninterrupted view of the magnificent coast scenery is obtained, and this part of the north-east coast is probably the most truly beautiful of any to be met with. Each spot has some legend attached to it, and no locality is free from having associated with it some romantic story or poetic allusion. The operations immediately connected with the construction of this new railway have been attended with many failures. The first sod was, with due and proper ceremony, cut in the year 1871 by the Dowager Marchioness of Normanby, who was then seventy years of age. She said she would see the line completed, and ought to have done, for she lived twelve years after that; but the work which she inaugurated, and in which she took so much personal interest, remained unaccomplished. Those who undertook the consummation of the enterprise had apparently under-estimated the difficulties. They met with many peculiar obstructions, the exceedingly treacherous nature of the ground altogether upsetting previous calculations. The original work came to a sudden stop. All the navvies were discharged, and there was for a period of three or four years or more a complete cessation of work. Subsequently the completion of the line was undertaken by the North-Eastern Railway Company, the work having been placed in the hands of Mr. Waddell. The line itself commences at Loftus; from thence it passes through various deep cuttings in the rock until Easington is reached. At this point the first engineering work occurs, for here it has been found expedient to form a tunnel through a deep mass of rock and hard-bound clay, the tunnel itself being 900 yards long. The extraordinary work which was here met with was not ended, for at the very termination of the tunnel a deep cutting had to be encountered, the difficulty of the undertaking being enormously augmented by the exceedingly treacherous nature of the ground. Leaving this sombre locality with its necessarily damp and "clammy" associations, one is relieved and adequately rewarded with the exceeding contrast which bursts suddenly on the view. The woodlands hereabout are wild and beautiful. Passing this, a place locally known as "Sliding Banks" is reached, where great difficulty was also experienced in getting the proper foundations and effecting solidity of work. This difficulty, or rather the singular character of the ground, may be more readily understood when it is mentioned as a fact that at one time, notwithstanding all ordinary precautions made, nearly nine acres of land was "on the move," drifting seaward all at one time. Two miles and a-half from Loftus, what may be said to be probably the most popularly interesting, and certainly, from an engineering point of view, one of the most peculiar pieces of work in the whole line, namely, Staithes Viaduct, is reached. This viaduct is 150ft. in height, measuring from the bed of the "beck" below, and is 264 yards long. It is constructed entirely of iron. This was one of the weak points of the line; but since the Government inspection, which happened immediately after the Tay Bridge catastrophe, singular precautions have been taken in order to test thoroughly and well its capabilities. Most extraordinary, and, we are informed, hitherto unapplied bridge tests have been set in operation, with a result that General Hutchinson has expressed himself well satisfied with the result of the ordeal through which the seemingly slender structure has passed. At the Whitby end of this viaduct there is a neat, substantial-looking station. In passing over the giddy height which this viaduct spans, the singularly peculiar-looking village of Staithes is seen to the best advantage. Apart from its own individuality, this fishing town should be noted as having been the scene of some of the earlier successes of Captain Cook, the illustrious circumnavigator. Leaving Staithes, level fields, now teeming with verdure and pretty rural scenery, meet the eye, and at Hinderwell there is another station, this being situate four and three-quarter miles from Loftus. From Loftus a long series of cuttings and high embankments are traversed until the little village of Kettleness is reached. Just before arriving at this curious village there is an uninterrupted view of the charming bay of Runswick. This bay is certainly the most compact on the north-east coast, and at one time the Government had some serious notions of constructing a harbour of refuge there. The general beauty of the view is enhanced by the curious formation of the village itself, the houses—red tiled or thatched roofed for the most part—being literally embedded in the side of the precipitous cliffs. After Runswick, in the course of a few minutes the train rushes into a sharply curved tunnel, 308 yards in length, and on emerging from this a glorious view of the open sea and the high cliffs presents itself. The view, however, is short-lived; there is scarcely time to realise the magnificence, the beauty, the varied richness of the view, for a plunge—no word is more expressive—is made into the darkness of a tunnel 1651 yards in length. This tunnel is the third, and much the longest in the route, the gradient being a peculiar one, namely, 1 in 55½, falling towards Whitby. When daylight again presents itself, there is a continuous view of the romantic coast, variegated with its busy shipping, and forming at all times an increasing range of interest on account of its constant changeableness. From this point, too, a good view of the historic ruins of Whitby Abbey, standing up clear and sharp against the sky, is obtained. At the pretty seaside village of Sandsend another station is built, this point being 12¾ miles from Loftus. In close proximity with this station there is another tunnel, built on the same principle as the one at Staithes. After this, in quick succession, three more viaducts, namely, at Eastrow, Newholm, and Upgang, are passed. The Whitby West Cliff Station is then reached, being the last new structure of that kind on the line, and being nearly 15 miles from Loftus. From this point the line falls rapidly through deep cuttings to join the main line at Bog Hall Junction. In passing through the last cutting a high brick retaining wall is noticed on the left-hand side. This is intended in future to carry the Scarborough and Whitby Railway, now in course of construction.

PROPOSED LIGHTHOUSE ON THE SALTCAR ROCK.—A committee appointed by the Brethren of Trinity House visited Redcar on the 24th inst., to inspect the Saltscar Rock with a view to erecting a lighthouse there. A number of shipowners and others met the committee and gave evidence in favour of this site being chosen. The committee will lay their report before the Elder Brethren on their return to London. The Tees Bay ports contribute £20,000 per annum towards the maintenance of lighthouses, and as there are no Trinity lights between the Whitby High Lights and Souter Point, near Sunderland, it is thought only reasonable to ask that another lighthouse should be erected, and there is great need for one on Saltscar.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—Alfred J. Allen, chief engineer, to the Espiegle, vice Lucas; Adam Shoolbread, chief engineer, to the Enchantress, temporarily; Caleb J. North, engineer, to the Victor Emanuel, for Hongkong Yard, vice Scott; Hugh Hawkins, engineer, to the Asia, additional, vice North; William F. Innes, chief engineer, to the Indus, additional, vice Taylor; and Charles H. Pellow, engineer, to the Vernon, for the Bloodhound, vice Riley; and Thomas S. Stanlake, engineer, to the Pembroke, additional, for the Forward.

WORKING MEN'S EXHIBITS AT THE ENGINEERING AND METAL TRADES EXHIBITION.—JURORS' REPORT.—A copy of the report of the jurors, Mr. Samson Fox and Mr. J. A. Hopkinson, has reached us, and from it we find that they have decided that only those models which showed originality of conception and practical utility should be made the subject of the chief awards. The jurors are of opinion that great praise is due to several modelists, but they are of opinion that invention and improvement are more fruitful than mere excellence of finish of models of well known things. They therefore recommend the award of the certificates of merit mentioned below. First prize: Wm. Purdy, miner, Eastwood, near Nottingham, for his improved safety lamp, pneumatic lock, and unlocking apparatus. Second prize: Robert Dawkins, shoemaker, 11, Bridport-place, Hoxton, for his improvements in shoemaker's tools. Third prize: Edward Barnes, carpenter, 61, Amity-road, West Ham, for his improved double-action door spring; and they also recommend for a fourth prize the improved tuyere apparatus of C. F. Hengst, practical mechanician, 80, Elm-street, Plumstead. They recommend that the following should receive "certificates of merit" for workmanship:—Special merit, Richard Arkwright, fitter, for his locomotive and tender; honourable mention to T. W. Bishop, boilermaker, model of torpedo boat; James Adams, smith, model of a safe; B. Riches, engineer, model of a foot lathe; Samuel Yarrow, engineer, model of a trunk engine; Edwin Hackett, pattern maker, model paddle engines; Thos. Wm. Taylor, watchmaker, small model engines; Joseph Wayman, gas meter maker, working model meter.

THE IRON AND STEEL INSTITUTE.—The following is the outline programme for the meeting at Middlesbrough in September. Tuesday 18th.—10.0 a.m.: General meeting in Oddfellows' Hall, for the reading and discussion of papers. 1.45 p.m.: Luncheon, on the invitation of the local iron trade. 3.0 p.m.: Excursion by special train to visit the steel works and blast furnaces of Bolckow, Vaughan, and Co., at Eston. Wednesday 19th.—10.0 a.m.: General meeting of members at Oddfellows' Hall, for reading and discussion of papers. 1.45 p.m.: Luncheon, on invitation of local iron trade. 3.0 p.m.: Visit the works of the Anderston Foundry Company, and the blast furnaces and salt works of Messrs. Bell Bros. 7.0 p.m.: Annual dinner of the Institute. The new steel works of the North-Eastern Steel Company, and other works in Middlesbrough and district, will be open for inspection on this and the following day from three to five o'clock, on the production of cards of membership, or of invitation as visitors. Thursday 20th.—10.0 a.m.: General meeting of members, for the reading and discussion of papers. 1.30 p.m.: Depart for Stockton by special train. 2.0 p.m.: Luncheon at Stockton, on the invitation of the local iron trade. 3.0 p.m.: Visit ironworks, &c., in Stockton. 5.0 p.m.: Launch at 1 of Stockton shipbuilding works, if possible. 5.30 p.m.: Depart from Stockton for Middlesbrough and Saltburn-by-the-Sea. 8.0 p.m.: *Fête* and display of fireworks in gardens of Saltburn Improvement Commissioners. Friday 21st.—Three alternative excursions have been arranged for, viz.: (1) Depart from Middlesbrough in steamer provided by Tees Conservancy Commissioners, to visit the river works. (2) Leave Middlesbrough by special train for Crook, where the new plant of coke ovens, on the Simon-Carvès system, will be seen at work at the collieries of Messrs. Pease and Partners, visiting the Darlington Works *en route*. (3) Visit to the ironstone mines in the Cleveland district.

RAILWAY MATTERS.

THE directors of the Leicester Tramways Company will, at the general meeting on the 2nd inst., recommend a dividend of £10 per cent.

THE first Sunday's traffic on the railway from Königswinter up the Drachenfels, of which we have previously given some particulars, was very promising, 833 passengers going up and 648 coming down. A *Times* correspondent mentions that there were, however, 2000 pedestrians.

THE London and North-Western Railway Company is now carrying out an improvement which has long been needed at its station in Wolverhampton. It consists in the erection of an iron lattice foot bridge spanning two platforms, connection between which was previously by an underground tunnel alone.

SIR EDWARD WATKIN is still on tunnelling bent. Speaking at the meeting of the shareholders of the Manchester, Sheffield, and Lincolnshire Railway, on Wednesday, he intimated that his directors intended to make certain experiments with a view of ascertaining the practicability of driving a tunnel under the Humber at Hull. This scheme, if successful, would get rid of the objectionable ferry arrangement by which the company connect their terminus at New Holland with the busy town over the estuary.

WE are informed that the accounts of the London, Chatham, and Dover Railway for the past half-year have been submitted to and approved by the Board, and that, subject to final audit, they show an available balance sufficient to pay a dividend of £1 17s. 6d. per cent. on arbitration preference stock for the past half-year. This amount, added to the dividend of £2 5s. per cent. paid in respect of the half-year ending the 31st of December last will make a dividend of £4 2s. 6d. for the year ending the 30th of June last, as against £4 5s. for the previous year.

THE Great Eastern Railway Company has just made another addition to its cheap continental handbooks. The new one is "The Moselle, from the battle-fields to the Rhine: A Handbook to a New Tour arranged by the Great Eastern Railway *viâ* Harwich." It forms the third of a series of illustrated guides, published at a penny, to some less frequented districts on the Continent. It is edited by Mr. Percy Lindley, and is prettily and more fully illustrated than those which have preceded it. It contains sufficient historic information to excite interest in the places described, and each page has a margin for notes and memoranda.

GERMAN newspapers state that the Administrative Council of the Northern Pacific Company have sent invitations to Germany, to the public authorities, corporations, and leading newspapers, to send representatives to the opening of the line for public traffic, which it is expected will take place about the end of August. The Imperial Government of Germany purposes sending over some of the higher officials connected with railway administration. The President of the Reichstag, Herr Von Leventzow, will not be able to make the journey, but one of the vice-presidents will cross the ocean for the occasion. The principal German newspapers will also send special correspondents. It has been arranged that all those German gentlemen will sail from Bremen by the steamer Elbe on August 15th. From the moment of embarkation till their return to Bremen, they will be the guests of the Northern Pacific Railway Company.

ON Monday the French Chamber took up the convention with the Mediterranean Railway Company. M. de La Porte argued that anything was preferable to the conventions, and that with 1500 millions the railways might still be bought up. M. Richard Waddington urged a greater reduction of fares as being in the interest both of the shareholders and of the public, and said that the Belgian and German fares were considerably lower. On this ground alone the conventions should be rejected. M. Lebaudy, on behalf of the committee, admitted that Belgian and German fares were lower, but urged that the French companies had promised material reductions. M. Vacher maintained that the less populous and agricultural departments would be sacrificed by the conventions, and that strategic lines had been given up. M. Raynal, Minister of Public Works, replied that not a single strategic line had been abandoned. Of the 12,000 kilometres of the Freycinet scheme 2000 had been struck out, but they were simply postponed, and some of them would be narrow gauge lines.

LOCOMOTIVE makers continue busy, and orders for early delivery cannot be placed in any of the factories, but makers still complain that prices are insufficient. The standard of cost which determines price in competition is, however, that of the best situated or managed factories, and some of the leading firms have been making fairly good profits. The experiments on the London and North-Wessern Railway with engines fitted with high and low-pressure cylinders have been sufficiently favourable to encourage further trials. In Europe these compound engines are being tried on the Western Railway of France and the Austrian State Railways, and it is stated that the system is to be tried on some of the Indian and South American lines. In Australia, Messrs. Matheson and Grant's "Report" says, the preference given to colonial-built locomotives has not proved very satisfactory, for while little else is done in the Colony than the putting together of parts made in England, some 150 engines so produced by colonial contractors have cost about 20 per cent. more than they could have been imported from England.

A CORRESPONDENT writes to the *Times* complaining that there is no reliance to be placed on the provision of sleeping cars by the Calais-Bâle trains. He says: "I think it right to warn travellers against taking 'wagon lits' on the new route from Calais to Bâle. My wife took a ticket from a company calling itself the 'International Sleeping Car Company,' for the 14th of this month. On arriving at Calais she found that no 'wagon lits' were to be had, the carriage containing them being said to be out of repair. Having myself taken a ticket for the 19th, I called at the office on Wednesday to ascertain whether the requisite repairs had been made, and was assured that they had, and that the 'wagon lits' were in perfect order. On starting from Calais the violent oscillation of the carriage indicated something wrong. At 10.30 the occupants, most of them in bed, were suddenly turned out into an ordinary carriage amid much bustle and confusion. One of the wheels had heated, and was on the point of taking fire. The carriage was obviously unfit for service, and we narrowly escaped a serious accident. I am informed here that accidents to the sleeping cars are of common occurrence."

A WRITER in the Birmingham *Daily Mail*, speaking of the recent construction of about half-a-mile of tramway, at Moseley, in fourteen days, including two Sundays, the hurry being caused by the delay in getting terms from the road authorities of King's Norton and Balsall Heath, says, "That one Birmingham Tramway Co. has about twenty miles in hand to complete by the 12th of next July. In the northern division will be lines—(1) from the Old-square to Perry Bar station, and Villa-cross, Handsworth; (2) from the Old-square *viâ* Gosta Green to the borough boundary at Saltley; and (3) to near the borough boundary in Nechells; and (4) from Albert-street along the Vauxhall-road into the Nechells line. In the southern division, besides the line to Moseley, there will be lines from the Queen-street side of the New-street station to (1) Spark Hill along the Stratford-road, and (2) Small Heath-park, *viâ* the Coventry-road. The engineers for all these lines are Mr. Kincaid, C.E., and Mr. E. Pritchard, C.E. Thus we shall have in Birmingham some time next year about eighty miles of tramway open, besides about twenty for which Parliament is asked to grant powers this session. Up to the present we have been very far behind some other towns. I find that in Liverpool—where steam is about to be adopted—they have fifty miles of line open; in Manchester, 120; in Bristol, 13; in Glasgow, 25; and in Edinburgh, 17."

NOTES AND MEMORANDA.

To ascertain the side of the largest square that can be cut from a circular sheet of given size, multiply the diameter by 0·7071.

PROFESSOR PALMIERI announces the existence in the lava of Vesuvius of a substance giving the spectrum line of "helium," an element hitherto recognised only in the sun.

AN ascent has recently been made of the volcano Tongariro, New Zealand, the main crater of which turns out to be a mile in circumference and 400ft. deep. Boiling springs, which emitted vast volumes of steam and sulphurous fumes, were observed at the bottom of the crater. The Ruapehu was also ascended, the snow line being found at an altitude of 6000ft. Vegetation ceased at 7400ft., and the total height proved to be 10,000ft. An enormous crater was filled with snow.

THE rate of mortality for the week ending July 21st, in twenty-eight great towns of England and Wales, averaged 21·3 per 1000 of their aggregate population, which is estimated at 8,620,975 persons in the middle of this year. The six healthiest places were Brighton, Halifax, Bradford, Wolverhampton, Oldham, and Cardiff. In London 2559 births and 1781 deaths were registered. Allowing for increase of population, the births were forty-three below, whereas the deaths exceeded by 87 the average numbers in the corresponding weeks of the last ten years. The annual rate of mortality from all causes, which had steadily increased from 16·9 to 22·9 per 1000 in the five preceding weeks, rose to 23·5 last week. During the past three weeks of the current quarter the death-rate averaged 22·2 per 1000, against 24·3 and 17·7 in the corresponding periods of 1881 and 1882.

A VARNISH has been patented in Germany for foundry patterns and machinery, which it is claimed—we do not know how justly—dries as soon as put on, gives the patterns a smooth surface, thus insuring an easy slip out of the mould, and which prevents the pattern from warping, shrinking, or swelling, as it is quite impervious to moisture. This varnish is prepared in the following manner:—30 lb. of shellac, 10 lb. Manila copal, and 10 lb. of Zanzibar copal are placed in a vessel, which is heated externally by steam, and stirred during four to six hours, after which 150 parts of the finest potato spirit are added, and the whole heated during four hours to 87 deg. C. This liquid is dyed by the addition of orange colour, and can then be used for painting the patterns. When used for painting and glazing machinery, it consists of 35 lb. of shellac, 5 lb. of Manila copal, 10 lb. of Zanzibar copal, and 150 lb. of spirit.

THE alizarine required by the dyers and calico-printers of England and Scotland is now very large in quantity, and its manufacture on a large scale is proposed. Mr. Joan Levinstein, in a paper read before the Society of Chemical Industry, estimates the consumption of all countries at about 9000 tons per annum. For the production of 9000 tons of artificial 20 per cent. alizarine, there are required somewhere about 3000 tons of from 55 to 60 per cent. anthracene; from 3000 to 4000 tons of bichromate of potash—in this estimate there is no allowance made for the regeneration of the chromates; 18,800 tons of rectified sulphuric acid, or correspondingly less when muriatic acid is used for precipitating the alizarine; from 2000 to 3000 tons of from 45 to 50 per cent. anhydrous fuming sulphuric acid; 10,000 tons of 70 per cent. white caustic soda—this includes the necessary quantity of carbonate—and from 450 to 500 tons of chlorate of potash.

THE most recent report of the Swiss Department of the Interior states that there are in Switzerland 8642 factories and workshops under legal supervision, 1472 of which are worked by machine power. Of these, water furnishes the movement to the amount of 41,316-horse power, steam to the amount of 18,064, and gas to the amount of 117. The number of operatives employed are 134,862, of which 70,364 are males and 64,498 females. There are 10,462 children between fourteen and sixteen years of age, 14,590 between sixteen and eighteen, and 109,810 over the latter age. The textiles, such as cotton, silk, woollen, and linen, occupy 1619 factories, with 85,705 workpeople; 68 establishments carry on tanning, leather dressing, hair weaving, &c., with 3753 hands; there are 6636 hands employed in 143 food-preparing shops; 2749 in 102 chemical works; 4950 in 150 printing shops. There are also 111 wood-working establishments, occupying 2913 hands; 353 for clock and jewellery making, with 24,988 workpeople; and 96 for glass-making, &c., with 3170.

HERR KOPPEL has devised a new explosive substance, which he expects to be less costly than any other, to give out no injurious fumes, and not to be liable to explosion by shock or friction. The following figures give the composition of two kinds, the first of each pair of figures relating to explosives suitable for hard rocks, such as basalt, and the second of each pair for softer, such as sandstone:—

	No. 1.	No. 2.
Saltpetre	35	42
Soda	19	22
Sulphur	11	12·50
Sawdust	9·50	10
Chlorate of potash	9·50	—
Charcoal	6	7
Sulphate of soda	4·25	5
Prussiate of potash	2·25	—
Refined sugar	2·25	—
Picric acid	1·25	1·50
	100	100

ACCORDING to reports of the inspectors of mines for the year 1882, recently published, the aggregate number of persons employed in and about the whole of the mines in the United Kingdom amounted to 559,493 persons. Of these 503,987 were employed under the Coal Mines Regulation Act, and 55,506 under the Metalliferous Mines Regulation Acts. The total number of fatal accidents was 959, and the total number of deaths occasioned thereby, 1218; showing an increase compared with the totals for 1881, of 30 in the number of fatal accidents, and an increase of 165 in the number of lives lost. The general summary also shows that, on an average, during the year 1882 there was one fatal accident among every 583 persons employed, and one death by accident among every 459 persons employed. The average for the nine years, 1874 to 1882, is one fatal accident for every 596 persons employed, and one death by accident among every 454 persons employed. The proportion of fatal accidents in 1882 to the number of persons employed is, therefore, a little higher than the average of the last eight years; but the death-rate is very nearly the same. Other summaries shows the quantities of mineral wrought.

DR. LAGNEAU, in a paper read to the Paris Academy of Moral and Political Science, shows that the foreigners in France have nearly tripled in the last thirty years, the numbers in 1851 being 379,289, and in 1881, 1,001,110. The Belgians have in this period increased from 128,103 in 1851 to 374,498, in 1876, the Italians from 76,539 to 165,313, the Swiss from 25,485 to 50,203, but the English only from 20,357 to 30,077. Germany, England, and America send more women than men, whereas with Belgium, Italy, Spain, and Holland, the reverse is the case. The English consist of 12,764 males and 17,313 females, the Spaniards of 25,366 males and 27,171 females, the Italians of 100,278 males and 65,035 females. The immigrants are chiefly to be found in the large cities on the frontiers and on the southern coast. The English are chiefly in Paris and the Western Pyrenees, with a few on the north coast; the Germans, in Paris, the east, and the north; the Spaniards, in the Pyrenees; and the Italians, at Marseilles, in Savoy, and the eastern frontier up to Belfort. The three departments of the Seine, Nord, and Bouches-du-Rhône — in other words, Paris, the Lille district, and Marseilles, comprised respectively 193,046, 277,711, and 74,738 foreigners—an aggregate of 545,495, leaving only 455,615 for all the rest of France. Brittany and the central departments contain the smallest foreign element.

MISCELLANEA.

THE Autumn meeting of the Iron and Steel Institute, which will take place in Middlesbrough, will be held in the Oddfellows' Hall on September 18th, 19th, 20th, and 21st.

LORD SUDELEY, Sir W. Thomson, Sir W. Siemens, and Sir F. Abel have been appointed British Commissioners for the Vienna Electrical Exhibition, which opens next Wednesday.

THE number of visitors on Saturday to the Fisheries Exhibition was 23,058, making a total for the last week of 92,311. The total number from the opening of the Exhibition has been 874,764.

THE town commissioners of Weston-super-Mare have sanctioned plans for the erection of a new promenade over a mile in length. The cost will be £70,000. This improvement, with the scheme for a new sea front, will involve an expenditure in all of £100,000.

ON the evening of the 18th inst. a slight break in the lighting of the great conservatory at the Fisheries Exhibition was reported next day as a general stoppage. The truth was that the brushes of the dynamo supplying the conservatory had to be renewed, an operation which took but a few seconds.

LAST week's arrivals of live stock and fresh meat at Liverpool alone from the United States and Canada amounted to 1548 cattle, 1530 sheep, 4033 qrs. of beef, and 224 carcases of mutton; but this showed a rather large decrease in both live stock and fresh meat in comparison with the figures of the previous few weeks.

ACCORDING to an article on "The Alarming Destruction of American Forests," which will appear in the August number of *Forestry*, from the pen of Mr. William Little, of Montreal, the United States will, at the present reckless rate of cutting, be entirely denuded of its merchantable yellow pine in seven years.

A TRIAL trip of the s.s. Arratoon Apcar took place in the Thames on the 6th inst. She is a vessel of 2400 tons, and has recently been fitted with new machinery by Messrs. Maudslay, Son, and Field. The steam steering machinery was by Messrs. Davis and Co., Limited, and the decorations of the saloon and cabins by Messrs. Vigor. A speed of 12 knots was obtained.

ON Saturday Messrs. Robert Thompson and Sons launched an iron screw steamer for Messrs. Thompson and Wrightson, Sunderland. The dimensions are as follows:—Length over all, 250ft.; length between perpendiculars, 240ft.; beam, extreme, 36ft.; depth, 15½ft. She is classed 100 A 1 at Lloyd's, and built under special survey. Her engines, which are of 120-horse power, are by Messrs. Black, Hawthorn, and Co., Gateshead-on-Tyne.

ON the 19th inst. Messrs. Raylton Dixon and Co. launched a steamer named the Samarang, which has been built by them for the Rotterdam Lloyds, Rotterdam, and is the sixth vessel they have built for the same owners during the last few years, and the tenth for the same trade. Her dimensions are:—Length over all, 311ft.; breadth, 37ft.; depth of hold, 25ft. 9in. Her engines, of 200 indicated horse-power, will be fitted by Messrs. R. and W. Hawthorn, of Newcastle.

THE Glamorganshire Agricultural Show was opened at Pontypridd on Wednesday, when there was a very large assemblage and keen competition. The implement show was good, and, says our South Wales correspondent, one could but note, in going over a good breadth of country, how hand labour is being discarded. Mechanical and engineering appliances are getting commoner year by year, and even on the small mountain farms it is now ordinary to see blue and red painted implements from the first English houses.

THE Executive Board of the Fife and Clackmannan Miners' Association have held a meeting at Dunfermline, under the presidency of Mr. J. Innes, Cowdenheath, at which the following resolution was adopted:—"The board, having in view the continued improvement of trade, the steady increase in the selling price of coal, and the inadequate character of the recent advance of wages given to the men when compared with the higher prices now obtained, asks the men in the various districts to consider whether they are prepared to take some action to enforce a further advance of wages to the extent of 6d. per day—the reports from the men to be sent in to the general secretary not later than Monday, the 30th inst."

THE activity which has prevailed in shipbuilding for the last four years still continues, but the easier terms on which vessels can be contracted for, is a sign that the demand is slackening, and the large number of steamers now seeking employment seems to show that the trade has been overdone. But, Messrs. Matheson and Grant say in their half-yearly "Metal Trades' Report," it must be remembered that when competition becomes keen, the newest steamers, with all the latest improvements, have the advantage, and this continued advance in design is the real explanation of new orders. Any considerable slackening of the shipbuilding trade will tell severely on the steel and iron rolling mills, and will promote a further fall in prices.

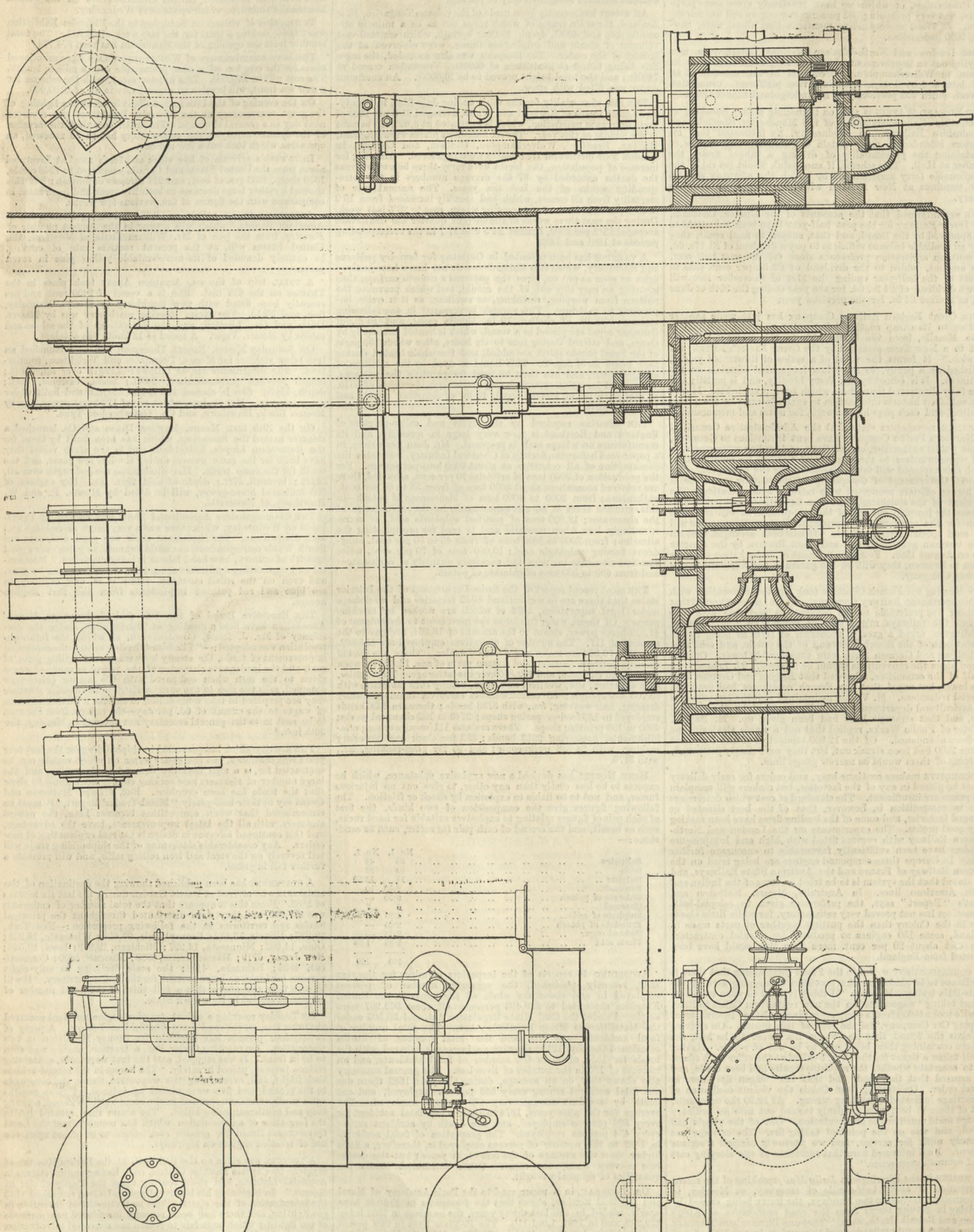
A STATEMENT has been published showing the destination of the emigrants who arrived at Castle Garden during the last six months of 1882. From this it appears that the total number of emigrants was 277,020, and they were distributed throughout the principal States and territories in the following proportion:—New York, 99,627; Illinois, 33,834; Pennsylvania, 25,602; Wisconsin, 18,232; Ohio, 14,602; Minnesota, 14,297; Michigan, 12,619; Iowa, 12,546; New Jersey, 6719; Massachusetts, 6380; Missouri, 5600; Connecticut, 4833; Nebraska, 4458; the scale declining to only eight persons for Idaho and two persons for the Indian territory. It will be seen from the above that a full third of the total number of emigrants settled in New York State.

ON Tuesday morning a serious traction engine accident occurred at Owler Bar, on the road from Sheffield to Baslow. A party of twenty-four persons left Sheffield for Stoney Middleton in two wagonettes. On reaching Owler Bar, a traction engine was seen to be in front. It was stopped, and the first wagonette, containing sixteen persons, passed in safety. The horses in the second vehicle took fright, and, overturning the wagonette, threw the occupants to the ground, and five were picked up injured. Fifteen months ago a similar accident occurred in the same neighbourhood, a young lady and gentleman being killed. The alarm then created led to the formation of an association which has memorialised the Local Government Board for greater restrictions to be placed upon the use of traction engines on highways.

A LECTURE was given on the 19th inst. at the Parkes Museum of Hygiene by Captain Douglas Galton, on "Recent Improvements in Artificial Lighting, and their bearing upon the Purity of Air in Rooms." In beginning his lecture, Captain Galton remarked that the introduction of the electric light had stimulated invention in gas lighting, and there had been recently introduced new methods of gas lighting which bade fair to retard the universal introduction of the electric light for domestic use. Every form of matter, when sufficiently heated, had the power of emitting rays of light, and thus became self-luminous. This was called incandescence, and all artificial sources of light depended upon the development of light during incandescence. For the illumination of our streets and houses at night use had hitherto been made of a combustible gaseous combination of carbon and hydrogen, which was the chief constituent of ordinary coal gas. When this hydrocarbon burnt it underwent partial decomposition, and evolved heat. Carbon was separated in the solid state, and floated in a finely divided and incandescent state in the interior of the burning vapour, and this constituted the flame. The more imperfect the combustion of any sort of artificial light, the more deleterious was its effect upon the air of the room. He remarked in conclusion that the electric light would probably supersede all others, but it was probable that the great advance which had been made in illumination by means of gas might enable that material still to hold its own for some time longer.

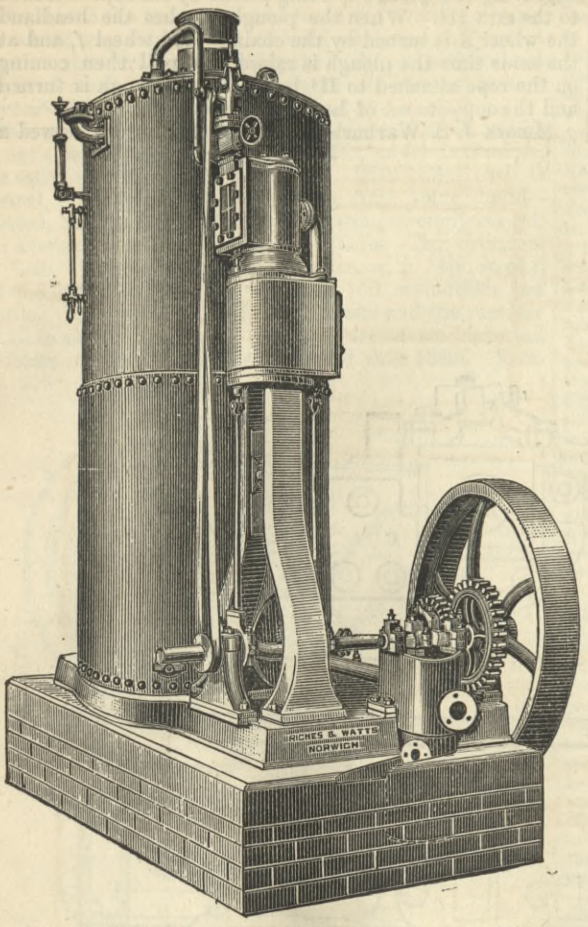
EXHIBITS AT THE R.A.S. SHOW AT YORK.

(*For description see page 69.*)

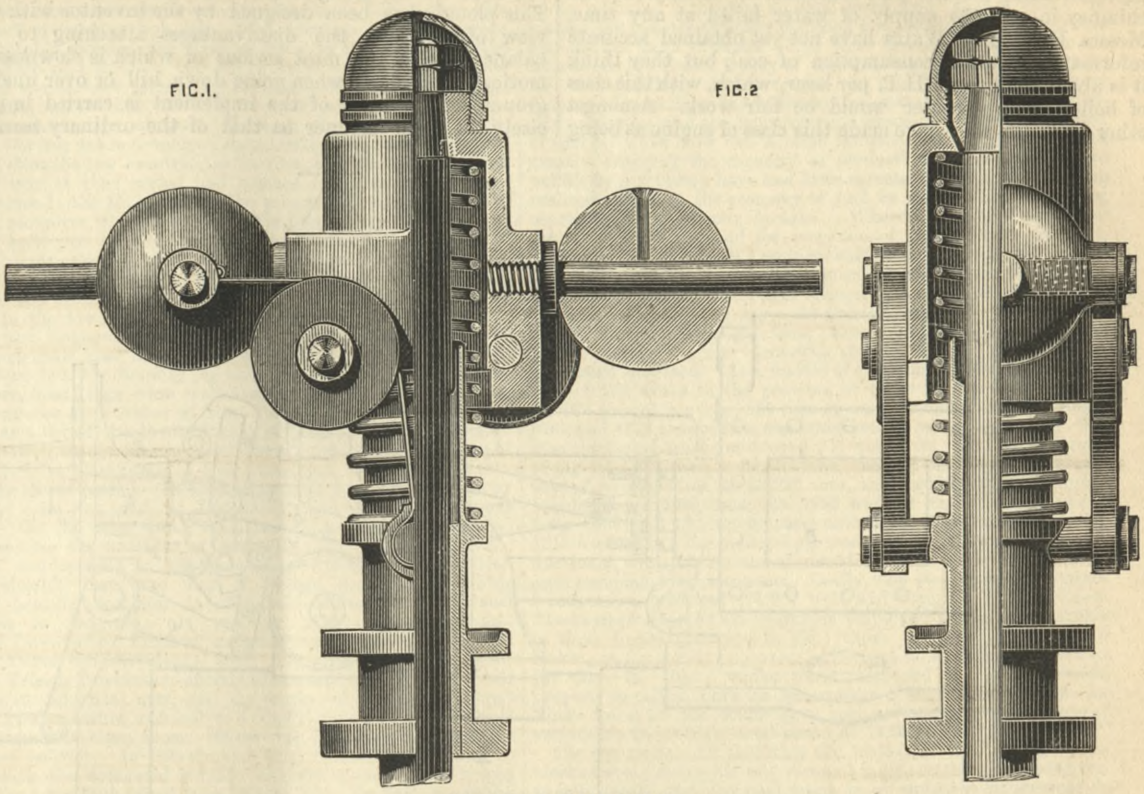


MESSRS. E. R. AND F. TURNER'S COMPOUND PORTABLE ENGINE.

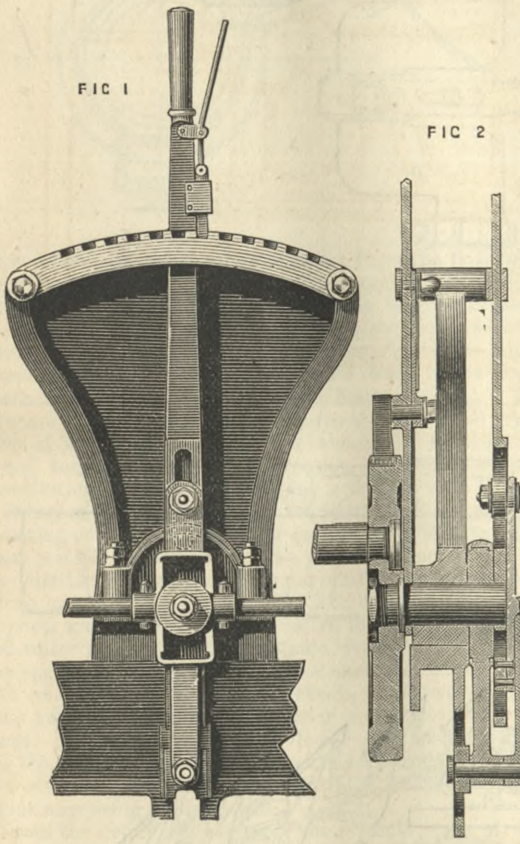
EXHIBITS AT THE R.A.S. SHOW AT YORK.

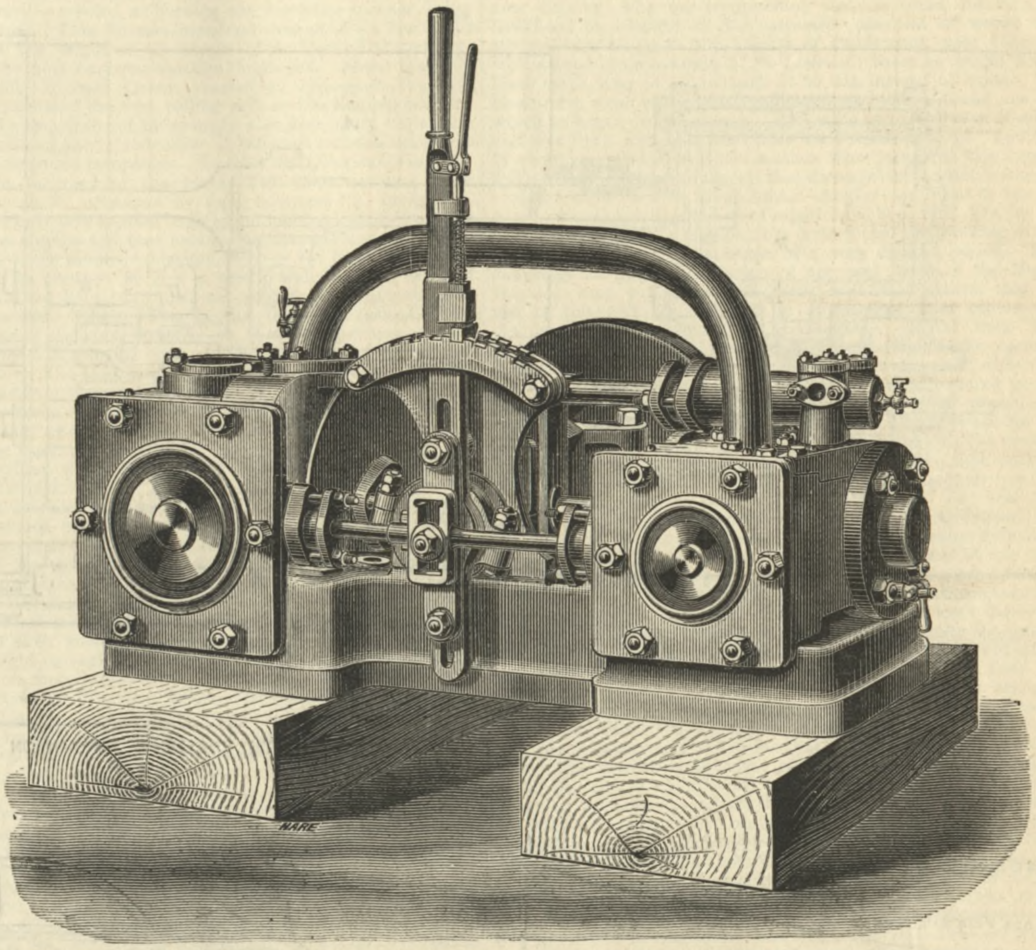


RICHES AND WATT'S COMPOUND VERTICAL ENGINE.



BURRELL'S GOVERNOR.





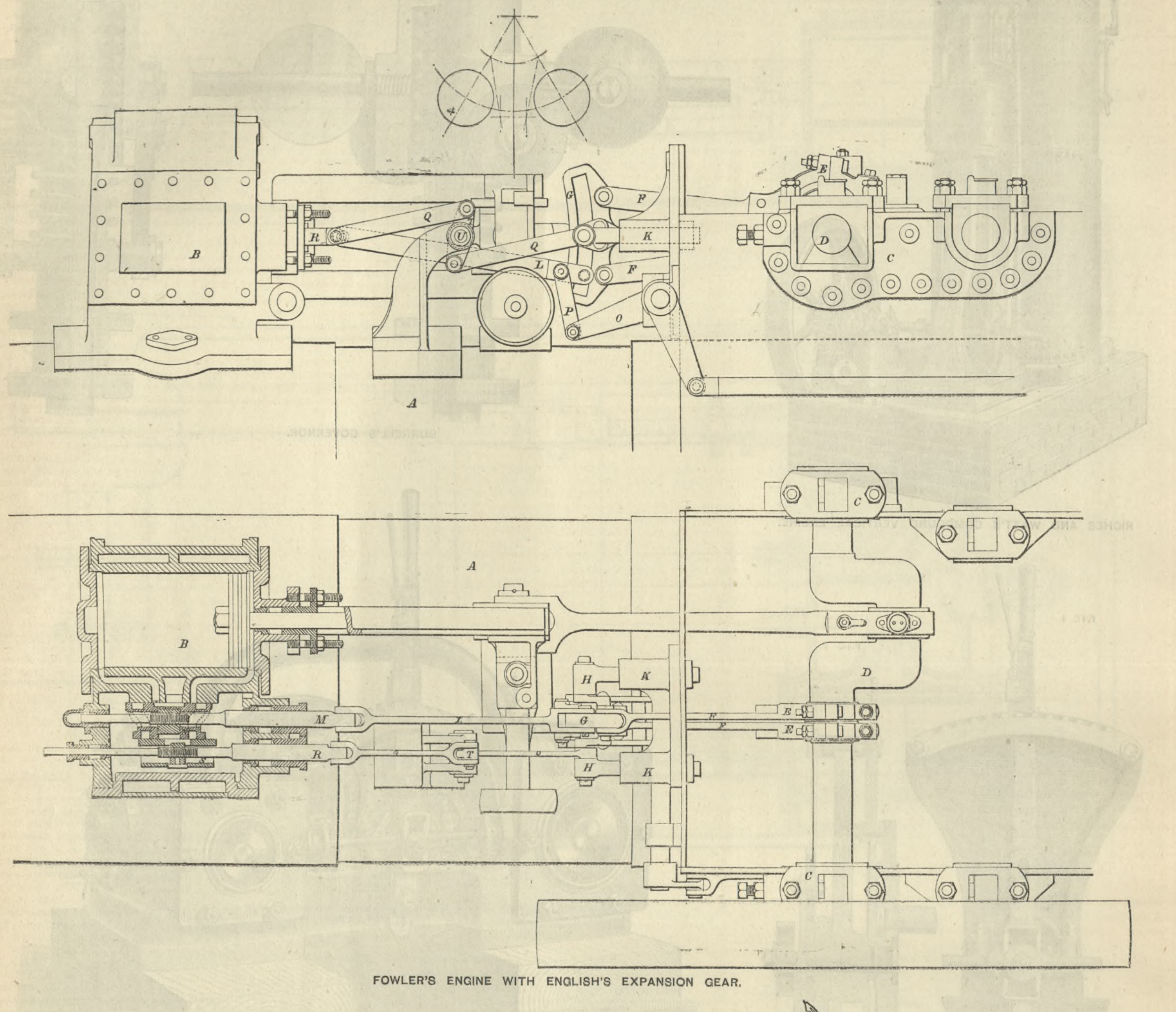
SHANK'S COMPOUND YACHT ENGINE AND REVERSING GEAR.

THE ROYAL AGRICULTURAL SOCIETY'S SHOW AT YORK.

IN our last impression we mentioned several of the exhibited articles which we could not describe without drawings. One of these was the semi-portable compound engine of Messrs. Fowler and Co., Leeds, fitted with English's expansion gear, as also applied to a road locomotive. Of this gear we now give engravings on page 68. This arrangement of expansion gear is designed to work with an ordinary link motion reversing gear without the addition of extra excentrics or many extra working parts. It is designed for the purpose of obtaining an early cut-off for ordinary link motion reversing gear without the necessity of a corresponding increase in the travel and lap of the main slide valve, the result obtained being that in a link motion of ordinary proportions the cut-off can be varied by linking up with the reversing lever between a quarter and five-sixths of the length of the stroke, without sensibly altering the release or compression of the steam. The gear illustrated is as arranged for one of Messrs. Fowler's B class agricultural road locomotive engines. The boiler A, cylinder B, crank shaft bearings C, crank shaft D, are the same as usual; E E are the valve excentrics and F F the excentric rods; G the expansion link, and H the centres on which the expansion link vibrates. The link is held in its central position, and is allowed to work inwards or outwards by the slide rods which slide in the guides K, and which are fixed to the front of the crank shaft box. L is the radius rod for the valve spindle M of main valve N. This radius rod is acted upon by the reversing lever and lifting lever O and lifting link P in the usual manner. Q Q are the radius rods for working the expansion valve spindle R and expansion valve S; T is a lever centred at U. At the opposite ends of the lever T the radius rods Q Q are attached, and the other end of the radius rod Q coupled to the centre pin on link, and the end of the other radius rod Q is coupled to the valve spindle R. This gives the desired motion to the expansion valve. The arrangement is strong and simple, and secures the advantages mentioned where another excentric could not be employed and would not be as efficient.

Another novelty was Messrs. Burrell and Sons' radial governor, illustrated above. The object aimed at in this governor is simplicity of construction and the utilisation of the centrifugal tendency of a pair of balls sliding on radial rods, revolving in a plane common to the pair, and thus to employ the whole of the energy due to their rotation in the working of the sliding collar and connected parts controlled by a spring, and none in lifting their own or other weight. The construction is such that in all positions of the balls, the work which must be done on the governor itself does not increase as it does with the increase of the angle between the spindle and pendulum arms of a pendulum governor, as the balls rise from one position to another, the work for a given amount of rise of the sliding collar remaining uniform, which is not the case in any governors in which the weights or balls rise as the sliding collar rises. Messrs. Burrell say the spring is calculated to balance the pressure of the balls at the two extreme positions, and that a very steady action is the result, the friction and sensitiveness remaining constant. The balls are connected to the sliding collar or sleeve by one steel band on each side which passes over flanged rollers of large diameter. These bands are secured in such a manner at the ends that they are not weakened by rivets or pins, but are fastened by a clip, which makes them perfectly safe. It has been suggested that the bands might break and allow the balls to fly away, but the margin of safety is high, as they are tested to half a ton, and as the strain on each band is only 33 lb., there is little fear of breakage. Should one band break, the other would still hold the balls quite securely. No stop is shown on the radial rods, but no doubt such a measure of safety will be used. It will be noticed that the governor can be finished almost entirely from the lathe, a feature of great importance from a manufacturing point of view. There is an absence of levers or parts, the wear of which would affect the action of the governors.

A novelty in vertical engines was exhibited by Messrs. Riches and Watts, of Norwich. We believe this is the first condensing engine shown at work at any of these shows, and certainly the first compound condensing engine with boiler combined ever so exhibited, and may therefore be claimed as a novelty. This engine we illustrate above. It has cylinders 4½in. diameter, 7in. diameter by 10in. stroke, with 80 lb. of steam in the boiler, and running at 180 revolutions per minute. It has indicated 12½-H.P. as shown by the diagrams, page 68. At this power, the makers inform us, that they had no difficulty whatever in keeping up steam with the boiler shown, which is vertical type, 6ft. 8in. high, 2ft. 10in. diameter, with ½in. cross tube in fire-box and eight 2½in Field tubes. The cylinders are as shown—"Tandem"—with the small cylinder at top fitted with an intermediate stuffing-box, of a form which the makers have used for ordinary inverted cylinders for thirty years. The valves are simple three-ported ones, worked from an excentric on either side of the crank throw, the arrangement being very simple and easy to get at. The air pump is single-acting, and placed inside the condenser, worked by gearing about one to one and a-half of engine. The engine can in a few minutes be converted into a non-condensing compound by simply disengaging the exhaust pipe and fixing another pipe that leads the exhaust into the chimney in case the supply of water failed at any time. Messrs. Riches and Watts have not yet obtained accurate information as to the consumption of coal, but they think it is about 3½ lb. per I.H.P. per hour, which, with this class of boiler, they consider would be fair work. Amongst other purposes, they have made this class of engine as being



FOWLER'S ENGINE WITH ENGLISH'S EXPANSION GEAR.

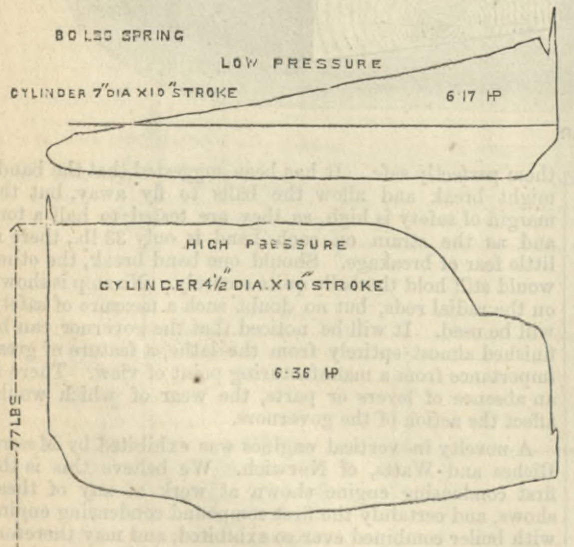
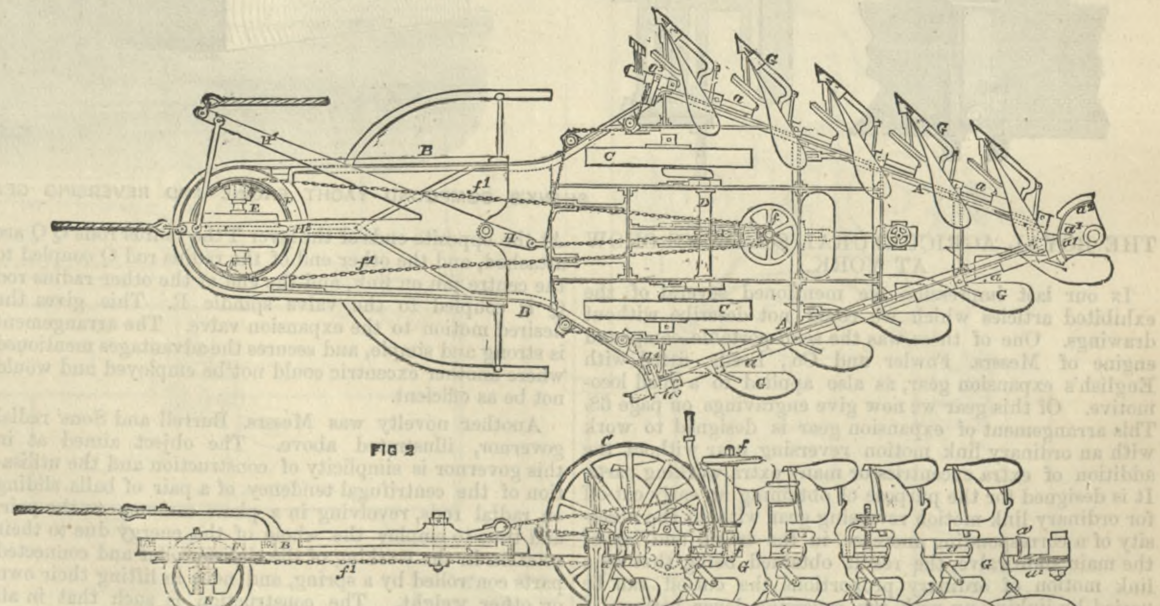


DIAGRAM FROM RICHES AND WATTS' ENGINE.



CATLEY'S STEAM TURNING PLOUGH.

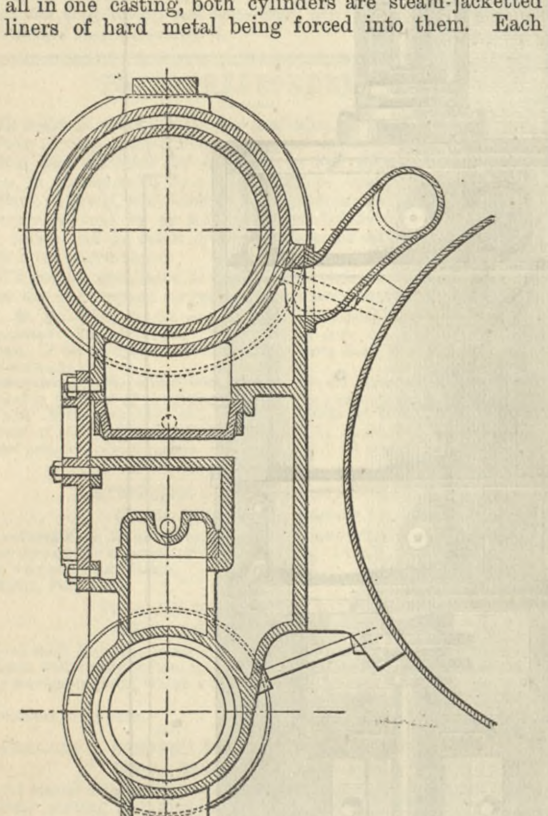
well adapted as an auxiliary power for small water mills for driving one, two, or three pairs of stones when the supply of water for the water wheel falls short; but it of course recommends itself for any other purposes wherever a supply of water can be easily obtained. The feed pump is worked from an excentric cast on the same cog-wheel, which works the air pump and feeds from the hot well on top of condenser.

The steam turning plough, for which Mr. Catley was awarded a silver medal, is illustrated by the above engraving. This, however, shows the plough as fitted with five breasts on each side, while that exhibited had six, and the connection between the two ends of the semi-rotating shafts *a* carrying the bodies G is somewhat modified. The principle of the plough is, however, exactly the same. This plough has been designed by the inventor with the view of avoiding the disadvantages attaching to the balance plough, the most serious of which is slowness of motion, particularly when going down hill or over uneven ground. The frame of the implement is carried in precisely the same manner as that of the ordinary turning cultivator, and is thus steady in action. The back part of the frame is V-shaped, each side of the V carrying a rocking shaft *a*, the two shafts being geared together in such a way that when one set of plough bodies is at work the other set is raised from the ground. When the implement arrives at the headland the engine at the opposite side of the field commences to pull, the effect being that the relative positions of the two sets of ploughs are reversed, the implement is turned round, and the return journey entered upon. Two implements, plough and cultivator, are also combined in one, and the change from one to the other can be made in a short time. Satisfactory trials have, we are informed, been made with the plough travelling at fully six miles an hour. As shown in the engraving the plough is being pulled by the rope attached to the arm H^2. When the plough reaches the headland the wheel E is turned by the chain f^1 and wheel f, and at the same time the plough is raised, the pull then coming on the rope attached to H^1 by which the plough is turned and the opposite set of bodies put into work.

Messrs. J. S. Warburton and Co., of Preston, showed a new potato digger, in which the front wheel by which the depth of digging is adjusted, is mounted on a lever carried by a pin in the axis of a bevel quadrant, so that the hand lever is brought to the side of the machine, in a very handy position for the man working the plough. The forks are set at an angle, so that the potatoes are more effectually separated from the earth thrown up with them.

The Hull Wagon Works Company showed a wagon of the long colonial form, fitted with Barrett's metallic wheels, in which the spokes are of steel, and are attached to the tire by bolts and clamped between discs forming the nave. The spokes may thus be taken out for repair or renewal. The body is so mounted on the axles that a rise of one of each pair of wheels six inches or more above the others, leaves the body level and free from twisting strains. The whole wagon is of iron, or mild steel, and the perfect freedom obtained by mounting the body on longitudinal axes is of great importance for wagons to be used in new countries where the roads are but tracks.

The engravings on page 66 show Messrs. E. R. and F. Turner's new compound portable, which, as far as possible, is exactly like their ordinary engines. The boiler shell is of steel, the longitudinal seams of the same being double-rivetted, the fire-box is of Low Moor iron, strongly stayed. The average working pressure is 100 lb. The cylinders are 7½in. diameter, and 12in. diameter, with 14in. stroke, and the engine works at a speed of 150 revolutions per minute. The cylinders, with valve chests and the receiver are all in one casting, both cylinders are steam-jacketted by liners of hard metal being forced into them. Each



steam jacket has direct communication from the boiler for steam supply and drainage. The receiver is placed between the two cylinders, and is thus steam-jacketted. The governor is Messrs. Turner's automatic expansion governor, which regulates the steam supply to the high-pressure cylinder in proportion to the work to be done, whether the load on the engine is heavy or light. The governor is very sensitive, and secures a very marked regularity of speed. The slide valve and governor are connected together without intervention of a strap or any complication of parts. The engine is built so that it may be detached from the boiler, if required, for shipment, &c. A casting rivetted to the boiler carries the cylinders. The steam joint is made between the planed under surface of the cylinder and the planed upper surface of the casting before mentioned. The wrought iron elastic crank shaft supports are bolted to angles rivetted to the boiler, and the feed-water pipe is bolted to a nozzle rivetted to the boiler. The engine parts can therefore be detached from the boiler with only two steam joints to break, which can also be easily re-made. A feed-water heater is connected with the pump. The engine is of good design and workmanship, and the arrangement gives the boiler remarkable freedom from strains. Messrs. Shanks and Sons compound yacht engine engraving explains itself.

From the detail engravings of the reversing gear of this engine—page 67—the reversing gear will be easily understood. It will be seen that by throwing the reversing lever over the excentric is caused to take a new position with reference to the crank.

In our last impression we stated that Messrs. John Cowley and Son were amongst the exhibitors of gas engines, but they write us to say that they were not exhibiting these, but were only using two of the Bisschop engines to work some of the machinery they exhibited.

We should mention that Messrs. Priestman Brothers, whose new dredger and ditcher we noticed last week, were awarded a silver medal for that machine.

HISTORY OF THE IRON AND COAL INDUSTRIES IN THE LIEGE DISTRICT.

By M. EDOUARD DE LAVELEYE, of Liége.*

The iron trade.—It is difficult to say exactly how the art of working iron originated in those provinces of ancient Belgium, which have since become known as the district of Liége. It is certain that Asia was the cradle of iron working, and it is possible that the Eburones and the Nervii, the ancestors of the present Belgians, brought with them from the Euxine, where they had their origin, secrets which had been already known for ages in that district. However this may be, it is almost certain that when Cæsar arrived in Gaul he found among the tribes he subjugated a knowledge of the art of transforming the ores of iron into a metal which they used for different purposes, especially that of arms. The discovery, in 1870, of ancient furnaces, still filled with materials, at Lustin, near Namur, enables us to understand the primitive method employed for the manufacture of iron. The furnace consisted of a single excavation in the ground, oval in form and rounded at the bottom; it was about 12ft. long by 9ft. wide and 3ft. deep, and was formed in a bed of clay; a channel pierced through the clay allowed air to enter the bottom of the furnace. In this hollow was found the metal, which contained 93·48 per cent. of iron, 0·37 of carbon, 4·94 of fusible materials, and 1·21 of sulphur and phosphorus. It is probable that the Romans communicated to the ancient Belgians the use of the bellows, which had long been known to them; and that other improvements were made during their rule in the art of treating iron ores. The invasion of the German tribes probably stopped the impulse given by the Romans to the manufacture of iron. In the 8th century, under Charlemagne, appeared the furnace called the Forneau à Masse, or Stückofen, which was higher than the old furnaces, and thus allowed a greater concentration of heat. Between the 8th and the 12th century the iron trade developed considerably, and the metallurgist Karsten cites the low countries as the district where the manufacture of iron at that period had reached its highest perfection. From thence to the 15th century the progress realised was small. In 1468, moreover, the ironworks of the Liége district were almost entirely destroyed by the troops of the Duke of Burgundy. It should be remarked that up to this time malleable iron was almost the only product; but Karsten, who has been cited above, observes that the first apparatus for producing cast iron was established in the low countries, from whence the art extended into Sweden and England. The oldest blast furnace appears to have been constructed near Namur, in 1340. It is, at any rate, certain that before 1400 the foundry pig blast furnaces of Les Vennes and Grivegnée, near Liége were well known. During the succeeding three centuries the number of blast furnaces grew so rapidly that in 1700 an edict of the Prince Bishop of Liége forbade the erection of any new furnaces for the next twenty-five years. The use of coke as fuel for blast furnaces was introduced from England at a relatively recent period. In 1769 an attempt to smelt iron ores by means of coke was made at Juslenville, near Spa, but without success. On the other hand, wood becoming scarce, raw coal had been used for the finishing of malleable iron as early as 1627; but its employment in the process of transforming cast iron into malleable iron was also of foreign importation. This process became common in England whilst it was still unknown in Belgium. It was in 1784 that Cort and Partnell invented in England the puddling furnace and grooved rolls. Those improvements were introduced into Belgium, but the French Revolution shortly afterwards put an end to all progress in industrial arts, and the works of the Liége district were in great measure reduced to a condition so deplorable that it was necessary to close them. There was, however, no long intermission of activity. In 1800 circular blast furnaces were found to be replacing the octagonal furnace hitherto in use. Their height was at the same time raised from 15ft. to 25ft. In 1803 the casting of cannon was commenced at Liége, and soon became the largest industry of the province. The idea, however, was still general that the coal of Liége was not fit for making coke, and it was not until 1823 that an Englishman, whose name has become celebrated —John Cockerill—erected at Seraing the first blast furnace, using coke as its fuel. This furnace remained unique of its kind until 1830; it was the origin of the works of the Cockerill Company, now one of the most important on the Continent. About the same time—in 1821—Michael Orban erected at Grivegnée the first puddling furnace and the first rolling mill on the English pattern. After 1830 the iron trade of Liége made a sudden start under the double influence of the introduction of railways and the inauguration of large financial companies. In 1839, and afterwards in 1848, serious crises occurred in the trade; but these reverses were succeeded on both occasions by new advances in prosperity. Hitherto, the only ores treated in Belgium had been those from the district of the Ourthe and that between the Sambre and the Meuse. These ores are now almost exhausted down to the level from which water could be pumped to give a profit, and the iron trade of Belgium could not have continued had not new raw material been brought into use. There exists in the Devonian formation an important bed of oligiste or specular ore, of an oolitic character; but for a long time this mineral was considered impossible to reduce. In 1853, however, the blast furnaces of Ougrée produced a revolution in the Belgian iron trade by succeeding in the utilisation of these ores, and the trade then entered upon a new series of prosperous years. We may now proceed to the improvements introduced into blast furnace working. In 1803 the bellows, which had been in use from the earliest times, began to be replaced by blowing engines with metallic pistons; and in 1837 the Cockerill works took the initiative in introducing the hot blast. It was the same works which introduced into Belgium the making of Bessemer steel. The first converters were erected in 1863. It is probable that the discovery of the cementation process for the making of steel had its origin in Liége. At the commencement of the seventeenth century, in 1613, a permission to convert iron into steel is found to have been officially accorded to two armourers of Maestricht, a town which then belonged to the province of Liége. Karsten is, therefore, right in saying, "England, which has now become the school of iron metallurgy, owes to the Continent"—in fact, as we have said, to the district of Liége—"two great discoveries, viz., that of the blast furnace and that of cemented steel." Our notice of the iron trade may be concluded by some details as to its situation at the present time. The discovery of the means of reducing the specular iron ores, at the time when the old ores were exhausted, saved the district from ruin. At this moment, however, the former ores in their turn are nearly exhausted, and the blast furnaces are almost exclusively supplied, as far as pig iron for puddling is concerned, from ores raised in the Grand Duchy of Luxembourg, and so far as steel pig is concerned, from ores raised in Spain. Thus during the year 1882 the blast furnaces consumed 394,405 tons of foreign ores, of which 182,842 tons came from Luxembourg, and 152,023 tons from Spain and Algeria. On the other hand only 82,612 tons were indigenous ores. As a set off to this disadvantage the Belgian works are placed in the centre of a district producing coke, which is cheap and of good quality. They are in a country where prices are in general favourable, where labour is abundant, and where workmen are skilful. The ores of Luxembourg are relatively poor in iron, and contain a good deal of phosphorus; but they fuse with great rapidity, inasmuch as they frequently contain a flux within themselves. They have gradually modified the nature of the Belgian trade. A restricted make, of superior quality, has given place to a largely increased make, but no longer of so high a character. The tendency at this moment is, however, to place the blast furnaces in the localities where ore is raised, and the works for finishing the iron at the centres of the production of the fuel. It is found more economical to carry over the same distance a ton of coke and a ton of pig than to carry three tons of ore and flux. This has produced a displacement of the pig iron industry, which has been transferred in part to the southern part of the Luxembourg province, in the neighbourhood of the mines. On the whole, the Belgian iron trade has thus received a fresh advance, in place of declining, as a consequence of the exhaustion of its native ores. In spite of all the disadvantages which weigh on the country, the care given to every detail, and the application of strict economy even in the smallest points, have preserved to Belgium her place in the metallurgic world, and enabled her to contend successfully against the most powerful competitors. A few figures will be enough to show the progress which has taken place. It is known that the low hearths formerly in use produced in 1546 about 300 kilogrammes of iron—6 cwt.—in 24 hours. At the end of the 16th century the blast furnace then in use produced about 3 tons per day. At the end of the 18th century it remained almost the same. A furnace at Chimay produced about 720 tons per annum. For any very great advance upon this we must go forward to the coke furnace erected at Seraing by John Cockerill in 1823. This furnace produced about 10 tons in the 24 hours. About 1840 furnaces of a new type, erected about the same time in the Cockerill works and in those of Esperance and of Grivegnée, regularly produced 14 tons of foundry pig or 20 tons of refinery pig per day. In 1848 24 tons was considered a good average make per day, and in 1860 the Grivegnée furnaces, which gave the best results in production, did not run more than than 9000 tons of pig per annum, or about 25 tons per day. The make has now very largely increased. The Seraing furnaces produce from 65 to 68 tons of Bessemer pig per day, whilst at Ougrée, two furnaces produced altogether in 1882 more than 41,000 tons. In making pig iron for ordinary puddling a make of more than 90 tons per day has been attained. The blast furnaces at Esch, on the Alzette, in the Grand Duchy of Luxembourg, produce as much as 110 tons per day. As to wrought iron it is difficult to give exact figures. The skill of the workman is a main element in the quantity produced; and the improvements effected by the substitution of coal for wood have had a large influence on the price, without greatly changing the capacity of production. The attempts to puddle by machinery have had little success, and progress has been realised chiefly in the economy of fuel by means of gas furnaces, especially the Bicheroux furnace. Whereas formerly about one ton of coal was required for every ton of puddled bar produced, 550 kilogrammes (11 cwt.) are now sufficient. As regards steel, we will only consider the steel produced by the converter process. The first Bessemer converters, erected at Seraing in 1863, gave 10 to 12 tons of steel per day. At present each pair of converters may be reckoned on to give from 150 to 160 tons in the twenty-four hours; and on the new American system, 340 and even 360 tons have been obtained. As a matter of statistics, the annual production of the works in the province of Liége was estimated in 1829 at 7078 tons of pig iron, 660 tons of castings, 5011 tons of wrought iron, and 4778 tons of iron manufactured for various purposes. The manufacturing works employed 711 workmen. In 1850 the make of pig iron had risen to 65,393 tons, that of castings to 7688 tons, that of wrought iron to 23,252 tons, and, lastly, that of manufactured iron to 7093 tons. In 1882 we find that the province of Liége contained 13 blast furnaces actually in blast, and employing 1215 workmen. The make of pig iron was 238,968 tons. The production of wrought iron and of manufactured iron was 126,461 tons, and occupied 5180 workmen. Lastly, the steel works contained 9 converters, produced 171,937 tons, and occupied 2747 workmen. The average wages of the workmen employed at the blast furnace is three francs per day—2s. 6d.; those employed at works for making or for working up wrought iron get an average of 3·46 francs per day—2s. 10½d.; whilst those employed at the steelworks, properly so called, have on an average 3·58 francs per day—3s. These works on the whole have been actuated by 473 engines of various kinds, giving a total power of 14,688-horse power.

The coal trade.—In sketching the history of the iron trade we meet at every step with one element indispensable to its progress, namely, coal; and the coal trade is of sufficient importance in Belgium to give interest to some details as to its history. The discovery of coal in Belgium dates from the middle of the twelfth century. A legend states that an angel appeared to a blacksmith of Plainevaux, a village situated in the neighbourhood of Liége, near Seraing, who was complaining that he could not earn his livelihood on account of the excessive dearness of wood; and advised him to go to the heights of Publémont, near Liége, on which stood the monastery of St. Laurent; there he would find a black earth, easy to kindle and fit to use instead of wood. The blacksmith went to the place indicated, and there found coal, of which he began to make use. His name was Hullos or Houllos, and it is from him that coal took its French name of "houille." It should be added that the author who transmits this legend, Father Bouille, himself suggests that the angel in question—Angelus —might have been an Englishman—Anglus—and that in the old Latin manuscripts the one word might have been mistaken for the other. However this may be, it is certain that the working of coal in the province of Liége began at a very distant period. As is shown by the geological section of the coal basin of the Meuse, the beds crop out at several points, and it is natural that the use of this rock, so different in appearance from others, and endowed with properties so remarkable, should have been known at a very early stage in the history of the country. Advancing to the present day, we find that the chief difficulties which beset the mining of coal have all to be encountered in this locality. The workings have attained a very great depth, and would be overpowered by water and fire-damp were it not for the improved engines which now exist. We will sketch the mode in which these difficulties have been overcome. The first workings of coal were undoubtedly in the open air; subsequently headings were driven along the beds from the hill-sides. As these beds descended below the surface it was soon necessary to follow them by means of sloping galleries. Before long it became difficult to prevent the rain from filling these excavations, and at the same time the lifting of the coal to the surface became more and more troublesome. It was necessary to find means for overcoming these difficulties, and it is probable that chance led to their discovery. The same bed had been attacked at two outcrops, near the summit and near the bottom of the hills; the two workings accidentally met each other, and it was found that the waters from the surface ran out at the bottom. Such is probably the origin of the "Areines," or adits for drainage. The earliest of these at Liége dates from the thirteenth century; there is one which at this moment comes to the surface near the Church of St. Antoine and which is mentioned in the records of 1243; and the fountain in the market place is still fed by water coming from old Areines. Working by shafts goes back to the end of the twelth century; but they were only used in order to descend along beds which were inclined at a very steep angle; they were, in fact, sloping headings rather than actual shafts. The invention of gunpowder furnished the means of attacking hard stone, and thus sinking vertical shafts, or driving headings across the rocks which separate the several beds of coal. In the eighteenth century the average depth of the mines was 650ft; at the same period, in order to prevent too great an inflow of water, tubbing began to be employed, first in wood and afterwards in cast iron, when at a later period this system was introduced from England. Finally, about 1850, M. Trasenster conceived the idea of replacing brickwork by cut stone in this description of work. The process of sinking by means of compressed air, in order to pass through soft and water-bearing strata, was employed for the first time at Liége by the Sclessin Company, when sinking the Perron shaft now belonging to the company of Val Benoît and Grand Bac. This process was again taken in hand and much improved, in 1857, by the Cockerill Company, in order to sink the Marie shaft; and was afterwards used for sinking the new shafts of the Horloz Colliery at Tilleur. Coal was originally lifted from the pit on the backs of men; then for a long period in panniers, afterwards in barrels hung from a rope or chain, which was wound round capstans worked first by men and afterwards by horses. Steam winding engines were imported from beyond the Channel; the first was installed in 1811 by M. Orban at the Plomterie Colliery.

(*To be continued.*)

* Institution of Mechanical Engineers.

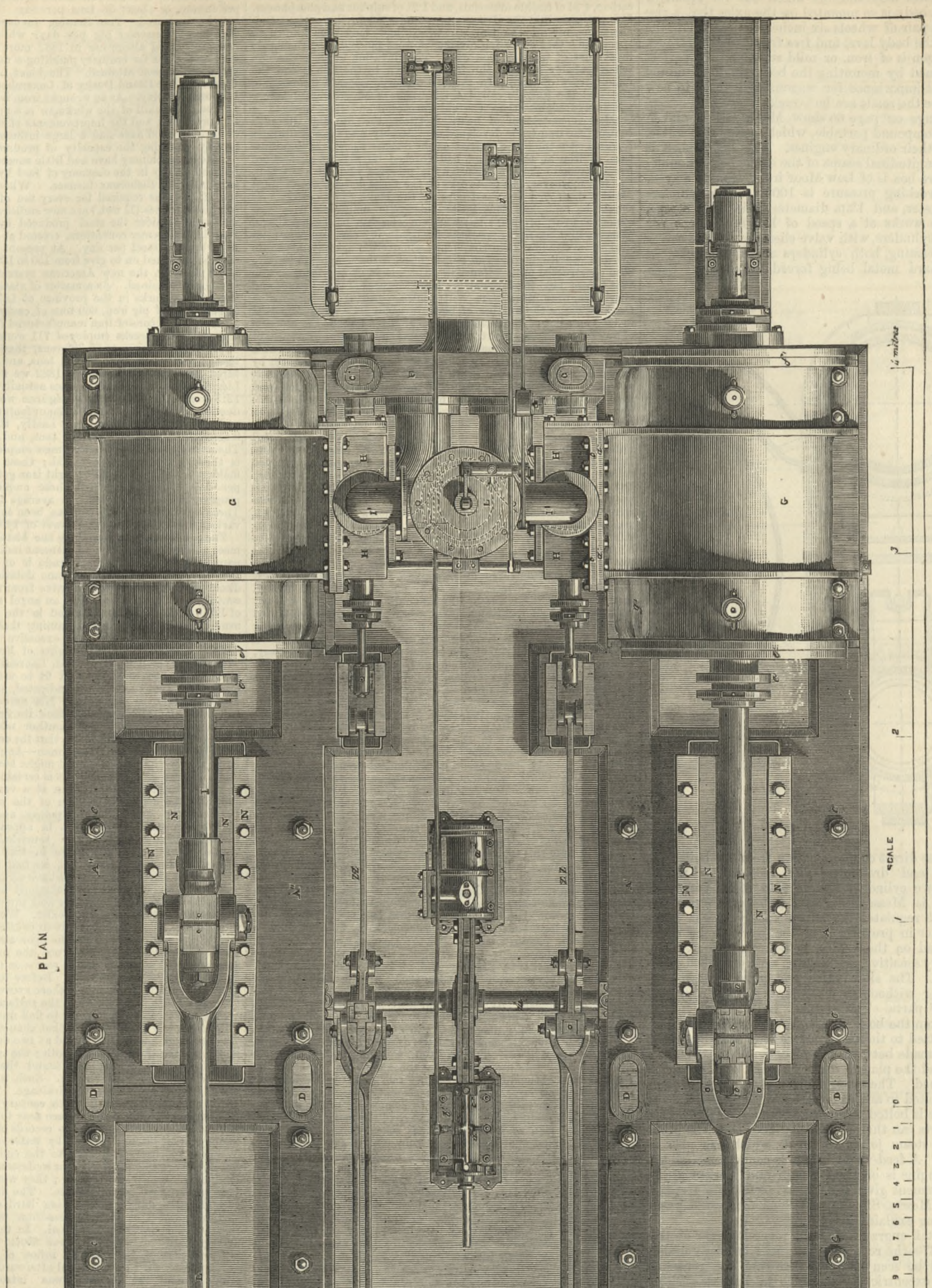
IN the International Electrical Exhibition, Vienna, to show the progress which has been made in the electric transmission of power, the erection of a fountain in the centre of the Rotunda has been determined upon. As far as the advanced time and the locality will allow, it will be arranged on the plan of the fountains in front of St. Peter's at Rome. By a pump, driven by electricity and requiring 40-horse power, a considerable quantity of water will be conveyed into a height of from seven to eight metres, falls thence on an intercepting vessel below, and thence into the basin of the well-known high water-spout well, which will likewise have its water columns play during the exhibition to the height of twenty-five metres. The *Société Gramme*, of Paris, which showed for the first time at the Universal Exhibition in the year 1873, the electric transmission of power by driving a small pump, and employed about 2-horse power, will establish the installation above mentioned, and exhibit their engines, then employed, as historical models.

REVERSING ROLLING MILL ENGINE, SERAING WORKS, BELGIUM.

MESSRS. F. COCKERILL, AND CO., SERAING, ENGINEERS.

(*For description see page 63.*)

PLAN



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STRENGTH OF VOLUTE SPRINGS.

(*To the Editor of The Engineer.*)

SIR,—Permit me to ask through your columns where I can find some information on the strength of volute springs. I shall be obliged to any reader who can afford it me. R. B.

Sheffield, July 19th.

FALL OF NAVIGABLE RIVERS.

(*To the Editor of The Engineer.*)

SIR,—I shall feel it a great favour if some one of your many correspondents will kindly inform me as to what is the greatest fall per mile on any navigable river, which a steamboat is known to be able to overcome. A CONSTANT READER.

Dovercourt, July 25th.

PARALLEL *v.* STEPPED TEETH IN WHEELS AND RACKS.

(*To the Editor of The Engineer.*)

SIR,—I should esteem it a favour if any of your readers can inform me why some planing and shaping machines are worked by parallel or ordinary teeth, whilst others have wheels of the same width across the teeth, but divided into segments or steps, at an angle. Is there any theoretical solution of this problem? If so, I should be glad if any one will kindly give an example of it. J. A. H.

Manchester. July 23rd.

[There is a difference of opinion about this.—ED. E.]

MANUAL POWER ACCUMULATORS.

(*To the Editor of The Engineer.*)

SIR,—May I ask if any of your readers can give me any information respecting manual power accumulators—such a machine, for instance, constructed so that, say, a couple of men can in the morning accumulate as much power as will keep the machine going all day, and in the case of a vehicle be capable of drawing a weight? I shall be glad of any information of machines of this nature, practical or experimental. M. M.

London, July 20th.

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THE ENGINEER.

JULY 27, 1883.

OUR FOOD SUPPLY IN WAR.

THERE are very few who do not rejoice to see any misunderstanding between England and France come to an end. A war with France at the present time would be a calamity. The question, however, may well have suggested itself lately to many minds, whether a few years hence such a war would not be a still more serious matter if the navy of France continues to increase at its present rate. The discussion of the Naval Estimates last May has called attention to this question, and undoubtedly it has been presented to us in a clear shape by the paper read by Mr. Barnaby at the United Service Institution, on the 9th February last. Previous to the reading of that paper we doubt not that many officers and others may have perceived what we consider to be the ugly features of the question, but it was probable that they would in most cases feel that their knowledge was imperfect; that answers might be supplied to uncomfortable doubts by those who knew more, and that so important a matter must be before the minds of our rulers and their naval advisers, and thus the spectre called up would be dismissed by being, as it were, mentally referred to the Admiralty, where no doubt it might be supposed its case would have been dealt with.

The reading of Mr. Barnaby's paper has disposed of this plea. Our information is brought up to date, and officially endorsed, and however careful a responsible authority may be in his utterances, we at least are confident that no fact lies kept in reserve which will radically negative the view he presents to us. Mr. Barnaby did not draw the conclusions we arrive at, undoubtedly, but they were expressed by naval officers in the discussion on his paper, while Lord H. Lennox, in his speech on the Naval Estimates, went in some respects further than we can follow him. Both Mr. Barnaby and Lord H. Lennox dealt with the actual power of our navy to fight and attack an enemy, the latter especially contemplating the case of France—*Vide* ENGINEER, May 11th last. Now, for our present purpose, the relative strengths of our navies may be dealt with very shortly, for we propose rather to consider the question of our supplies of food. England, as an island, depends wholly on the food we grow ourselves and on what comes to our shores in ships. The former of these sources of supply has long become so inadequate to our wants that, if the latter can be stopped, England would be as surely starved out as was Paris in the winter of 1870—1871. It would be a magnificent operation of war, and doubtless an experiment which the naval and military foreign critics would watch with much interest.

The supply of food by our merchant ships depends much, of course, on the relative powers of our own navy and that of our enemy; but not so much on the bare question of whether our fleet, as a whole, can dispose of the one opposed to it, as on the powers of our ships when dispersed and acting singly. We cannot contemplate an enemy gathering an inferior fleet, to be disposed of by ours in a single blow. We know that the line of action which has commended itself to foreign officers—notably those of Russia—is to avoid our men-of-war and strike at our merchant ships. If Lord H. Lennox were correct in stating that, at the end of the year, France would have seventeen first-class ironclads and England only eleven, then, indeed, France might well seek a general engagement, not with an inferior, but with a superior force at her command. Happily we cannot see grounds for such a statement, if the vessels are classed on any reasonable principle. Supposing, however, we take Mr. Barnaby's figures—which appear to be by no means unfavourably presented for England—we find that he reckons, even at the present moment, that the French completed ironclads bear a proportion to our own of 12·5 to 18, or something over two-thirds. This would be quite sufficient, in all probability, to prevent our ships watching and reckoning with all of them. Any that elude us have a magnificent prey before them in our trading shipping, which, according to Mr. Barnaby, bears a proportion to that of France of 11·4 to 1·2, that is, nine and a-half to one. This proportion is really of little account except to remind us that the shipping trade of France is not essential to her existence in the sense that ours is. The absolute bulk of our own is more to the point. In 1875 the number of our trading ships appears to have been 19,991, of which 17,221 were sailing ships and 2970 were steamers. Each of these—especially each of the steamers—takes repeated trips during the year, so that we may reckon on a very large proportion of the above having to run the gauntlet through water infested by an enemy's cruisers during the first three months of a war. We do not wish to make any extravagant supposition. We will admit, for the sake of argument, that we have some merchant men who could generally escape fairly from any man-of-war that hove in sight, and might be rendered too formidable to be dealt with by any light cruiser likely to be sufficiently swift to overhaul them. For the rest we suppose that we should have a certain number of powerful swift armourclads seeking the enemy's war ships, to whom some of the slower vessels might fall a prey. On the other hand, we presume—and Mr. Barnaby's paper favours the presumption—that some of our slower ironclads would accompany fleets of merchant ships as convoys. This last leaves greater freedom to the French men-of-war to cruise in search of unprotected ships, and there remains a great mass of trade that appears as if it must be stopped, and an enormous amount of suffering would follow. How wide a difference exists between the present state of things and that in the time of the war with the first Napoleon, may be seen by quoting a few statistics. The population of England in 1811 was 9,551,888; Scotland, 1,805,688; Ireland, 5,937,856; Wales, 611,788. The total may have been about $18\frac{1}{2}$ millions, including army, navy, &c., which then amounted to about 640,500. In 1871 the total population, including small islands, was 31,817,108, and in 1881 it was 35,246,633.

The quantity of food produced in the country varies comparatively little; what, therefore, was only a supplementary supply in the beginning of the century is now our main source of food. It may be asked, however, whether we are not merely pointing out an unavoidable evil. Perhaps in a greater or less degree our supplies must fail us in war, still much may be done to limit the probable evil. Mr. Barnaby suggested the following questions:—(1) Whether England should build monsters of power and speed, offering the advantages of concentration of force, enabling powerful and quick blows to be struck regardless of cost; (2) Whether we could keep an enemy's ships in by blockading her ports; (3) Whether unarmoured men-of-war should be built such as could compete with the newest and swiftest merchant ships, or whether these latter ships themselves could not be rendered formidable in time of war; (4) What would be the part played by the fast gun and torpedo ship; (5) Ought we to have the heaviest guns possible or not? To us two or three classes of vessels appear specially necessary. We need a certain small number of monsters of crushing power to watch the entrance of harbours containing hostile men-of-war, and we need some vessels, possibly merchant steamers, with the highest speed attainable, to play the part of frigates in supplying information. Doubtless all heavily clad ships might be valuable as convoys, but without dogmatising as to such points, we would venture to hope that the subject may receive more earnest attention than it appears to have hitherto attracted.

SANITARY VALUE OF THE LONDON WATER SUPPLY.

WITH cholera raging in Egypt, a natural anxiety arises for the safety of the public health in this country. A large amount of good advice is being given, and much of it is worthy of being observed. Especially are people warned to have regard to the purity of the water they drink. Cisterns should be cleansed, care being taken that they are not only made clean, but systematically kept so. Private wells should be carefully examined, to see that the contents are uncontaminated by any contiguous cesspool. Such is human nature that we may pretty confidently predict these homely precautions will be very widely neglected, while everybody is expressing deep concern as to the purity of the public supply. The metropolis is specially subject to a sort of feverish apprehension as to the character of the water which it has to drink. Past visitations of cholera have made the people of London peculiarly sensitive as to the perils connected with polluted water, and their fears have been aggravated by the alarmist theories of Dr. Frankland and others. We need not dispute that, in times gone by, the water supply of London was of a nature to occasion a serious amount of sickness. But the fact has been overrated, and a school of ultra-purists has arisen, promulgating doctrines which are almost enough to frighten nervous people into cholera at once. "Dilute sewage" is the favourite phrase with some teachers concerning the metropolitan water supply. With far more reason might the atmosphere of London be stigmatised as "aerated poison." The fact seems to be overlooked that the water supply of London has undergone enormous improvement since the years in which cholera swept through the metropolis, and that the conditions are materially altered. The intakes of the Thames companies have been shifted to points up the river, where they are removed to the farthest possible distance from the presence of sewage. On the Thames and the Lea respectively there is a Conservancy Act in force, which prohibits the discharge of sewage into the stream, and the Conservators are not slow to assert their authority in the matter. The utmost skill of the analyst fails to detect the presence of sewage in the water supply of the metropolis, and Dr. Frankland has announced in his last monthly report on the subject, that the water sent out by the Thames Companies was "again unusually free from organic matter;" while of the Lea water he says it was also "exceptionally free from organic impurity." The New River Company's supply is said to have been "chemically but slightly inferior to the best of the deep well waters." That such water could disseminate cholera, or any other form of zymotic disease, would seem utterly impossible. Supposing cholera to enter the metropolis, there is nothing in the water supply which could assist in the propagation of the disease. The water supply of London comes from a source miles higher up the stream than the situation of London itself, and the discharge of metropolitan sewage takes place at points altogether too low down to affect the supply. As for the danger of infection from localities above London, the idea is refuted by the present excellence of the water, which shows that the sewage of the up-river towns is practically excluded.

An increased amount of attention has been given to the quality of the metropolitan water supply within a recent period. The circumstance is a fortunate one, as it affords a broader basis on which to form our conclusions. Three eminent authorities—Mr. Crookes, Dr. Odling, and Dr. Meymott Tidy—have been engaged by the seven metropolitan water companies which take their supply from the Thames and the Lea to analyse the water which they distribute to the consumers. The analyses have not been limited to a single sample per month in the case of each company, making in all little more than eighty samples in the course of a year; on the contrary, more than two thousand samples were operated upon in 1882, and the London water supply has thus been brought under daily instead of merely monthly supervision. The circumstance that these examinations have been conducted by analysts engaged for the purpose by the water companies need not discredit their results. No one can question the integrity of the analyses, and all who understand the subject can draw their own conclusions from the data thus supplied. The examination has been thorough; no point has been neglected, and so satisfactory are the results that the only refuge for the alarmists is found in the plea that while the water is chemically pure, it may yet be dangerous to drink. The danger in such a case must be so remote that we might be extremely thankful if every peril were as far off. Admitting the theory of cholera germs, it cannot be supposed that a solitary germ will prove fatal to human life. A certain number must assuredly enter the system in order to multiply themselves with sufficient rapidity to make their presence manifest in the form of acute zymotic disease. If water be chemically pure, it is not reasonable to suppose that it abounds with the germs of cholera or fever, and it may be safely averred that in such a case the danger is not merely masked, but is so weakened and reduced that it practically amounts to nothing. If absolute purity is to be the only standard of safety, there are assuredly other vehicles for the transmission of disease far more to be dreaded than the water supply of London as it now exists. How far the water supply is independent of choleraic attacks is, perhaps, indicated by the incidence of diarrhœa. How are we to account for the fact that, during the second week in the present month, out of 325 deaths from diarrhœa and dysentery in the metropolis, 247 were of infants under one year of age, and 56 of children aged one and under five years? The babes are not likely to have been water drinkers. If water were the poison that killed, the mortality ought to be at a minimum instead of a maximum in the first year of life. It is clear that atmospheric influences are at work, and if it be so with diarrhœa, it is a fair inference that the same thing will occur with cholera. The facts with regard to the spread of cholera are not all so clear as some would have us believe. If the water supply of London were as pure as the snow on the summit of the Himalayas, we might still have diarrhœa and its congener, cholera. It is a matter of experience in foreign countries that the kindling of fires impregnated with sulphur has averted the progress of this fearful epidemic. At the same time, no one can deny that water contaminated with choleraic matter is in the highest degree objectionable. That there is risk of the London water supply being thus contaminated is the point at which we join issue with those who speak as if the supply were a source of special danger. We believe that if the water supply of the kingdom at large were as pure as that of the metropolis, there would be practically no peril to the public health from that source. Unfortunately, all England is not favoured to the same extent as London, and hence there is need for enforcing the doctrine that a water supply which is actually and positively polluted is an evil calling for the earliest possible remedy.

That the metropolitan water supply is not in that dubious condition which some people are ready to believe, is shown by every practicable test. We may even take evidence from Dr. Frankland himself to this effect. In his report on the water supply of London for the year 1881, we read that "the sediment deposited from turbid water on standing is often found by the microscope to contain living and moving organisms." People have heard about these "organisms" until they have an idea that every glass of water from the metropolitan mains contains more or less of these dreadful creations. But when we look into Dr. Frankland's report, we observe that in 1881 there were only two companies out of seven which supplied water so turbid as to afford a *nidus* for these "organisms." The Grand Junction supply is said to have exhibited them on three occasions, and the Lambeth on one. The Chelsea, the West Middlesex, the Southwark, the New River, and the East London, had none. It is commonly understood that the water supply from the Thames and the Lea is getting worse rather than better from year to year. But we find Dr. Frankland repeating that in the year 1882 there were only two instances in which he found "living and moving organisms" in the sediment of the London water supply. This is better than four in the preceding year, and better still than seven in 1880. The average annual number of cases in which these "organisms" appeared in the last five years is 5·6. In the previous five years the average was 16·6. During the last seven years the annual average of the samples containing organisms has been a fraction more than eight, while in the previous seven years the average was sixteen. Last year there was one instance of these organisms in the Lambeth supply, and one in the East London, the other five river companies being exempt. During the last four years no organisms have been detected in the Southwark supply, and during the last three years none in the Chelsea or West Middlesex. Taking the range of the last fourteen years, the improvement in the character of the supply is very marked, so far as these "organisms" are concerned. It is observable that on no occasion during the past year was the water supply, as reported upon by Dr. Frankland, either "turbid" or "very turbid." On twenty-eight occasions it is reported as "slightly turbid." On the remaining fifty-six occasions it was "clear and transparent."

We have already remarked on the limited number of samples taken by Dr. Frankland. Mr. Crookes and his two colleagues found, during the past year, forty samples "very slightly turbid," ten "slightly turbid," and one "turbid," leaving 2059 samples entirely free,—so far as unaided vision could determine—from suspended matters. Of the total fifty-one samples not entirely free from suspended matter, thirty-five were connected with periods of heavy rainfall. But there are other considerations of more precise value with regard to the wholsomeness of the supply. One of a very important character is that which has reference to the presence of free oxygen in the water. This is a test which Mr. Crookes and his colleagues have alone applied, and the result is decidedly favourable. The free oxygen averages from 1·74 cubic inches per gallon in August, to 2·25 in February. The water being then fully oxygenated, proves the absence of putrescent matter. There is nevertheless a statement from Dr. Frankland that during 1882 the river water supplied to London was in times of flood "often largely polluted with organic matter and unfit to drink." On the character of the water, as affected by this "organic matter," there is a dispute between Dr. Frankland on the one hand, and Mr. Crookes and his friends on the other. It is pointed out that if judged by this standard, the water of Loch Katrine would be condemned, and would appear as far inferior to that of the East London and New River supply. Dr. Frankland is, in fact, accused of adopting an ingeniously contrived scale of unwholesomeness, by an appeal to which the water of the London companies is month after month held up to public execration. Experience seems to show that this organic matter is of such a nature as not to menace the public health. It is somewhat singular that the mortality of London seems to be highest in those years when there is least of this organic matter in the water supply, and the mortality is lowest when the organic matter is in excess. Of course the significance of this organic matter depends on its real nature. It might be very harmful, but there is reason to believe it perfectly harmless. The quantity is small, and its nature seems to identify it as "a normal constituent of most river waters." The Royal Commission on water supply, of which the Duke of Richmond was president, reported in 1869 that there was not any reason to regard the organic matter of the Thames water as objectionable. The Royal Commissioners asked for better filtration, and for more efficient measures to exclude sewage from the Thames, the Lea, and their tributaries. When the Commissioners reported, they considered the water to be "generally good and wholesome." Beyond this, they believed that when the measures they recommended were adopted, "water taken from the present sources would be perfectly wholesome, and of suitable quality for the supply of the metropolis." At the time when the Commissioners investigated the subject, filtration was "in many cases very imperfectly performed." In this and other respects great progress has been made since 1869. Dr. Frankland himself is constrained to acknowledge "the very extensive and effective arrangements and apparatus which the water companies drawing from the Thames and Lea have for storage and filtration." The same authority speaks of "the comparative freedom from excessive organic pollution which has been observed in Thames water since the year 1875," and attributes it to the increased storage space acquired by the companies drawing from this source.

The indications of "past and present contamination," as set forth by the total amount of combined nitrogen, are stated by Dr. Frankland to show a reduction during recent years. This he considers "partly due to the longer storage to which the water is subjected by the companies, and probably to some extent to the processes of partial purification to which most of the sewage discharged into the Thames in now submitted." The statement is fairly encouraging. But a very important element in this question as affecting the public health is the abundance of the metropolitan water supply. This is sometimes questioned, but there is indisputable evidence that the companies furnish a liberal supply in the aggregate, whatever may be the manner of the individual appropriation. The average daily supply in 1867, including the chalk water of the Kent company, was under 99,000,000 gallons. Last month the average daily quantity was more than 159,000,000 gallons. Considerable economy has lately been effected in connection with the constant supply, which makes the consumption last month the more remarkable. The weather was generally hot, and it was specially important that the supply should be unstinted. An insufficient water supply during a period of unusual heat would itself be perilous to the health of a crowded population, and the unfailing abundance which arises from a river supply is an advantage of no slight value. Reviewing all the conditions of the metropolitan water supply, we feel justified in saying that cholera is far more likely to meet with an opponent than an auxiliary in that quarter.

THE PATENT BILL.

THE Patents for Inventions Bill, as amended by the Standing Committee on trade, to which it was referred, is waiting for the consideration of the whole House. We do not propose now to consider it in detail. There is, however, a matter to which we deem it necessary the attention of the Legislature should be particularly directed. The pendency of the Bill has, as might have been expected, checked applications for letters patent. Inventors hesitate to proceed. They are conscious that the Bill, if passed, will effect considerable changes, and they not unnaturally hold their hands until the period of transition shall be determined. It is, therefore, to the highest degree desirable that the suspense should be ended with the least possible delay; that if we are to give up the old love we may be on with the new with every despatch. The Act is intended to come into force on the 1st January, 1884, but, oddly enough, the Bill as it stands at present makes it impossible that it should be fairly and properly workable at that time. By the 99th Clause it is provided that the rules which are to furnish the machinery for the working of the Act are to be laid on the table of the House, and are not to be effective until they have occupied their position for forty days. It is obvious, therefore, that we cannot hope to proceed under the new measure—except, perhaps, in a very tentative and unsatisfactory manner—until next year has considerably advanced, and in the meantime, by Clause 110, the old Act will be repealed. No doubt the 99th Clause is permissive—"The Board of Trade may" make rules "for regulating the practice under this Act"—but it seems to be beyond dispute that the Act cannot be properly worked without them, and that it is the intention of the Government that details of practice shall be furnished. We have no hesitation in saying that this stipulation is unnecessary. Rules were from time to time made under the old Acts, but they were never submitted to Parliament, and no one was ever the worse for the omission of such control. When the rules were framed under the existing Trade Marks Act, much doubt was expressed whether they did not unduly extend the Act, and were so far *ultra vires;* but it was said in reply that inasmuch as the rules were submitted to Parliament, they had legislative force. It is very far from desirable that this should happen with the new Act. The Bill is fairly precise in its details, and the public will be quite satisfied to dispense with the check which the submission of the rules to Parliament is supposed to create. Every one knows that rules laid on the table lie there and nothing more happens. The new rules of procedure under the Judicature Acts, which in themselves constitute a sweeping measure of reform, and which have lain on the table for nearly half the time already, have only, as we write, become to a limited extent accessible to the public, and have only within the last two or three days been submitted to the Judges, other than those who framed them. The Bar and solicitors have never had a chance of expressing an opinion upon them. We earnestly hope that the House of Commons will reconsider this clause.

THE HUDDERSFIELD TRAMWAY ACCIDENT.

THE verdict of the coroner's jury on the fatal tram-car accident in Huddersfield has been given, and no criminal blame is imputed by it to any one in particular. The jury, at 6.30, retired to consider their verdict, and they returned at 9.18, or after nearly three hours' consideration, with the following:—"(1) We find that the deceased persons, Isabella Woodhouse and others, came by their death from the falling over of the tram-car when running at an excessive speed consequent upon the driver having lost control of his engine through the breaking of one of the pistons, preventing him from effectively applying the reversing motion. (2) That we severely censure the driver for having in disobedience of orders closed one entirely and the other partly of the valves admitting steam to the automatic brake, thereby preventing any chance it might otherwise have had in coming into action." The primary cause of the accident was, it seems clear from the evidence, some mishap with the engine, and if it is assumed, as the evidence showed, that the fracture of one of the pistons rendered one of the cylinders powerless for stopping the engine, it would appear difficult to attach blame to the driver, although he is censured for putting the governor brake gear out of action. One of the witnesses—Mr. A. G. Evans, of the Lancashire and Yorkshire Railway—supposed the breakage to occur through the intervention of a loose screw from the piston body. Mr. J. M. Pratt, engineer, of Huddersfield, was also called, and gave evidence to the same effect as that of Mr. Evans, and agreed that if the piston had not broken, the car accident would not have happened, as at the speed of about ten miles an hour sufficient check could have been put on the engine, without the governor brake, to prevent it. No adverse criticism seems to have been made on the engine, which is of the Wilson type; but a good deal met the evidence of the borough engineer, Mr. R. S. Dugdale, between whom and the tramway inspector, Mr. Laxton, there seemed to be difference of opinion, as with unfriendly rivals. The latter stated that he had reported on the unsatisfactory state of the curve on which the accident occurred, there being insufficient superelevation of the outer rail, but had been told on this or another occasion to mind his own business—a suggestion for limitation of duties which Mr. Dugdale did not afterwards seem to consider it desirable to explain. The car, however, was very heavily loaded at the top, or it would probably not have overturned. Taken altogether, it appears clear from the evidence that the engine was not provided with sufficient brake power to enable it to deal under all circumstances with a loaded car on the steep gradients of Huddersfield. It is very desirable that ample brake power should be readily available, as it is quite clear that roadways cannot often be made to suit the requirements of superelevation of outer rail for high speeds.

PRECAUTION AGAINST THE INFECTION OF CHOLERA.

THE Memorandum issued by the Local Government Board concludes with the following paragraph, "It is important for the public very distinctly to remember that pains taken and costs incurred for the purpose to which their memorandum refers cannot in any event be regarded as wasted. The local condition which would enable cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of cholera, create and spread other diseases—diseases which, as being never absent from the country, are in the long run far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera, would to their extent, though cholera should never reappear in England, give ample remunerative results in the prevention of those other diseases." Commenting on this "A Physician, of Mayfair," writes to a morning contemporary, that in the course of many years' medical practice in the fashionable quarters of the metropolis he has rarely found a house among the dwellings of the rich which in any way fulfilled the requirements of modern sanitation. As a rule, he writes, they are as carefully prepared for the inroad of disease as are any of the filthy courts in crowded parts of the city. . . . The dust-bin is a plague spot attached to every house. Year after year, and through various tenancies, it remains a neglected source of passive, and frequently of vital danger to health. . . . Many householders will say that the remedy for this evil lies with the dust contractor, and if he did his duty this evil would not exist. This is a great mistake, for the mischief lies in the construction of the dust-bin proper, which is usually built of solid stone inside a dark, unventilated cellar, and the bottom of which is foul with the refuse of ages. Such a hole never is, and never can be, cleansed; besides, it is nobody's duty to do it, and no domestic servant would like the duty if asked to do it. The only true remedy is to do away with the dustbin. Some years ago, he writes, I caused mine to be levelled with the ground and the saturated earth to be carted away, and having laid down fresh concrete, I hung up a row of sacks for the reception of dry dust. In order to provide for kitchen refuse I established two zinc-covered pails, which stood in the open air to be washed by the rain. One is taken away full and returned empty every day. Thus, when the dustman calls, the sacks are ready to be shouldered and carried to the cart without leaving a track of litter *en route.* The ideal plan at this stage of the proceedings would be to have a closed cart with a shoot down which the contents of the sacks could be sent; but, failing this, the sacks have to be emptied as best they may, while the advent of the dustman, instead of being an active source of danger to health, is now nothing more than a convenience in the way of ordinary house cleaning. . . . I have occasionally known rich people have their drains attended to and their cisterns cut off from the sewers after they have suffered the penalties of negligence. But however perfect a house may be made in these respects, there is always the inevitable dustbin left behind as a fertile source of disease. A great portion of the vegetable and animal refuse matter of a house can be burnt at once in the kitchen fire, and the refuse which the dust contractor has to remove may, to a great extent, be confined to mineral matter.

LUMINOSITY OF FLAMES.

A PAPER has recently been published by Sir W. Siemens on this subject in the *Ann. Phys. Chim.* He says that the luminosity of burning gases is a secondary phenomenon dependent on the separation and incandescence of solid particles suspended in the flame. Gases from which no such particles are separated, burn with a feebly luminous flame, and this luminosity is assigned to the incandescence of the gases themselves. No experiments have hitherto been made to ascertain whether pure gases heated to a high temperature really emit light. In order to examine this point, the author's brother made a series of observations with a Siemens' regenerative oven of the form used in the hard glass manufacture, whereby a temperature of the melting point of steel, 1500 to 2000 deg. C., could easily be attained. By a suitable contrivance the interior of the oven could be examined, and it was found that provided the experimental room was kept perfectly still, the heated air in the oven emitted no light. The introduction of a luminous flame into the oven caused its interior to be only feebly illuminated. As a result of the experiments, it follows that the supposition that the luminosity of the flame is due to the incandescence of the gas is incorrect. In order to determine the temperature at which luminous waves become non-luminous, the author suggests a repetition of the above experiments with a more refined apparatus. The author further demonstrates that the heat rays emitted from hot gases are very small in number as compared with those emitted from equally hot solid bodies. Observations on the behaviour of flames themselves prove equally that the luminosity of flames is not due to the incandescence of the products of combustion. If the gases to be burnt are more quickly mixed the flame becomes shorter, since the process of combustion is accelerated and hotter, since less cold air is mixed with the burning gas. The same phenomenon occurs if the gases are strongly heated before they are burnt; but since the ascending products of combustion are maintained for a short time only at the temperature of the flame, the above phenomenon would be reversed were the gas self-luminous. The luminous part of the flame is separated by a line of demarcation for the products of combustion, and is coincident with the termination of chemical action, which is probably the cause of the emitted light. If it be assumed that the gas molecules are surrounded with an envelope of ether, then a chemical combination between two or more of the molecules will cause a vibration of the ether particles, which becomes the starting point of the light and heat waves. The luminosity of gases when an electric current is passed through them can be explained in a similar manner, and the author has already observed that all gases are conductors of electricity when their point of so-called polarisation maximum has been reached.

FOREIGN VESSELS AND ENGLISH TRADE.

WE referred some time ago in THE ENGINEER to the foreign vessels that are engaged in English trades. Our fullest information on the matter is obtained in the returns that relate to that part of the trade that is included in the export of coals, on which we have returns for the past month. It appears that at Newcastle-on-Tyne there were 367 British and 227 foreign vessels that took coal cargoes away from that port last month; from the little port of Blyth 19 foreign and 14 British vessels took away cargoes; from North Shields the proportions were 23 British and four foreign; and from Sunderland 104 British and 83 foreign; other ports sent numbers that correspond—West Hartlepool, Hull, Liverpool, Cardiff, and others; and it becomes more and more apparent that it is in a large degree due to the timber importation that we have to trace this large use of foreign vessels at some of the ports. Vessels come from the Baltic with cargoes of timber to the coal exporting places, and they take back cargoes of coal. This is probably the explanation for the great bulk of the vessels. But it may be added that the proportionate tonnage, if procurable, would be less unfavourable to the British shipowners, because it is mainly vessels of small burden that come thus from abroad; and it may also be added that there is now increasing an importation of timber by British steamers which is likely to lessen to a very great extent the employment of the small sailing vessels. The steamer has brought down, and is likely to bring down still further, the rate of freight, and as it does so, and as the sailing vessels are lost and not replaced, there will be more and more a divergence of the trade from the foreign vessel to that of our own country. It will increasingly employ our own vessels, and will indirectly stimulate the trade of this country, and that to an extent that will be appreciable.

LITERATURE.

James Nasmyth, Engineer. An Autobiography. Edited by SAMUEL SMILES, LL.D., Author of "Lives of the Engineers." London: John Murray. 1883.

[FIRST NOTICE.]

THIS is pre-eminently an age of biographies, and Dr. Smiles may almost be said to have earned the title of biographer-in-chief of a class of men whose claims on the public gratitude have not always been fully recognised. The successful politician, the popular divine, the great soldier has always been sure of a record of his life, but the lives of inventors, engineers, and such like, have not, until lately, been considered worthy of notice. Their contests are with the silent forces of nature, and their victories are mostly achieved in secret. No nation looks on in wondering expectation; nor was it ever the fashion to keep special messengers in readiness to announce to the world that success had crowned their efforts. In not a few cases it was denied that anything at all had been accomplished; and when at length it became evident that the new invention would minister to people's comfort, or enable them to make money, then the unfortunate inventor has been held up to execration as a monopolist bent upon depriving the community of knowledge which they had in reality always possessed, though it had never happened until that moment to be required.

Dr. Smiles was amongst the first to recognise that the lives of these men might be made interesting to the general reader as well as to the professional man. Without any taste for that "horrible wrangling about priority," to use Humboldt's words, it has been found that a large circle of readers exists for the history of men who have neither deposed kings nor re-arranged the map of Europe, but whose inventions have had a permanent effect upon the happiness, well-being, and comfort of the entire human race. In the present instance he has been singularly fortunate in his subject, and although the book is professedly an autobiography, and therefore not written by Dr. Smiles, it should be remembered that the first scantling of the work appeared twenty years ago in his "Industrial Biography." The first three chapters of the book consist of an account of Mr. Nasmyth's remote ancestors and his immediate progenitors. If it should be thought that this might well have been omitted, it is sufficient to state that one object Mr. Nasmyth had in view in compiling his autobiography was to put on record at the same time notices of the life of his father, who is constantly referred to throughout the work.

James Nasmyth was born at 47, York-place, Edinburgh, on the 19th of August, 1808, and belongs to a family in which artistic and constructive talent seems to have been hereditary. For four or five generations the Nasmyths were builders and architects, many important buildings in Edinburgh having been erected by them. Mr. Nasmyth's father—Alexander—was, as is well known, a celebrated painter, and Patrick, his elder brother, also became famous as an artist, though he died at the early age of forty-four. The father was not only an artist, but he was possessed of great mechanical ability. He was the contriver of the now well-known "bow-and-string bridge," as he named it. A sketch from his hand is extant, dated 1796, which was reproduced in THE ENGINEER of November 13th, 1868. He was also, as we now learn for the first time, the inventor of the method of rivetting by pressure instead of a blow, although he never seems to have proceeded further than the mere squeezing of the rivets between the jaws of a vice. Young Nasmyth was sent to the Edinburgh High School at the usual age, but he does not seem to have learned very much there. His father was intimately acquainted with some of the best Edinburgh men of the day, and the lad's real education was being silently carried on by association with his elders. His father had a workshop, and James spent many hours there, the result of his father's careful instruction being that he attained a considerable amount of manipulative skill when he was but a child. He also devoted some time to chemistry, making it a rule not to buy his reagents, but whenever possible to make them. In this way he "eventually produced perfect specimens of nitrous, nitric, and muriatic acids." We venture to suggest that there is some mistake as regards nitrous acid, the preparation of which is certainly beyond the powers of a couple of schoolboys, and which is, moreover, a very unattractive product. He left the High School in 1820, and subsequently attended the classes at the Edinburgh School of Arts, as well as some courses of lectures at the University. A sectional model of a condensing steam engine which he made was the foundation of a small business in that line, and he obtained several orders for working models of steam engines for institutions which were founded in different parts of the country in imitation of the Edinburgh School of Arts. About the year 1827, when the subject of steam carriages on common roads took such a firm hold on the public mind, he set to work on a "big job" of the kind, and in about four months the machine was ready. It was exhibited before the members of the Scottish Society of Arts, and for three or four months experimental trips were made with it on the Queensferry-road. The runs were generally of four or five miles, and it carried eight passengers. It is greatly to be regretted that this interesting machine was not preserved intact. It was unfortunately broken up, the engines and boiler being sold for £67, "a sum which more than defrayed all the expenses of the construction and working of the machine," says Mr. Nasmyth. He continued to direct his attention to the steam engine, taking every opportunity of seeing and making drawings of such machines. In the course of his observations he was led to notice the superiority of the engines made by the Carmichaels, of Dundee, who, he afterwards found, were the first Scottish engine builders who gave due attention to the use of machine tools. He became familiar with the name and fame of Henry Maudslay, and the chief object of his ambition was to come to London and work under him. How was this to be done? Maudslay had ceased to take apprentices, and, even if he had not, the elder Nasmyth had not the means of paying the heavy premium required in such cases. He executed two "diploma works," one being a most complete working model of a high-pressure engine, with a cylinder 2in. diameter and the stroke 6in., and the other a set of hand sketches of machines and parts of machines in perspective. Packing up his engine and drawings he set sail for London on the 19th of May, 1829, accompanied by his father, who had been introduced to Maudslay a few years before. The result of the interview was that Nasmyth was engaged as Maudslay's assistant in his private workshop, and he filled that position until Maudslay's death in 1831. This part of the book is full of interest, as it contains the best account of Maudslay's method of working with which we are acquainted. In August of the same year Nasmyth returned to Edinburgh, and rented a piece of ground at Old Broughton as a workshop, in which to construct the machine tools necessary for a start in business on his own account. His choice lay between Liverpool and Manchester, and he eventually decided in favour of the latter, his place of business being in Dale-street. He remained there two years, and in 1836 he removed to Patricroft, where he spent twenty years of the most active portion of his life; and it is with the Bridgewater Foundry that his name seems to be most closely connected. He retired from business in 1856 at the early age of forty-eight, and went to live at Penshurst, Kent, in a house which he named "Hammerfield." Long may he flourish! From that period he devoted himself mainly to astronomical pursuits, the results of which are set forth in detail in his "Autobiography." Perhaps we may be excused from entering into that part of the subject, as being rather beyond the scope of this journal. Moreover, the results of his laborious observations on the moon are well known. Whatever astronomy may have gained, it will hardly be denied that the science of engineering has lost in a corresponding degree by his early relinquishment of those pursuits in which he first obtained name and fame.

THE ENGINEERING AND METAL TRADES EXHIBITION.

No. IV.

MESSRS. Beck and Co., Southwark, exhibited a variety of their specialities for water supply, consisting of sluice valves, hydrants, double and single outlet stand pipes, gun-metal fire-cocks, &c., as well as specimens of safety valves, stop valves, the "Beck" whistle or fog horn for steamers, and a number of other fittings. An ingenious water waste preventing cistern—Bell and Wheatley's patent—is also being shown, the chief points of merit being its simplicity and freedom from liability to get out of order. On page 74 is shown a sectional elevation of this waste preventer. The discharge is effected by means of a syphon, which is charged and brought into action by a small cylinder containing a loosely fitting piston connected to a lever, and which, when the lever is pulled down, forces sufficient water to start the syphon. The cistern exhibited will discharge two gallons at each flush.

Messrs. Thwaites Brothers, Bradford, have a very large display of machinery in motion. A steel tilt hammer, with double wrought iron standards, is a strong and substantial piece of work; the hammer head and piston-rod being both made of mild steel. The valve gear is of case-hardened wrought iron with large wearing surfaces. Several stamping irons are also shown; these have double frames with guides, and are designed to be used either as steam drop stamps or ordinary forging hammers. They are both self-acting and hand-worked, and the stamping motion is controlled by a foot treadle, so that the piston can be held up until the article to be stamped is placed on the die, and then suddenly dropped with full force as soon as the attendant places his foot on the treadle. On page 74 we illustrate an improved circular saw for hot iron, which Messrs. Thwaites specially recommend for use in smiths' shops. It is a simple and handy tool, and where much work is done will no doubt soon repay its first cost by economy in wages, fuel, and iron. The saws are made in sizes varying from 24in. to 36in. in diameter, and are run at a speed of from 1500 to 2000 revolutions per minute, a trough being formed in the frame for containing water, so as to keep the lower part of the blade continually immersed. All bearings are of phosphor bronze. Messrs. Thwaites also exhibited the well-known Root's blower, with direct-acting engines, and Thwaites' improved quick speed trunk air compressor, with cylinders 7½in. diameter, and 10in. stroke, fitted with Holt's patent valves.

A stone and ore crusher of somewhat new design was shown by Messrs. W. H. Baxter and Co., Leeds, who claim for it several important advantages over the older form known as Blake's crusher. The chief difference lies in what is termed the "knapping" motion, the jaw being brought up with a quick movement, which cracks the stone much more readily than the slow moving jaw worked by the ordinary toggle joint. Instead of taking half a revolution to give the blow, as in the Blake machine, it is accomplished in a quarter of a revolution, the backward motion occupying the same time, so that the jaw is stationary during the other half. It is stated that with the knapping motion only one-half the driving power is required, while the material is more evenly cubed, and there is much less waste from dust and chippings. The sudden opening of the jaws also leads to improved results in working, it being found that the crushed material falls away with greater readiness, and is therefore not broken more than necessary. It is also stated that the strain on the crank shaft is very considerably reduced, and that there is much less liability to breakage than in the older form.

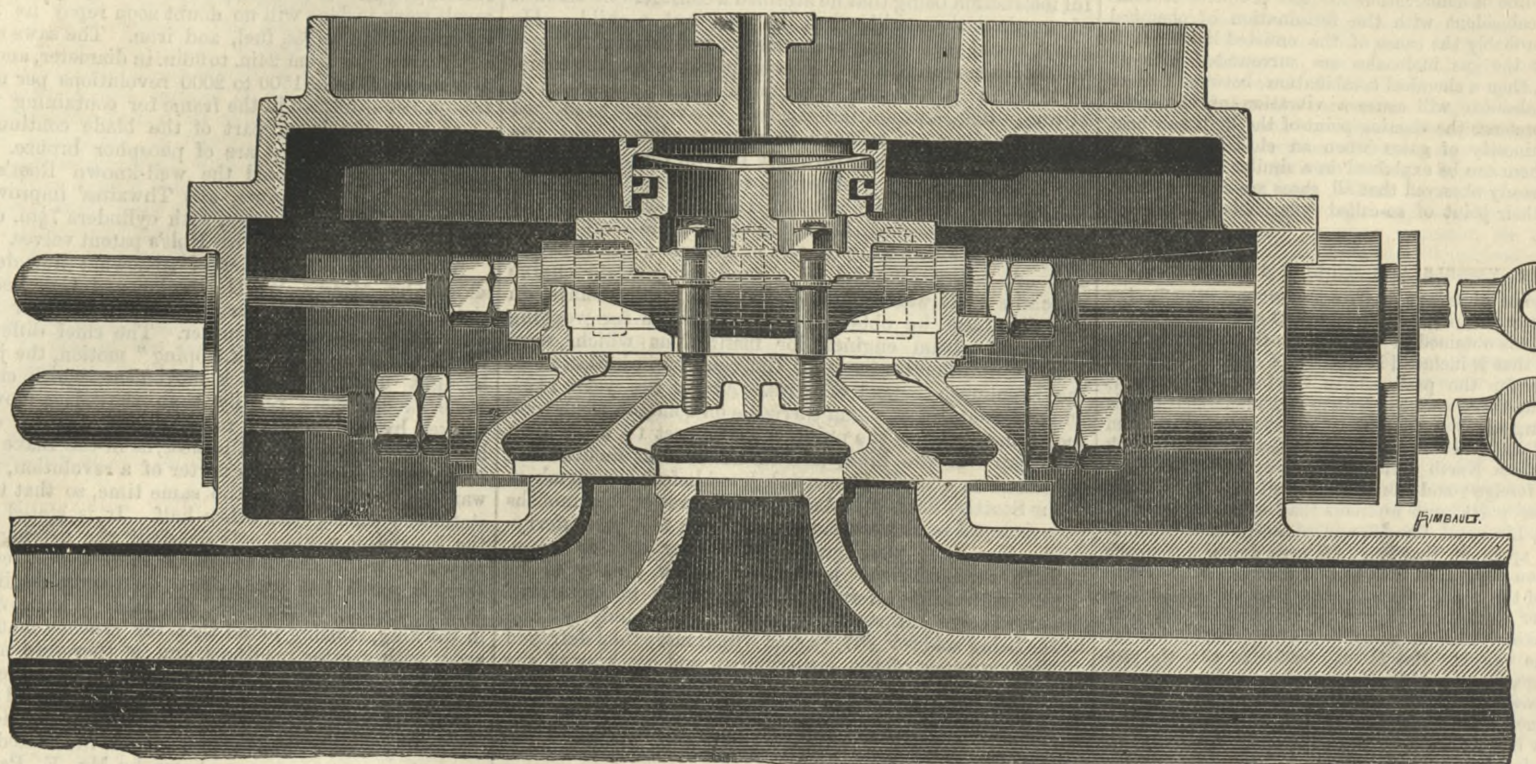
The hydraulic and steam joint illustrated by the engraving, next page, was shown by Mr. E. Penning, of Westminster. This joint consists of a slightly bell-mouthed flanged end to the pipes, and within the internal wedge-shaped space formed by the meeting of two such pipes is inserted a joint piece, either in one or in two separate washers, as shown in the diagram. The joint has been tested at Sir W. Armstrong's works to a pressure of 4000lb., and has been found to remain tight. It will be seen that the greater the pressure the greater the tightness of the joint.

The engraving, page 74, represents a shearing machine exhibited by Messrs. J. Rhodes and Sons, Wakefield, Yorkshire, for cutting iron plates 4ft. wide by ½in. thick. The body of this machine is cast in one piece, and the moving beam on which the shear blades are fixed works in strong bracket slides, which are bolted at each side of the machine. These brackets are adjustable and arranged so that they will bring the cutting knives nearer or further apart. This prevents all packing behind the shear blades. The machine is fitted up with a patent clutch motion, and can be instantly thrown in or out of motion when out of gear. The moving knife always remains at the top ready for use. It is worked by a double excentric shaft, connected with rods to a moving beam. No special foundation is required for it. The same makers exhibit a machine for shearing corrugated iron. It is 36in. wide, and is made on the same plan as the 4ft. shearing machine just described. The machine saves a great amount of labour hitherto expended in cutting corrugated iron, work most often done with a hammer and chisel.

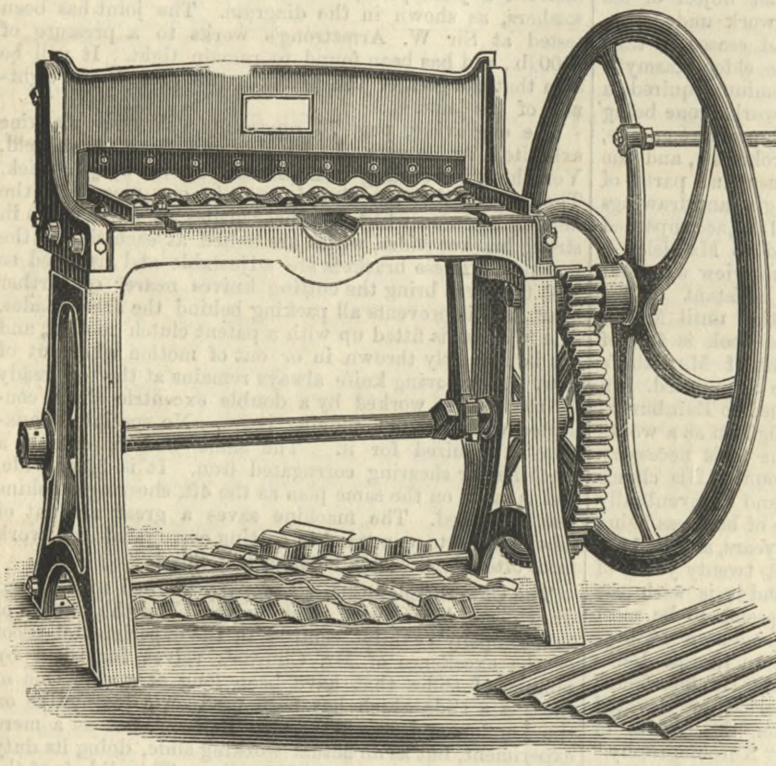
The Church Engineering Company showed models and drawings of Mr. Church's slide valves. But the interest of this company's exhibit centred in the experimental proof of the excellence of Mr. Church's valves furnished by samples of slides that have been long at work. One of these is a slide which has been used on a locomotive on the London and South-Western Railway, not as a mere experiment, but as an actual working slide, doing its duty during a running over 120,619 miles. This slide is of the circular form held in a loop or buckle, in which it is free to turn round, and in which in fact it is made to turn partly round at every stroke, and always in the same direction. This rotation, combined with the reciprocating motion, gives the slide a gliding movement along the port face, and by continually changing the parts of the surfaces that come in contact with each other, prevents most effectually the formation of hollows or protuberances in the rubbing surfaces. The bearing parts of the port face are also so shaped that there is no part which is not overlapped by the slide at every stroke, and consequently there is no wearing to a shoulder. By means of a central supporting surface, on which the back of the slide takes a bearing, a large part of the pressure forcing the slide against the port face is relieved, and thus friction is greatly reduced, and the power necessary for working the slide is largely economised. A slide with these arrangements in its favour might be expected to wear little, and to wear evenly; but the actual condition of the slide and facing after their work over more than one hundred and twenty thousand miles is such that one is surprised to see anything so true and perfect, while the wear is scarcely perceptible. Another sample is the slide, with expansion slide on its back, which Mr. Church fitted more than six years ago to the engine of H.M. tug Camel. This compound slide is illustrated at page 74. It has been in constant use since January, 1877, except for a short time in 1879, when new cylinders were fitted to the engines, the same slides being continued in use with the new cylinders. The slide in this case is of rectangular form, so that it has no rotary motion; but the pressure on it is so relieved and balanced by three rings, arranged to work against the slide cover, that the wear—which, so far as it can be measured, does not amount to one-hundredth of an inch on each surface—is perfectly equal. The surfaces are so perfect that, on placing one upon the other, the atmospheric pressure holds them together in opposition to very considerable force exerted to separate them.

EXHIBITS AT THE ENGINEERING AND METAL TRADES EXHIBITION.

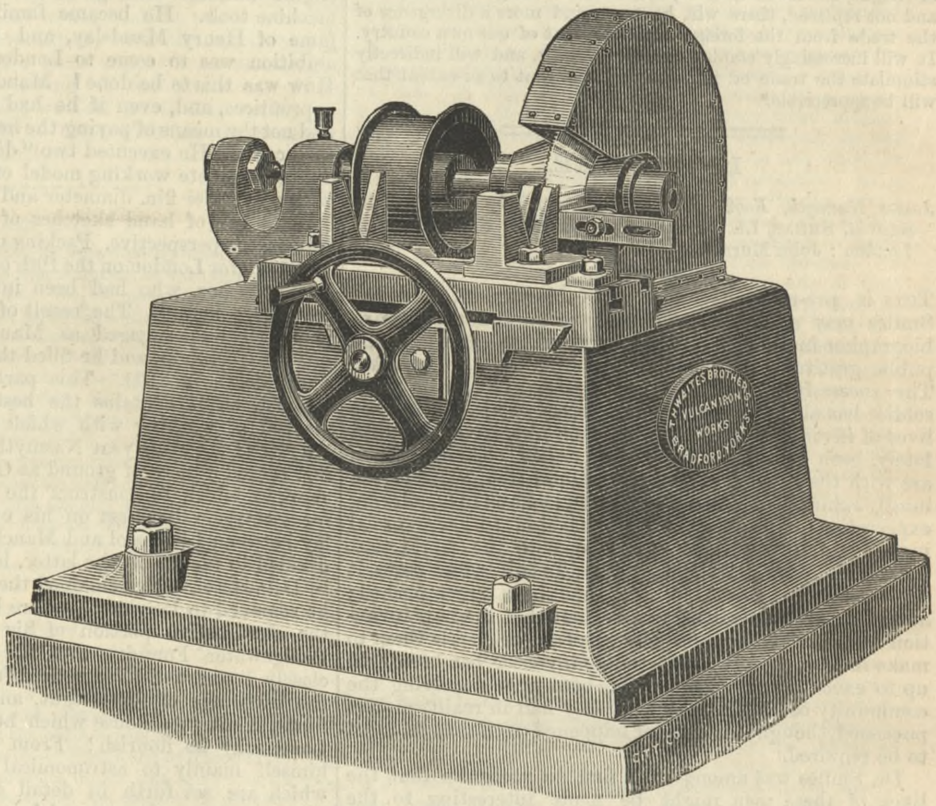
(*For description see page 73.*)



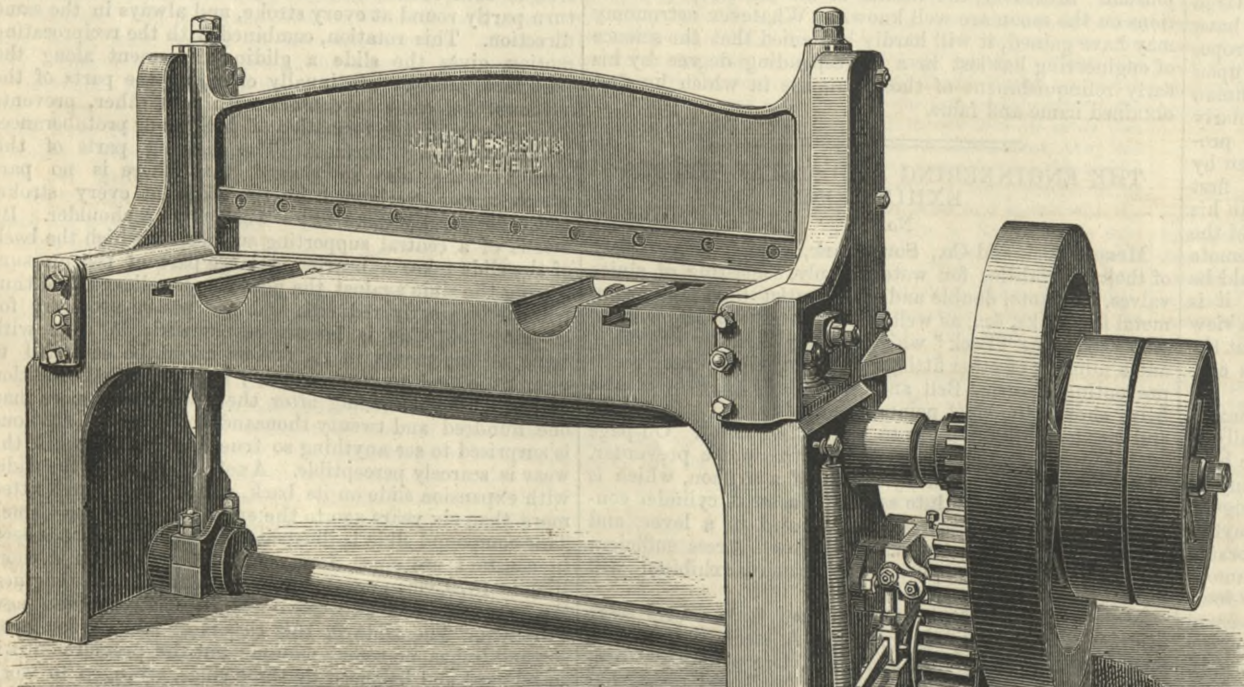
CHURCH'S BALANCED SLIDE VALVE.



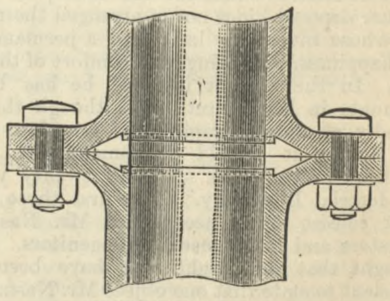
RHODE'S CORRUGATED IRON SHEARS.



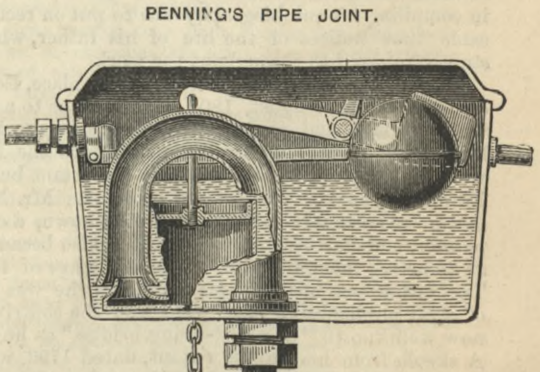
THWAITES BROTHERS HOT IRON SAW.



RHODE'S PLATE SHEARS.



PENNING'S PIPE JOINT.



BECK'S WASTE PREVENTER CISTERN.

BELGIAN FIELD AND MOUNTAIN GUNS.

MESSRS. COCKERILL AND CO., SERAING, ENGINEERS.

FIG. 4.

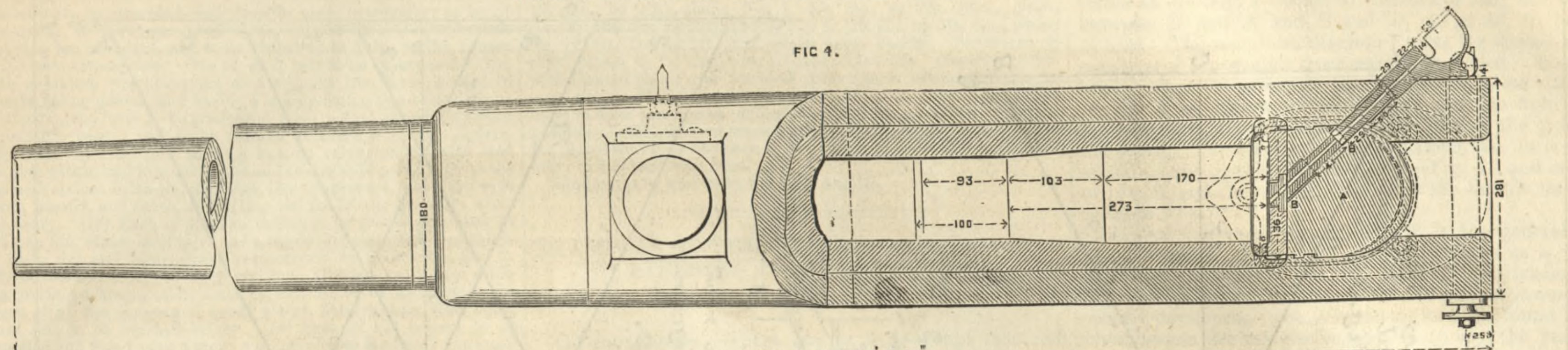


FIG. 5.

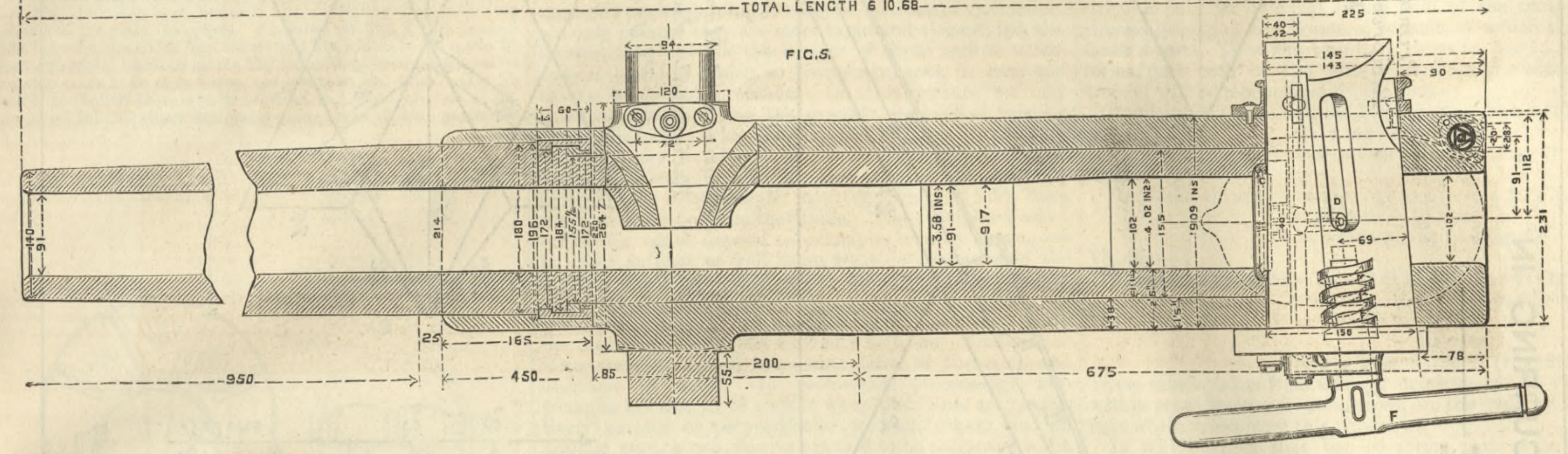


FIG. 1

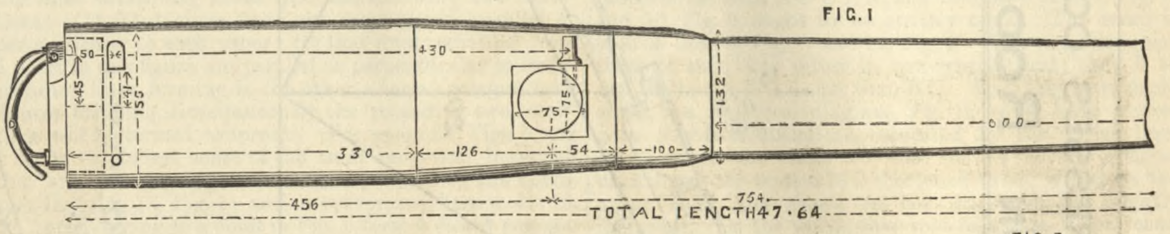


FIG. 2

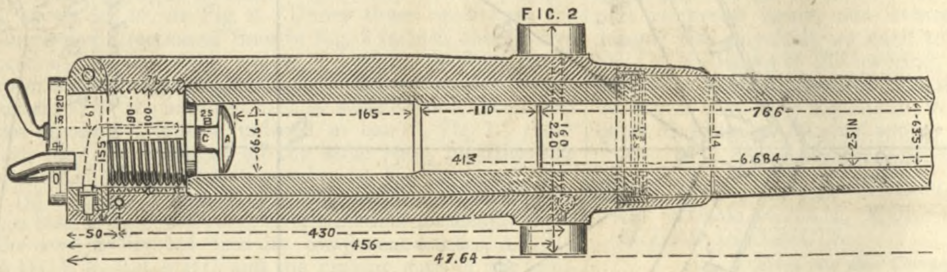
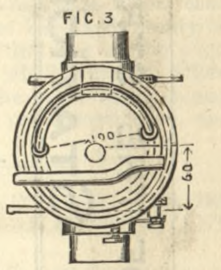


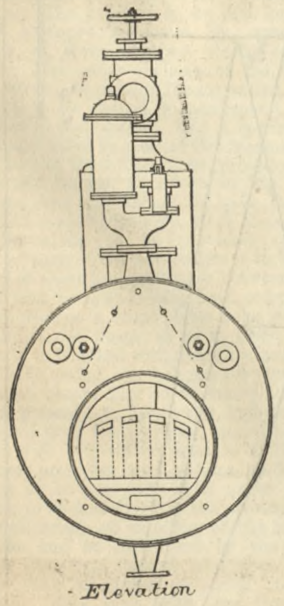
FIG. 3



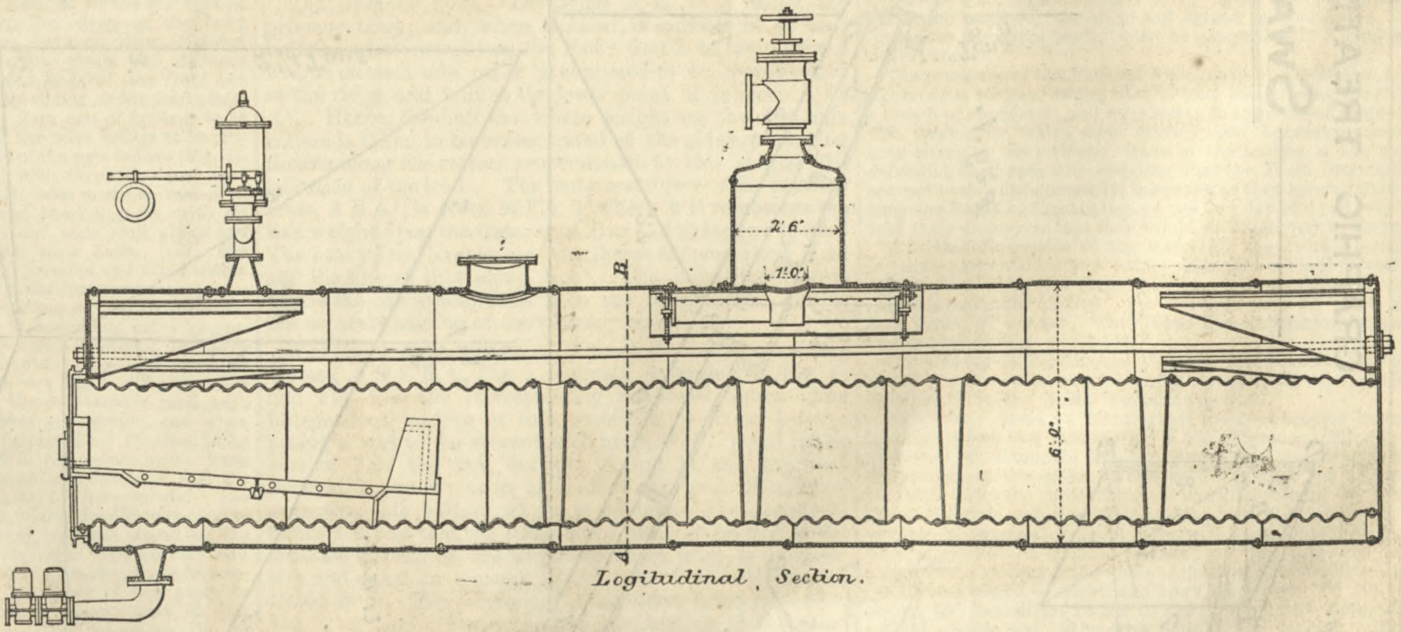
CONTRACTS OPEN.

BOILERS FOR THE CROSSNESS PUMPING STATION.

THE following is the specification to be observed by the contractor for making, completing, and delivering six new boilers for the Crossness Main Drainage Pumping Station, Erith Marshes, in the parish of Erith, in the county of Kent:—(1) The accompanying drawings are: No. 1, details of new boilers; Nos. 2 and 3, details of safety valves, steam valves, feed cocks, and other fittings. (2) Each new boiler to be cylindrical, 6ft. outside diameter in the smallest part, by 30ft. long inside, with one internal cylindrical fire flue. (3) The shell to be made of eleven rings of plates, each ring to be of one plate same size; the longitudinal joints are to be arranged so as to break joint; care must be taken to place the plates so that their edges shall not form shelves for water to lie in. The rings to be cylindrical, not taper; that is, each alternate ring is to be placed either inside or outside of its two adjacent rings, and with 2½in. lap. (4) In the joint of the sixth and seventh rings of the shell, a hole, 12in. diameter, is to be cut and surrounded by a steel strengthening ring 3¼in. by ¾in., and surmounted by a steam chest 2ft. 6in. outside diameter by 3ft. 8in. high; with plates ⅝in. thick and welded joints. The top plate of the steam chest to be flanged to join to the side plate, and the side plate to be flanged to join to the shell of the boiler. On the top of the dome, a steel forging, as shown on Fig. 1, with orifice 8in. diameter, is to be rivetted. The contractor to verify from actual measurements the position of the safety valves, manholes, and steam chests, and all fittings existing on the present steel boilers previous to commencing the contract, so that every fitting may be interchangeable with any of those on the existing six steel boilers, or with the six specified in this contract. (5) The ends are each to be of one plate flanged inwards, so as to make a joint to the shell of the boiler. All flanging to be at least 3in. in depth from edge of plate to inside. At the fire end the plate is to be flanged outwards, to receive and make a joint with the fire tube, and the opposite end is, for the same objects, to be flanged inwards. (6) The fire flues to be Fox's patent corrugated flues, with circulating tubes, as shown on Fig. 1, with welded longitudinal seams, and of 3ft. inside diameter. The transverse seams in the flues to be made by rivetting with 2¼in. lap, and to be arranged so that the edges of the plates shall not have the fire directed on them. (7) The whole of the plates of the boiler—shells, furnace, flues, steam chests, &c.—are to be of the best Landore-Siemens, Siemens-Martin, Leeds Forge Company's, or equally good, selected, mild quality of steel, ⅝in. thick, with the exception of the end plates, which are to be ½in. thick. Strips 24in. long, planed, 2in. wide, to be cut off any of the steel plates when requested, in the presence of an officer of the board, for testing the tensile strain and elongation. Any test piece giving less than 30 tons per square inch ultimate stress, or a less elongation than 30 per cent. will be rejected, and other plates must be provided at the contractor's own cost. Should the testing be satisfactory, the plates that the test pieces are cut from will be taken and paid for by the board at 18s., price of the per cwt. (8) All the plates are to have the names of the makers stamped on them in such a manner as when the boiler is completed it shall on each plate be visible from the exterior of the shell, or the interior of the flues, as the case may be. (9) Any plate which cracks in the flanging or rivetting, which is shelly, or has any other defect, or which weighs at a less rate than 5·4 lb. for every ⅛in. in thickness per foot superficial, is to be rejected. (10) The rivets to be ⅝in. diameter, of the same brand as the plates, to accurately fit the rivet holes, to be made with heads of the form shown, and generally to be placed at 2in. pitch; but the longitudinal seams of the shell are to be double rivetted, with 2¼in. pitch on the straight, and 2in. on the diagonal. (11) The rivet holes throughout the boilers are to be drilled in position, after the plates have been bent into form and fitted together, with the view of securing truth in the holes and perfect accuracy in the fit of the rivets. The heads of the rivets to be pressed against by a tool—if rivetted in a steam rivetting machine or by a holder-up if hand rivetted—formed with a cup to fit them, so as to prevent their being swelled over or cracked. Steam or hydraulic rivetting will be preferred to hand rivetting. (12) The plates to have the corners properly trimmed down when required, and no loose pieces or filling in pieces are to be used on any account. The edges of all plates to be turned or planed. The whole of the seams to be chipped and caulked inside and out. No salammoniac or other material is to be used to rust the seams; but they are to be made tight entirely by good and careful work. (13) Each new boiler to have its two ends stayed to each other by two longitudinal wrought iron stay rods and gussets, as per drawing. Each stay rod to be 2in. in diameter, screwed to take nuts inside and outside the boiler, which nuts are to bear on turned wrought iron washer plates 6in. diameter by ½in. thick, and outside nuts to the front to be finished bright. The gussets of steel, ⅝in. thick, to be fastened to the shell by 3in. × 3in. × ⅝in. angle steel properly rivetted. (14) One steel welded and flanged manhole to be made in each new boiler, with steel cover dished inwards, and faced with bright bolts, nuts, and washers, the cover to be provided with a lifting boss, a strengthening band of the steel specified in Clause 7, 3¼in. by ¾in., to be rivetted on round the opening. (15) In the centre of the bottom of the first ring of shell of each boiler there is to be cut a 10in. diameter hole, round which is rivetted a cone steel forging for blow-off, and in the second ring on the top of shell of each boiler there is to be cut a

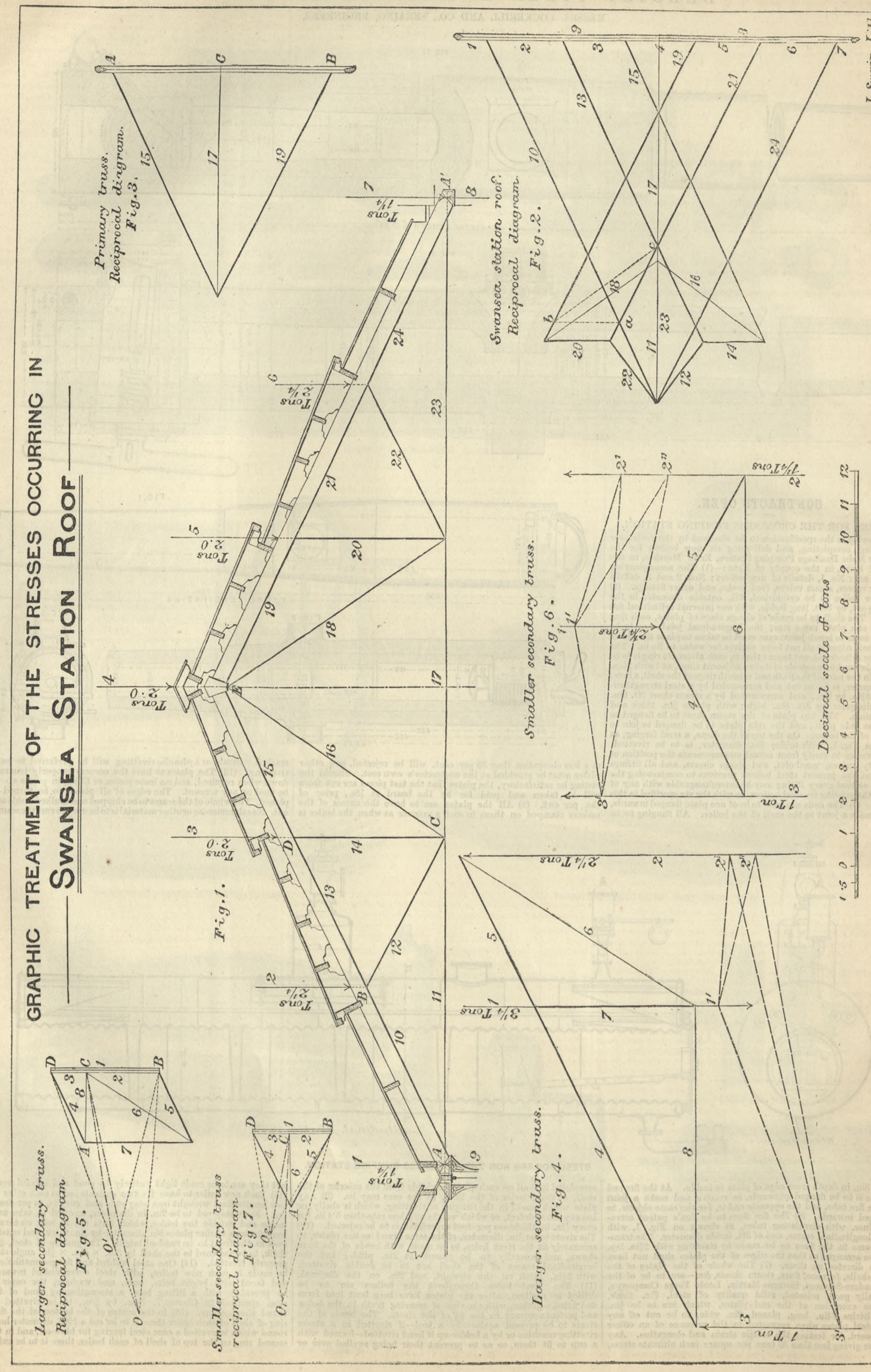


Elevation



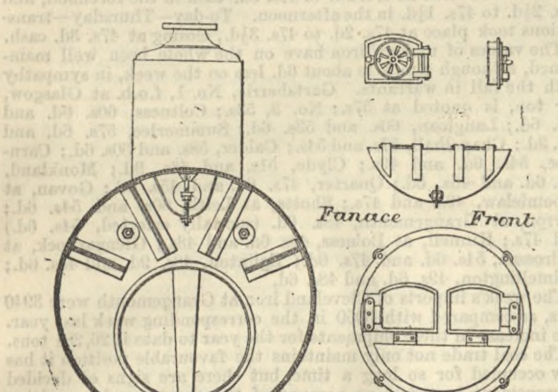
Logitudinal Section.

STEEL BOILERS FOR THE CROSSNESS PUMPING STATION.



GRAPHIC TREATMENT OF THE STRESSES OCCURRING IN
SWANSEA STATION ROOF
Fig. 1.
Primary truss. Reciprocal diagram. Fig. 3.
Swansea station roof. Reciprocal diagram. Fig. 2.
Larger secondary truss. Reciprocal diagram Fig. 5.
Smaller secondary truss reciprocal diagram Fig. 7.
Larger secondary truss. Fig. 4.
Smaller secondary truss. Fig. 6.
Decimal scale of tons
J. Swain. Lith.

4in. diameter hole for safety valve steam-way. This is to be surmounted by a steel cone forging, as shown at Fig. 1. The openings in the front of boilers for the scum and feed connections to be strengthened by turned steel rings, 7in. diameter, 1in thick, with countersunk rivets. (16) A pair of safety valves, 4in. diameter, to be provided, and fixed to each new boiler; to be of gun-metal, to have gun-metal seats, carried on a double-branch cast iron box standard, and to be loaded up to 35 lb. on the square inch above atmosphere. One of each pair to be an exposed valve, with a sliding weight carried on a wrought iron lever, guided in loosely-fitting guides, and having a loosely-fitting gun-metal pin as a fulcrum, the lever to be graduated from actual experiment with a pressure gauge, and to be marked at every 5 lb. with figures. The other of each pair to be a lock-up valve, loaded with lead weights within cast iron cover, the said covers to be perforated on the top with sixteen holes ½in. diameter, like the present, and fitted with lever, handle, and cover, and lifting rod for lifting the valve when necessary. (17) Each of the new boilers to be provided andted fit with an 8in. steam stop valve and a regulating stop-back feed valve, of such size and dimensions—respectively as shown on Fig. 2. The bodies and covers to be of cast iron, all their respective working parts, packing glands, seatings, &c., to be of gun-metal; the edges of all the flanges and cover plates, hand-wheels, stud bolts, nuts, &c., to be finished bright. (18) Each of the boilers to be supplied and fitted with a stout gun-metal stop feed cock and spanner, 2in. diameter bore between the regulating stop-back feed valves and the main feed pipes. As shown on Fig. 2, the connections between the check feed valves and the boilers to be made by stout gun-metal distance pieces, the connections between the valves and stop cocks to be of cast iron, not less than ½in. thick. (19) To each of the boilers there is to be provided and fitted two sets of ⅜in. gun-metal tubular steam and water-gauge cocks of same pattern as



Section at A.B.

in use, each pair of gauge cocks to be provided and fitted with a stout copper drip pipe, ⅜in. diameter bore, to carry water into ashpits below floor plates. (20) A 2in. diameter bore gun-metal screw cock, as shown at Fig. 2, and ⅛in. thick copper connecting tube, from cock to blow-off pipe, to be provided and fitted to the front of each of the boilers. (21) Two strong 2½in. diameter bore gun-metal blow-off cocks, as shown at Fig. 2, with a connecting length of ¾in. thick cast iron flanged bend to boiler and ⅛in. copper flanged bend junction pipes from cocks to blow-off pipe range, to be provided and fitted to each of the boilers. (22) To each new boiler a Bourdon's steam-pressure gauge, to show up to 100 lb. per square inch above atmosphere, is to be provided and connected by a suitable pipe; and a No. 1 fusible alloy plug cap, manufactured by Allen, Harrison, and Co., of Manchester, is to be provided and fixed, with proper steel saddle on the top of each fire flue. One spare cap is to be provided for each new boiler and delivered into the board's stores. (23) A cast iron door front like those in use is to be provided and bolted to each new boiler, and to bear on the ends of the fire flues, and not to hang on the bolts, which are to be collar bolts, and firmly fixed in the boiler. The fronts are to be fitted with cast iron fire-doors, having deep air chambers bolted on, and air slots with a gridiron sliding plate to cover the same in each door. The fronts are also to be fitted with wrought iron hanging ashpit dampers, hung so as to be removable at pleasure. (24) Cast iron dead plates are to be put into the door frames and fire flues, also cast iron bridges and bearing bars are to be provided and fixed with all necessary brackets and lugs to take the fire-bars, which are to be generally of wrought iron in two lengths, except the side furnace bars, which are to be of cast iron, to fit the corrugation of flue. The fire-bars to be 3ft. long, 3in. deep—at the belly—and arranged to leave ½in. spaces between them, rivetted in sets of three bars by means of ⅞in. rivets and distance pieces. The under surfaces of the front ends of the front bar to be curved, to provide for expansion, by sliding on the dead plate, which is to be shaped to correspond. Two sets of fire-bars to be supplied to each boiler. (25) A special fire-brick bridge to be provided and fitted in each of the furnaces of the new boilers (Fig. 1). (26) Each of the boilers to be provided with three cast iron soot doors and frames, as shown in Fig. 3; also a strong cast iron damper door and frame, to have faced bearing parts, with all requisite copper wire rope, steel screws and nuts, wall plates and handles along to be provided with each boiler. (27) The front of each of the new boilers is to be provided and fitted with a casing of sheet iron, the space between boiler front and casing to be fitted with non-conducting heat composition, as may be directed; all the fittings in front plates to be so arranged and fitted by gun-metal distance pieces, so as to come through casings. (28) Each boiler is to be fitted with a cast iron anti-priming pipe, with wrought iron baffle casing, and hangers for same—see Fig. 1. (29) The new boiler on completion to be tested in the contractor's yard, with steam pressure to 75 lb. per inch above atmosphere, and when delivered upon the working, and the fittings fixed thereon, to be tested with cold-water pressure at 100 lb. per square inch. Each of these pressures is to be kept up for at least one hour, and the boilers to be perfectly tight under both of these proofs. The testing to be performed in the presence, under the direction, and to the satisfaction of an officer of the board, who will attend for the purpose, and be instructed by the engineer. (30) Provide and supply cast iron flanged feed-pipes, 6in. diameter, made to templates, the thickness of metal in the body of the pipes to be ¾in. Any pipe with less thickness in any part of ⅝in. will be rejected. The flanges to be after facing up 1in. in thickness. The flanges of junctions to be not less than ¾in. thick. The number of feed pipes required is as follows:—No. 10 pipe, with 2in. junctions, 9ft. 1in. in length; No. 8 pipe, with 2in. junctions, 6ft. 1in. length; No. 4 pipe, 2ft. in length. The height of the flange of the junction above the outside of pipes will be about 8in. (31) Provide and supply cast iron blow-off pipes 8in. diameter, made to template. The thickness of the metal to be 1in. in the body of the pipes, ⅞in. in the body of the junctions. Any pipe having a thickness in any place ⅛in. less than these dimensions will be rejected. The flanges, after being faced, are to be 1in. on the pipes, and ¾in. on the branches. The number of blow-off pipes is as follows:—No. 15 pipe, 9ft. in length, with two branches for junctions, 2½in. and 2in.; No. 1 pipe, 8ft. 2in. in length, with two branches for junctions, 2½in. and 2in.; No. 1 pipe, 5ft. 8in. in length, with a 2½in. junction branch. Provide for the feed and blow-off pipe No. 250 ¾in. diameter turned bolts, 3½in. long, with hexagon heads, and one nut and washer to each bolt. All pipes specified for feed and blow-off pipes must be perfectly sound under hydraulic test of 100 lb. per square inch. (32) Provide and supply cast iron ashpit cover plates made to templates and with planed edges, thickness to be 1in. The approximate sizes are as follow:—No. 2, 4ft. 2in. by 3ft. 1in. chequered; No. 10, 4ft. 10in. by 3ft. 5½in., chequered; No. 4, 4ft. 3in. by 3ft., chequered; No. 3, 4ft. 3in. by 1ft. 9in., chequered; No. 4, 4ft. 3in. by 2ft., chequered; No. 12, 4ft. 2in. by 2ft. 3½in. plain; No. 12, 4ft. 2in. by 2ft., plain; No. 1, 4ft. 3in. by 2ft. 10in., plain; No. 8, 4ft. 3in. by 2ft., plain; No. 1, 4ft. 3in. by 2ft. 8in., plain; No. 12, 4ft. 2in. by 1ft. 3in., plain angle backed. Seventeen of these plates to be cast with rebated holes 12in. diameter, fitted with rebated plates over blow-off cocks; sunk lifting holes to be cast in these circular covers. All the plates to have sunk lifting holes cast on same, and drilled and cut for all pipes, wherever necessary. (33) The contractor must provide £100 in his tender for plates that may be taken by the board on successful testing and other extras that may arise.

Tenders to be sent in by the 10th August.

EXAMPLES OF THE GRAPHIC TREATMENT OF STRESSES IN FRAMEWORKS.

By ROBERT HUDSON GRAHAM, C.E.

No. I.

(1) *Introduction.*—There can be little doubt that civil engineers prefer graphic to analytic methods of calculation, not only because they are more rapid and elegant, but also because they obviate the danger of those serious arithmetical blunders which so frequently occur in long and tedious analytical processes. On this account we may anticipate that ere long the graphic methods of treating stresses in frameworks—first applied by Taylor, and afterwards largely developed by Clerk Maxwell, Culmann, Cremona, Fleeming Jenkin, and Lévy—will gradually supersede the older analytic methods, except in a few cases where analysis becomes inevitable. The examples worked out in this series depend on principles already expounded by other authors, as well as on some developments of the subject, which have occurred to the writer during a long period of research in this field of science, and which are embodied in a work now going through the press. Here the theory of the subject will only be so far introduced as is necessary to explain the construction of the reciprocal diagrams of stress. In geometrical phraseology, two triangles are said to be similar when their lines are respectively parallel or perpendicular to each other; and in graphic statics, two figures are said to be reciprocal when the lines composing them fulfil the following two conditions:—(1) That their lines are respectively parallel or perpendicular to each other; (2) that lines radiating from a point in one figure are parallel or perpendicular to corresponding lines, forming in the other a closed polygon. All figures fulfilling simultaneously the preceding two conditions will be termed reciprocal. For example, Figs. 1 and 2 are in the fullest sense of the term reciprocal, insomuch that any line 18, Fig. 2, is drawn parallel to the corresponding line 18, Fig. 1; and moreover, any lines 4, 15, 16, 18, 19 converging to a point in Fig. 1, form a closed polygon 4, 19, 18, 16, 15, in Fig. 2. Under these conditions, the length and direction of lines in Fig. 2 furnish the stresses produced by the given system of loads in the bars correspondingly numbered in Fig. 1. Thus line 18, Fig. 2, measured off the annexed decimal scale of tons, determines the amount of tension induced in bar 18, Fig. 1. Similarly line 10, measured off the same scale, furnishes the amount of compression in member 10, Fig. 1.

(2) *Swansea Station Roof.*—The roof structure, Fig. 1, has been treated according to two distinct methods. First, the roof is divided into its component trusses, A E A', A D C E A, and A B C, and the graphic sum of the component stresses is then taken, in order to find the resultant stresses in each bar. This may be called the method of summation. Next, the roof is treated as a whole, and the resultant stresses found in one operation, by aid of the general reciprocal diagram, Fig. 2. The two methods mutually check each other.

The primary truss.—The truss A E A' is called the primary truss; and, when isolated, is considered to bear half the whole weight on the roof; that is to say, half the weight on each side rafter is supposed to be concentrated at the ridge, and half at the lower point of support A or A'. Hence, one-half the whole weight on the two side rafters is taken to be concentrated at the ridge, producing thrusts along the rafters proportionate to this special distribution of the loads. The reciprocal figure of the primary truss, A E A', is given in Fig. 3, where A B represents the half weight upon the truss, or, A B = ½ of 13 tons = 6½ tons. The heavy line 15 represents the thrust induced along E A; and the line 19 that along E A'. The light line 17 furnishes the component tension in the tie-rod A A', due to the separate loading of the primary truss.

The larger secondary truss.—One of the larger secondary trusses, A D C E A, Fig. 1, is shown separately in Fig. 4; and Fig. 5 is the corresponding reciprocal figure. The independent loading of this truss can be found by supposing a load to be concentrated at D, Fig. 1, equal to the sum of half the load between A and D, and half that between E and D; or in all, to half the load distributed over the side rafter, which is 6½ tons. The reciprocal figure 5 shows that the stress along bar 7 or 14, due to the separate loading of the larger secondary truss, is compressive and equal in amount to the load of 3¼ tons concentrated at D. The component compressive stress in bar 15, Fig. 1, or bar 5, Fig. 4, due to the loading of the same truss, is represented by the dark line 5, Fig. 5; that in bar 13 or 4 by the line 4, Fig. 5; the tension in bar 16 or 6 by line 6, and the component tension in member 11 or 8 of the tie-rod by the unshaded line 8, Fig. 5. All these lines must be measured off the given decimal scale of tons. The upward reaction at the ridge, arising from the independent loading of the larger secondary truss, is shown on Fig. 5 by the double line B C, and is equal to 2¼ tons; the other reaction at the point of support A is represented by the double line C D, equal to 1 ton on the given decimal scale. The amounts of these reactions, as well as the points C, Figs. 3, 5, and 7, are determined by the usual graphic method of polar or funicular polygons, constructed relatively to different poles O, as shown on the figures. For instance, the triangle in dotted lines 1' 2' 3', Fig. 4, is the polar or funicular polygon reciprocal of lines converging from the points B C D to the pole O, Fig. 5.

The smaller secondary truss.—One of the smaller secondary trusses is shown separately in Fig 6, of which Fig. 7 is the corresponding reciprocal figure. The independent loading of this truss is found by supposing a load to be concentrated at B—Fig. 1—equal to the sum of half the weight between B and A and B and D, or, in all, to half of 4½ tons. The reciprocal diagram 7 gives the stresses in the members of the smaller truss separately loaded. The dark line 5—Fig. 7—represents the thrust along bar 12 or 5; the line 4 the thrust in bar 10 or 4; and the light line 6 the component tension in member 11 or 6 of the great tie-rod A A'. The tensional reaction along bar 14 is represented by the double line B C or 2—Fig. 7—and is equal to 1¼ tons, and the reaction at A, by the double line C D, equal to 1 ton.

General reciprocal figure.—Fig. 2 is the general reciprocal diagram of the roof structure, taken as a whole, and forms a check upon the method of division into separate trusses and summation of component stresses previously developed. The component stresses, found by the truss-process are cumulative, that is to say, the resultant stress in any bar is equal to the sum of the component stresses belonging to the several trusses, of which the bar forms a part. Thus, the resultant stress in bar 15, which forms part both of the primary and larger secondary trusses, will be represented by the sum—

$$\begin{aligned}\text{Resultant thrust, } 15 &= \text{line 15 (Fig. 3)} + \text{line 5 (Fig. 5)}\\ &= 7\tfrac{3}{8}\text{ tons} + 2\tfrac{5}{16}\text{ tons}\\ &= 9\tfrac{11}{16}\text{ tons} = \text{line 15 (Fig. 2)}\end{aligned}$$

Again—

$$\begin{aligned}\text{Resultant thrust, } 14 &= \text{line 7 (Fig. 5)} - \text{line 2 (Fig. 7)}\\ &= 3\tfrac{1}{4}\text{ tons} - 1\tfrac{1}{4}\text{ tons}\\ &= 2\text{ tons} = \text{line 14 (Fig. 2)}\end{aligned}$$

Thirdly—

$$\begin{aligned}\text{Resultant tension, } 11 &= \text{line 17 (Fig. 3)} + \text{line 8 (Fig. 5)} + \\ &\qquad + \text{line 6 (Fig. 7)}\\ &= 6\tfrac{1}{4}\text{ tons} + 2\tfrac{3}{16}\text{ tons} + \\ &\qquad + 2\tfrac{3}{16}\text{ tons}\\ &= 10\tfrac{5}{8}\text{ tons} = \text{line 11 (Fig. 2)}\end{aligned}$$

These values, taken from a larger drawing, can be verified within small fractional differences, on the reduced drawings which accompany this paper.

It will be seen that bar 16 forms part of only one independent truss A D C E A, and therefore lines 6, Fig. 5, and 16, Fig. 2, ought to be strictly equal. The same is true of lines 5, Fig. 7, and 12, Fig. 2. The end-triangular truss of each side rafter is non-symmetrical; that is to say, the bar A B is longer than B C. Had they been made equal, the reciprocal diagram, Fig. 2, would have undergone slight modifications, indicated by the dotted lines *a b c*, where the stress *a b*, that is, 14 or 20, remains unchanged, the tension 18 is shortened to *b c*; whilst, on the other hand, the thrust in bar 22 would be slightly increased. On the whole, this roof furnishes a very compact reciprocal figure, and evinces care and beauty of design; the only fault we have to find lies in the overhang in the ledges of the covering, which seems to afford a leverage to wind pressures. On the other hand, it may be urged that they contribute to good ventilation, and quick discharge of rain and snow.

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

(*From our own Correspondent.*)

THE ironworkers' strike continues in the West Bromwich and Smethwick districts; but to these districts it is now almost exclusively confined. The operative secretary to the Wages Board estimates that the number still "out" is something less than 2500, but the strike leaders put the numbers at much higher figures. They state that support is coming from other districts as well as Staffordshire to enable the men to fight. But while this may be in a measure true, their statement that "in all districts where work had been resumed, the men had agreed to contribute 5s. per furnace to the strike funds," must be accepted with a good deal of reservation.

The president of the National Amalgamated Association of Ironworkers has written, dating from Wigan, condemning the strike as a breach of confidence, and repudiating the promise of support from that Association which some unrecognised Lancashire men have been giving to the strikers. Some of the leaders of the men are defending their action by asserting that the West Bromwich men are not acting dishonourably, inasmuch as they severed themselves from the Board of Conciliation on the 2nd day of April, when they told their employers that they would no longer pay to its support.

A further illustration of the loss which the strike is occasioning to South Staffordshire is a public statement made this week by a Birmingham firm, who state that they are considerable users of iron of a particular quality. For this they have for some months been paying £7 per ton. They have now contracted for a supply at a remote distance at £6 15s.

On 'Change in Birmingham this afternoon boiler-plate makers stated that the strike had led to the cancelling of orders which had been placed in the South Yorkshire district.

As 'Change closed in Birmingham to-day it became known the leading masters had met earlier in the afternoon, under the presidency of Mr. Benjamin Hingley, chairman of the trade, to discuss the position of the strike. Fears were expressed lest the masters who still resist the men's demands should be forced to give way, and to prevent such a result it was resolved that unless the iron-workers of Smethwick, West Bromwich, and Oldbury commence work forthwith, a general meeting of the trade be held to arrange for a lockout of the whole of the South Staffordshire district.

Common plates to 4 cwt. and 5 cwt. each were £8 10s.; boiler plates, £9; best ditto, £9 10s. to £10; double best ditto, £10 10s. to £11; treble best, £12; ditto suitable for flanging outwardly, £12 10s.; ditto suitable for fire-boxes, strong work, and flanging inwardly, £15 to £15 10s. Charcoal plates varied from £17 10s. to £19 5s. according to quality.

Market generally was much improved on the week to-day. Inquiries were more numerous and makers were prepared to accept them. Sheets were especially sought after for early delivery. Makers of such iron asked 5s. advance. Thus doubles for galvanising were £8 10s. to £8 15s., and latens £9 10s. Galvanised sheets were quoted by the Birkenhead Galvanising Iron Company £13 5s. delivered Liverpool.

Galvanised corrugated sheets are quoted by Messrs. Morewood and Co., of the Lion Works, at:—For the "Red Star" brand of 18 to 20w.g., £12 15s.; 24g., £13 15s.; 26g., £15 15s.; and 28g., £17 15s. Their "Red Diamond" brand was 5s. more per ton as to each grade. Their "Lion" brand was £13 5s. for 18 and 20g., £14 4s. for 24g., £16 5s. for 26g., and £18 5s. for 28g. Double best close-annealed and cold-rolled galvanised tinned flat sheets of the "Lion" brand were £20, £22, £24, and £26 respectively; and their smaller sheets of the "Anchor" brand, £18 10s., £20 10s. £22, and £24 also, according to gauge. Morewood's "Woodford

Crown" galvanised flat sheets were £16, £18, £19 10s., and £21 10s., according to gauge.

Hoops were freely selling on export account at £6 5s. to £6 10s. Nail strip for Canada and Russia sold at £6 5s. Common bars also about £6 5s. to £6 2s. 6d.

Pigs are dull at 45s. to 47s. 6d. for Northamptons, and Derbyshires at 40s. to 38s. 9d. for common Staffordshire.

A report is current that on August 1st Cannock Chase coal will be advanced 1s. and slack 6d. per ton.

Hardware merchants report this week that business with Egypt is suspended, and that it is impossible to conjecture when it will be resumed. This is the more unsatisfactory since the inquiries from Alexandria have of late pointed to the probability of an increased trade in the early future. Gratification is, however, expressed that the demand from New South Wales—which is becoming a market of increased importance—continues good, and that the prospects are healthy.

The Suez Canal question continues to exercise the minds of traders in this district. The Dudley Chamber of Commerce have passed a resolution approving of the abandonment of the provisional agreement, and expressing the opinion that in future negotiations, "after agreeing to all that is right and reasonable in the interests of all nations, should be duly considered and insisted upon before any definite arrangement is concluded." The Walsall Chamber have passed a resolution in favour of increased facilities and lower dues for the passage of ships between the Mediterranean and the Red Sea. At a special town's meeting, held in Birmingham on Monday, after the action of the Government in deferring the question had become known, a resolution was moved by Mr. George Dixon, seconded by Mr. R. Tangye, and passed, declaring that in view of the valuable concessions obtained from M. de Lesseps, the meeting expressed full confidence in Mr. Gladstone and his colleagues. This resolution was first moved as an amendment to a motion which was subsequently lost, expressing satisfaction at the Government determination to postpone the agreement.

The second annual report of the Birmingham and Aston Tramways Company, Limited, advises the declaration of a half-year's dividend at the rate of 6 per cent. per annum. The number of engine miles ran has been 61,170. During the year four new engines have been ordered from Messrs. Kitson and Co., and eight large cars from the Starbuck Car and Wagon Company, Limited. The cars have been delivered this month.

NOTES FROM LANCASHIRE.

(*From our own Correspondents.*)

Manchester.—Generally the iron trade of this district is quiet, pig iron especially meeting with only a very limited inquiry, and what activity there is in the finished iron trade has been stimulated more by the temporary diversion of business into this district as the result of the Staffordshire strike than by any actual legitimate improvement in the demand. For pig iron prices are nominally maintained, as makers, being mostly well sold, abstain from forcing sales; but there are no large buyers in the market, and it is only on the very smallest scale that business is done on the basis of the prices now being asked. The forges are kept well employed as a rule; there is no great weight of business offering, nor is there much disposition on the part of buyers to contract forward at present rates, but for current requirements there are orders giving out in sufficient quantity to keep up a steady tone in the market.

There was an average attendance at the Manchester 'Change meeting on Tuesday, but the market was flat. Beyond one or two offers for Lancashire pig iron at about 3d. to 6d. per ton under makers' prices, there appeared to be little or no business stirring, so far as the raw material was concerned. Local makers, however, having their books tolerably well filled for the remainder of the year, hold firmly for the full rates. Buyers, on the other hand, appear to be equally independent, and with a difference of not more than 3d. per ton business is allowed to fall through. For district brands there were scarcely any inquiries, and in Middlesbrough iron there were indications of attempts to "bear" the market, second-hand lots being offered at fully 1s. to 1s. 6d. per ton under the prices asked by makers. For delivery equal to Manchester quoted rates remain nominally at 45s. to 45s. 6d. for Lancashire, 44s. 10d. to 46s. 10d. for Lincolnshire forge and foundry qualities less 2½ per cent., and 48s. 4d. net cash for best foundry brands of Middlesbrough.

In the finished iron trade a brisk demand was reported for sheets, buyers being still compelled to give out orders in this district owing to the continued stoppage of many of the Staffordshire sheet mills, and local makers have no difficulty in realising £8 per ton for delivery equal to Manchester or Liverpool, with good Staffordshire sheets quoted at £8 5s. to £8 7s. 6d. per ton. For hoops there is a moderate inquiry, but the quoted price of £6 12s. 6d. for ordinary Lancashire qualities delivered is not very readily obtained, and for good specifications £6 10s. per ton is being taken. In bars a fair business is being done on the basis of £6 5s. per ton delivered.

The shipping trade continues only moderate, with buyers offering low prices.

The forges in this district continue at work on the old rate of wages, any definite action with regard to the reduction being still held in abeyance pending the final settlement of the dispute in Staffordshire.

At their cotton machine works Messrs. Hetherington have put down special plant for the manufacture of revolving flat carding machines. By means of this machinery the flats are first drilled at both ends, next tapped at each end, then eight lengths are passed simultaneously through a special milling machine, where the edges are planed at the rate of 8ft. per hour. From this they are taken to a second milling machine, making simultaneously four different cuts. They are then finished on the working face at another machine, and finally tested in a machine indicating up to the 500th of an inch. In the revolving flat carding machine there are 105 of these flats in the set, and these are carried round the bend by an endless chain, so that about one-half of the flats are constantly in operation whilst the remainder are making the return journey.

In the coal trade a very steady business is being done for the time of the year, and, if anything, the market shows rather more animation. The summer season is being got through much more satisfactorily than has been the case for the last two or three years. Not only are the pits being kept better employed, but stocks are not accumulating to any generally very large extent, and prices are being well maintained at a slight advance upon last summer's rates. Business, of course, is still only quiet, and where stocks in wagons accumulate sales in quantity for quick delivery are made at a little under list rates. There is, however, no giving way in the quoted rates, and the probabilities of an early advance in prices are so strong that colliery proprietors will only sell for prompt delivery at present rates, whilst there is a general pressure on the part of buyers to secure forward contracts. But even at advanced prices colliery proprietors are very indifferent about committing themselves to forward engagements. At the pit mouth prices remain about as under:—Best coal, 9s.; seconds, 7s.; common round coal, 5s. 6d. to 6s.; burgy, 4s. 6d. to 5s.; best slack, 4s. to 4s. 3d.; and common sorts, 3s. to 3s. 3d. per ton.

Shipping is fairly active on the basis of late rates, steam coal delivered at Liverpool and Garston averaging 7s. 3d. to 7s. 6d.; and seconds house coal about 8s. 6d. per ton.

The colliery proprietors in the Ashton and Oldham districts have succeeded in striking a tolerably good bargain with their men. The sliding scale, which previously regulated wages, has recently been practically abandoned owing to the dissatisfaction expressed by the men at the awards, and an agreement has now been made between the coalowners and the men to work on at the present rate of wages until the end of the year.

Barrow.—For a considerable time past I have had week by week to chronicle the same unsatisfactory state of trade, which has continued without much change for some time. The hematite pig iron market still continues very quiet, and the business done, comparatively speaking, is very light. Prices are as last quoted, and makers have in most cases declined to accept orders which have been offered to them at less than current rate. They have no desire to go below present prices if they can possibly avoid it, and their determination to do so is taken as an indication that makers of pig iron are not without hope that prices have reached the minimum. Stocks are not increasing owing to the shipments being heavier. Steel makers are fairly employed, but prices for rails are very low. The demand from all quarters, both on account of pig iron and steel, is quiet, especially the former. Other industries steadily employed. Shipping in good business.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

IN the iron trade the men continue to carry out their agreement that they should work on the old terms until the result of the dispute in South Staffordshire was ascertained, and that they should abide by it whatever it may be. Prices continue somewhat firmer, and more business is being done; but there is a general indisposition to speculate. Messrs. Newton, Chambers, and Co., of Thorncliffe Ironworks, are still sending considerable shipments of their Thorncliffe pig iron to the United States. In Barnsley and district there is no change to report in the condition of the iron departments, which are somewhat flat.

Speaking at a recent meeting of a large local limited liability company, extensively concerned in steel, coal, and iron, Mr. Benjamin Whitworth remarked the other day that he believed the demand for coal had now overtaken the supply, and he anticipated there would now be a progressive preponderance. This may be taking a somewhat sanguine view of the situation, and it is news which the miners' delegates would soon turn to account in a fresh agitation. Still, it is believed that the outlook in the coal trade is less cheerless than it was at the corresponding period last year. In several colliery districts better prices are being obtained in the classes of fuel which were selling too low. The improvement is steady and very slow, and lest an impression get abroad which might encourage a renewal of disastrous agitation, it may be useful to remember that the colliery owners have not yet secured an advance in the value of their commodity equal to the rise in wages which was conceded last year. Steam coal is better by about 6d. per ton, but 1s. a ton would be needed to make up for the 10 per cent. granted in 1882. A good tonnage of coal is at present being sent to Goole and Grimsby. Though the house coal trade is quiet, as it usually is at this season of the year, three to five days are being worked per week. On the whole, if the coalowners and colliers can get along harmoniously without any rash attempts to disturb the situation, there are hopes that the recuperative tendency of business will in due time help both.

In armour plates, marine forgings, and steel castings generally, there is continued activity; but generally the lighter industries are but indifferently employed. The American demand for cutlery has fallen off very considerably, and the pressure for razors has ended. Edge tools are briskly called for, but languor is reported in the white metal and plating trades, in files, and brass work—which is mainly done in Rotherham. The file manufacturers are disturbed by the action of the file grinders, who still persist in their demand for 10 per cent., after the file cutters have recognised the futility of the struggle. The dispute is stated to be sending business into other districts, for files are no longer a speciality of Sheffield production.

The cholera in Egypt and the East is telling on business with the Levant, and very little is doing for these markets, which are always very sensitive to any "scare," and more particularly to so serious a state of affairs as now prevails. Some little anxiety has also been caused by France's action in Madagascar, where complications which may arise any moment would interrupt confidence and prevent any ordering forward.

A very good business has recently been done in farming implements and agricultural goods of all descriptions, the favourable prospects of harvest having caused farmers to order more freely. Warm weather is now much needed to ripen the crops, which, although very healthy, require sunshine to bring them to fruition. A late harvest under any circumstances is now inevitable.

The Sheffield Chamber of Commerce convened a meeting "to consider the proposed convention between her Majesty's Government and the Suez Canal Company with regard to a second canal through the Isthmus of Suez." The meeting was summoned for the 24th inst., and on the night of the 23rd the Government abandoned the scheme. Thereupon the Chamber passed the following resolution:—"That this Chamber having viewed the terms of the proposed Suez Canal Convention with very great apprehension and regret, hereby records its satisfaction that the scheme has been abandoned by the Government." A rider, urging that the Government had been moved to take up the matter in consequence of the urgent representations of Chambers of Commerce and the commercial interests of the country, was rejected.

Sheffield cutlery and other manufacturers are again concerned about the rapid advances in ivory, which they use so much as a hafting material. At Liverpool 28 tons of African ivory were offered, and all sold. There was a large attendance of Continental and American buyers. Prices began at last sale's rates, and got higher as the sale proceeded. Several Cameroon tusks—12½ lb. average—fetched £63 10s. per cwt., and Niger tusks—large—touched £63 per cwt., the highest prices ever realised. Angola large tusks were £2 to £3 dearer. Still further advances are anticipated in London this week.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THE Cleveland iron market, held at Middlesbrough on Tuesday last, was well attended, but the tone of affairs was rather flat, and there was only a moderate amount of business done. Consumers, having purchased what they require for early delivery, are now doing what they can to bring prices down again. The merchants have already reduced their quotations, and some of them were on Tuesday disposing of small lots of No. 3 g.m.b. for early delivery at from 3d. to 4½d. per ton below the rates obtainable last week. Merchants generally were asking 39s. 1½d. to 39s. 3d. for No. 3 g.m.b. Producers are fairly well supplied with orders, and are not so anxious to sell at present, they, therefore, continue to quote 39s. 6d. to 40s. for No. 3.

Warrants are in poor demand, though some holders have again reduced their price to 39s.

The stock of Cleveland pig iron in Messrs. Connal's Middlesbrough store declined 1035 tons during last week.

The exports of pig iron from the Tees have been very good this month, but not quite so heavy as for June. Up to Monday night the total had reached 67,052 tons, of which 18,780 tons were sent to Scotland.

Business is very quiet in the finished iron trade. Prices, however, continue steady, and it is thought that consumers will have to come into the market before long, as a good many existing contracts are being rapidly worked off. There is no change in prices since last week. Ship plates are £6 to £6 5s.; angles for shipbuilding, £5 12s. 6d. to £5 15s.; and common bars, £5 15s. to £6 per ton, free on trucks at makers' works, less 2½ per cent. Puddled bars are about £3 15s. net on trucks.

Steel rails are in poor request, but most of the works are fully employed with orders still in hand. Heavy sections are offered at £4 15s. per ton net, and iron fish plates at £5 15s.

The Tyne and Wear employers met a deputation of workmen at Newcastle-on-Tyne on the 19th inst. to discuss the dispute between the employers and workmen at Sunderland. After a conference lasting four hours the proceedings were adjourned without anything definite being settled. The engineers on strike held a meeting at Monkwearmouth the following day, and resolved not to return to work until the limit of apprentices is adhered to.

The blacksmiths and strikers employed by the Wallsend Shipway Company, who have been out on strike for an advance of 2s. per week since June 9th, have come to terms with their employers. They are to have an advance of 1s. 6d. per week upon the old rates.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THE Glasgow warrant market has been idle during the greater part of the week, and prices have been declining a penny or twopence a day, being now about the same figures that were current a month ago. We have not yet got into full working order since the holidays, which are indeed only just closing; so that in the matter of stocks the usual weekly quantities have not been carted to stores. This partly accounts for the fact that the week's increase in Messrs. Connal and Co.'s holding does not exceed 30 tons. The shipments are very good, having turned out fully 2000 tons larger than was anticipated. The quantities despatched to the United States and Canada are slightly greater than usual, and there is a prospect of considerable additions being made to the Canadian shipments within the next few weeks. On the other hand, as is generally the case towards the end of July, inquiries from the Continent have slackened.

At home the consumption is large, and may be expected to increase during the month of August.

Business was done in the warrant market on Friday forenoon at 47s. 5d. to 47s. 3½d. cash, also 47s. 7d. to 47s. 6d. one month, the afternoon quotations being 47s. 3½d. to 47s. 4d. cash, and 47s. 6d. one month. On Monday morning transactions took place at 47s. 4d. to 47s. 2d. cash, and 47s. 6d. to 47s. 3½d. one month; the afternoon prices were 47s. 1d. to 47s. 2d. and 47s. 1d. cash, and 47s. 4d. to 47s. 3d. one month. The market on Tuesday was very quiet, with a few transactions at 47s. ½d. cash. On Wednesday business was done at 47s. 2d. to 47s. 3d. cash in the forenoon, and 47s. 2½d. to 47s. 1¼d. in the afternoon. To-day—Thursday—transactions took place at 47s. 2d. to 47s. 3½d., closing at 47s. 3d. cash.

The values of makers' iron have on the whole been well maintained, although g.m.b. is about 6d. less on the week, in sympathy with the fall in warrants. Gartsherrie, No. 1, f.o.b. at Glasgow, per ton, is quoted at 57s.; No. 3, 53s.; Coltness, 60s. 6d. and 53s. 6d.; Langloan, 60s. and 53s. 6d.; Summerlee, 57s. 6d. and 51s. 3d.; Chapelhall, 57s. and 54s.; Calder, 58s. and 50s. 6d.; Carnbroe, 54s. 6d. and 49s.; Clyde, 51s. and 48s. 9d.; Monkland, 48s. 6d. and 46s. 6d.; Quarter, 47s. 6d. and 45s. 6d.; Govan, at Broomielaw, 49s. and 47s.; Shotts, at Leith, 60s. and 54s. 6d.; Carron, at Grangemouth, 48s. 6d. (specially selected, 54s. 6d.) and 47s.; Kinneil, at Bo'ness, 49s. 6d. and 48s.; Glengarnock, at Ardrossan, 54s. 6d. and 47s. 6d.; Eglinton, 48s. 9d. and 45s. 6d.; Dalmellington, 49s. 6d. and 48s. 6d.

The week's imports of Cleveland iron at Grangemouth were 3940 tons, as compared with 3050 in the corresponding week last year. The increase in these shipments for the year to date is 26,281 tons.

The coal trade not only maintains the favourable position it has now occupied for so long a time, but there are signs of decided improvement in prices on account of the short supply resulting from the stoppage of labour for the holidays and the brisk demand for shipment. At Glasgow the inquiry continues remarkably good and the shipments are extensive, among those of the past week being a cargo of 2600 tons for the steamer Lauderdale for Montreal. Trade is brisk in Fifeshire, where the quotations are well maintained, ranging from 7s. 6d. to 8s. 6d. per ton f.o.b., according to quality. At Leith 5000 tons of coal were exported, while 4000 tons were despatched at Bo'ness, and no less than 11,575 tons at Grangemouth.

Messrs. William Baird and Co. have discovered a new seam of coking coal in their mineral fields at Rishend, near Kilsyth. It is fully 4ft. in thickness, and of superior quality. A short railway connecting the pits with the Kelvin Valley Railway will soon be available. This firm have also opened a seam of good blackband ironstone at their Haugh works in the same district. These additional operations will necessitate the employment of about three hundred extra miners.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

THE Taff Vale Company has scored a success in the Barry Dock struggle. It was intimated by the chairman of Committee, House of Lords, that without expressing an opinion upon the Bill, as a whole, the preamble as regarded the Barry line from the Rhondda to Treforest, parallel with the Taff, was declared not proven. This gives the Taff power to levy tolls for fifteen miles, that is supposing the line be continued from Treforest to Barry. Important and interesting evidence was given this week by Mr. W. T. Lewis, an agent for the Marquis of Bute, who owns 27,000 acres of mineral property in Glamorgan. Mr. Lewis showed that 27,000 acres constituted the Cardiff mineral district, and not 176,352 as stated, and that large quantities of coal went to Newport, Porthcawl, Briton Ferry, Neath, and Swansea. Dowlais, too, sent largely over the London and North-Western system from Birkenhead, and the new line of rail to Newport, *viâ* Caerphilly, to be opened this year, will take large consignments to Newport. Mr. Lewis's evidence was most exhaustive on the area of minerals, capacity of collieries, estimated increase, capacity of Bute and Penarth Docks, and the increase of facilities, by movable tips, &c., to meet a greater demand than was likely to occur. This evidence, supported by Mr. Taylor, a large colliery proprietor, and by Mr. Wales, H.M. inspector for South Wales, was regarded in unbiassed circles as very strong. Mr. Lewis noted the earliest working of steam coal in Merthyr Valley, followed by the Aberdare Valley, and that when signs of exhaustion set in, by the starting of the Rhondda collieries.

There is not much fresh coal land now untaken in the Rhondda district. In the Cardiff district the coal trade is quieter, though prices are firm. Cardiff docks continue to exhibit a decreased coal export, and instead of 150,000 tons being sent to foreign destinations, the coal export was limited to 112,000. Newport and Swansea maintain their average. Swansea a little more so, and during the past week has exhibited a good deal of activity in coal and patent fuel.

The colliers at Mountain Ash have decided to support the Staffordshire colliers now on strike. The assistance is not to be by levy, but contributions.

The iron trade has not much new matter to recommend it to note; 6000 tons left the Welsh ports this week. The works are fairly well occupied, and this would have been the case at Dowlais but for a breakage in one of the mills which will interfere with the steel rail contracts in hand for a time.

Patent fuel is in good demand; foreign ore, too, is looking up at Dowlais, and Ebbw Vale have been getting large consignments. I am sorry to report unfavourably again of tin-plate; prices appear to be receding. A small start has been made at Cwmavon of the Jersey Iron and Steelworks, under the direction of Byass, Daniel, and Co. This was the Old Western Works. A small tin-plate works also has been started anew at Pontardulais, known as the Cambria.

SOCIETY OF ENGINEERS.—The members and associates of this society paid a visit on the 18th inst. to the Thames Ironworks and Shipbuilding Yard at Blackwall, and the works of the Gaslight and Coke Company at Beckton. The visitors were conveyed to their destination by the Lotus steamer, and were courteously received at the works by the managing director, Mr. Hill, who conducted them round the extensive premises and pointed out the principal works in progress. Mr. G. C. Trewby, chief engineer to the Gas Light Company, having hospitably entertained the party, placed himself at their service as guide during the tour of inspection of the retort houses and other departments of the vast works, which find employment for some 3000 hands. Upon their return to town the members and friends dined together at the Guildhall Tavern, Mr Jabez Church, president of the society, occupying the chair.

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.

17th July, 1883.

3499. Steam Engines, H. J. Allison.—(*E. F. Spalding, J. K. Hallock, and E. S. Smith, Erie, U.S.*)

3500. Horse Rakes, J. Howard and E. T. Bousfield, Bedford.

3501. Making Cigarettes, A. M. Clark.—(*H. E. Casgrain, Quebec.*)

3502. Rotary Web Printing Machines, G. A. Wilson, Liverpool.

3503. Rotary Web Printing Machines, G. A. Wilson, Liverpool.

3504. Fog Signals, H. A. Bonneville.—(*F. Brown, New York, U.S.*)

3505. Telephonic Apparatus, J. Graham, London.

3506. Sewing Machines, J. W. Post, New York.

3507. Packing for Stuffing-boxes, J. H. Smith and R. Marshall, London.

3508. Decorating Glass, C. D. Abel.—(*A. Schierholz, Plaue, Germany.*)

3509. Embroidering Machines, R. H. Brandon.—(*J. Becker, Boston, U.S.*)

3510. Weighing Machines, E. Thomas, Aberdare.

3511. Stoppering Bottles, J. A. Bowles, London.

3512. Water-closets, E. Gilbert and E. A. Gilbert, Dundee.

3513. Washing, &c., Machines, T. Woolfall and T. T. Mercer, Blackburn.

3514. Breaking Up Balls of Slag, &c., R. Dalgliesh, Asfordby, and F. G. Lynde, Melton Mowbray.

3515. Bicycles, &c., G. Warwick, Aston.

3516. Electric Signalling Apparatus, W. R. Lake.—(*J. H. Cary, Boston, U.S.*)

3517. Manufacturing Fodder, H. J. Haddan.—(*H. Hencke and Co., Grünech, Germany.*)

3518. Bending Blanks for Chain-links, F. C. Glaser.—(*W. Hegenscheidt, Gleiwitz, Germany.*)

3519. Rolling Mills and Rolls, A. W. L. Reddie.—(*Wilmot Hobbs and Co., Bridgeport, U.S.*)

3520. Holding Drawing Rolls, W. R. Lake.—(*J. H. Congdon, W. Sprague, and A. Sprague, Rhode Island.*)

3521. Water-wheels, A. J. Barlow.—(*F. Pallansch, Vienna.*)

3522. Dyeing of Aniline Colours, L. Heppenstall, jun., Milnsbridge.

3523. Colouring Matter, F. Wirth.—(*H. Baum, Höchst-on-the-Main.*)

3524. Preparing Match-sticks or Splints, W. R. Lake. (*W. H. H. Sisum, Brooklyn.*)

3525. Regulators of Level in Steam Boilers, P. Gauchot, Paris.

3526. Marine Drags, W. Clark.—(*A. J. Clarke, U.S.*)

3527. Colouring Matter, F. Wirth.—(*H. Baum, Höchst-on-the-Main.*)

18th July, 1883.

3528. Refractory Material, W. R. Hutton, Partick, and A. Granger, Cardross, N.B.

3529. Raising Sunken Vessels and Structures, R. P. Wylie, London.

3530. Reels for Winding Yarn, &c., G. Bernhardt, Radcliffe.

3531. Steel, W. Naylor, Penistone.

3532. Apparatus for Sounding Bells on Buoys, &c., C. J. Harrison, London.

3533. Electric Meter, W. McWhirter, Glasgow.

3534. Velocipedes, G. de M. Soares, London.

3535. India-rubber Assistant Bearing Springs, G. Spencer, London.

3536. Elimination of Nitrogenous Matters, &c., E. R. Moritz and H. C. Lee, London.

3537. Hose Couplings, R. Gosling, Ipswich.

3538. Obtaining Fibres and Juices, A. W. L. Reddie.—(*J. Kennedy, Kingston, Jamaica.*)

3539. Ascertaining Distances, C. E. Kelway, London.

3540. Sash Weights, W. Ayres, London.

3541. Cans or Vessels, W. R. Lake.—(*E. Burnett, Southborough, and A. P. Browne, Boston, U.S.*)

3542. Feeding, Gumming, &c., Sheets of Paper, J. J. Allen, Halifax.

3543. Rocking Furnace Bars, J. Hampton, Loughborough.

3544. Repeating Fire-arms, W. R. Lake.—(*Larsen Rifle Company, Liége.*)

3545. Refrigerating Apparatus, J. H. Johnson.—(*E. Fixary, Paris.*)

19th July, 1883.

3546. Moulds Employed in Refining Sugar, J. Duncan and B. E. R. Newlands, London.

3547. Withdrawing Beer from Barrels, &c., H. C. Trenery and J. Naylor, Sheffield.

3548. Expressing Juice, A. C. Henderson.—(*A. Désgoffe and L. A. di Giorgio.*)

3549. Washing Machines, J. Heselwood, Leeds.

3550. Beetling Machines, C. J. Webb, Randalstown.

3551. Additions to Pocket Knives, J. H. Johnson.—(*J. Thurnauer and Co., Paris.*)

3552. Folding Hoods for Perambulators, &c., J. T. Shaw, Manchester.

3553. Electric Meters, G. Hammersley and C. H. Worsey, London.

3554. Bottle Stoppers, M. F. Roberts, London.

3555. Slabs and Coverings, C. J. Marson, London.

3556. Locking Screw Nuts and Bolts, T. Johnson, London.

3557. Closing Canisters, A. W. Jaeger and C. A. Farwig, London.

3558. Producing Coloured Patterns on Wood, &c., H. C. Webb, Worcester.

3559. Lasting Boots and Shoes, W. R. Lake.—(*J. R. Scott, New York.*)

3560. Utilising the Rise and Fall of the Tide, C. M. Walker, London.

3561. Motive Power Engines, H. E. Newton.—(*G. Sweanor, Montreal.*)

3562. Hot-air and Caloric Engines, E. Field, Westminster, and H. Aydon, Whitton.

3563. Barrels, &c., C. L. Eyre.—(*G. Spofford, New York.*)

20th July, 1883.

3564. Tricycles, &c., J. A. Griffiths, Liverpool.

3565. Plates or Electrodes, R. Cunningham, Kingston Hill.

3566. Facilitating Ball Practice, J. H. Johnson.—(*E. Gaupillat, Paris.*)

3567. Spinning and Twisting Rings, B. Mayon, Eagley, near Bolton.

3568. Gas Motor Engines, C. T. Wordsworth, Leeds, and H. Lindley, Manchester.

3569. Water-spinn Machines, F. C. Glaser.—(*N. Schlumberger and Co., Gebweiller, Germany.*)

3570 Bottle Stopper Fastenings, B. D. Marks, Louisville, U.S.

3571. Earthenware and Glass Vessels, E. Harwood, Habergham Eaves.

3572. Shirt and Collar Studs, &c., W. C. Alldridge, Birmingham.

3573. Manufacturing Slabs, Blocks, &c., L. A. Groth.—(*S. Paul, Bilbao, Spain.*)

3574. File-cutting Machine, L. A. Groth.—(*F. Bathe, Berlin.*)

3575. Voltaic Batteries, W. R. Lake.—(*J. M. Stebbins, New York.*)

3576. Water Meters, J. Imray.—(*A. Frager and V. Michel, Paris.*)

3577. Embroidery, C. F. Bally, Switzerland.

3578. Time Signalling Mechanism for Clocks, &c., W. S. Harrison, London.

3579. Machines for Manufacturing Wood Screws, W. R. Lake.—(*E. Nugent, Brooklyn, U.S.*)

3580. Purifying Mineral Oils, W. R. Lake.—(*A. André, jun., Paris.*)

21st July, 1883.

3581. Steam Packing, J. V. Taylor, Warrington.

3582. Automatic Steam Traps, T. Wilkins.—(*A. Gimbel, Berlin.*)

3583. Heating Water, &c., M. Steel and T. Smales, Gosforth.

3584. Framing Photographs, &c., J. Cooke, London.

3585. Crucible Furnaces, B. J. Mills.—(*G. Fischer, Hainfeld, Austria.*)

3586. Annealing Castings, &c., B. J. B. Mills.—(*G. Fischer, Hainfeld, Austria.*)

3587. Spinning and Doubling, E. Dyson, near Bolton.

3588. Connecting Ropes, &c., J. D. Sprague, Upper Norwood.

3589. Lithographic Presses, H. J. Haddan.—(*A. Schapiro, Berlin.*)

3590. Perpetual Calendars, G. W. von Nawrocki.—(*O. Fleischhauer, Berlin.*)

3591. Scouring Wool, &c., J. Petrie and F. W. Petrie, Rochdale.

3592. Gas Distributor, H. Marlow, London.

3593. Cigar Making Machines, W. Clark.—(*F. Haehnel, Paris.*)

3594. Box or Case, R. B. Jackson, London.

3595. Small-arms, H. C. Suft, London.

3596. Fanning Apparatus, J. A. Farquhar.—(*H. P. Roberts, New York.*)

3597. Manufacturing Cotton Cloth, &c., H. H. Lake.—(*P. C. J. Richter, New York.*)

3598. Corsets, H. H. Lake.—(*C. Chadwick, Brooklyn.*)

23rd July, 1883.

3599. Pulp and Manure, T. H. Cobley, Dunstable.

3600. Ink, C. E. Bolton, Leeds.

3601. Purifying Air and Gases, F. Windhausen, Berlin.

3602. Pantographs, C. Pieper.—(*A. Keller-Dorian, Mülhausen, Germany.*)

3603. Fire-escapes, G. S. Prindle.—(*G. H. Thompson, Plattsmouth, U.S., and S. Ryder, New York.*)

3604. Distilling Coal, H. L. Pattinson, jun., Felling.

3605. Lids of Boxes, G. W. von Nawrocki.—(*H. Lorentz, Stettin, Germany.*)

3606. Sulpho-acids, F. Wirth.—(*Farbfabrik vormals Brönner, Frankfort-on-the-Main.*)

3607. Pocket Knives, G. W. von Nawrocki.—(*A. Coppel, Solingen, Germany.*)

3608. Turnbuckles, &c., A. W. L. Reddie.—(*E. W. Merrill, Brooklyn.*)

3609. Pianoforte Actions, C Collard, London.

3610. Cigar and Cigarette Holders, G. Jones, Oxford.

3611. Locks, G. W. von Nawrocki.—(*Werkzeug und Maschinenfabrik Oerlikon, Switzerland.*)

3612. Railway Chairs and Keys, J. K. Thompson and and G. R. Race, Leeds.

3613. Implements for Cultivating Land, R. Hitchcock, Taunton.

3614. Artificial Marble, J. Heinemann.—(*H. Rothe, Hanover, Germany.*)

3615. Ornamenting Leather, F. Wirth.—(*L. Klöpfer, Münshen, Germany.*)

3616. Repeating Fire-arms, H. H. Lake.—(*Spencer Arms Company, New York.*)

3617. Compound for Covering Drawing Rollers, E. Edwards.—(*J. Appelt, Bohemia.*)

3618. Steam Boilers, W. Clark.—(*E. Delpech, France.*)

Inventions Protected for Six Months on Deposit of Complete Specifications.

3494. Bearings for Journals, H. H. Lake, Southampton-buildings, London.—A communication from G. W. Stewart, Atlanta, Georgia, U.S.—*16th July*, 1883.

3499. Steam Engines, H. J. Allison, Southampton-buildings, London.—A communication from E. F. Spaulding, J. K. Hallock, and E. S. Smith, Erie, Pennsylvania.—*17th July*, 1883.

3501. Making Cigarettes, A. M. Clark, Chancery-lane, London.—A communication from H. E. Casgrain, Quebec, Canada.—*17th July*, 1883.

3504. Fog Signals, H. A. Bonneville, Cannon-street, London.—A communication from F. Brown, New York.—*17th July*, 1883.

3506. Sewing Machines, J. W. Post, New York.—*17th July*, 1883.

3509. Embroidering Machines, R. H. Brandon, Paris.—A communication from J. Becker, Boston, Massachusetts.—*17th July*, 1883.

3518. Bending Blanks for Chain Links, &c., F. C. Glaser, Berlin.—A communication from W. Hegenscheidt, Gleiwitz, Germany.—*17th July*, 1883.

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

2933. Trapped Gullies or Gratings, C. Burge, London.—*16th July*, 1880.

3029. Roller Mills, J. A. Buchholz, London.—*23rd July*, 1880.

3000. Circular Knitting Machines, H. J. Haddan, London.—*21st July*, 1880.

3015. Spinning Machinery, H. J. Haddan, London.—*22nd July*, 1880.

3066. Steam Engines and Boilers, G. H. Babcock, Plainfield, U.S., and S. Wilcox and N. W. Pratt, Brooklyn.—*26th July*, 1880.

3091. Bars for Securing Glass in Window Sashes, &c., J. D. MacKenzie, Glasgow.—*27th July*, 1880.

3114. Motive Power Apparatus, A. C. Kirk, Glasgow.—*29th July*, 1880.

2968. Connecting Warp to Warp Beam, G. D. Sykes, Huddersfield.—*19th July*, 1880.

3161. Sewing Machines, E. Wiseman, Luton.—*31st July*, 1880.

2992. Obtaining Extracts from Tea, &c., W. J. Clapp, Nantyglo.—*20th July*, 1880.

2995. Expanding Boiler Tubes, D. J. Morgan, Cardiff.—*20th July*, 1880.

3001. Preserving Food, F. Artimini, London.—*21st July*, 1880.

3007. Measuring, &c., Liquids, &c., J. J. Tylor and W. A. Tylor, London.—*21st July*, 1880.

3017. Printing Colours on Fibrous Materials, A. Benn, Clayton.—*22nd July*, 1880.

3097. Composition for Cleansing Boilers, &c., W. Seymour, Wallsend-on-Tyne.—*27th July*, 1880.

3116. Lubricating Compounds, R. Irvine, Royston.—*29th July*, 1880.

162. Heating, &c., Wire, J. Law and H. Law, Cleckheaton.—*14th January*, 1880.

2997. Navigable Vessel, H. C. Bagot, Conway.—*21st July*, 1880.

3024. Types and Typographic Apparatus, J. Greene, London.—*22nd July*, 1880.

3028. Dry Gas Meters, J. Foxhall, Newport.—*23rd July*, 1880.

3076. Spinning, E. Crossley, L. J. Crossley, and W. Sutcliffe, Halifax.—*26th July*, 1880.

3085. Hulls of Ships, P. M. Justice, London.—*27th July*, 1880.

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

2913. Keyless Watches, H. M. Robottom, Liverpool.—*17th July*, 1876.

2953. Kneading and Mixing Machine, P. Pfleiderer, Norwood.—*20th July*, 1876.

2993. Permanent Way, J. H. Tozer, London.—*25th July*, 1876.

3164. Compressing Air, P. Brotherhood, London.—*10th August*, 1876.

2950. Salts of Barium, &c., R. W. Wallace and C. F. Claus, London.—*19th July*, 1876.

2966. Scouring, &c., Leather, F. A. Lockwood, Fall River, Bristol, U.S.—*21st July*, 1876.

Notices of Intention to Proceed with Applications.

(*Last day for filing opposition, 10th August*, 1883.)

1360. Portable Fire-proof Shelving, &c., B. Harlow, Macclesfield.—*14th March*, 1883.

1373. Gas Stoves, A. J. Boult, London.—A communication from P. Géoffrey-Gomez.—*14th March*, 1883.

1378. Fire-escape, S. Bott, Birmingham.—*15th March*, 1883.

1382. Injecting Insecticide Liquid into Vines, &c., E. Edwards, London.—A communication from A. B. Escourron.—*15th March*, 1883.

1396. High Speed Valveless Rotary Motor Pump, W. Dawes, Leeds.—*16th March*, 1883.

1399. Automatic Pencil Holder, O. Bussler, London.—*16th March*, 1883.

1404. Cutting Leather, C. P. Carpenter, London.—*16th March*, 1883.

1405. Shearing Ropes, P. M. von Swyndregt, Kralingen.—*16th March*, 1883.

1408. Disintegrating Animal and Vegetable Fibres, G. and J. E. Tolson, Dewsbury.—*16th March*, 1883.

1421. Gas Stoves, W. T. Sugg, London.—*17th March*, 1883.

1423. Screening Coals, R. H. Silcock, Warrington.—*17th March*, 1883.

1429. Preserving Meat, P. R. Conron, Lewisham.—A communication from S. Conron.—*17th March*, 1883.

1432. Treating White Peat, S. J. Blane, London.—*19th March*, 1883.

1449. Ironing Machine, B. J. B. Mills, London.—A communication from H. Schmidt.—*19th March*, 1883.

1450. Railway Carriage Lamps, J. H. Johnson, London.—A com. from J. Schulke.—*19th March*, 1883.

1453. Tobacco Pipes, C. Jackson, Nottingham.—*20th March*, 1883.

1463. Breech-loading Small-arms, T. W. Webley, Birmingham, G. Bouckley, Aston, and E. C. Hodges, London.—*20th March*, 1883.

1476. Stopping Gear for Machinery, W. H. Beck, London.—A com. from W. Dawson.—*21st March*, 1883.

1485. Compressing Air, O. J. Ellis, Derby.—*21st March*, 1883.

1522. Treating Sewage, J. H. Kidd, Wrexham, and T. J. Barnard, London.—*22nd March*, 1883.

1531. Jacquard Apparatus, J. Chapman, Nottingham.—*24th March*, 1883.

1565. Separating Metal Compounds by Electrolysis, L. Elmore, London.—A communication from G. J. Atkins.—*27th March*, 1883.

1572. Fulling Machines, &c., A. Roger, Paris.—*28th March*, 1883.

1842. Producing Ammonia, R. Tervet, Clippens.—*12th April*, 1883.

1868. Rotary Pumps, J. H. Johnson, London.—A com. from G. Griendl and L. Poillon.—*12th April*, 1883.

1922. Forks for Agricultural Purposes, G. Pickhardt, Hagen.—*16th April*, 1883.

2119. Salicylic Acid, W. L. Wise, London.—A communication from W. Hentschel.—*26th April*, 1883.

2157. Longitudinal Pipe Joint, E. Quadling, Forest Hill.—*28th April*, 1883.

2659. Harness Shaft-tugs, S. E. Davies, Liverpool.—*29th May*, 1883.

2746. Lubricator, J. Imray, London.—A communication from H. Zweiffel.—*2nd June*, 1883.

2853. Metal Handles for Knives, C. D. Abel, London.—A communication from W. Lorenz.—*7th June*, 1883.

2876. Belting, J. K. Tullis, Glasgow.—*9th June*, 1883.

2995. Metallic Alloys, G. Selve, Altena.—*16th June*, 1883.

3006. Stockings, A. P. Sheffield and A. W. Wills, Leicester.—*16th June*, 1883.

3050. Rotary Blowing and Exhaust Fans, H. Aland, New Wandsworth.—*20th June*, 1883.

3067. Tricycles, W. Jackson, London.—*20th June*, 1883.

3499. Steam Engines, H. J. Allison, London.—A communication from E. F. Spaulding, J. K. Hallock, and E. S. Smith.—*17th July*, 1883.

3504. Fog Signals, H. A. Bonneville, London.—A communication from F. Brown.—*17th July*, 1883.

3506. Sewing Machines, J. W. Post, New York.—*17th July*, 1883.

3509. Embroidering Machines, R. H. Brandon, Paris.—A communication from J. Becker.—*17th July*, 1883.

(*Last day for filing opposition, 14th August*, 1883.)

987. Tip Vans, E. Burton, Nine Elms.—*23rd February*, 1883.

1278. Raising Mud into Carts, E. Burton, Nine Elms.—*10th March*, 1883.

1435. Spinning Machines, L. A. Groth, London.—A communication from J. Bourcart.—*19th March*, 1883.

1436. Refining Fibrous Material, L. A. Groth, London.—A com. from C. Kraemer.—*19th March*, 1883.

1444. Sectional Warping, H. Yates, Manchester.—*19th March*, 1883.

1445. Picking Motion for Looms, H. Yates, Manchester.—*19th March*, 1883.

1446. Locks for Purses, &c., M. Wolfsky, London.—*19th March*, 1883.

1452. Electric Telephony, J. H. Johnson, London.—A com. from J. A. Maloney.—*20th March*, 1883.

1454. Propelling Tram-cars by Ropes, C. Hinksman, London.—*20th March*, 1883.

1459. Metallic Foot-warmers, T. H. Ash, Birmingham.—*20th March*, 1883.

1460. Hydraulic Motors, W. P. Thompson, Liverpool.—A communication from E. B. Benham, H. B. Richardson, and J. W. Currier.—*20th March*, 1883.

1467. Tables, &c., A. E. Maudslay, Littlebourne.—*20th March*, 1883.

1469. Treating Fish for Producing Artificial Guano, M. Zingler, Belsize Park.—*20th March*, 1883.

1470. Pumps, A. Russell and F. Curtis, Newburyport, U.S.—*20th March*, 1883.

1472. Propelling Cars by Electricity, P. R. Allen, London.—*20th March*, 1883.

1481. Generating Electricity, J. A. Kendall, Middlesbrough.—*21st March*, 1883.

1484. Nut-locking Device, W. J. Brewer, London.—*21st March*, 1883.

1486. "Lap" Forming Machines, J. Walker and T. G. Beaumont, Dewsbury Mills.—*21st March*, 1883.

1489. Detecting Waste of Water from Pipes, G. F. Deacon, Liverpool.—*21st March*, 1883.

1503. Umbrellas and Parasols, R. H. Brandon, Paris.—A com. from E. M. L. Blaguière.—*22nd March*, 1883.

1513. Pavements, R. M. Ordish, London.—*22nd March*, 1883.

1519. Pulverising, &c., Diamondiferous Ore, A. J. Struthers, Glasgow.—*22nd March*, 1883.

1541. Electric Batteries, H. H. Lake, London.—A com. from Radiquet et fils.—*26th March*, 1883.

1550. Brewing Apparatus, W. and T. S. Bucknall, Kidderminster.—*27th March*, 1883.

1558. Lock Nuts, E. and A. E. Gilbert, Dundee.—*27th March*, 1883.

1569. Incrusting Metal to Represent Sculpture, A. Baillif, Paris.—*28th March*, 1883.

1571. Fire-arms, H. Pieper, Liège.—*28th March*, 1883.

1632. Electric Signalling Apparatus, W. H. Preece, Wimbledon, and W. E. Langdon, Dundee.—*31st March*, 1883.

2101. Break-down Snap Guns, S. A. Grant and W. Adams, London.—*25th April*, 1883.

2106. Giving Motion to Fluids, W. Smedley, Liverpool.—A com. from C. Smedley.—*26th April*, 1883.

2121. Lanterns, A. M. Clark, London.—A communication from G. F. Fisher.—*26th April*, 1883.

2133. Machine for Peeling Potatoes, J. C. Mewburn, London.—Com. from J. Burnichon.—*27th April*, 1883.

2667. Telephonic Transmitting Apparatus, &c., J. Graham, Haverstock Hill.—*29th May*, 1883.

2693. Graining Painted Surfaces, &c., J. A. Meginn, Liverpool.—*30th May*, 1883.

2702. Gas Motors, C. Pieper, Berlin.—A communication from E. Körting & G. Lieckfeld.—*31st May*, 1883.

2871. Bleaching, &c., Woven Fabrics, J. Farmer, Salford.—A com. from A. Lalance.—*8th June*, 1883.

2978. Creating a Vacuum in Bulbs of Electric Lamps, C. H. Stearn, Forest Hill.—*15th June*, 1883.

3010. Producing Illusory Dramatic Effects, W. R. Lake, London.—A communication from J. W. Knell.—*16th June*, 1883.

3177. Printing Cloth, L. H. Phillipi, Hamburg.—*26th June*, 1883.

3391. Carburetters, H. J. Haddan, London.—A communication from W. M. Jackson.—*9th July*, 1883.

3397. Clarifying Saccharine Liquors, H. H. Lake, London.—A com. from H. Hughes.—*9th July*, 1883.

3412. Reeds, W. R. Lake, London.—A communication from M. Bray.—*10th July*, 1883.

3473. Dyeing Gloves, A. M. Clark, London.—A communication from E. Peyre.—*13th July*, 1883.

3494. Journal Bearing, H. H. Lake, London.—A communication from G. W. Stewart.—*16th July*, 1883.

3501. Cigarette Machines, A. M. Clark, London.—A communication from H. Casgrain.—*17th July*, 1883.

3518. Bending Blanks for Chain Links, F. C. Glaser, Berlin.—A communication from W. Hegenscheidt.—*17th July*, 1883.

Patents Sealed.

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

2274. Propelling Sea-going Vessels, H. Gerner, New York, U.S.—*4th May*, 1883.

2544. Gas, S. Pitt, Sutton.—*22nd May*, 1883.

2546. Hammocks, C. E. Hierster, Harrisburg, U.S.—*22nd May*, 1883.

2606. Obtaining Artificial Light and Heat, J. S. Muir, London.—*25th May*, 1883.

(*List of Letters Patent which passed the Great Seal on the 20th July*, 1883.)

209. Steam Generators, H. Lane, London.—*13th January*, 1883.

286. Thrashing Machines, J. H. Johnson, London.—*17th January*, 1883.

296. Driving Belts, G. H. Hebblethwaite, Huddersfield.—*18th January*, 1883.

330. Groynes, A. Dowson, London.—*20th January*, 1883.

357. Dynamo-electric Machines, H. H. Lake, London.—*22nd January*, 1883.

361. Electric Lamps, H. H. Lake, London.—*22nd January*, 1883.

363. Spinning Bobbins, H. Southwell, Heywood, and W. H. Dawson, Manchester.—*23rd January*, 1883.

370. Railway Vehicles, J. Cleminson, London.—*23rd January*, 1883.

371. Electric Lamps, A. E. Swannikoff, London.—*23rd January*, 1883.

383. Obtaining Motive Power, S. Hart, Hull.—*24th January*, 1883.

386. Finishing Hats, G. Atherton, Stockport.—*24th January*, 1883.

393. Photometer, A. J. Beer, Canterbury.—*24th January*, 1883.

410. Smoking Pipe, R. C. Christian, Dublin.—*25th January*, 1883.

421. Railway Signals, J. H. Cureton, London.—*25th January*, 1883.

438. Phosphates, S. G. Thomas and T. Twynam, London.—*26th January*, 1883.

456. Kilns for Drying Malt, P. R. Norton, Dublin.—*27th January*, 1883.

473. Porcelain Tile-clay Baths, J. Hall, Stourbridge.—*29th January*, 1883.

488. Surface Condensers, H. Guy, West Cowes.—*29th January*, 1883.

506. Propelling Vessels, E. P. Alexander, London.—*30th January*, 1883.

509. Etching upon Bright Metal Surfaces, E. Nienstadt, Berlin.—*30th January*, 1883.

527. Shuttles for Sewing Machines, H. J. Haddan, London.—*31st January*, 1883.

540. Distilling Mineral Oils, &c., N. M. Henderson, Broxburn.—*1st February*, 1883.

578. Cutting Stone, &c., P. Gay, Paris.—*2nd February*, 1883.

584. Crucibles, H. L. Doulton, London.—*2nd February*, 1883.

625. Substitute for Leather, W. L. Wise, London.—*5th February*, 1883.

649. Pistons, W. Rowan, Belfast.—*6th February*, 1883.

676. Telephonic Apparatus, H. H. Eldred, London.—*7th February*, 1883.

748. Bichromates of Potash and Soda, J. H. Johnson, London.—*10th February*, 1883.

757. Breaking Grain, C. Pieper, Berlin.—*12th February*, 1883.

801. Sewing Machines, F. J. Drewry, Burton-on-Trent.—*14th February*, 1883.

865. Metallic Dowels, W. D. Player, Birmingham.—*16th February*, 1883.

978. Effecting Illumination by Liquid Hydrocarbons, C. D. Abel, London.—*22nd February*, 1883.

1131. Balancing Sliding Window Sashes, J. B. Adams and J. Telford, Liverpool.—*2nd March*, 1883.

2118. Electrical Accumulators, P. Higgs, Leith.—*26th April*, 1883.

2155. Baling Presses, J. Watson, Bayswater.—*28th April*, 1883.

2193. Railroad Brake Apparatus, B. J. B. Mills, London.—*1st May*, 1883.

2201. Knitting Machines, J. Higham, Newton Heath.—*1st May*, 1883.

2217. Determining the Rate of Water Consumption, H. E. Newton, London.—*1st May*, 1883.

2344. Signalling in Vessels, R. Chipperfield, London.—*8th May*, 1883.

2408. Organs, &c., A. Gern, London.—*11th May*, 1883.

2556. Rivetting Shoe-lace Studs, H. H. Lake, London.—*22nd May*, 1883.

(*List of Letters Patent which passed the Great Seal on the 24th July*, 1883.)

142. Sewing Machines, W. Walker, Dunstable.—*10th January*, 1883.

416. Hammers, F. Wirth, Frankfort-on-the Main.—*25th January*, 1883.

428. Furnace Bars, C. J. Chubb, Clifton.—*26th January*, 1883.

437. Tube Scrapers, W. S. Turner, London.—*26th January*, 1883.

442. Cooking Food, A. F. Link, London.—*27th January*, 1883.

450. Rope Traction Tramways, &c., G. J. Chapman, Enfield.—*27th January*, 1883.

454. Electric Temperature Indicators, &c., W. P. Thompson, London.—*27th January*, 1883.

476. Weaving Looms, T. Lonsdale, Blackburn.—*29th January*, 1883.

478. Rope Driving, M. H. Smith, Halifax.—*29th January*, 1883.

479. Grinding Wheat, G. Perrott, Cork.—*29th January*, 1883.

573. Sharpening Picks, R. Walton and F. A. Stansfield, Rawtenstall.—*2nd February*, 1883.

590. Furnaces, J. P. Cotiart, Havana.—*3rd February*, 1883.

620. Protecting Plants from Insects, &c., J. Walker, Leeds.—*5th February*, 1883.

627. Coupling Shafts, J. J. Purnell, London.—*5th February*, 1883.

697. Etching on Glass, J. G. Sowerby, Gateshead-on-Tyne.—*8th February*, 1883.

711. Combing Wool, J. Holden, J. Burnley, and J. Fawell, Bradford.—*9th February*, 1883.

719. Electric Safety Plugs, K. W. Hedges, London.—*9th February*, 1883.

721. Felting Wool, A. Monchablon, Paris.—*9th February*, 1883.

740. Jacquard Machines, I. Thomis, Eccleshill, and M. Priestley, Wibsey.—*10th February*, 1883.

758. Pressing Glass, J. G. Sowerby, Gateshead-on-Tyne.—*12th February*, 1883.

777. Grinding Corn, H. H. Lake, London.—*12th February*, 1883.

805. Ordnance, G. A. Cassagnes, Paris.—*14th February*, 1883.

818. Spoked Wheels, E. Dearden, Sheffield.—*14th February*, 1883.

953. Dense Metal Casting, C. M. Pielsticker, London.—21st February, 1883.
967. Extracting Sugar from Molasses, C. Steffen, Vienna.—22nd February, 1883.
1219. Lawn Tennis Bats, R. C. Powell and F. Thompson, London.—7th March, 1883.
1739. Pyrometers, A. Longsdon, London.—6th April, 1883.
1889 Removing the Ends of Eggs, R. H. Rowland and T. F. Stidolph, Woodbridge.—11th April, 1883.
1915. Spinning Collars, W. Jackson, Kingston-upon-Hull.—16th April, 1883.
2156. Electrical Measuring Instruments, W. E. Ayrton and J. Perry, London.—28th April, 1883.
2253. Galvanic Batteries, J. Lea, London.—3rd May, 1883.

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

5580, 6d.; 5647, 4d.; 5656, 2d.; 5669, 6d.; 5672, 6d.; 5674, 6d.; 5676, 2d.; 5679, 2d.; 5681, 2d.; 5682, 6d.; 5683, 6d.; 5688, 6d.; 5693, 6d.; 5698, 4d.; 5700, 2d.; 5703, 8d.; 5705, 2d.; 5706, 2d.; 5708, 4d.; 5710, 2d.; 5711, 4d; 5712, 6d.; 5713, 4d.; 5714, 4d.; 5718, 2d.; 5719, 2d.; 5720, 8d.; 5724, 6d.; 5725, 6d.; 5726, 4d.; 5727, 8d.; 5728, 6d.; 5729, 4d.; 5731, 6d.; 5732, 2d.; 5733, 6d.; 5735, 6d.; 5738, 2d.; 5739, 6d.; 5740, 8d.; 5749, 6d.; 5755, 4d.; 5765, 4d.; 5771, 6d.; 5793, 4d.; 5853, 6d.; 5911, 8d.; 5927, 4d.; 6070, 6d.; 1616, 10d.

*** 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.*

4824. Incandescent Lamps for Electric Lighting, *Emilius Muller, London.—11th October,* 1882.—(*Not proceeded with.*) 2d.

The inventor substitutes a bar of carbonised wood for the filaments at present in use, and connects it with the outer wires through sealed orifices on either side of the bulb, instead of connecting it through a special tube at the base of the lamp.

5400. Carbons for Use in Electric Lamps, *John Edward Tenison Woods, Peckham Rye.—13th November,* 1882.—(*Not proceeded with.*) 2d.

During the process of manufacture of the carbons, a wire of aluminium, magnesium, or other suitable metals having high conductivity and colourless flames is inserted in the centre of the carbon rods. The inventor claims that smaller carbons can be used in low tension arc lamps, and that the lines of least resistance will always be at the centre of the carbon points from which the arc will continually proceed.

5495. Improvements in Electric Arc Lamps, *William Buller Fullerton Elphinstone, Baron Elphinstone, Musselburgh, Charles Wilson Vincent, Holloway, and J. Cottrell, Brixton.* 6d.

The inventors' object is to simplify the regulations of arc lamps and to render the maintenance of a steady light independent of the feed of the carbons. This is effected by applying a bellows or pneumatic apparatus in combination with a solenoid as described, the same for maintaining the arc at a uniform level.

5504. Incandescent Electric Lamps, *A. Swan, Gateshead, Durham.—20th November,* 1882. 6d.

The improvement is stated to consist in passing a current through the terminal wire while the glass is being formed around it, and in the use of moulds for forming that portion of the glass through which the terminations pass.

5518. Distribution of Electricity by Underground Conductors,* *C. D. Abel, London.—20th November,* 1882.—(*A communication from L. A. Brasseur, Brussels.*) 6d.

The inventor divides the conductors into separate sections, connecting their ends in pillar or wall-boxes, the conductors being placed in conduits at the road level, with a perforated double bottom to protect them from moisture.

5556 Breech-loading Guns, *W. R. Lake, London.—22nd November,* 1882.—(*A communication from W. Gardner, Hartford, U.S.*) 6d.

This relates to the construction of the barrel, a cartridge receiver, the breech bolt, and a cartridge feeder.

5566. Exhausting Bulbs of Incandescent Lamps, *M. K. Cherrill, Paris.—22nd November,* 1882. 4d.

A gas is formed or placed within the bulb, excluding the air; then drawn out through a substance with which it combines. Ammoniacal gas in connection with phosphoric anhydride is used.

5599 Tricycles, &c., *H. J. Hissett, Plymouth.—24th November,* 1882. 6d.

The inventor claims the combination of a hollow shaft, enclosing both driving shafts, and carrying mechanism for connecting or actuating both shafts by balance gear, with clutches mounted on the said hollow shaft, capable of being connected with or disconnected from either, or disconnected from both of the wheels from which power is transmitted from the treadles.

5600 Water Heater, *E. Vermeiren, Brussels.—24th November,* 1882.—(*Not proceeded with.*) 2d.

A series of horizontal plates are arranged in a casing, and water caused to flow over them and become heated by the products of combustion, or other heating media caused to circulate between such plates.

5601. Secondary Batteries, *A. Tribe, Notting Hill.—24th November,* 1882. 4d.

This invention relates to a method for preparing the positive plates of secondary batteries.

5602. Uniting Sheets of Paper at the Edges to Form Tablets, Blocks, and Pads, *E. Bond, London.—24th November,* 1882.—(*A communication from W. Doughtie, Cleveland, U.S.*)—(*Not proceeded with.*) 2d.

This consists in applying to the edges of the sheets to be united to form a block or pad a composition consisting of glue, gelatine, glycerine, rice, flour, dextrine, acetic acid, brown sugar, extract sea onion, and aniline, heated and mixed together in proportion to form a plastic mass, which, when set, will bind the sheets together, and will yet allow them to be separated without tearing the paper.

5603. Mechanism Applicable to Machines for Treating and Manufacturing Fabrics, *J. Ashworth, Rochdale.—25th November,* 1882. 8d.

This relates, First, to improvements on selvage guiders, described in patents No. 615, A.D. 1881, and No. 3239, A.D. 1882, the object being to make the arrangements more perfect and capable of operating upon fabrics of different character and upon cloth having irregularities in its width, so as to require less attention. The guider is hinged on a vertical axis, and has a surface for the cloth to slide along, while another surface (hinged at that end of the guider where the cloth passes away) rests and presses upon the passing selvage of the cloth. Where the cloth enters is another small separate hinged surface to press upon the cloth. Several modifications are described. Secondly, to the use of pairs of coned rollers to act upon fabrics to bring the weft threads square with the selvages or to stretch fabrics.

5604. Benzol, Nitro-benzol, Nitro-toluol, and their Homologues, *S. Mellor, Patricroft.—25th November,* 1882. 4d.

This consists, First, in subjecting coal or other gas containing benzol, toluol, or their homologues, to a pressure of four or more atmospheres so as to mechanically separate the benzol, toluol, &c., therefrom; Secondly, the nitrifying of benzol, toluol, and their homologues by passing into them nitric acid direct from the still in which it is formed; Thirdly, the extraction of benzol and toluol as nitro-benzol and nitro-toluol from coal or other gas containing such compounds by melting it in a column or tower with strong nitric acid alone, or mixing it with other acid capable of assisting the reaction; Fourthly, the passing of the gas deprived of its benzol, &c., and containing traces of nitric acid, through milk of lime or other alkaline solutions, which removes the nitric acid from the gas, and the use of the washings so produced as a source from which nitric acid may be obtained for future operations.

5606. Taking Soundings, *F. Sutcliffe, Liverpool.—25th November,* 1882. 8d.

A line carrying a lead is wound in a groove formed on the periphery of a wheel, to the side of which a spiral wheel is attached, and on it a second line is wound and carried over supports through a block at the forward part of the vessel, and thence to the lead on the first line, so as to keep it from trailing astern. The wheel and its spiral attachments are so proportioned relatively to each other and to the base or horizontal distance from the lead to the leading block on the fore part of the vessel, that both lines remain taut and cause the lead to remain in the same horizontal position relative to the boats at all depths. One end of the axis of the first wheel has a sleeve bearing that can be revolved within its pedestal, and to it are attached two pointers, the longer to indicate the readings on the rim of the wheel and the shorter to mark the reading on a disc similarly divided to the wheel.

5607. Treating Mixed Solutions of Chloride of Copper and Sulphate of Soda, *W. Weldon, Burstow.—25th November,* 1882. 6d.

This consists in precipitating in the state of oxide, by means either of lime alone or of a mixture of lime and magnesia, the copper contained in mixed solutions of chloride of copper and chloride of sodium, which mixed solutions have been obtained by precipitating by means of calcium chloride the sulphuric acid of the sodium sulphate contained in mixed solution of sodium sulphate and chloride of copper.

5608. Looms, *G. Keighley, Burnley.—25th November,* 1882. 6d.

This relates, First, to the method of and apparatus for letting off the warp and taking up the woven material in a positive manner. The warp is let off by a surface roller, the warp being retarded sufficiently to prevent overrunning. The roller and the take-up roller are connected by gearing so that their relative speeds can be varied by change wheels, such variation being necessary on account of the difference between the length of the warp and the woven fabric caused by the introduction of the weft. The invention further relates to the construction of crank arms, so as to prevent the constant wear and tear of straps, gibs, and rollers, which are entirely abolished.

5609. Cutting up Sugar Cane and other Vegetable Stalks, *C. D. Abel, London.—25th November,* 1882.—(*A communication from A. Perret, France.*) 6d.

The apparatus consists of two revolving knives similar to those of a chaff-cutter, but formed in one piece and mounted on a shaft at the side of an inclined shoot, through which the cane is made to travel downwards, and at the front end of which is a metal plate having an opening through which the cane is protruded, and against which the cutters pass in close contact as they revolve, so as to cut the protruded cane with a shearing action, the cane being advanced through the opening by a step-by-step motion, so as to remain stationary while being cut.

5612. Stands or Frames for Bottles and Vessels, *C. Pembrook and J. Dingley, Birmingham.—25th November,* 1882.—(*Not proceeded with.*) 2d.

The bottles are supported in a frame capable of swinging in the stand, and can be locked in position when their stoppers are under the cross-bar at top, so as to prevent the bottles being taken out.

5613. Tip Vans or Wagons, *E. Hora, Camberwell-road.—25th November,* 1882.—(*Not proceeded with.*) 2d.

The body, when released from the stationary frame and pushed upwards, first turns on a pivot formed on one end of a lever, until the rear end comes in contact with the other end of such lever, when the lever, and with it the van body, turn round the rear axle on which the lever is pivotted. Means are provided for opening and closing the tailboard simultaneously with the tipping action of the body.

5614. Permanent Way or Roadway of Railways and Tramways, *W. T. Garnett, Bradford.—25th November,* 1882.—(*Not proceeded with.*) 2d.

The sleepers are preferably of wrought iron or steel, the plates being corrugated, and the bottoms of the chairs made to fit the corrugations. The chairs are fastened to the sleepers by bolts and nuts.

5615. Machinery for Making Paper Bags, *J. H. Johnson, London.—25th November,* 1882.—(*A communication from F. B. Bilon, Paris.*) 8d.

This relates to machinery for manufacturing satchel-buttoned paper bags. The paper is unwound from a roll, and after being printed upon, is pasted along one edge, cut and placed upon a mandril, the sides being folded over so as to form a tube, which is carried to a feeding device, which pushes it to the end of the mandril, when an upper and a lower folder are caused by cams and levers to move forward and form the upper and lower folds of the bottom. A paster supplies paste, and another pair of folders advance and form the side folds, which they press against the mandril. The bag thus formed passes to a creasing device, which flattens and delivers it between pressing rollers, which send it either to the drying apparatus or direct to the carrier of the packer. Various improvements in the mechanism employed for effecting the different operations are described.

5616. Apparatus for Exhausting, Lifting, Forcing, or Measuring Fluids, *H. S. Stewart, Westminster.—25th November,* 1882. 6d.

This relates to improvements on patent No. 2588, A.D. 1880; and it consists in so varying the velocity of the motion of the vanes that each of them, instead of being alternately stopped—as in the above-mentioned patent—is alternately caused to travel from the inlet to the outlet port in the same time as the other vane occupies in travelling from the outlet to the inlet port. A central shaft passes through a cylindrical case, and has vanes attached to it. To the part of the barrel of one vane, which projects through the end of the case, a crank arm is fixed, and a similar crank is attached to the spindle. Each crank has a pin at its end long enough to end a metal block, capable of sliding in a slotted bar at right angles to the driving shaft, on which is a pulley serving to transmit motion to the vanes. The main shaft is parallel, but excentrically to the axis of the case.

5618. Process of Fermenting Liquids, *N. Lubbock, London.—25th November,* 1882.—(*A communication from F. J. Seard, British Guiana.*) 4d.

The inventor claims, First, the application and employment of certain inorganic salts of ammonia by their addition to a fermentable liquid in order to promote the growth of the yeast or ferment; Secondly, the application and employment of nitric acid by its addition to a fermentable liquid in complete or partial substitution for another acid, in order to promote the growth of the yeast or ferment.

5620. Spindles for Spinning and Twisting Frames, &c., *D. Skeoch, Stewarton, N.B.—27th November,* 1882.—(*Not proceeded with.*) 2d.

The object is to ensure the efficient lubrication of spindles for spinning and twisting frames, and to render them less liable to wear and tear, as well as to remove dirt or foreign matter from the bearing parts. The spindles have top and bottom side bearings, and a footstep bearing at the lower end. The bearing parts are carried in a tube, at the upper end of which is a slit, and holes are formed at each bearing. The tube is enclosed in an outer tube containing the lubricant, and by which the spindles are secured to the rails.

5622. Tubular Steam Generators, *C. D. Abel, London.—27th November,* 1882.—(*A communication from L. C. Uhler, Paris*) 6d.

This relates to boilers in which the water is caused to circulate through a series of horizontal or inclined pipes, heated by the flames and hot gases of the furnace, and consists in causing the said water tubes to enter at one end a series of horizontal collecting tubes, which serve to connect together each row of water tubes, and which in turn communicate at one end with the vertical collecting tube, connected at its upper end with a cylindrical vessel, in which steam collects, and from which the water circulates through the water tubes and connecting tubes. Within the water tubes smaller loose tubes are placed, and serve to facilitate circulation, and to collect calcareous or other deposit. The upper part of the generator consists of three cylindrical vessels, one placed above the other two, and connected together by pipes. The furnace grate is formed of tubes, connected at each end with pipes connected to the upper water vessels.

5626. Metal Cisterns, *H. Sutcliffe, Halifax.—27th November,* 1882. 6d.

This relates to cisterns of sheet metal, the parts of which are soldered together, and many of which are divided by a partition, the object being to facilitate the soldering and form a better cistern by use of improved apparatus for folding and shaping the parts. Two metal blocks, of a form similar to the compartments, which rest upon a platform capable of being partially revolved, are employed, and a sheet of lead is then folded and the fold inserted between the blocks and held by wedging or closing the blocks, the other portion of the sheet being spread over the two blocks and pressed over them.

5627. Portable Railways, *H. A. Spalding, Prussia.—27th November,* 1882. 4d.

This consists of sections of portable railways composed of two rails with two sleepers at their ends or one sleeper and a cross-tie, with a joint which allows a universal adjustment of the sections, the end of each entering the incline or curved shaped mouth of the preceding one. A special clamp forms the joint.

5629. Bicycles, Tricycles, &c., *J. Hix, New Wandsworth.—27th November,* 1882.—(*Not proceeded with.*) 2d.

This relates, First, to the driving mechanism of bicycles by a system of levers fitted with treadles and connected by rods to the cranks; and Secondly, to the construction of the rims or felloes of wheels, the forks and backbones of velocipedes, a special section of wire for wheel spokes, and an improved spring.

5630. Piled Fabrics, &c., *J. Holt, Bolton.—27th November,* 1882. 6d.

This relates to pile fabrics with a long pile to form a ring, which when scoured and finished or dyed has the appearance of a skin rug. Two warps are wound upon separate beams, one for the ground and one for the pile, and they are each drawn into separate healds. The beam containing the pile warp has a letting-off motion, so that when turned a quantity of warp is let off and taken up by a falling rod working in a diagonal slide in a bracket on the frame. A certain number of picks of plain cloth are woven, both ground and pile being interwoven with the weft, when the loom is stopped and the pile warp only raised. The "slack" is taken up by the rod and a shred of the pile warp is lifted and drawn into loops.

5632. Surgical Truss, *E. Edwards, London.—27th November,* 1882.—(*A communication from P. C. B. Borlique, France*)—(*Not proceeded with.*) 2d.

A thin plate is hollowed and provided with a wood block padded with wool and covered with leather, such plate having a stem by which it is connected to one end of a belt to be buckled round the wearer. A second strap is attached to the back of the belt, and passing between the legs, is buckled in front to the lower edge of the pad.

5634 Toys, *H. H. Lake, London.—27th November,* 1882.—(*A communication from J. N. Gifford, jun., Massachusetts.*) 6d.

This relates to toys in which there is a target and a tethered ball for shooting the same, and it consists in the employment of a figure as the target, the arms being jointed and moving when the ball hits the figure.

5635 Shears for Cutting Paper, &c., *H. H. Lake, London.—27th November,* 1882.—(*A communication from G. S. van Pelt, New York.*) 4d.

This relates to shears for cutting two sides of a right angle simultaneously, and it consists in the combination of a hinged pair of blades having the usual cutting edges, and a second pair of cutting edges placed at the end of the blades at right angles to the usual cutting edges.

5636. Preventing the Flow of Sewer Gas into Buildings, *T. Carder, Bideford.—27th November,* 1882.—(*Not proceeded with.*) 2d.

A vessel has two or three cavities formed in it, one above the other, and divided by a wall, so that a double or triple seal is effected.

5637. Fret Saw Machines, *R. D. Sanders, Acton.—27th November,* 1882. 6d.

The vibrating arms for holding the saw are fixed to a block working on a fulcrum at one end of the table, one arm extending above and the other below such table at an angle to each other, such that their ends are further apart than the length of the saw, whereby when secured to the saw sufficient tension is put on the latter. The saw is fastened to spindles on the arms, which can be turned so as to direct the saw as desired. A spring between the table and top arm assists the upstroke. The top spindle to which the saw is secured can receive a drill so as to drill holes in the work.

5638. Cultivating Land by Steam or other Power, *W. Fisken, Stamfordham, and S. S. Robson, Sunderland.—27th November,* 1882. 6d.

This relates, First, to a tillage implement; and Secondly, to anchor windlasses used in connection therewith. The tillage implement frame consists of two vertical plates connected by cross bars, and at its lower front angle a flat bar is mounted loosely, so as to be capable of rocking, and carries a set of shares or cutting points. To this bar two or more levers are attached, and rise above the frame where they are connected together, and when actuated, raise or lower the shares. Coulters are placed in front of the lever bars, and are arranged to turn on their thick or heel side when actuated by a lever. Between the plates and behind the front cross bar is a shaping platform with its front end close to the share bar, and level with the back of the bar, and its rear end raised as high as the depth of soil operated on. The soil passes up the platform, and is acted upon by a rotating soil-breaker. In anchor windlasses the frame to hold the drums is hung in a frame of sufficient length to receive the main hauling drum and anchor forward hauling drum with the driving pinions, and deep enough to admit the thickness of the drums. In the frame a hole is formed in the lower and upper bar near one end, and through them a stud passes and stands upright from a plate or coulter, which cuts the soil and bears all the pull. The frame and its gearing turns on this stud, and allows the other end to swing round into the line of draught.

5639. Coupling and Uncoupling Railway Vehicles, *W. and L. Younghusband and T. Hudson, Darlington.—27th November,* 1882. 8d.

This relates to means for coupling and uncoupling from either side of railway vehicles, and it consists of a sliding carrier frame for the coupling chain, capable of being projected from the end of the vehicle, and of being raised or lowered to bring the end link over the hook of the draw-bar, such carrier frame being actuated by side levers.

5640. Producing Designs, &c., upon Glass, Metal, and other Surfaces, *A. M. Clark, London.—27th November,* 1882.—(*A communication from H. Beau, Paris.*)—(*Not proceeded with.*) 2d.

This consists in printing the desired designs upon unsized bank post paper, to which a colourless varnish is then applied and the paper stove dried, whereby the paper is rendered colourless, when it is secured to the glass to be decorated, and the designs appear as if engraved or printed directly on the glass.

5641. Stays or Corsets, *W. Rosenthal, London.—27th November,* 1882—(*A communication from H. Rosenthal, Germany.*) 6d.

The object is to enable the steels, whalebones, busks, or other stiffeners to be readily removed and renewed, and consists in inserting them in pockets formed in the stays, and the ends of which are closed in any convenient manner.

5642. Forks or Tongs, chiefly for Domestic Purposes, *H. J. Allison, London.—28th November,* 1882.—(*A communication from R. W. Turner, Boston, U.S.*) 6d.

A pair of forked jaws are pivotted to a tube, within which is a rod capable of sliding therein when pushed down by a head at top, and the lower end of which is connected by links to the jaws so as to cause them to open, a spring being arranged to act upon the rod so as to close the jaws and grasp any desired article when the rod is released.

5643. Mashing Apparatus, *J. A. L. and W. V. Biden, Gosport.—28th November,* 1882.—(*A communication from N. Pigeon, New York.*) 6d.

The object is to so construct mashing apparatus as to have a perfect control over the temperature of the mash; and it consists of a vessel in which an agitator is caused to revolve, and which is supported within an outer vessel, to which steam or hot or cold water can be admitted as desired.

5646. Fire Lighters, *F. K. de Stasicki, London.—28th November,* 1882.—(*A communication from F. A. Christ and J. Weiler, Vienna.*)—(*Not proceeded with.*) 2d.

The fire-lighter consists of three pieces of wood, which are made into a bundle and dipped into an inflammable mixture of oil, paraffine, asphalte, pitch, or other suitable substance.

5647. Machines for Moulding or Shaping Clay or Earthenware Cans, Jars, &c., *W. Crawford, Glasgow.—28th November,* 1882.—(*Not proceeded with.*) 4d.

This relates to improvements in the general construction of the apparatus.

5648. Drawing, Annealing, and Pickling Wire, &c., *H. Roberts, Pittsburgh, U.S.—28th November,* 1882. 10d.

This relates, First, to the means for engaging the drum with the driving wheel in the drawing operation, and consists in commencing the motion of the drum by friction and afterwards engaging directly abutting surfaces. The wheel is horizontal, and has one long recess curved to conform to the motion of the wheel and extending round a considerable arc, shallow at the forward end and deep at the rear end. The lower face of the drum has a projection, correspondingly wedge-shaped, and which causes the drum to tilt and bind on the shaft. When the revolution of the wheel brings the recess under the projection the drum sinks further and engages; Secondly, to making annular annealing pots of cast iron with an exterior top flange, and two interior lugs with which a lifting device engages. The wire is placed in the pots and covered with sand, and the pots piled one upon the other in heated pits; Thirdly, in providing a number of wood reels adapted to stand on end and receive the bundles of wire for pickling. The lower part of each reel is fitted with removable pins, which, when the reel is placed in a stand, are removed. The invention further relates to feeding a number of wires through a coating bath, at the same time such wires being kept slack to allow time to the attendant to correct entanglement or obstructions, to the use of rollers for agitating asbestos used to wipe off surplus metal, and to the use of slag wool for wiping off surplus metal.

5649. Zinc Coated Wire, &c., *H. Roberts, Pittsburg, U.S.—28th November,* 1882. 8d.

This relates, First, to means for holding and transportation of wire which is formed in coils and placed in a hollow cylinder open at both ends, and having a series of pins inserted diametrically in bosses formed at the lower end. In annealing the open cylinder allows the frame to circulate through and heat the coils of wire from both inside and outside; Secondly, to cleaning surfaces before immersion in melted zinc by passing wires through a proper acid and containing a quantity of gravel or small stone, after which it is passed through a heated space to raise it to near the temperature of the melted zinc. The invention further relates to the use of rollers for agitating loose substance employed for removing surplus metal from coated wires, and to the use of steel or other scrapers for removing surplus metal from coated wires.

5650. Chairs, *H. J. Haddan, Kensington.—28th November,* 1882.—(*A communication from E. Schmidt, Leipzig.*)—(*Not proceeded with.*) 2d.

This relates to chairs in which the seat is raised and lowered by turning, and consists in connecting the seat with a disc placed between the legs and provided with an external screw thread, while the legs carry inclined teeth or parts of a screw, between which the thread of the disc fits.

5651. Composition to be used as a Remedy for Whooping Cough, *P. F. Vandersteenstraaten, London.—28th November,* 1882. 2d.

This relates to a composition to be rubbed on the chest, and consists of 35 per cent. turpentine, 25 per cent. oil of tallow, and 40 per cent. camomile oil, or in lieu of the latter 25 per cent. of camomile oil, and 15 per cent. of poppy or croton oil.

5652. Fastening together the Ends or Parts of Straps or Belts, *H. Tetlow and J. Holding, Lancaster.—28th November,* 1882.—(*Not proceeded with.*) 2d.

Plates of untanned hide are attached to the ends to be connected by screws, holes being drilled in the plates to receive the screws, and preferably, recesses formed in the underside of the plates, so that the ends of the strap will be drawn into such recesses.

5653. Loom Pickers, *H. Tetlow and J. Holding, Lancaster.—28th November,* 1882. 6d.

The object is to lessen the shock when the shuttle is struck by the picker, and it consists in providing the latter with a yield spring buffer against which the shuttle tip strikes.

5656. Steam Boiler with Rapid Circulation, *H. Matheson, Barnes.—28th November,* 1882.—(*Void.*) 2d.

The object is the construction or arrangement of steam boilers in which water can be heated in small quantities at the parts most in contact with the fire, and as steam is generated the water rises up short internal tubes, whose upper ends are above the water level, and from thence it falls into the volume of water, whereby a rapid circulation is readily effected with a free escape of steam therefrom.

5657. Heel-paring Machines for Boots and Shoes, *F. Cutlan, Leicester.—28th November,* 1882. 6d.

This relates to improvements on patent No. 5318, A.D. 1880, and consists in substituting for the roller on the knife stock spindle a clip or hooked bar to clasp the back of the boot a little above the heel, and protect the upper leather from injury by the friction of the knife stock. The knife is fixed to a loose piece hinged to the knife stock. An arrangement for driving the machine by steam power is also described.

5658. Securing Buttons upon Leather or other Material, *W. R. Lake, London—28th November,* 1882.—(*A communication from J. Mathison, Massachusetts.*) 10d.

This relates to a machine for securing a series of buttons by a continuous thread, in such manner that each one is independently attached. The buttons are secured by drawing a primary loop of thread through the material on which the buttons are to be fixed, and also through the eye of the button, then drawing a secondary loop through the material and through the primary loop outside the eye of the button, tightening the primary loop, and finally passing the secondary loop over the button and tightening the said loop, thereby interlocking both loops and forming a square knot, one loop or bight of which passes through, and the other around the eye of the button. The invention consists in the general construction of a machine for effecting such sewing on of the buttons.

5659. ORNAMENTAL SHEARING OF PILED FABRICS AND APPARATUS FOR THAT PURPOSE, *C. D. Abel, London.—28th November*, 1882.—(*A communication from E. de Montagnac et Fils, Paris.*) 6*d*.
This consists in applying perforated plates to fabrics to be acted upon by a shearing machine, and combining their movement with that of the fabric, so as to produce novel ornamental effects.

5660. APPARATUS FOR UTILISING CARBONIC ACID GAS AS A MOTOR, *W. R. Lake, London.—28th November*, 1882.—(*A communication from A. Gateau, Chicago.*)—(*Not proceeded with.*) 2*d*.
The generator consists of a shell containing tubes in which smaller tubes are secured, so as to form annular independent spaces for generating the gas, communicating with chambers in combination with a central passage, by which, the tubes, and enclosing shell, a double return passage is formed for the hot air. A cylinder has a central part attached to a casing, and the ends provided with liquid chambers secured to the central part. A condenser consists of a casing containing separate horizontal coils one above the other, and having a common vertical connection with the exhaust passage from the motor cylinder.

5661. AUTOMATICALLY WINDING UP CLOCKWORK, *W. R. Lake, London.—28th November*, 1882.—(*A communication from N. Silberberg, Roumania.*) 6*d*.
The object is to effect the re-winding of clocks by means of the variations in length of metal bars during changes in temperature. A set of zinc bars are connected together by pivotted levers, so as to form a chain, one end of which is secured to a fixed point in the clock case, while the other is connected to the winding mechanism.

5662. RAISING AND LOWERING RAILWAY AND OTHER CARRIAGE WINDOWS, *E. Clennett, West Hartlepool.—28th November*, 1882. 4*d*.
This relates to the use of a coiled spring in a box, which acts as a pulley, round which a cord passes, and is secured to the bottom of the window sash. When the sash is pushed down the spring is coiled and the window retained in position by a catch. On releasing the catch the spring raises the sash.

5663. APPARATUS FOR COMMUNICATING BETWEEN PASSENGERS, GUARD, AND ENGINE-DRIVER OF RAILWAY TRAINS, *W. Sharpe, near Brighouse.—28th November*, 1882. 4*d*.
A lamp with glasses on two or more sides is attached to the roof or other part of the carriage, and enclosed in a box with folding doors or flap sides. Cords are connected with the box to the guard's van and engine, such cords also communicating with the different compartments of the carriages. When the cord is pulled the lamp-box is raised or the doors opened, so as to expose the lamp.

5664. SUGAR CANE SHREDDERS, *J. H. Johnson, London.—28th November*, 1882.—(*A communication from J. Parker, New York.*) 6*d*.
The main feature of the invention consists of two drums, each having rows of teeth, one drum, which revolves slowly, serving to feed the stalks in limited quantities to the other toothed drum, which shatters the stalks and reduces them to shreds.

5665. MANUFACTURE OF TWISTED RIBS FOR GUN BARRELS, *W. James, Birmingham.—28th November*, 1882. 6*d*.
This consists in making the ribs by taking bars of iron having, by preference, a cylindrical figure, twisting the said cylindrical bars so as to give the desired twisted structure or texture to the said bars, and rolling the said twisted bars into gun-barrel ribs.

5666. LETTER BALANCES, *W. Hiscock, Soho.—28th November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to indicate the weight of parcels and the corresponding postage they will require by separate index hands moving over different dials.

5667. TOOLS FOR CUTTING AND REDUCING TUBES, &c., *S. Goodby, sen., Wolverhampton.—29th November*, 1882 6*d*.
The chief object is to construct tools for this purpose so that they may be carried in and operated by the ordinary stock used for screwing tackle, but also refers to the construction of adjustable cutting tools for reducing the diameters of tubes, and adjustable tools capable of fitting the heads of two or more sizes of screwing taps, whereby to hold and operate such taps. The ordinary rotary tube-cutting tool is carried in a block shaped at the sides like a screwing die, so as to fit within the stock. A block with a V cut out of its face towards the cutting tool, and its sides shaped as a screwing die, is also placed within the stock. The tools for reducing the diameter of tubes fit the stock, and each has a concave curved face with cutting teeth across it. The tools to hold and operate taps for screwing tube sockets consist of two V'd blocks with sides shaped to fit in the stock, and are adjustable by means of the screwed handle of the stock, like the other tools.

5668. MECHANISM CONNECTED WITH LOOMS FOR WEAVING, *J. F. Brown, Glasgow.—29th November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to looms with several shuttles which are regulated by metallic or other cards, the object being to facilitate the throwing in and out of the shuttles in the case of complicated patterns. Upon each card several rows of holes are formed instead of one or two rows only, and each row forms part of a different series giving a certain rotation in the order of the shuttles. The fingers or pointer for regulating the shuttle boxes are so mounted and pivotted that their ends are enabled to be directed to one row or other of the holes in the cards, so as to select the holes of a particular series. The elevation or depression of the pointing ends of the fingers is effected by a jacquard actuating a wiper or cam attachment bearing against the under side of the fingers.

5670. DIVIDING AND MOULDING OR TREATING DOUGH TO FORM LOAVES, *J. Melvin, Glasgow.—29th November*, 1882. 6*d*.
One form of apparatus is designed for dividing one mass of dough to form two loaves, and for rolling, working, or moulding the same; but the apparatus may be modified to divide and form a mass of dough into more than two loaves. A rotating drum with a concave circumference is fixed on a horizontal shaft, and works in combination with a fixed casing or channel piece extending about two-thirds round the drum. A channel of oval section is thus formed, gradually narrowing towards the exit end. The dough enters the wide end, and is carried round by the drum which works and rolls it. A rotating disc knife divides the dough, and the parts each pass down a channel formed between a second drum and two fixed channel pieces, and is finally delivered in a rounded oblong form suitable for baking.

5672. REGULATING APPARATUS FOR STEAM ENGINES, *A. Budenberg, Manchester.—29th November*, 1882.—(*A communication from C. F. Budenberg, Buckau, Magdeburg.*) 6*d*.
This consists in the application of an oscillating rotary valve opening in both directions, and whose spindle is only subject to the friction arising from its turning in its stuffing box, said valve resting against a footstep which receives the variable steam pressure on the area of the stuffing box. Also in the application of a pallet or trip gear moving over an arc or sector of a circle, and whose pallets or disengaging levers move in a plane perpendicular to that in which the spindle or other controlling organ of the governor moves, so that the latter has only to overcome the smaller component of the resistance of the pallets.

5674. MACHINERY FOR GLAZING OR BURNISHING PAPER, &c., *S. Wells, Canonbury.—29th November*, 1882. 6*d*.
This relates to arrangements whereby the glazing or burnishing materials are caused to move to and fro longitudinally over the surface of the web of paper or other fabric as the same is moved longitudinally between the bearing table or roll and the said glazing or burnishing materials.

5675. MOWING AND REAPING MACHINES, *R. Davison and F. H. Hallard, Lancaster.—29th November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is, First, to obtain an instantaneous grip as soon as the machine starts, so as to ensure that the knife starts simultaneously with the machine, and it consists in the use of a wheel with a series of curved inclines on its periphery, and which is keyed to the driving shaft and works inside a box attached to the land wheel; in each incline is a loose roller, which, when the machine goes forward, runs up the incline and becomes wedged; and, Secondly, to enable a right or left-hand cutter bar to be used in the same machine, the crank shaft is arranged between the land wheels, and a platform arranged with sockets to receive the pole on either side of the crank shaft.

5676. CAPSTANS AND OTHER HAULING MACHINERY, *J. Downs, Kingston-upon-Hull. — 29th November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to the construction of the capstan, in which there are no projections to come in the way of anything, and there is no gearing outside.

5678. APPLIANCES FOR FEEDING CALVES, &c., *J. R. Hudson, Derbyshire.—29th November*, 1882.—(*Not proceeded with.*) 2*d*.
A waterproof air-tight bag is used to contain a liquid or semi-liquid food, and is suspended from a frame with a movable lid and having by preference an outer bag provided with a teat, the object being to keep the food warm and to provide a feeding apparatus resembling nature.

5679. CONSTRUCTION OF SHIPS OF WAR, *J. D. Barker, Easton in Gordano, Somerset.—29th November*, 1882.—(*Void.*) 2*d*.
The object is to obtain increased protection against the attack of torpedoes.

5680. STEPS OF FLIGHTS OF STAIRS, *H. Doulton, Lambeth.—29th November*, 1882. 4*d*.
This consists in forming the steps of terra-cotta with a tread of hard vitrified stoneware.

5681. MACHINES FOR BEVELLING CARDS, BOOK COVERS, &c., *J. D. Weiste, London.—29th November*, 1882.—(*A communication from A. Fomm, Leipzic.*)—(*Not proceeded with.*) 2*d*.
This relates to the arrangement for introducing the cards quickly and accurately.

5682. SCREENS FOR SCREENING CORN, &c., *R. Boby and T. Stevens, Bury St. Edmunds.—29th November*, 1882. 6*d*.
This consists, First, in the application to corn screens of a detachable grid and clearers; Secondly, in the application to corn screens provided with a removable grid and travelling clearers of a riddle.

5683. APPARATUS FOR RECEIVING MONEY AND FOR CHECKING AND RECORDING THE RECEIPT THEREOF, &c., *H. T. Davis, Newington.—29th November*, 1882. 6*d*.
This consists in the construction and arrangement of parts in one machine opening to receive the fare, to actuate the count or indicator mechanism, to display a value figure, to pass the money received and convey the same to a closed money bag or receptacle, to grip and project a serially numbered ticket to and from the outside shears of the machine, to ring the bell alarm and to grip the ticket riband readily for the shearing off of the ticket already projected, and prevent the return of the riband into the machine upon the apparatus resuming its normal position.

5684. FIXING SWORDS AND OTHER SIDE ARMS IN THE SHEATH, *P. Jensen, London.—29th November*, 1882.—(*A communication from A. Coppel, Germany.*)—(*Not proceeded with.*) 2*d*.
This consists in fitting the blade of the sword with a spring catch which takes under a projection on the sheath and has to be depressed before the sword can be drawn.

5687. HARROWS, *J. Howard and E. T. Bousfield, Bedford.—29th November*, 1882. 6*d*.
This relates to improvements on patent No. 2699, A.D. 1882, in which the tines are made separately and connected to the frame by transverse bars; and the present invention consists in forming the tines and cross bars in one piece and using them as transverse connections of the longitudinal bars.

5688. SCREENS FOR SEPARATING AND CLEANING GRAIN, &c., *H. S. Coleman and A. G. E. Morton, Chelmsford, and T. F. Stidolph, Woodbridge.—29th November*, 1882. 6*d*.
This relates to improvements in screens having a reciprocal or vibratory action for separating skin kernels from the best corn, and also for cleaning grain and for other purposes. It consists in constructing such screens with a series of screening beds or surfaces made of parallel wires of triangular or other suitable section, or otherwise constructed and arranged stepwise in a frame which has a considerable slope, whilst the screening surfaces or beds themselves are nearly

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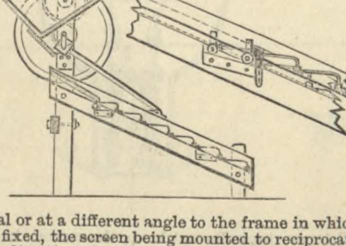

horizontal or at a different angle to the frame in which they are fixed, the screen being mounted to reciprocate in such a direction that the screening beds or surfaces move each in its own plane. It further consists in intersecting the channels or grooves of the screening being with circular openings to allow seeds of the same diameter as the grain to pass through, while the grain itself being of a greater length than the diameter of the said openings, will slide along the grooves or channels to the delivery point.

5689. COUPLINGS FOR RAILWAY WAGONS, &c., *C. Roberts, Wakefield.—29th November*, 1882. 6*d*.
The object is to provide an efficient coupling, combining a spring draw-bar and a spring buffer, and it consists in forming a hook on the top side of the buffer stem and a pivotted link on the buffer at the other end of the wagon to take over the hook formed on the buffer of the next wagon.

5690. TRAMWAYS, *H. H. M. Smith, London.—29th November*, 1882.—(*A communication from A. S. Hallidie, San Francisco.*) 4*d*.
The object is to provide rails which can be readily removed for renewal or reversal, and it consists in forming them in two longitudinal parts resting upon chairs. Wedges are dropped between the two parts, so as to press them outwards against the chair and leave a groove between them. The wedges can be forced up from below to release the rail.

5692. COLOURING MATTERS, *J. Levinstein, Manchester.—30th November*, 1882 2*d*
This consists in the production of yellow colouring matters by the action of nitric acid on the mono or disulpho acid of alpha, nitroso, naphthol, or other mixtures of these two acids.

5696. COLOURING MATTERS, *J. Imray, London.—30th November*, 1882.—(*A communication from La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, and Messrs. Roussin and Rosenstiehl, Paris.*) 2*d*.
This consists in the manufacture of improved colouring matters by direct addition of bromine to nitrogenous sulphonic colouring matters.

5697. MOULDS USED IN CASTING PIPES AND CYLINDERS, *J. and F. Chambers, Derbyshire.—30th November*, 1882. 6*d*.
This relates to the production of moulds for giving the external form to pipes and cylinders, and it consists of an ordinary box through which a pattern forming a portion of the length to be moulded is drawn by means of a small stem acted upon by a crane or other drawing means, and in passing through the box compresses the moulding sand.

5698. DYEING ANILINE COLOURS, *L. Heppenstall, jun., near Huddersfield.—30th November*, 1882. 4*d*.
This consists in the application in addition to the dyeing ingredient, of alum, red argol, or fustic, used either separately or combined, for the purpose of fastening or fixing the said colours upon animal fibre.

5699. ADJUSTABLE SORTING OR SEPARATING SIEVE, *G. W. von Nawrocki, Berlin.—30th November*, 1882.—(*A communication from L. Hirschfeldt, Germany.*) 4*d*.
Beneath an obliquely placed frame open in the middle a set of rods forming the sieve are jointed to bars hinged in the middle by pins which slide in slots parallel to the rods, while the other ends of the bars slide in slots at right angles to the former slots.

5700. APPARATUS TO BE USED IN CONNECTION WITH GAS ENGINES TO PREVENT FLUCTUATION OF THE GAS IN THE MAINS, &c., *C. G. Beechey, Liverpool.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
This consists in introducing a controlling or regulating apparatus between the reservoir or gasholder and the gas main or supply pipe.

5701. LOCKING OR SECURING NUTS ON BOLTS, *S. Watkins, Wolverhampton.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
A groove is formed in the bolt and contains a spring which engages with grooves formed across the thread in the nut.

5703. SEWING MACHINES, *M. Gandy, Liverpool.—30th November*, 1882. 8*d*.
This relates to sewing machines in which shuttles, hooks, or loopers are employed, and to the means of operating the shuttle, or hook, or looper with reference to the needle, which means consist in arresting the motion of the shuttle, or hook, or looper at the stage of its cycle of operation when its point enters the loop of the needle thread, and of holding it in that position until the needle is clear of the fabric, the shuttle, or hook, or looper then resuming its motion, distending, passing through the loop, and drawing down the thread.

5705. MODERATOR LAMPS, *G. E. Ménage, London.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to provide for the use of mineral oils in moderator lamps.

5706. BRAKE APPARATUS FOR THE SPINDLES OF YARN OR THREAD-WINDING FRAMES, *B. M. Knox, Kilbirnie, N.B.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to brake apparatus to be applied to the bobbin spindles of yarn or thread-winding frames or machines, in combination with what are known as stop motions for preventing the breaking of the thread in winding, or for stopping the spindles when the thread is broken.

5707. WHEELS FOR PERAMBULATORS, *J. Simpson and S. T. Fawcett, Leeds.—30th November*, 1882. 6*d*.
The nave is of wood and the spokes of wood, and they are attached to a hollow metal rim by means of metal chairs, the rim being hollowed to receive a rubber tire.

5708. MANUFACTURE OF PAPER PULP, MILLBOARD, &c., FROM PEAT MOSS, *P. Jensen, London.—30th November*, 1882.—(*A communication from Tallahofs Pappersbruks Aktiebolag, Yönköping, Sweden.*) 4*d*.
This relates to the general treatment of the peat moss for the purpose of making millboard, &c.

5709. FASTENING DEVICES FOR BUTTONS, &c., *A. J. Boult, London.—30th November*, 1882.—(*A communication from J. Weidenmann and C. de Quillfeldt, New York.*) 6*d*.
The button is provided with curved teeth attached to levers operated from the upper side of the button, the teeth passing through holes in the button and being adapted to pass through the fabric and secure the buttons in position.

5710. LOCKING LEVERS FOR THE PREVENTION OF THE ACCIDENTAL DISCHARGE OF FIRE-ARMS, *J. Needham, Hammersmith.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
According to one arrangement this consists in attaching to the trigger pin a bent lever, so arranged that the one end of it projects upwards in front of the trigger and prevents the pull of the trigger until the locking lever is released, the fore end of the locking lever being in connection with the hammer.

5712. CONSTRUCTION OF DREDGING APPARATUS, *G. E. Vaughan, London.—30th November*, 1882.—(*A communication from S. Meinesz, Brussels.*) 6*d*.
The invention consists of a dredging apparatus composed of a series of steel blades arranged to work on the bottom of a river or of the sea.

5713. DISTILLATION OF COAL, *W. J. Cooper, Westminster.—30th November*, 1882. 4*d*.
This consists in the admixture and use of lime in the form of quicklime, or of carbonate of lime (or chalk) or of spent lime, or of mixtures of any two or more of them with coal.

5714. MANUFACTURE OF LUMINOUS PAPER, *W. C. Horne, Old Charlton.—30th November*, 1882. 4*d*.
The inventor uses what is known to chemists as sulphide of calcium, taking care that it is of a quality that will, after exposure to light, remain (as seen in a dark place) luminous for a considerable time.

5717. DISTILLATION OF COAL, &c., *G. E. Davis, Manchester.—30th November*, 1882. 4*d*.
The inventor claims, First, the method of collecting benzol from the gaseous portion of the products of distillation of coal by cooling them in a freezing machine or air cooler, and afterwards bringing them in contact with a heavy hydrocarbon; Secondly, producing sulphate of ammonia by the combination of sulphurous acid and ammonia or its carbonate, with subsequent oxidation by the employment of a series of two or more towers; Thirdly, the process for the treatment of waste liquors or solid substances produced in any of the processes to which the invention is applicable containing sulpho and other cyanides or nitrogen bases, in which they are heated with lime or soda lime to a temperature of about redness.

5718. COMBINED PRINTING OR ENDORSING STAMP, INKING PAD, PENCIL, PENHOLDER, PENKNIFE, &c., *G. K. Cooke, Paris.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.
The object is to make the article in such a manner that when closed it will form a straight case or holder, which will have only those projections which are absolutely necessary when it is opened and ready to be used.

5720. MACHINERY FOR MAKING RAILWAY SLEEPERS, &c., *J. C. Bunten and A. Russell, Glasgow.—1st December*, 1882. 8*d*.
This relates to the arranging or combining together of the parts of machines for simultaneously operating vertical and horizontal punches in making railway sleepers and other articles.

5719. NICKEL PLATING AFTER ENGRAVING ON ROLLERS, *D. Appleton and G. W. Horsfield, Manchester.—1st December*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to the depositing of nickel metal upon copper and other metal rollers after they have been engraved, so as to make them more durable.

5724. CLIPS AND WASHERS USED FOR RAILWAY FASTENERS, *E. G. Sheward, Richmond, and W. E. Jones, London.—1st December*, 1882. 6*d*.
The drawing shows a rail to be held down to the sleeper by means of the improved clip. A is the rail, B the wood sleeper, C C[1] the clips, and D D the bolts or screws holding down the clips to the sleeper; *a a* are knive-edges running along two sides of each clip,

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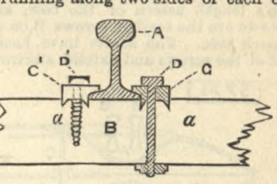


on the bottom thereof as shown. These knife-edges are tightened into the wood of the sleeper as the clips are fastened down by means of the bolts, and thus offer great resistance against any lateral movement of the rail, and materially assist, therefore, in the maintenance of a true gauge.

5725. TUBE STOPPERS, *D. J. Morgan, Cardiff.—1st December*, 1882. 6*d*.
This relates to the combination with the known device of a washer expanding tube stopper, of an internal rod or tube, keying on a bridged nut at the end of the tube remote from the operator.

5726. APPARATUS FOR "WINNING" COAL OR ROCK BY HYDRAULIC OR ATMOSPHERIC PRESSURE, *E. Warre and T. W. Salmon, Eton.—1st December*, 1882. 4*d*.
The object is an improved apparatus to be inserted into a tamp hole or into a fissure of coal or rock, in order to win or get the coal or rock by the expansion of an envelope or expansible casing of the apparatus under the influence or action of liquid or air forced into it by a pump.

5727. APPARATUS FOR TRANSFERRING, RAISING, LOWERING, AND TILTING RAILWAY WAGONS, &c., *G. Taylor, Penarth.—1st December*. 1882. 8*d*.
This consists in the combined employment of portable staiths, portable turntable, and carriers forming a complete system of apparatus for use in connection with suitable railways for enabling railway wagons to be discharged at variable points along a dock, quay, or wharf for loading vessels.

5728. PLOUGHS, *H. J. Haddan, Kensington.—1st December*, 1882.—(*A communication from F. W. Unterilp, Dusseldorf.*) 6*d*.
This relates to ploughs having several shares, and has for its object to render the plough capable of turning the earth at will, either to the right or the left side.

5729. STEAM FIRE ENGINES, *G. Witte, Berlin.—1st December*, 1882. 4*d*.
The inventor claims the introduction of liquid carbonic acid into the boiler of steam fire engines, simultaneously with the heating of the boiler.

5731. ACTION FOR PIANOFORTES, *T. C. Dauncey, Stroud.—1st December*, 1882. 6*d*.
The object is to do away with the friction of the pianoforte action

5732. COMBINED EQUILIBRIUM AND STOP VALVE, *P. Gibbons and A. S. F. Robinson, Wantage.—1st December*, 1882.—(*Not proceeded with.*) 2*d*.
The object is, First, to maintain the most perfect equilibrium; and, Secondly, to prevent the stop valve from becoming leaky and defective.

5733. STYLOGRAPHIC FOUNTAIN PENS, *M. H. Kerner, New York.—1st December*, 1882. 6*d*.
The special features consist in attaching the longitudinally-moving needle rigidly to the tubular air duct, and in supporting the latter within the hollow handle or barrel of the pen by means of an elastic yielding washer or diaphragm applied to the upper extremity of the tubular handle, whereby it serves both to close the ink reservoir and to permit the necessary longitudinal movement to and fro of the air tube and needle.

5734. METALLIC ALLOYS OR COMPOUNDS, *G. A. Dick, London.—1st December*, 1882. 4*d*.
This consists in adding to alloys of copper and zinc a quantity of manganese copper, or a certain quantity of manganese copper and phosphuret of copper.

5735. METHOD OF AND APPARATUS FOR THE GENERATION AND AUGMENTATION OF POWER FOR MANUFACTURING PURPOSES, *S. Broadbent and S. Broadbent, jun., Tong, Yorks.—1st December*, 1882. 6*d*.
The object is the construction of an apparatus for the utilisation of power contained in steam, compressed air, or water, and this object is attained by constructing a wheel the periphery of which is fitted with a series of teeth, and in combination with the wheel is one or more valves which admit and cut off the pressure to and from the teeth.

5738. POTTERY KILN, *J. Broadhurst, Fenton.—1st December*, 1882.—(*Not proceeded with.*) 2*d*.
This relates to improvements in the general construction of the kiln.

5739. MANUFACTURE OF BOOTS AND SHOES, &c., *H. E. Randall, Northampton.—1st December*, 1882. 6*d*.
This relates to the mode of attaching india-rubber soles to the leather.

5740. APPLIANCES FOR EFFECTING ROPE ATTACHMENTS, &c., *C. M. E. Kortüm, Wolverhampton.—1st December*, 1882. 8*d*.
The object is to provide means and appliances for fixing hooks, eyes, screw junctions, and other attachments to the ends and other parts of ropes.

5743. WIND MOTORS, *A. M. Clark, London.—1st December*, 1882.—(*A communication from A. Dumont, Paris.*) 1*s*. 2*d*.
This relates to a wind motor with curved vanes or blades automatically presented to the direction of the wind, with or without a director vane, and self governing as regards speed, so that the motor can be safely left unattended, and will work equally well in violent tempests as in light winds The invention consists in the special form given to the vanes; in a counterpoised pivotted frame to enable the mill to adjust itself to the wind without the aid of a directing vane; and in a special vane or rudder whereby position and speed are adjusted and regulated.

5745. FIRE-ESCAPES, *H. J. Allison, London.—2nd December*, 1882.—(*A communication from D. A. Burr, New York.*) 8*d*.
This relates to the employment of a series of ladders, one for each storey.

5749. MANUFACTURE OF CHAINS, COLLARS OR NECKLACES, &c., *W. E. Gedge, London.—2nd December*, 1882.—(*A communication from E. Armelin, Angouleme, France.*) 6*d*.
The characteristic of the invention is particularly in the opening of the terminal ring of the parts or elements.

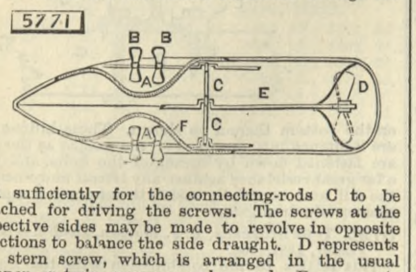
5755. FENCING, *G. Greig, Edinburgh, and J. Leck, Brora.—2nd December*, 1882. 4*d*.
The inventors claim the means of securing the wires to the droppers, standards, or uprights, consisting in the employment of sliders with inclined tongues retaining the wires in recesses in the edges of the uprights.

5765. TREATMENT OF SUBSTANCES CONTAINING MIXED ANIMAL AND VEGETABLE MATTER TO SEPARATE THE SAME AND TO PRODUCE VEGETABLE FIBRE FOR THE MANUFACTURE OF PAPER, &c., *W. C. Clennell, London.—4th December*, 1882.—(*A communication from C. A. Sanceau, Versailles.*) 4*d*.
The inventor claims a method for the separation of

animal from vegetable fibres contained in materials of any shape or form without the use of chemicals or any agent other than steam superheated or not, and obtaining thereby an insoluble powder which can easily be rendered soluble or directly a powder soluble in water, either powder being available for manure or other purposes, and an uninjured vegetable fibre adapted to any of the purposes for which vegetable fibre is used.

5771. SCREW PROPULSION OF VESSELS, *A. M. Clark, London.—4th December, 1882.—(A communication from J. Gartner, Dallas, U.S.)* 6d.

The vessel is formed at each side of its hull with a recess A located from one quarter to one third of the ship's length astern of the bow, and within these recesses are the tandem screws B on a single shaft F at each side. The shafts have bearings upon each side of the screws and extend sternward through the



hull sufficiently for the connecting-rods C to be attached for driving the screws. The screws at the respective sides may be made to revolve in opposite directions to balance the side draught. D represents the stern screw, which is arranged in the usual manner, or twin screws may be used. E represents the ordinary propeller shaft.

5793. MATTRESSES, *S. K. Ibbetson, Southsea.—5th December, 1882.* 4d.

The inventor claims the combination of adjustable and tensible mattresses with a steel or tensible under frame.

5795. SASH FASTENINGS, *J. Whitehouse and S. Peacock, Birmingham.—5th December, 1882.* 6d.

A flat bolt slides in a case on one sash, and takes into a staple on the other sash, the bolt having no spring, and being operated by a lever or arm fitted with an excentric pin engaging with a slot in the bolt, and the end of the lever being formed with a hook to engage with a headed stud on top of the staple that receives the bolt.

5798. REFRIGERATING MACHINERY, AND PUMPS AND CONDENSERS THEREFOR, *W. H. Wood and G. Richmond, New York.—5th December, 1882.—(Complete.)* 10d.

This relates to that class of ice machines or refrigerating machines in which cold is generated by the process of vaporisation of ammonia, ether, benzole, &c., which, in assuming the vaporous form, change sensible heat to latent, extracting it from the objects most convenient thereto, such as water or brine.

5805. WHEELS FOR RAILWAY PURPOSES, *W. R. Lake, London.—5th December, 1882.—(A communication from F. S. Smith, Cleveland, U.S.)—(Complete.)* 4d.

This relates to wheels in which the tire and central portion are in separate parts firmly connected together. The tire has an inwardly projecting flange, which fits into a recess in one side of the central plate at its periphery, while the opposite side of the plate is united to the edge of the tire by a tongue and groove lock, the tire and plate being also secured by bolts passing through the plate and the flange of the tire.

5815. STEAM BOILER AND OTHER FURNACES, *O. D. Orvis, New York.—6th December, 1882.* 6d.

This relates to furnaces in which one or more pipes or nozzles open into the fuel chamber above the fuel, and through which combined jets of steam and air are introduced, and, mingling with the gases from the fuel, supply the oxygen and hydrogen necessary for consuming the gases, and the objects are to provide means for heating the air before its contact with the steam blast, and to regulate the proportions of air and steam injected and the force of the blasts. The air and steam nozzles are arranged in pairs connected with one vacuum chamber, and they are directed so that those on opposite side of the fuel chamber converge, and their jets direct each other about midway between the side walls.

5831. MACHINES FOR THE MANUFACTURE OF CONFECTIONERY, *W. R. Lake, London.—6th December, 1882.—(A communication from Messrs. Thiele and Holzhause, Germany.)* 6d.

This relates to improvements on patent No. 1840, A.D. 1881, and it consists in providing a double pressing lever having two connecting levers operated upon by the same cams, which imparts motion to the tension rod connected to the rocking lever of a pawl and ratchet device. The cam-actuated levers have rollers to run on the cam, and spiral springs for imparting upward motion to the double lever are arranged in guide-boxes for the latter.

5853. VELOCIPEDES, *W. R. Pidgeon, Putney Hill.—8th December, 1882.* 6d.

This relates to the method of obtaining differential driving in tricycles.

5911. PUMPS USED IN CONNECTION WITH THE CONDENSATION OF STEAM, *T. F. Stenson, Handsworth.—11th December, 1882.* 8d.

This refers to pumps in which the suction or incoming stream of water is, during a portion of the piston's lifting motion, throttled or wholly cut-off for the purpose of causing the motion of the pump during that time to produce an exhaustion superior to that produced by friction and the hanging column of water in the suction pipe.

5927. MANUFACTURE OF BICHROMATE OF POTASH, *F. C. Glaser, Berlin.—12th December, 1882.—(A communication from P. Romer, Elberfeld, Germany.)* 4d.

This consists in the production of bichromate of potash by the decomposition of a lye containing equivalent quantities of chromates of potash and of soda, by means of a quantity of sulphuric acid equivalent to that of the chromate of soda.

5928. TUBULAR STRUCTURES FOR COMMUNICATION UNDER WATER, *H. N. Maynard and H. J. Cooke, Westminster.—12th December, 1882.* 6d.

This consists in forming water-tight joints between sections of subaqueous tubular structures by the use of a metal ring in one section, which is forced by screws against an elastic seating on the other section, the screws being rendered water-tight by cup leather packings. The sections are formed with enclosed spaces for excavating beneath the section, caissons with guiding flanges being used to guide the sections in their descent.

6070. PRESSING OF HORNS AND HOOFS TO BE USED IN THE MANUFACTURE OF COMBS AND OTHER ARTICLES, &c., *D. Stewart, Aberdeen.—20th December, 1882.* 6d.

This relates more especially to the plates between which the horns and hoofs are situated in the hydraulic press.

6145. FLOUR-SIFTING MACHINES, *H. E. L. Bauermeister, Hamburg.—23rd December, 1882.* 4d.

This relates to flour-sifting machines in which centrifugal flyers operate inside a gauze-covered reel, and the object is to rub off the gluten from the hulls and separate the flour entirely from the offal while sparing the gauze envelope of the reel as completely as possible. Inside the reel, which is fastened to a hollow shaft, rotate two flyers in a direction opposite to that of the reel. The arms of the flyers are of different lengths, one having concave blades or scrapers, being nearly twice as long as those of the flyer fitted with rejectors, which throw the meal outwards on to the gauze. Both rejectors and scrapers are shaped lengthwise so as to form screw lines of quick pitch.

6180. MANUFACTURE AND USE OF PAPER BOARD, *S. H. Hamilton, Bushnell, U.S.—27th December, 1882.—(Complete.)* 6d.

This consists principally in an improved article of manufacture, composed of paper pulp, glue, and bichromate of potash, mixed together, formed into sheets, and subjected to heavy rolling pressure.

44. KNITTING MACHINES, *H. J. Allison, London.—3rd January, 1883.—(A communication from C. H. Carter, Colborne, Canada.)* 8d.

The object is to knit either circular or ribbed flat web, to longitudinally stripe either ribbed or plain fabric, to effect an interchangement of the ribbing and cylinder needles without removing the stitch, and to obtain a corresponding length of stitch of the cylinder and ribbing needles in a positive manner.

297. AUTOMATIC LOCKING DEVICES FOR NUTS, BOLTS, &c., *G. Macaulay-Cruikshank, Glasgow.—18th January, 1883.—(A communication from S. H. Raymond and C. N. Shepard, Michigan, U.S.)* 6d.

This consists in the use of an elastic washer in combination with a metal washer capable of moving along the bolt, but prevented from turning thereon, and formed with projections which engage with recesses in the under face of the nut.

664. BELT FASTENERS, *C. D. Abel, London.—6th February, 1883.—(A communication from P. Thacher, Cleveland, U.S.)* 6d.

A plate is formed with projecting teeth of elliptical section at the base and tapering to a point with two flat sides, such teeth being forced through the ends of the belt to be joined, and the teeth then turned over or clinched.

811. MANUFACTURE OF NICKEL AND COBALT, &c., *F. Lotter, Prussia.—14th February, 1883.* 4d.

The object is to produce nickel which can be welded, hammered, drawn, or rolled, by mixing nickel oxide with an oxide of manganese in the form of powder, so that on smelting the mixture after reduction thereof, the manganese is made to take up the oxygen, forming a slag which separates out, leaving the nickel in a perfectly ductile condition. The process above described is also applicable to the production of cobalt free from oxide.

1120. TELEPHONIC APPARATUS, *W. R. Lake, London.—1st March, 1883.—(A communication from E. Holmes, Brooklyn, and E. T. Greenfield, New York.)* 6d.

This relates to the combination of a number of subscriber's lines with a multiple telephonic receiver at a central office normally in circuit with the service lines, a single telephonic transmitter at the central office normally out of circuit, a switchboard whereby different lines may be connected to each other or the transmitter, and other improvements in telephonic apparatus.

1149. OBTAINING MULTIPLE COPIES OF WRITINGS AND DESIGNS, *A. Paget, Loughborough.—3rd March, 1883.—(Complete.)* 4d.

The inventor claims the process and means for the preparation of a stencil sheet, consisting in writing or drawing thereon with a spring pen or instrument, whilst the said sheet is supported upon a surface coated with a sharp and hard granulated material.

1192. UNDERGROUND CONDUITS FOR ELECTRIC WIRES, *A. J. Boult, High Holborn.—6th March, 1883.—(A communication from W. Plankinton, Milwaukee, Wisconsin, U.S.)* 4d.

This relates to underground conduits of clay piping fitted with tubes carrying wires, and having bridges of peculiar construction so as to allow testing and inspection of any wire or wires through openings in the outer pipe or conduit.

1198. WOOD POLISHING MACHINES, *A. J. Boult, London.—6th March, 1883.—(A communication from J. L. Perry and C. A. Mather, Berlin, U.S.)—(Complete.)* 8d.

This relates to several improvements in the general construction of the machine.

1204. TONGS FOR DOMESTIC PURPOSES, *W. R. Lake, London.—6th March, 1883.—(A communication from A. S. Adams, Boston.)—(Complete.)* 8d.

This consists essentially of a hollow handle, in which are enclosed a rod controlled by a spring and two sets of movable jaws, or the like, pivotted to the handle and connected to the said enclosed rod.

1304. HORSESHOES, &c., *H. J. Haddan, Kensington.—12th March, 1883.—(A communication from M. M. Marks, Cincinnati, U.S.)—(Complete.)* 6d.

This relates to a machine for producing either flat or corrugated or ordinary calked horseshoes of any desired shape, and it consists of a pair of rolls geared to revolve in opposite directions, one being provided with the "former" and "die" to shape the blank, also formed with circumferential grooves that guide a pair of shaping rollers or discs, which bend the blank round the former. The other roll has a wedge to force the blank on the die to form corrugations, creases, or calks. By a special tempering apparatus the under surface of the shoe is rendered as hard as steel, while the upper portion is soft and pliable.

1313. DYNAMO-ELECTRIC MACHINES, *H. H. Lake, Southampton-buildings.—12th March, 1883.—(A communication from G. W. Fuller, Norwich, Conn., U.S.)* 8d.

The inventor increases the steadiness of the machine by rotating the field magnets; he makes the armature core independent of the coils that surround it, and keeps all parts of it in unchanged polar relation to the field magnets. Further improvements on this machine are described in the inventor's patent No. 1347 for this year.

1332. SMELTING FURNACES, *A. M. Clark, London.—13th March, 1883.—(A communication from G. H. and W. H. Nichols and J. B. F. Herreshoff, Brooklyn, U.S.)—(Complete.)* 6d.

The object is, First, to provide a furnace for smelting copper with means for the proper outflow of the matt and slagg into a well without risking a too rapid destruction of the walls through which the matt and slag escape, and likewise without unduly chilling the escaping mass; Secondly, to permit due continuity of process by providing for the removal when full or worn of the well or receiver and substitution of another. A water jacket is formed around the discharge opening near the lower end of the furnace, and a hole through it is made to correspond with an opening in a removable well or receiver mounted on wheels.

1340. PRINTING MACHINES OR PRESSES, *W. R. Lake, London.—13th March, 1883.—(A communication from H. P. Feister, Philadelphia.)* 6d.

The improved press comprises a double frisket, through which the continuous web of paper is passed; two rotating and reciprocating heads, one of which carries the type and the other the "make ready;" and an inking wheel in combination with the reciprocating type head, to ink type on the head with a different colour at each reciprocation. Various details of construction are also described.

1345. SEWING MACHINES, *W. R. Lake, London.—13th March, 1883.—(A communication from C. B. Tibbles, Burlington, U.S.)—(Complete.)* 1s.

This relates to the general construction of sewing machines, there being thirty-three claims.

1355. SOLUBLE COMPOUND OF COFFEE AND SUGAR, *C. A. Allais, Paris.—14th March, 1883.—(Partly a communication from F. V. Pillard, Paris.)—(Complete.)* 2d.

This consists in evaporating an infusion of coffee to which sugar has been added, and supplying it in the form of tablets or in a powder in a box containing the divisions necessary for a given number of persons.

1375. DYNAMO-ELECTRIC MACHINES, *H. H. Lake, Southampton-buildings.—14th March, 1883.—(A communication from G. W. Fuller, Norwich, Conn., U.S.)* 8d.

This relates to machines having cylindrical armatures, an armature core independent of the induction coils surrounding it, and held in unchanging polar relations to the field magnets by the attractive force of the latter. According to the present invention the armature core is cylindrical and loosely mounted upon a rotating shaft, upon which the induction bars are supported, and by which they are rotated, the field magnets being stationary.

1357. THERMO-ELECTRIC GENERATORS, *R. H. Brandon, Paris.—14th March, 1883.—(A communication from E. G. Acheson, Paris.)* 6d.

The claim is for each element composing the couple to connect a point or inner circle with each and every point on an outer or larger circle, the former circle being at one extreme of temperature, the latter at the other extreme.

1448. SOLDERING APPARATUS, *H. H. Lake, London.—19th March, 1883.—(A communication from J. J. Johnston, Boston.)—(Complete.)* 6d.

This consists partly in arranging a solder pot upon a furnace, and providing it with a post or spindle rising from its bottom, and a float adapted to be guided upon the said post or spindle as it rises and falls with the molten solder in the solder pot.

1458. MEASURING, REGISTERING, AND INDICATING THE QUANTITY OF LIQUID DRAWN FROM CASKS, &c., *G. A. Adams, Isle of Man.—20th March, 1883.—(Complete.)* 6d.

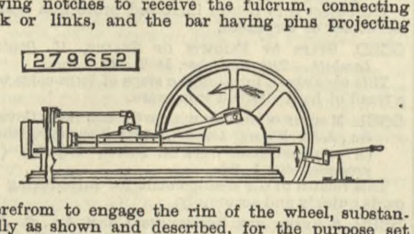
This relates to improvements on patent No. 3603, A.D. 1877, and it consists in the combination of a divided casing to protect all the working parts, with a tap inlet and outlet, and intermediate meter and motor mechanism actuated by the flow of liquid, arranged in one compartment, and a train of registering and dial indicating mechanism in the other.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

279,652. DEVICE FOR TURNING FLY-WHEELS OF ENGINES, &c., *Patrick P. Kilcullan, St. Louis, Mo. Filed May 7th, 1883.*

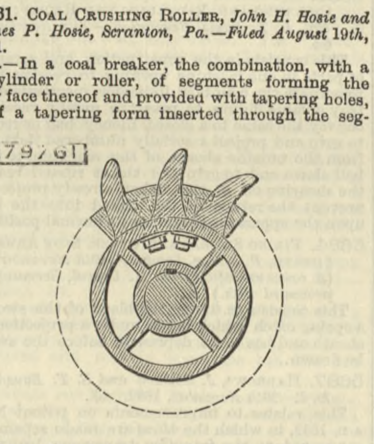
Claim.—(1) In a device for starting fly-wheels of engines, &c., the combination of fulcrum, lever, and bar, the bar being connected to the lever by a suitable link or links, and having pins to engage the rim of the wheel, substantially as shown and described, for the purpose set forth. (2) In a device for starting fly-wheels of engines, &c., the combination of a fulcrum secured near the wheels by bolts, the lever having notches for the fulcrum, connecting link or links, and the bar having pins projecting



therefrom to engage the rim of the wheel, substantially as shown and described, for the purpose set forth. (3) In a device for starting fly-wheels of engines, &c., the combination of fulcrum, lever, and bar, the bar being connected to the lever by a suitable link or links, and having pins to engage the rim of the wheel, one of which is adjustable, substantially as shown and described, for the purpose set forth.

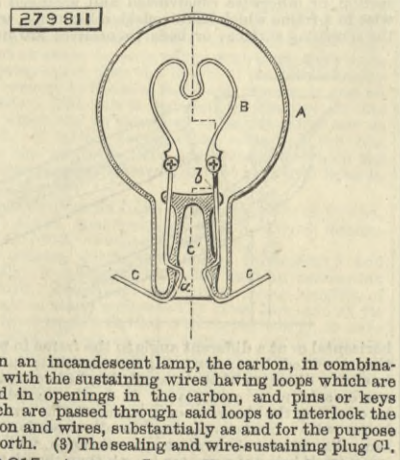
279,761. COAL CRUSHING ROLLER, *John H. Hosie and James P. Hosie, Scranton, Pa.—Filed August 19th, 1881.*

Claim.—In a coal breaker, the combination, with a plain cylinder or roller, of segments forming the exterior face thereof and provided with tapering holes, teeth of a tapering form inserted through the segments from the interior, and having their bases coincident with the inner faces of the segments, and securing means, whereby the roller, bases of the teeth, and inner faces of the segments are in contact, substantially as set forth.



279,811. INCANDESCENT LAMP, *Charles Richter, Camden, N.J.—Filed October 9th, 1882.*

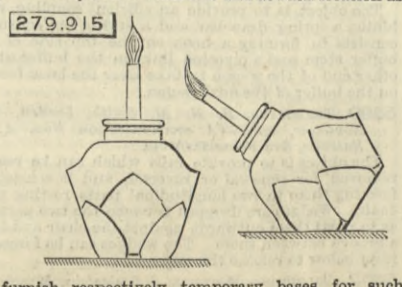
Claim.—(1) The hollow wire support C[1], in combination with the globe A of an incandescent lamp and the wires C, said support being provided in its sides with openings *a* and in its top with openings *b*, and said wires being passed inward through openings *a* and upward through openings *b*, substantially as shown.



(2) In an incandescent lamp, the carbon, in combination with the sustaining wires having loops which are fitted in openings in the carbon, and pins or keys which are passed through said loops to interlock the carbon and wires, substantially as and for the purpose set forth. (3) The sealing and wire-sustaining plug C[1].

279,915. ALCOHOL LAMP, *Norman Clark, Sterling, Ill.—Filed April 13th, 1883.*

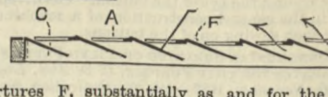
Claim.—The lamp, provided with faces or facets on its sides inclined from the perpendicular at about the angles shown, and of such size and at such location as



to furnish respectively temporary bases for such lamp, substantially as shown, and for the purpose described.

280,007. RIDDLE FOR GRAIN SEPARATORS, *Jno. H. Bell, Mount Ephraim, N.J.—Filed March 12th, 1883.*

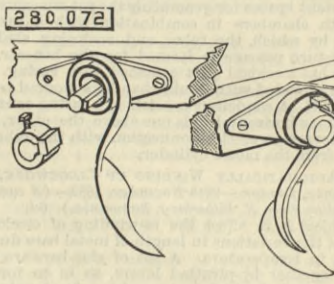
Claim.—(1) A riddle which consists of a frame covered with sheet metal plates A, consisting of integral combs B and oblique plates C, stamped from sheet metal, the said oblique plates C being arranged under the combs next in front, and leaving small



apertures F, substantially as and for the purpose specified. (2) A riddle plate A, consisting of an integral comb B, and oblique plate C, stamped from sheet metal, and having their line of junction re-enforced by a beading *c*, substantially as shown.

280,072. SPRING TOOTH FOR AGRICULTURAL IMPLEMENTS, *Nils Nilson, Maple-plain, Minn.—Filed July 14th, 1882.*

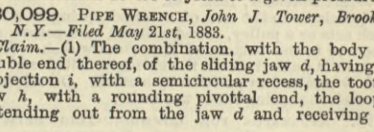
Brief.—The coil of the tooth is formed with an eye to fit the arbour and a lateral extension or ear to engage a corresponding recess in the collar, which



secures it on the arbour, said collar being secured by a set-screw. The screw prevents rotation under ordinary conditions, but may be regulated so as to act as a friction device to yield to a given pressure.

280,099. PIPE WRENCH, *John J. Tower, Brooklyn, N.Y.—Filed May 21st, 1883.*

Claim.—(1) The combination, with the body and double end thereof, of the sliding jaw *d*, having the projection *i*, with a semicircular recess, the toothed jaw *h*, with a rounding pivottal end, the loop *k*, extending out from the jaw *d* and receiving the



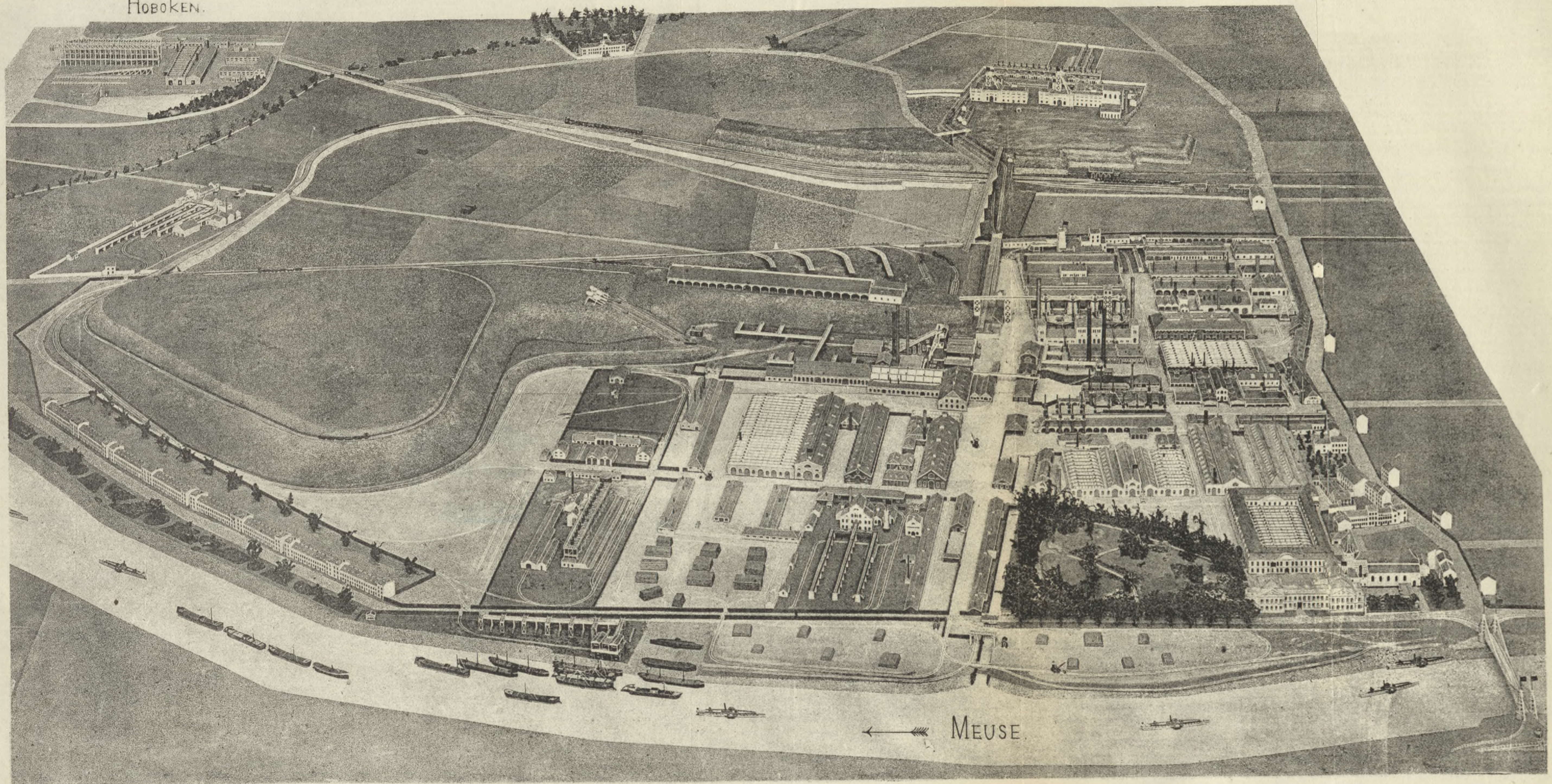
toothed jaw, and the pin *l* in the toothed jaw, for retaining the same in place, substantially as set forth. (2) The combination, with the body and the V-jaw *c*, of the sliding jaw *d*, having the projection *i* and semicircular recess, the toothed jaw *h*, and with a rounding pivottal end, the loop *k*, extending out from the jaw *d* to receive the toothed jaw, and means for retaining such toothed jaw in place, substantially as set forth.

CONTENTS.

THE ENGINEER, July 27th, 1883. PAGE

BY the advice of Sir William Jervois, South Australia is having built at Elswick a vessel of a large type. The *St. James's Gazette* says it will be a fourteen-knot cruiser, 185ft. in length, 30ft. in breadth, with a displacement of 900 tons.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending July 21st, 1883:—On Monday, Tuesday, and Saturday, free from 10 a.m. to 10 p.m., Museum, 11,065; mercantile marine, Indian section, and other collections, 5015. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 6 p.m., Museum, 2151; mercantile marine, Indian section, and other collections, 1437. Total, 19,668. Average of corresponding week in former years, 17,671. Total from the opening of the Museum, 22,204,940.



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