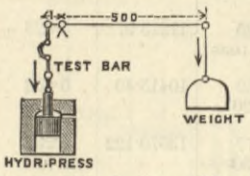
IRON AND STEEL WORKS, RESCHITZA, HUNGARY.

No. V.

Testing materials.—At 6, on the plan of rolling mill, Fig. 9, there is a falling-weight arrangement, like a pile driver, for testing rails, &c., by impact; and closely adjoining it is a machine for static tests, in which the V-shaped supports are brought nearer together, or set out wider, by means of horizontal screws. The progressive deflection of the bar under test is produced by means of a sliding weight, a system of levers, and a worm and worm wheel, while the strain is measured by a steelyard and weights. In order to comply with the requirements of the various railway companies which order their rails, tires and axles at Reschitza, a Pfaff machine for tensile tests has been erected in the engine house, marked 19 on the plan of blast furnace and Bessemer department, Fig. 7, page 84, *ante*.



While capable of exerting a stress of 70 tons, it is, at the same time, so delicate that fine wire and even strips of paper may be tested by it with accuracy. The accompanying sketch shows a diagram of the machine, which is constructed by the Ottakringer Maschinen-Fabrik—late Richard Fernand and Co.—Vienna, while an elevation, a vertical section and a plan are given at Fig. 14, below. The stress is

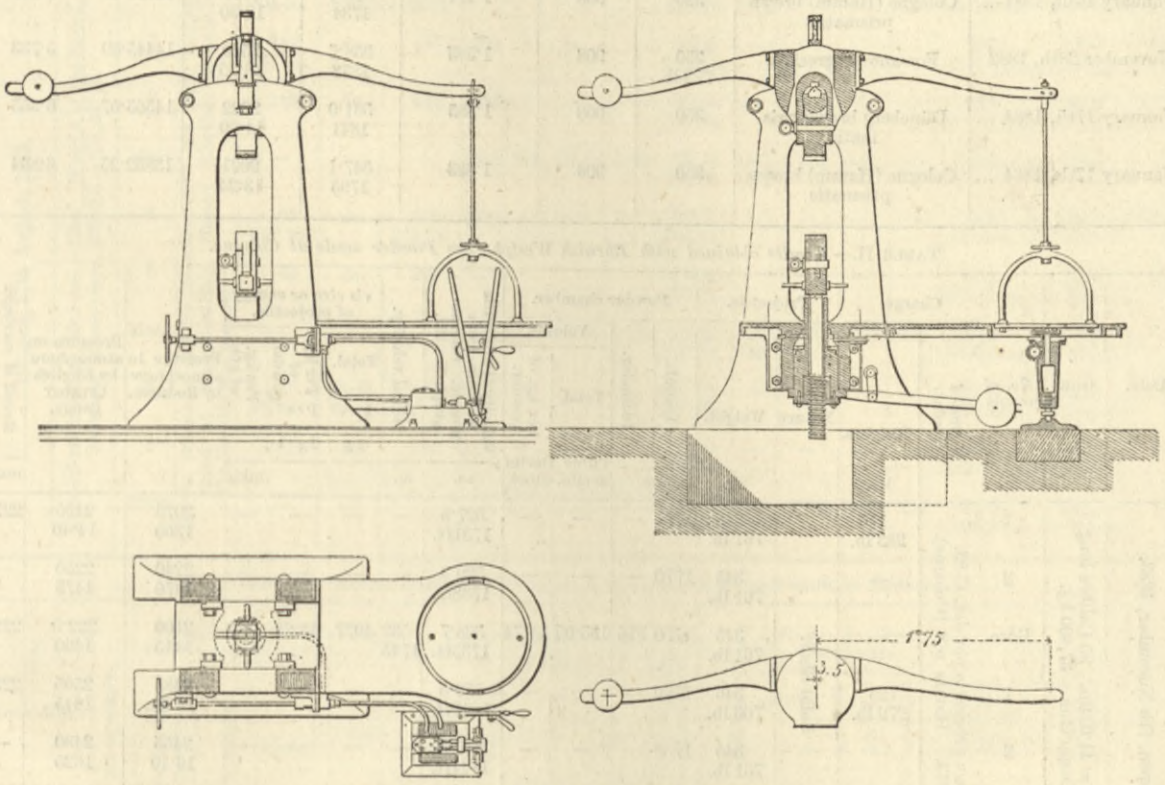
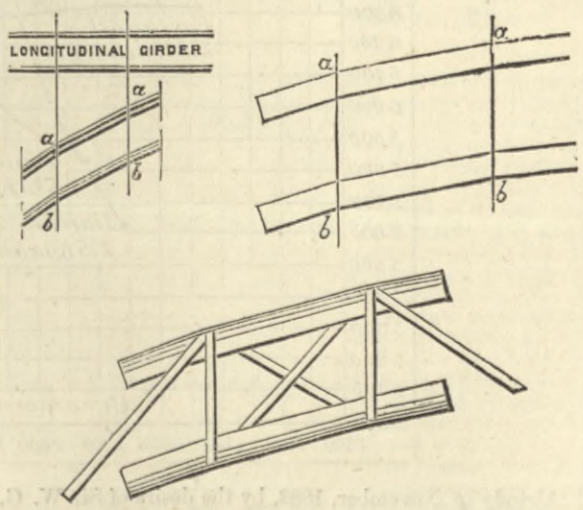


Fig. 14.—PFAFF 70-TON TESTING MACHINE.

applied by hydraulic pressure; and the power exerted is measured by means of weights placed on the scale of a beam in the proportion of 500 : 1. The vertical arrangement possesses many advantages. The construction of the machine is simplified, and the position of the test-piece is convenient for observation. The knife edges of the lever are also brought to bear naturally, thus permitting of easy and accurate adjustment, and dispensing with the cumbersome and complicated appliances required by horizontal machines for supporting, balancing, and verifying the weigh beam. The exact length of the two arms of the lever and their due ratio may be checked empirically by hanging heavy weights on the short arm in place of the test piece, when they should be exactly balanced by the 500th part of such weight placed in the scale. The system is in equilibrium when the scale plate is on a level with the table bolted on to the hydraulic cylinder, as shown more clearly by an index, which has been added subsequently. Bars up to 600 mm.—nearly 2ft.—long may be tested in this machine, while the lower jaw is adjusted for shorter lengths by the screw which passes through the piston. The stroke of the hydraulic piston permits of the bar elongating up to 200 mm.—nearly 8in. Special attention has been paid to the arrangement of the jaws, so that the centre line of the test bar shall coincide with that of the knife edge, and also with that of the hydraulic cylinder. Each jaw is made in two parts, and is held by a pin for ready insertion of the bar, the upper one in the suspension strap, and the lower one in the head of the adjustment screw. In order to avoid damage to the knife edges and an injurious effect on the test piece, due to the oscillations of the beam, the latter have been reduced to a minimum by elastic buffers, which limit the motion of the scale. In the event of the bar giving way suddenly, the suspension strap is prevented from flying up by a stop. The hydraulic pressure is supplied by a small pump on Kirchweger's system, with two double-acting horizontal plungers, worked by hand, their sectional area being $\frac{1}{700}$th that of the hydraulic cylinder, and the ratio of power applied to their working levers as 1 : 5000. A valve, fixed on the side of the machine, within easy reach of the operator, and worked by a differential screw, permits of conveniently ascertaining the limit of elasticity in the test piece. When this valve is opened, the piston is raised automatically to its highest position by the action of a counterweight. The knife edges are made of a high quality of cast steel, and are accurately ground to bearing by a special appliance. So carefully is this testing machine designed and constructed, with a view to its being as little affected by stresses as possible, that the stress on the uprights does not exceed 0·8 kilogramme per square millimetre, or half a ton per square inch, of their sectional area. Various appliances for determining the resistance to transverse and torsional strains, as well as to the operations of shearing, punching, &c., have been made by the constructors; and instruments for measuring elongation and contraction of sectional area are affixed, either to the uprights or to the test piece itself.

The same building that contains the Pfaff testing machine, also contains the Cockerill blowing engine, shown on page 166, and a view of which taken at right angles to the present was given on page 92, *ante*, with description on page 85.

Bridge and engineering shops.—For the remaining departments of this gigantic concern we must return to the plan of blast furnaces, &c., at Fig. 7, page 84, *ante*. At 34 are shown the forge and smithy of this department, which are provided with five large heating and four welding furnaces, seven wheel and thirty smith's fires, four large single-acting and four small double-acting steam hammers, besides an hydraulic press for V-ing or glutting the rims of railway wheels, and another for pressing various parts. A speciality consists of buffer cases, of which 8000 are made yearly. Adjoining is the point and crossing shop. There is also a dog and bolt smithy, capable of turning out a million and a-half of dogs and half a million each of bolts and wood screws. These articles are made from the special bars, rolled with projections, already mentioned, the screws being produced by pressure while the iron is hot. They are dipped hot in a mixture of lead and zinc to keep them from rusting. The boiler, girder, and bridge shops are marked 37 and 38. The bridge shop has lately been provided with thirteen electric lamps, on the Zipernifsky system, by Ganz and Co., of Buda-Pesth. The rivetting is chiefly done by hand; but lately the engineers have been making some hydraulic rivetters with not very satisfactory results. They have, in fact, been going over the same ground in a problem which has been so satisfactorily solved in England, and the practical results of which they would have found it far cheaper to adopt. Here were made all the iron bridges for the Temésvar and Orsova branch of the company's own railway system, representing a total weight of 1782 tons, and eighteen of them having spans of more than 20 metres, or 65½ft. A large order was executed last year in the railway bridge over the Danube at Neusatz, 436 metres = 1430ft. long, in five spans, the largest of which is 96 metres = 315ft., and the smallest 76 metres = 249ft. The six piers were sunk by means of compressed air; and the erection of the superstructure, consisting of continuous lattice girders with parallel beams, weighing 1800 tons, was begun in May and finished in September, the bridge being opened for traffic on the 10th of December, 1883.



But a still larger and more complicated job was the ironwork for the road bridge erected at Szegedin over the Tisza or Theiss, a tributary of the Danube, opened by King Francis Joseph on the 15th of last October. It is over 380 metres long, in four spans, of—in the clear—110 metres for the river, and 97, 86, and 66 metres for the flood water. This bridge was designed slightly askew to suit the arrangement of streets, and it is the largest arch bridge in Europe, the total weight of ironwork being 1473 tons. For setting out half of each arch, full size, a floor was laid down in the bridge shop, necessitating the demolition of part of the walls. Balks of timber were laid on the floor, and upon these were fixed specially cast standards, for carrying old Vignoles rails with the flanges uppermost. When these were perfectly levelled, 5-centimetre or 2-inch planks were laid across them. A true base line was obtained, in the manner adopted by sawyers, by stretching a 3 mm. = 0·118in. wire rubbed over with red paint. The abscissæ and ordinates for the vertical angle-irons were then marked off at the points *a a*, *b b*, in the sketches below; and these points were joined by straight lines, the arches being polygonal, and not true arcs. The top and bottom angle irons of the arch were then bent hot to these lines at the points *a a*, *b b*. This was not a difficult matter, as they only extend over two panels—that is to say, for a length of from 5·5 m. to 6·2 m., according to the span—having their joints in the middle of each alternate panel, as shown in the first sketch. The vertical plates of the arches were next bent hot at corresponding points, as shown by the second sketch. The rivet holes were marked on them by those in the angle irons that had been drilled before they were bent. The vertical and diagonal ties were then set out, the pieces cut and drilled, and the whole rivetted up, together with the top and bottom plates, 70 cm. = 28in. wide. In this way were produced two-panel lengths—as shown by the third sketch—which were put together in place. The setting out and superintendence of this ironwork was entrusted to Herr Robert Totth, who has had much experience in such work, and has conceived a new elementary theory as to arched bridges.

The pattern shop is marked 39, and the fitting and erecting shops 33, in Fig. 7, p. 84. The latter are provided with the usual machine tools, and produce a variety of work, from turntables to hydraulic cranes and steam engines, including the large pumping engines at the Anina and Szécül collieries. Locomotives, including the first constructed in Hungary, were formerly made here; but they are now turned out more economically at the company's works in Vienna. The drawing-offices, under the charge of M. Renwez, a good designer of steam engines, are contained in the block marked 40. The T and set squares, all made at the works, are constructed of slips of various woods, jointed edgewise, so as to counteract any tendency to warp.

Relations between employers and employed.—The Reschitza Works are placed in charge of an "Ober-verwalter," or chief of the local administration. This office was until lately held by Herr Hopftgartner, but on his resigning, the direction of the Reschitza and of the Anina works was united, and entrusted to Herr Kalusay, the former *Verwalter* at Anina. Herr Zwolensky retains his post of technical secretary; and Herr Engel, formerly works manager, has been advanced to the office of assistant engineer to the new *Ober-verwalter*. Second-engineer Liska has now been made chief-engineer of blast furnaces and steel works, and H. Nehoda has been promoted to a similar position in the puddling furnace, forge, and rolling mill department. The hands employed at Reschitza include Germans, Bohemians, Hungarians, Roumanians, Servians, Bulgarians, Sclavonians, Frenchmen, Italians, and one Englishman. The latter is Thomas Williams, a native of Pontypool, who accompanied his father to Russia when only ten years old, and has not seen his native country since. He has almost forgotten English, but speaks German, Polish, and Sclavonian; he married a Hungarian wife, by whom he has a family now grown up. He was a good roller; but—such is the irony of fate—a piece of wood, not iron, struck him in the eye and caused its loss. For the last twenty years he has been a labourer in the forge, and now despairs of bettering his position or of returning to England.

Including the wives and children of *employés* and workmen, upwards of 100,000 persons are dependent for means of subsistence on the company; and the administrators of this vast tract of country have not shirked their moral responsibilities. They have built and endowed hospitals at Reschitza and Steyerdorf, and erected baths wherever necessary. They have built five churches, have contributed to the erection of several others, and maintain twenty-one churches and fifteen presbyteries. They have built six new schools, and have participated by subventions in building others founded by the parish authorities. They keep up fourteen German and eleven Roumanian schools, and subsidise several others, besides paying the salaries of forty-three instructors. Every official is bound by the regulations to pay into the superannuation fund 20 per cent. of his first year's salary, and 4 per cent. of that during the succeeding years, besides 50 per cent. of all increase of salary, while the company contributes annually a sum equal to the total amount of the payments of 4 per cent. After ten years of service, he is entitled to a pension equal to 40 per cent. of his last year's salary, with an increase of 3 per cent. per annum for the ten succeeding years, and 2 per cent. per annum for the next ten years, so that after thirty-five years' service the *employé* is entitled to a pension equal to his last year's salary. In the event of his death, the widow receives two-thirds of his pension, or three-fourths if she have children under age. Orphans continue to enjoy their mother's pension up to 22 years old. Besides this, the whole family receive medical attendance from the doctors paid by the company.

Two separate arrangements are in force for workmen—one for those permanently employed, who pay 4 per cent. of their wages, and are entitled to assistance during illness, burial fees, and a pension in case of being incapacitated for work, as also are their widows and children; and another for those only engaged temporarily, who pay in 2 per cent. of their wages, have the right to assistance during illness, and burial fees, but no pension The company contributes in addition 27 per cent. of the receipts from both sources. The workman's pension is fixed at 30 per cent. of his average wages during the last three years of service, and increases by 2 per cent. for every subsequent year, without however exceeding 70 per

cent. of the last three years' average. Widows or orphans receive two-thirds of the pension, the latter up to their fifteenth year. During the first two months of illness the workman draws half his wages, or three-fourths if he have been injured during work. The payments are reduced to half the above amounts during the third month, after which they are subject to a decision, by the committee, on each individual case. Besides having built several workmen's colonies, the company encourages its men, by favourable terms and advances, to acquire their houses or to build for themselves. It has founded a store at Reschitza and other centres, where provisions, &c., may be purchased at wholesale prices, with a slight percentage added to cover expenses, the amount being deducted from the month's wages. The company has also built two corn-mills, with steel rolls, on the Hungarian system, in addition to stones. That at Oravitza, driven by steam, is capable of grinding 6000 tons yearly, and that at Bogsán, driven by a turbine, 2000 tons yearly. The flour is sold at nearly cost price, not only in the Reschitza district, but also in the neighbourhood of the company's collieries in Bohemia.

Since the beginning of last year, the official title of the company has been changed to the "Privilegirte Oesterreichiche-Ungarische Staats-Eisenbahn Gesellschaft," the initials "K.K."—Kaiserliche Königliche—being now dropped. Great changes have also been made in the management of its affairs, on account of the different *régime* in Hungary from that which obtains in Austria; for it will be remembered that, though Francis Joseph, of Hapsburg, is both Emperor of Austria and King of Hungary, the internal Government of the two countries is quite separate. The company's Austrian system of railways is now managed by a "directorium" at Vienna, under the presidency of M. de Serres, while the Hungarian system is managed by a directorium at Buda-Pesth, presided over by Hiernonymi-úr—the suffix is Hungarian for "Mr." Both these directoriums are subject to the Verwaltungsrath, or General Council—president, the Baron Moritz Wodianer—which holds its sittings, sometimes at Vienna and sometimes at Buda-Pesth. Three special services are directly dependent on this body, viz.: (1) That of railway construction; (2) that of administration or management common both to the railways and the domains; and (3) the office of the general secretary, M. Raspi. A third directorium, that of the Mines, Works, and Domains, is directly dependent on the General Council. The president of this third directorium is M. A. Ronna, who, with the collaboration of M. Petitgand, prepared a French edition of "Percy's Metallurgy," which has been largely circulated on the Continent. The other members of the committee are M. George Bresson, technical director of the domains; Herr Weinberger, chief of the commercial department of the domains; and M. Poloncean, director of workshops and plant. The secretary is M. A. Gouvy, formerly engaged as engineer at the Reschitza Iron and Steel Works, and to whom we are indebted for a large amount of technical information.

During the year 1883 the company had 2247 kilom. = 1396 miles of railway opened, against 2120 kilom. = 1317 miles in 1882. The number of passengers carried last year was 4,665,853, together with 6,049,807 tons of goods. The total receipts from railways in 1883 were 36,257,325 florins = to £3,021,444, against 35,192,418 florins = £2,932,701 in 1882—thus showing an increase, as far as railways are concerned, of 1,064,907 florins, or £88,742.

Electric Lighting at Gunpowder Mills.—We find that a statement we recently made that Messrs. Wakefield and Co., Gatebeck, near Kendal, were the first to apply electric lighting to gunpowder works is not correct, the Royal Factory at Waltham Abbey having had it in use since November, 1881. Recently the application of the electric light has been extended to those houses which, from the amount of dust generated, were formerly considered too dangerous to have any artificial light. This has been effected by means of a specially devised lamp, in which all the Swan lamps burn under water; but though there is a large volume of water in circulation, necessary to keep the lamp cool, there is little or no loss of light. Special precautions are also taken with regard to the insulation of the wires. This application of the electric light has doubled the power of the houses in which it has been placed.

International Health Exhibition.—Preparations for the holding of this Exhibition are proceeding rapidly. The Board of Trade have certified that the Exhibition is an International Exhibition, and exhibitors thereat will accordingly participate in the privileges accorded by the Patents, Designs, and Trade Marks Act of 1883. The officers of her Majesty's Customs have also announced that the Lords of the Treasury have consented to the buildings being considered as a bonded warehouse during the continuance of the Exhibition, as was the case of the late Fisheries Exhibition. The General Committee now numbers nearly four hundred members, and from these seventeen sub-committees have been formed. These have all been doing valuable work in advising the Executive Council as to the nature of objects which it is desirable should be fully illustrated, in obtaining the co-operation of many persons of eminence in the various branches on which the Exhibition will treat, and in supervising the applications for space. The allotment of space, which has been largely applied for, is being rapidly proceeded with, and applicants will soon be informed of the decision of the Executive Council with regard to their applications. Though it is impossible to state, at this early stage of the preparations, the names of exhibitors, we are, however, in a position to say that many well-known London and provincial firms—whose very names are a guarantee that their exhibits will be prepared in a first-rate manner—have announced their desire to take part. In response to a request made by his Royal Highness the Prince of Wales, President of the Exhibition, the eight water companies of London have resolved to exhibit in a pavilion which is being erected for them, their appliances for the supply, filtration, &c., of water, together with diagrams showing the various processes and localities; and a powerful sub-committee, under the active chairmanship of Colonel Sir Francis Bolton, has been formed to carry out this branch of the Exhibition. The water companies have also determined to put up in the grounds a large fountain, which will be illuminated at night by electricity. This fountain of light will, it is anticipated, materially add to the beauty of the illumination of the gardens. It is impossible, as yet, to give any definite information with regard to foreign countries; but, so far as one can judge at present, Belgium, China and India will be the best represented. A Royal Commission has been appointed in Belgium, and the Consul-General in London is their active representative here. To China has been allotted the space which it occupied last year at the Fisheries Exhibition, and a Chinese tea garden, restaurant, and shop will not be the least interesting objects in the Exhibition. India is to be adjacent to China, and strenuous exertions are being made to secure the united action of many of the principal tea planters in India, so as to insure a good and representative show of the Indian tea-growing industry.

BROWN PRISMATIC (COCOA) POWDER.

We have received the following account of the comparative trial of cocoa powder and Fossano progressive powder at Spezia, which we give in accordance with our promise in the last article on this subject:—Some very interesting experiments took place at Spezia on the 14th to 17th January, 1884, with an Armstrong 100-ton breech-loading gun, in the presence of Admiral Racchia, General Rolland, and ten officers. This gun is 26 calibres long, and weighs without the carriage 102,460 kilos.; the carriage weighs 41,000 kilos. The experiments were made in order to ascertain if the brown prismatic powder showed greater advantage than the Fossano progressive powder, which had been specially manufactured for the above gun.

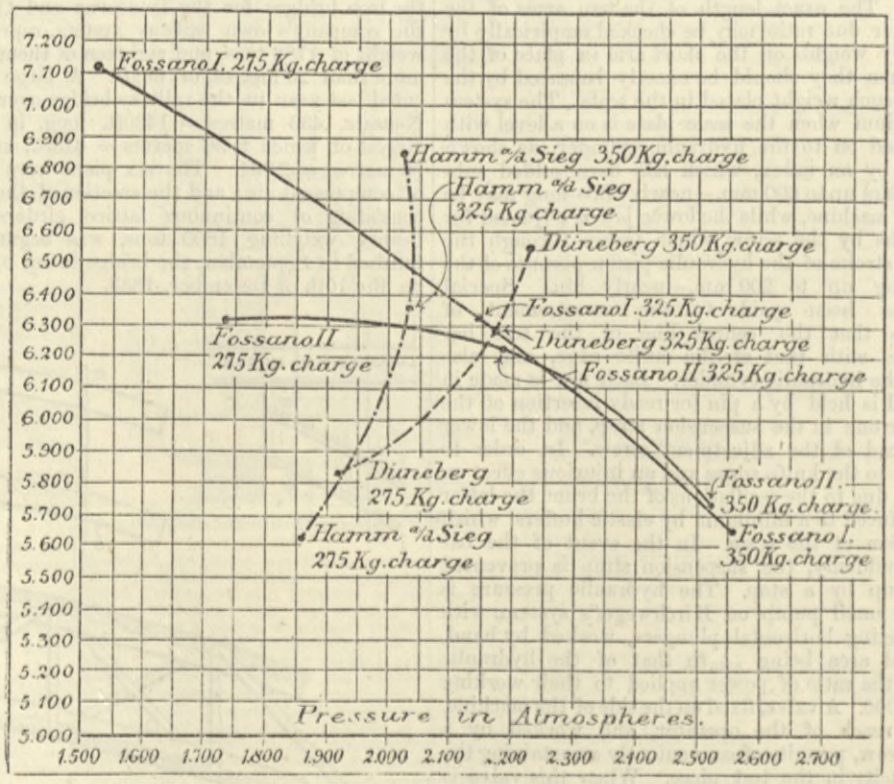
Table I.

Date of firing.	Description of powder.	Weight of charge.	Weight of projectile.	Cubic contents of powder chamber per kilogramme of powder.	Muzzle velocity.	Pressure in atmospheres crusher apparatus.	*Vis viva* or energy of projectile.	Energy per one atmosphere pressure.
November 23rd, 1882	Fossana progressive	Kilogs. 275 606 lb.	Kilogs. 908 2002 lb.	Cubic decimals. 1·761	Metres. 485·6 1593ft.	Atmospheres. 1731 11·35 tons	Metres, tons 10913·001	Metres, tons 6·304
January 14th, 1884 ...	Düneberg brown prismatic	275	908	1·761	492·2 1615ft.	1925 12·65 tons	11213·97	5·828
January 14th, 1884 ...	Cologne (Hamm) brown prismatic	275	908	1·761	474·4 1556	1859 12·20	10415·40	5·602
November 27th, 1882	Fossano progressive	325 716½ lb.	908	1·491	541·5 1777	2177 14·30	13570·122	6·237
January 16th, 1884 ...	Düneberg brown prismatic	325	908	1·491	543·3 1783	2172 14·25	13660·48	6·289
January 16th, 1884 ...	Cologne (Hamm) brown prismatic	325	908	1·491	528·4 1734	2029 13·30	12921·48	6·368
November 28th, 1882	Fossano progressive	350 772 lb.	908	1·383	558·7 1833	2520 16·55	14445·89	5·733
January 17th, 1884 ...	Düneberg brown prismatic	350	908	1·383	561·0 1841	2222 14·60	14565·07	6·555
January 17th, 1884 ...	Cologne (Hamm) brown prismatic	350	908	1·383	547·1 1795	2021 13·25	13852·25	6·854

Table II.—*Results obtained with Rhenish Westphalian Powder made at Cologne.*

Date.	Gun.	No. of rounds	Charge. Nature of powder.	Charge. Weights.	Projectile. Nature	Projectile. Weight.	Powder chamber. Length.	Powder chamber. Diameter.	Powder chamber. Volume. Total.	Powder chamber. Volume. Per kg. of powder.	Velocity of projectile at 100m. from muzzle. Chronograph No. 302.	Initial velocity.	*vis viva* or energy of projectile. Total. $P \cdot v^2$	*vis viva* or energy of projectile. Per kg. of powder. $P \cdot v^2$	*vis viva* or energy of projectile. Per kg. of gun.	Pressure in atmosphere by Rodman.	Pressure on atmosphere by English Crusher gauge.	Recoil of carriage.
				kg.		kg.	mm.		Cubic decim.	Decim cubes.	m.	m.	2 g	2 g·1	mkg			mm.
Meppen, 7th November, 1883.	28cm. = 11·024in. 35 Calibre long Krupp Gun. 37,400 kg.	1	Brown prismatic powder, C 83. No. 313. Hamm o/S (Cologne).	115 253 lb.	Solid Shot.	345 761 lb.	1771	—	—	—	527·5 1731ft.	—	—	—	—	2075 1360	2195 14·40	2220
		2		—		345 761 lb.	1770	—	—	—	529·8 1738ft.	—	—	—	—	2240 1470	2250 1475	—
		Bore.		—		345 761 lb.	1770	316	135·05	1·174	528·7 1735ft.	532 1745	4977	43·28	133	2160 1415	222·0 1460	2220
		1		125 276 lb.		346 763 lb.	1769	—	—	—	552·5 1813ft.	—	—	—	—	2485 16·30	2505 1645	2230
		2		—		345 761 lb.	1768	—	—	—	555·0 1821ft.	—	—	—	—	2455 16·10	2480 1625	—
		Bore.		—		345·5 762 lb.	1769	316	134·92	1·079	553·8 1817ft.	558 1831	5483	43·86	147	2470 1620	2490 1635	2230

Already in November, 1882, by the desire of Sir W. G. Armstrong and Co., black prismatic was fired against the specially manufactured Fossano powder, when the two kinds of powder gave about equal results, although the black prismatic employed was not manufactured with a view of being used in such large charges. In January, 1884, two kinds of brown prismatic (cocoa) powder were put forward for experimenting with, which powder, on account of the excellent results it has achieved, has recently attracted the attention of the highest authorities in scientific and military circles. One kind was sent from the Düneberg Factory—Director Duttenhofer—and the other kind from the United Rhenish Westphalian Gunpowder Mills, Cologne—Director-General Heidemann—that is to say, from their branch factory at Hamm-on-the-Sieg. Both manufacturers keep the composition and manufacture of the brown prismatic powder quite secret. Below will be found the results of the January experiments, accompanied by those obtained with the Fossano powder in November, 1882, so that the three kinds of powder can be easily compared one with another. On the basis of the generally accepted opinion that, "That powder is the best which, with the least tension to the gun, gives the greatest live force—*vis viva*—to the projectile," it is evident from the above figures that the Fossano powder has been decidedly beaten by the brown prismatic powder, *i.e.*, by the Düneberg as well as and more especially by the Cologne powder—Hamm-on-the-Sieg. This is very clearly illustrated in the last column of the above table of proof results, which shows that the live force



(*vis viva*) per one atmosphere pressure of the Fossano powder decreases with each succeeding higher charge, whereas the live force of the Düneberg, and more especially of the Cologne powder, increases considerably. The diagram will illustrate the above very clearly. The results obtained with the powder of the United Rhenish Westphalian Gunpowder Mills, Cologne, are of still greater interest to military circles, as exactly the same kind of powder, "H," has already been fired in England with splendid results; and when fired at Meppen and Essen by Mr. Fred. Krupp from his 28 and 30½ cm. guns, of 35 calibre length, it gave the best results ever obtained; so that a suitable and uniform powder has been found for all guns requiring charges of 100 kilos. and over.

The brown prismatic powder of the Cologne firm was fired also from the 26 cm. Krupp gun of 35 calibre length,

TABLE III.—*Results with Rhenish Westphalian Powder made in Cologne.*

Date.	Gun.	No. of rounds	Charge. Nature of powder.	Charge. Weight.	Projectile. Nature	Projectile. Weight.	Powder chamber. Length.	Powder chamber. Diameter.	Powder chamber. Volume. Total.	Powder chamber. Volume. Per kg. of powder.	Velocity at 100m. from nozzle. Chronograph No. 302	Initial velocity.	*Vis viva*, or energy of projectile. Total. $P \cdot r^2$ / 2 *g*.	*Vis viva*, or energy of projectile. Per kg. of powder. $P \cdot r^2$ / 2 *g* · 1	*Vis viva*, or energy of projectile. Per kg. of gun	Pressure by Rodman apparatus in atmospheres.	Pressure in atmospheres by English crusher gauge.	Recoil of carriage.
				kg.		kg.	mm.		Cubic-Decim.	Decim. cubes	m.	m.	mt.	mt.	mkg			mm.
Meppen, 17th August, 1883.	Gun, 35 calibre long, 30·5 cm. = 12in. Weight of the barrel, including breech-piece, 49200 K = 108,467 lb.	1	Brown prismatic powder, manufactory's No. 313, manufactured at Hamm-on-Sieg, United Rhenish Westphalian Powder Mills, Cologne.	150 331 lb.	Steel shell.	455 1003 lb.	1884	350	175·8	1·17	535·0 1755ft.	539 1768	6738	44·93	137	2350 15·40 tons	2455 16·10 tons	1900
		2		162 357 lb.	do.	455	1881	—	—	—	561·5 1842½ft.	—	—	—	—	2620 17·20 tons	2705 17·75 tons	1900
		3		162	do.	455	1884	—	—	—	561·0 1841ft.	—	—	—	—	2550 16·75 tons	2650 17·40 tons	1900
		Mean		—	—	—	1883	350	175·6	1·09	561·3 1842ft.	565 1867	7403	45·71	151	2585 16·95 tons	2680 17·60 tons	—
		4		162 357 lb.	do.	330 728 lb.	1886	—	—	—	625·2 2051ft.	—	—	—	—	2440 16 tons.	2540 16·65 tons	1890
		5		162	do.	330	1884	—	—	—	623·8 2047ft.	—	—	—	—	2530 16·60 tons	2480 16·30 tons	1890
		Mean		—	—	—	1885	350	175·9	1·09	624·5 2049ft.	630 2096	6676	41·22	136	2485 16·30 tons	2510 16·45 tons	—
		6		162 357 lb.	Shell.	282 622 lb.	1884	—	—	—	645·0 2116ft.	—	—	—	—	2240 14·70 tons	2310 15·15 tons	1870
		7		162	do.	282	1883	—	—	—	655·0 2149ft.	—	—	—	—	2335 15·30 tons	2405 15·30 tons	1870
		Mean		—	—	—	1884	350	175·8	1·09	650·0 2132ft.	657 2156	6204	38·31	126	2290 15·05 tons	2555 15·45 tons	—

TABLE IV.—*Results obtained with Rhenish Westphalian Powder made in Cologne.*

Date	Gun.	No. of rounds.	Charge. Nature of powder.	Charge. Weight.	Projectile. Nature	Projectile. Weight.	Powder chamber. Length.	Powder chamber. Diameter.	Powder chamber. Volume. Total.	Powder chamber. Volume. Per kg. of powder.	Velocity at 37·3m. from muzzle. Chronograph No. 27	Initial velocity.	*Vis viva* or energy of projectile. Total. $P \cdot r^2$ / 2 *g*.	*Vis viva* or energy of projectile. Per kg. of powder. $P \cdot r^2$ / 2 *g* · 1	*Vis viva* or energy of projectile. Per kg. of gun	Pressure in atmospheres by Rodman apparatus.	Pressure in atmospheres by crusher gauge.	Recoil of carriage.
				kg.		kg.	mm.		Cubic-decim.	Decim. cubes	m.	m.			mkg			mm.
Essen, 5th Nov., 1883.	26 cm. = 10·236. 35 calibre long Krupp gun, No. 2, Weight of gun, including breech-piece, 27,739 kg.	1	Brown prismatic powder, C. 83, H 10, 83. No. 336.	83 183 lb.	Solid shot.	280·0 617 lb.	1407	55¾in.	—	—	539·4 1770ft.	—	—	—	—	2480 16·30 tons	2470 16·20 tons	1900
		2		—	—	279·5 616 lb.	1401	—	—	—	537·2 1762ft.	—	—	—	—	2420 15·90 tons	2470 16·20 tons	—
		3		—	—	279·2 615½ lb.	1401	—	—	—	536·7 1761ft.	—	—	—	—	2570 16·85 tons	2510 16·45 tons	—
		4		—	—	278·0 613 lb.	1399	—	—	—	538·4 1766ft.	—	—	—	—	2490 16·35 tons	2480 16·25 tons	—
		5		—	—	278·7 614½ lb.	1401	—	—	—	537·3 1763ft.	—	—	—	—	—	—	—
		6		—	—	279·5 616 lb.	1402	—	—	—	538·7 1767ft.	—	—	—	—	—	—	—
		7		—	—	278·5 614 lb.	1403	—	—	—	538·4 1766ft.	—	—	—	—	—	—	—
		8		—	—	279·5 616 lb.	1405	—	—	—	536·8 1761ft.	—	—	—	—	—	—	—
		9		—	—	278·0 613 lb.	1405	—	—	—	537·8 1764ft.	—	—	—	—	—	—	—
		Bore		—	—	278·99 615 lb.	1402·7	300	96·97	1·17	537·9 1765ft.	539·3 1769	4136	49·8	149	2490 16·35 tons	2480 16·25 tons	1900

ordered by the Spanish Government, and gave in the above-mentioned gun, with a charge of 83 kilos. and a projectile of 279 kilos., out of nine rounds a mean muzzle velocity of 537·8 metres—1764·48ft.—with a mean deviation of 0·8 metre—2ft. 8in.—and a pressure of 2490 atmospheres—16·34 tons—according to the Rodman apparatus, and 2480 atmospheres, according to the crusher gauge. A great peculiarity of brown prismatic powder is that if set on fire in the open air it will not explode like the black prismatic powder, but will burn quickly away, so that it is much safer than other powder for transport and storage. When fired from guns there is much less smoke than with ordinary powder, and the smoke is more like thin vapour, which rapidly clears away. It is evident that this peculiarity is also of great importance, especially for forts and ironclads carrying large guns.

PRIZES FOR COMBINATION HARVESTER.—In competition for prizes, amounting to £300, offered by the Government of Victoria for the best combined reaper and thrasher, two machines came forward, one from Joseph Nicholson and Co., of Melbourne, and one from Rupert Smith, of Beaufort. The Nicholson machine, a 4ft. 6in. stripper, with winnowing and bagging appliances, was drawn by three horses, and bagged a good sample of clean wheat, and cut about an acre an hour. The judges awarded £75 to this machine and £25 to Rupert Smith.

THE FASTEST TRAIN IN GREAT BRITAIN.

SOME articles have lately appeared in the monthly magazines respecting the speed of railway trains, and the following information will correct some misunderstanding on the subject:—It has been represented that the Great Northern Scotch express is the fastest train in Great Britain, whereas the Great Western Flying Dutchman runs at a higher speed, and is still, as it always has been, the fastest train in the world. It leaves Paddington at 11.45 mid-day and runs to Swindon, a distance of 77¼ miles, in 87 minutes, an average of 53¼ miles per hour. After stopping at Swindon ten minutes it leaves for Bath at 1.22, arriving there at two o'clock, thus making a run of 107 miles in 125 minutes, an average speed of 51½ miles per hour. The Great Northern ten o'clock express runs without any stop from King's Cross to Grantham, 105 miles, in 2 hours and 9 minutes, nearly 49 miles an hour. The Great Western Dutchman stops at Bath 3 minutes, and gets to Bristol at 2.21, having run 118½ miles from Paddington in 143 minutes, not including the time it stops at Swindon and Bath, which gives an average speed of 50 miles per hour. But in reckoning speed for this distance it must not be overlooked that the Flying Dutchman loses 4 minutes in reducing speed to stop and start from Swindon, and the same at Bath, in addition to the time while it is actually standing at the stations, and taking this into account, gives an average speed of the train for the journey to Bristol of 52½ miles per hour, to be compared with the 49 miles per hour of the Great Northern express. In order, however, to get a more correct average speed further allowance should be made for both trains of 2 minutes for each start and the same for each stop, as at least this time is lost in getting up speed in starting and in reducing speed to come to a stand at a station. This gives an average speed of nearly 55 miles an hour for the Dutchman from London to Bath, 50 miles an hour for the Scotchman from King's Cross to Grantham, and 54 miles an hour for the Dutchman from London to Bristol. Those well acquainted with the road know that such an average speed is only obtainable by running at more than the traditional mile a minute over a great portion of the journey. The Scotch express certainly runs the longest distance, 105 miles, without stopping; but even with this advantage in regard to speed it does not travel as fast as the Great Western Railway Dutchman, which runs 2 miles more, in 4 minutes' less time, with an intermediate stop, than the Great Northern Railway Scotchman takes in running a distance shorter by two miles without any stop.

Taking the comparison shown recently in a monthly contemporary—*Chambers' Journal* for December 29th—of the run of the Scotch express to York, 188 miles in 235 minutes, with an average speed of 48 miles per hour including stoppages, and the Flying Dutchman's run to Exeter 194 miles in 255 minutes, average speed 45½ miles per hour, calculated in the same manner. The Scotch express has only one stop of 6 minutes at Grantham on this journey, whereas the Dutchman has four stops, viz., Swindon, 10 minutes; Bath, 3 minutes; Bristol, 5 minutes; and Taunton, 4 minutes; total 22 minutes. Deducting the stops only, it gives the average speed of the Dutchman to be 50 and the Scotchman 49 miles per hour; but also allowing for both trains working up to full speed in starting and reducing speed to a stop in every case, the average speed is 54½ miles for the Dutchman, and for the Scotchman 51 miles per hour. The Great Western Railway narrow gauge express from Paddington at 4.45 p.m. runs to Wolverhampton, 141½ miles, in 184 minutes; and deducting five minutes stop at Oxford and three at Birmingham, and allowing for getting up and reducing speed, the average speed is nearly 52 miles per hour, or 50½ miles deducting stops only. In further proof that the broad gauge Great Western Railway trains have run at a higher speed than 60 miles an hour, it is known that the Dutchman some time ago ran from Swindon to Paddington, 77¼ miles, in exactly 77 minutes. A special Cape mail train also ran the same journey in 76 minutes, and the fast Zulu express train ran it in 79 minutes. The fastest journey on record is that made by the Great Western Railway 9.15 p.m. express from Paddington on the 11th May, 1848. The train consisted of the broad gauge engine Great Britain, four carriages and a van, and ran to Didcot, 53¼ miles, in 47 minutes—an average speed of 68 miles an hour. The driver was Michael Almond, deceased, and the fireman was Richard Denham, who is living at Swindon, a superannuated engineman.

These instances quoted of Great Western trains running at a greater speed than the traditional mile a minute are cases of long distances verified by official record, whereas the instances of extreme speed referred to in a contemporary are apparently only founded on the statement of a writer who says he "has acquired some facility in guessing the speed of trains by noting the mile posts," and asserts that in doing this on one occasion he noted the speed of a North-Western train as 75 miles per hour for four or five miles, or at the rate of a mile in forty-eight seconds. The Great Western Railway broad gauge Flying Dutchman and Zulu express trains between London and Swindon run daily on portions of the journey—where the line is perfectly level—at more than 80 miles an hour for such short distances; and if it were not for the unavoidable stop of ten minutes at Swindon for refreshments, the Great Western Railway trains could be accelerated for a longer journey to such a speed that the Great Northern express would be left further behind the "Fastest Train in Great Britain."

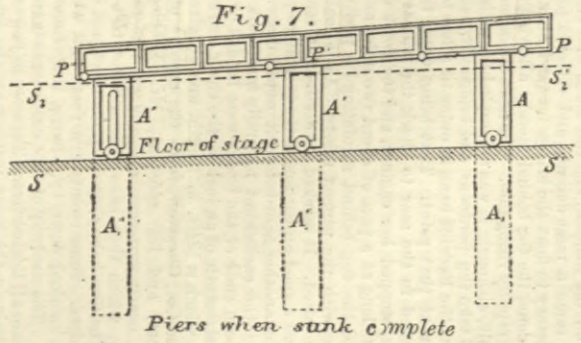
IT is stated that the Great Eastern steamship has been purchased by Messrs. E. D. Mattos and Co, of London and Cardiff, who intend to convert her into a coal hulk to lie at Gibraltar.

REMOVAL OF A BRIDGE.—An interesting engineering work has just been accomplished at Bristol, which, so far as we are aware, is unique. A large foot-bridge was lifted bodily from its place, moved a considerable distance, and dropped down *in situ*. A Bristol contemporary thus describes the work:—"An engineering feat of no small difficulty or importance was successfully accomplished, without hitch or accident, yesterday morning—the removal *en bloc* of the iron foot-bridge crossing the New Cut at the bottom of Redcliff-hill, and connecting that district with the Causeway, Bedminster, to its permanent position opposite Langton-street. The hour fixed for the operation was six o'clock, and although somewhat early for the bulk of people, the banks of the New Cut were lined with 18,000 or 20,000 persons. The pontoons for floating the bridge, which consisted of four 80-ton barges, braced together in pairs, with the necessary staging, were floated round from the harbour to Bedminster Bridge on the previous evening, and remained there until morning. When the tide raised them to a sufficient height they were taken up the Cut, a short distance beyond the footbridge, and then braced together so as to form one strong solid structure 64ft. in width. The value of the stout balks of timber was said to be about £200, and about eighteen men had been employed for nearly three weeks in its construction. It was all done in the floating harbour, near Messrs. Taylor and Low's wharf. The two pontoons, having been braced together, were brought back under the bridge, and placed in a most accurate position for balancing the 80-ton iron bridge. By six o'clock the top of the staging, which was 24ft. above water line, touched the under part of the bridge, and so correctly were the pontoons placed that when, a quarter of an hour later, the rising tide lifted the bridge, it was observed that both ends left the plate beds precisely at the same time. No further movement was made for something like twenty minutes, during which time the bridge had been raised by the tide some 4ft. above the plate beds, so that it was then clear of the railings on the Redcliff, and the stone wall on the Bedminster side. Now came a most delicate and difficult part of the work. It was necessary to float the bridge forward about 6ft.—but that was easily done, the tug behind merely allowing the pontoons to drift on the rapidly rising tide. The next operation was somewhat more difficult, although it was accomplished with amusing ease—that was to take the pontoons and bridge 6ft. nearer to the Bedminster than the Redcliff bank in order to allow for the curvature of the river at that point. That being done, the tug Sea Bird, which followed in the rear to check the too hasty movement of the pontoon, stopped her engines, and the great structure floated majestically along at a pace of about two miles an hour, the boats in front and the tug behind regulating its position in the centre of the river with the utmost nicety. As it floated along hearty cheers were raised. It reached its destination considerably before high tide, and a good proportion of the spectators preferred leaving to waiting for another hour before it would descend. As the tide fast receded the excitement naturally increased, until at exactly 8.20 a.m. both ends of the bridge were landed on their plate beds within one-sixteenth of an inch of the chalk mark made for them. The bridge, which is 134ft. in length, was constructed by Messrs. E. Finch and Co., Chepstow, from the designs of Mr. Ashmead, city engineer, and his assistant, Mr. Yabbicombe. It was commenced nearly two years ago, and part of their contract was its removal, which they have accomplished in so satisfactory a manner. The firm have played a prominent part in the making of our city bridges. Some twenty-five years ago, when the old Bath bridge was knocked down by a barge, they constructed the new iron bridge. The roadway of that comprises about twelve girders, and these were all floated from Chepstow in pairs and fixed in their places precisely in the same manner as the bridge was floated yesterday. Whenever it is practicable, they invariably utilise the tide to do their work. They made the new St. Philip's Bridge, the drawbridge and the swing bridge at Cumberland basin. They also widened both sides of Bristol Bridge. The work has been carried out entirely under the direction of Mr. James Rowe, managing director, assisted by his foreman, Mr. D. Davies, of Crumlin, near Newport. The piers and the other masonry are the work of Mr. Galbraith, contractor, of Bristol. Mr. Superintendent Harris was present during the operation with thirty police constables, who were judiciously distributed on each side of the New-cut and on Bedminster Bridge, and they succeeded in keeping good order."

THEATRICAL MACHINERY AT THE NEW PARIS OPERA HOUSE.

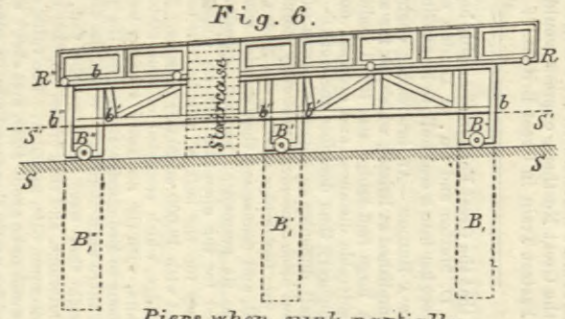
(For description see page 163.

Fig. 7.



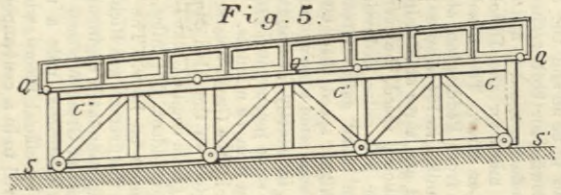
Piers when sunk complete

Fig. 6.



Piers when sunk partially

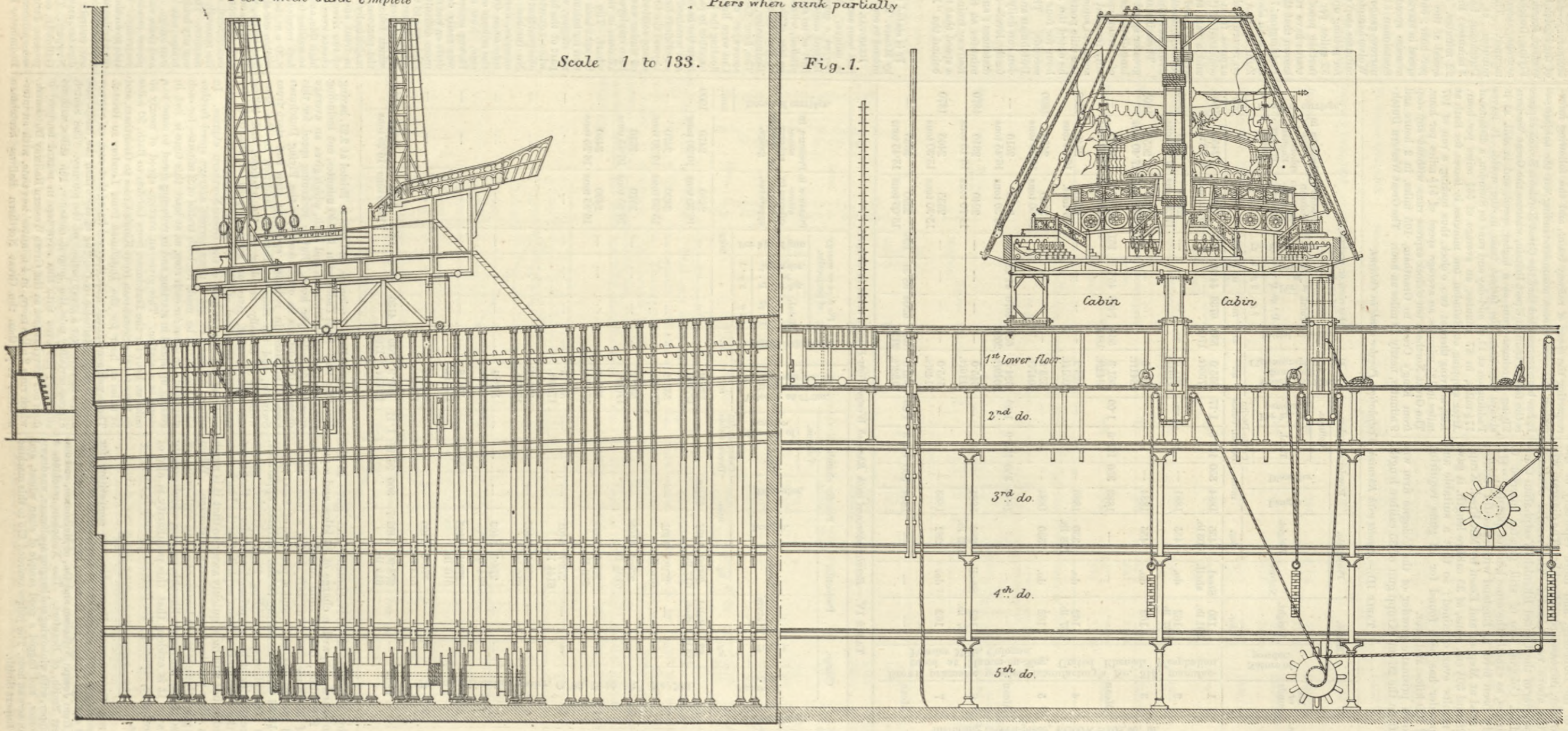
Fig. 5.



Frame fixing axis during sinking

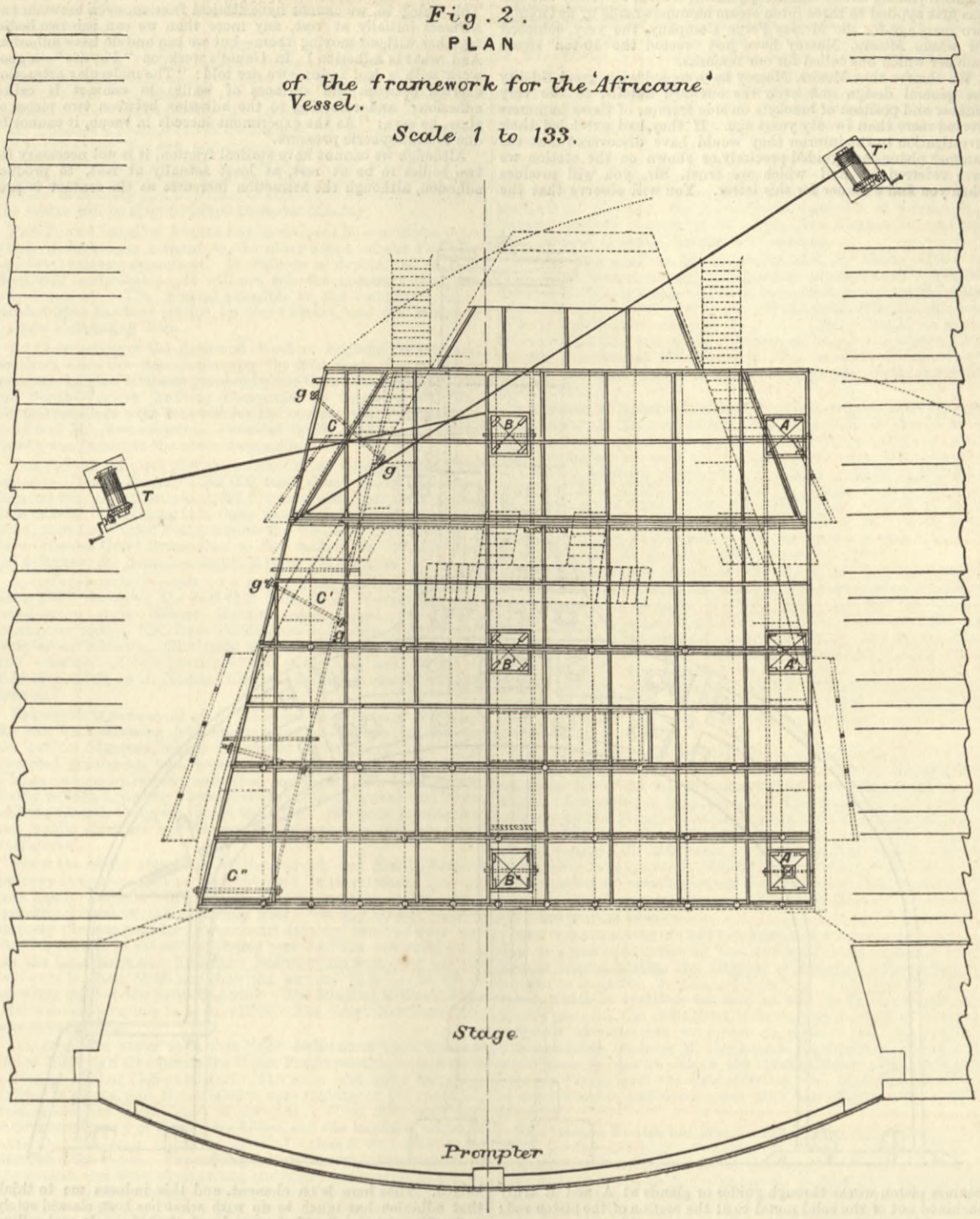
Scale 1 to 133.

Fig. 1.



THEATRICAL MACHINERY IN THE PARIS OPERA HOUSE.

Fig. 2.
PLAN
of the framework for the 'Africaine' Vessel.
Scale 1 to 133.



AMONGST the various branches of engineering, the machinery of the stage has hardly yet received a recognised place; nevertheless, it is an art of great antiquity, as is known to all who have studied the arrangements of the Greek theatre. It is also an art carried on under very special conditions, owing to the necessary lightness and mobility of all the parts, and the fact that their action must be screened from view. For this reason the theatrical machinist has hitherto kept himself aloof from the employment of iron, which in all other departments of engineering has become general if not universal. The stage apparatus is still constructed of wood in the lightest and cheapest forms. For this reason, if for no other, it is worth while to bestow a glance upon some of its features.

There are three principal conditions under which the art of the machinist is compelled to work: (1) He must produce an illusion in the eyes of the spectators by the simplest and readiest mechanical means which can be devised. (2) His structures must be sufficiently strong and firm never to produce any accident by undue deflection or by rupture. Such an accident, if seen from the theatre, would at once reduce the performance to a *fiasco*. (3) The parts of the structure must be of small scantling, easily put together or taken to pieces; and the whole must be readily removed to one side when the scene is over, or taken out of the theatre altogether when a new piece is put on the stage. This last condition is of great importance in the case of the new Paris Opera House, in which the stores for the reception of scenery, apparatus, &c., are at a considerable distance from the building itself. We shall illustrate these principles by a particular case, which has lately been described in our contemporary, the *Génie Civil*. It is that of the mechanical arrangements used at the Paris Opera for the construction and manœuvring of the vessel which is used in Meyerbeer's Opera, L'Africane.

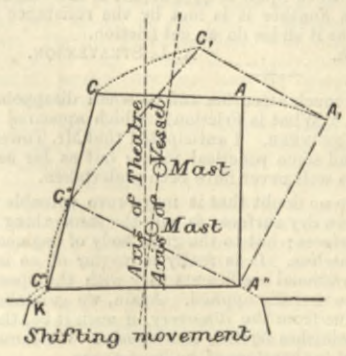


Fig. 3.

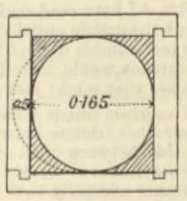


Fig. 4.
Axis of shifts

This opera was first represented at Paris in 1864, just at the time of Meyerbeer's death. In the third act a shipwreck occurs, which was announced in the programme as follows:—(1) The scene will represent a large three-masted ship at sea, with the stern towards the audience; this will shift its course towards the North. (2) The ship will strike on rocks rising from the stage, and sink. (3) The audience will see the interior of the vessel and the ladies' and captain's cabins upon deck. Here the scene will take place.

It will be obvious how much is here trusted to the effects of theatrical illusion; the ship is supposed to be cut in two by a transverse plane a little in front of the mainmast; thus the bowsprit, foremast, &c., exist only in the imagination of the spectator, and yet, thanks to the artistic effect, this absurdity passes unnoticed. The programme thus indicated was carried out by M. Lavastie in so complete a manner, that the whole of the chorus and actors, numbering 150 persons, were able to move about within the ship just as on the stage, and that the deck, bridge, &c., were all of them accessible.

The following table of dimensions of the vessel as constructed

Fig. 8.

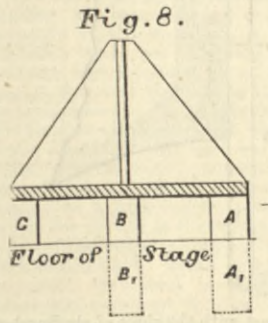
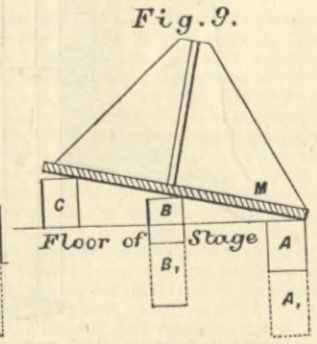


Fig. 9.



Position before sinking. Position during sinking.

at the Old and New Opera House will give an idea of its magnitude and weight:—

	Old Opera.	New Opera.
Width of deck	43·3ft.	43·6ft.
Length of deck	32·2ft.	45·9ft.
Level of deck above the stage	7·9ft.	8·6ft.
Height of poop	16·9ft.	18·7ft.
Height of masts	33·5ft.	40·5ft.
Area	1390 sq. ft.	2000 sq. ft.
Weight to be moved	12 tons	7 tons.

It will seen that whilst the dimensions at the New Opera were considerably larger, a more skilful use of the material enabled the weight to be very greatly reduced. There were two movements to be executed. The first, which we may call the "shifting movement," when the vessel altered her course, and the second, or "sinking movement," when she struck on the rocks and went down. We will take these in order.

The shifting movement.—To accomplish this M. Sacré, chief machinist at the Old Opera, employed two large timber platforms placed one above the other, and supported by cast iron rollers, a large central bolt serving as axis of rotation. This only allowed a shifting of about 5½ft., and had the following disadvantages:—(1) At the end of the movement a large part of the upper platform was projecting beyond the lower, and this part carried a considerable portion of the vessel itself and of the weight of the performers. (2) The platforms were very heavy, weighing about twelve tons, and their movement required forty carpenters in addition to the regular staff, together with counter-balanced wire ropes, and other expensive adjuncts. (3) The interval between the acts took twenty minutes. (4) After the act the two platforms had to be lifted to the top of the scenes and there left.

Position of supports during sinking

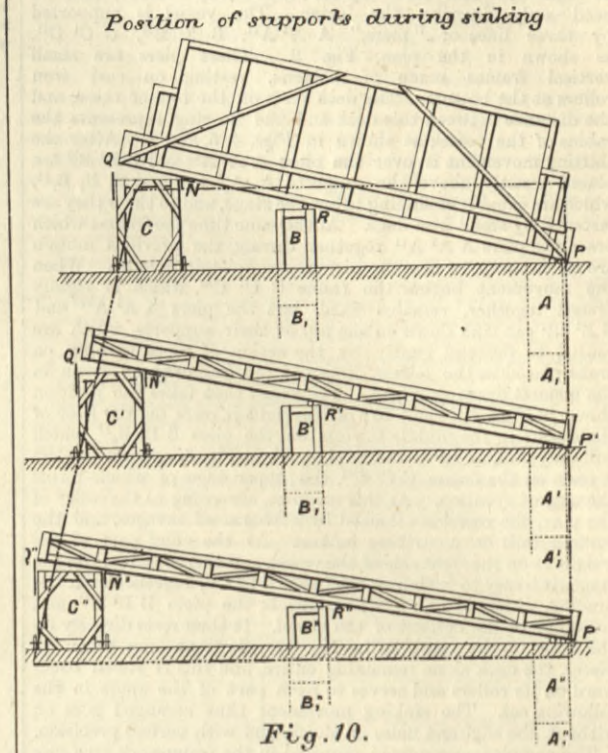


Fig. 10.

The problem has been solved by M. Mataillet, of the New Opera, in quite a different manner. He replaced the upper platform by a light timber frame, shown in plan Fig. 2. This frame is carried on rollers, and can move either forward or sideways on the floor of the stage, which replaces the lower platform previously used. The vessel is ready mounted on the frame before the representation, but is kept at the back of the

Fig. 11.

Position after sinking

stage, where it is hidden by the scenery. During the second interval the whole is brought forward to the front of the stage and placed square to the audience in the position shown in Fig. 2. In this position the pivot A_2 is made to fit into a socket on the frame. During this motion the first sets of rollers are employed, having their axles perpendicular to the centre line of the stage. As soon as the vessel is in place these rollers are

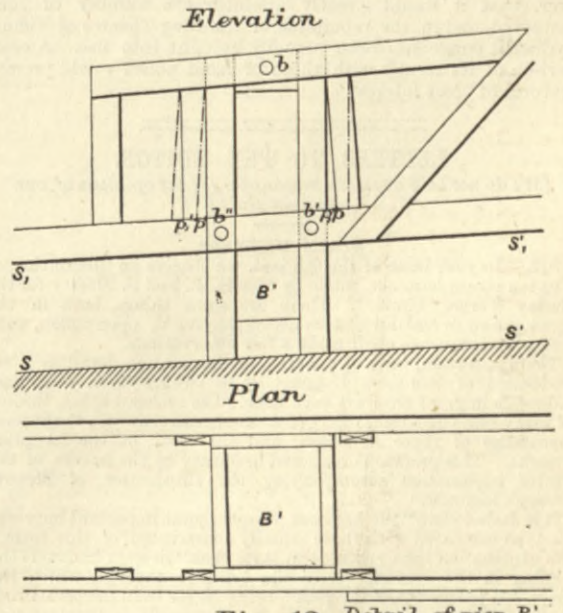


Fig. 12. Detail of pier B' with bolts.

replaced by a second set *g g*, having their axles pointing towards the axis of rotation A^{11}. By means of the winches T and T_1 the whole can then be shifted round this axis into the position $A^{11} A_1 C_1 C_1^{11}$, which is the position shown on the rising of the curtain. Thus the vessel when first seen is slightly inclined to the spectator, and both masts with their rigging, &c., are visible at the same time. The axis of rotation A_2^{11} consists of an oak post 6½in. square. It penetrates into the corresponding socket in the frame, but its upper part is slightly excentric to the axis of this socket, as shown in Fig. 4. This assists the turning of the vessel.

Such is the appearance when the third act commences. A few seconds before the shipwreck the order is given to shift the helm, and the vessel turns towards the north. This is effected

by hauling on the chain T, and thus bringing the frame back to the position A^{II} A C C^{II} in Fig. 2. During this motion the side scene between $C_1{}^{II}$ and C^{II} is made to roll upon itself, so as to contract as the space allowed for it narrows. The result of this operation is that the vessel can be shifted through a distance of 22ft., which is much more satisfactory than the small angle previously attained. The interval is also reduced to five minutes, and the movement is performed by two men only, working the hand winches, shown on plan. Every part of the vessel is easily taken to pieces and replaced in the stores, as soon as the opera is taken off the stage.

The sinking movement.—Here the methods adopted, both at the Old and New Opera, were very similar, and we need only describe the latter. The vessel is supported by three lines of "piers," A A^1 A^{II}, B B^1 B^{II}, C C^1 C^{II}, as shown in the plan, Fig. 2. These piers are small vertical frames made of battens, resting on cast iron rollers at the bottom. The deck rests on the top of these, and the distance between this deck and the flooring represents the cabins of the vessel, as shown in Figs. 4, 5, and 6. After the shifting movement is over the piers A A^1 A^{II} and B B^1 B^{II} are placed exactly above the supports A_1 $A_1{}^1$ $A_1{}^{II}$ and B_1 B_1 $B_1{}^{II}$, which are capable of sinking below the stage, and to these they are fastened by small iron dogs. At the same time the frames which brace the piers A A^1 A^{II} together during the previous motion are taken away, so that the piers are completely isolated. When the movement begins the frame C C^1 C^{II}, which is rigidly braced together, remains fixed, but the piers A A^1 A^{II} and B B^1 B^{II} can sink down on the top of their supports, which are caused to descend gently by the action of ropes turning on crabs placed in the lowest storey of the basement, as shown in the general drawing, Fig. 1. The vessel then takes the position shown in Figs. 8, 9, and 10; on the right it rests on the floor of the stage; in the middle it rests on the piers B B^1 $B_2{}^{II}$, which will only sink as far as the level, s_1 $s_1{}^1$, in Fig. 6, and on the left it rests on the frame C C^1 C^{II}, the upper edge of which forms the axis of rotation. At this moment, according to the order of the play, the vessel is attacked by a swarm of savages, and the curtain falls on a striking *tableau*. As the chief part of the weight is on the right side of the vessel, and therefore rests on the stage, it is easy to withdraw the frame C C^1 C^{II}, together with the bracing, which, in Fig. 6, still connects the piers B B^1 B^{II}, and to complete the descent of the vessel. It then rests directly on the floor of the stage, as in Fig. 11. It is at once taken to pieces, the deck alone remaining entire, and this is rolled backward on its rollers and serves to form part of the stage in the following act. The sinking movement thus arranged goes on without the slightest noise or shock, and with perfect precision.

The complex movements required in the framework give rise to various devices, of which only one can be dwelt upon. Up to the moment of sinking, the horizontal frame of the vessel is firmly connected to the piers d d^1 d^{II} by knees, and to the piers B B^1 B^{II} by three bolts b_1 b^1 b^{II}, as shown in Fig. 12. Before the shipwreck the knees are taken away, and also the bolts b^1 and b^{II}, so that the deck of the vessel may be shifted when required. This deck, in fact, is inclined more steeply than the floor of the stage, and thus the point P^{II} in Fig. 7 is that which naturally comes first to the floor, and so stops further motion. It is not possible to make the piers swerve from the vertical while sinking, and nevertheless the line P P^{II} must be made to coincide with the line S S^1, representing the floor of the stage; and as the axis of rotation N N^1 N^{II}—Fig. 10—is itself oblique to the stage, a double movement is required. In the first place, there is a horizontal displacement, which is facilitated by means of the rollers shown at P P^1 P^{II} and R R^1 R^{II} in Fig. 10; and secondly, a rotary movement, which takes place round the bolts b b^1 b^{II} in Fig. 12, this being rendered possible by the removal of the bolts b_1 and b_2. By this means the clearance p p_1, shown in Fig. 12, disappears, and is replaced by a clearance p^1 $p_1{}^1$. Thus the deck of the vessel is brought fair with the floor of the stage in a simple and ingenious manner.

The vessel itself is constructed of fir planks about 5in. by 1¼in., solidly fastened together and united by small keys and bolts of iron. It is strong enough to bear the violent movements of about 150 persons during the action, and at the same time a few minutes only are sufficient to produce its entire disappearance from the stage. The mechanical means employed, as we have seen, are small counterweights, capstans or crabs, and hempen ropes. It might be suggested that hydraulic power could be employed with advantage, but theatrical machinists seem to doubt its giving them sufficient power, and at the same time all the rapidity and regularity which is requisite. It is obvious, however, that it would greatly diminish the number of men employed, and in the rebuilding of the Ring Theatre at Vienna hydraulic power has been actually brought into use. A comparison of its results with those of hand power would present features of great interest.

LETTERS TO THE EDITOR.

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

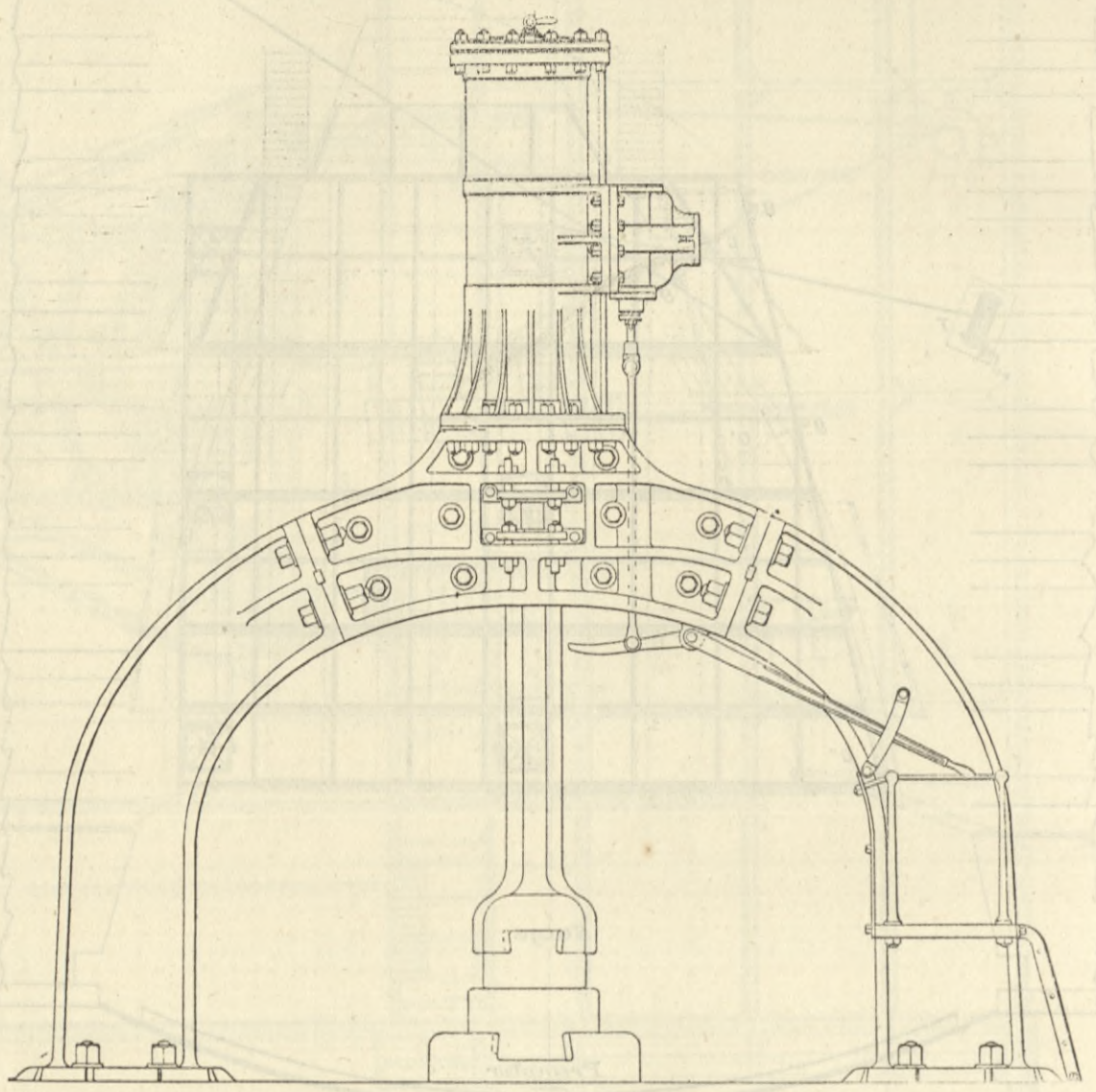
STEAM HAMMERS.

Sir,—In your issue of the 8th inst. we observe an illustration of a 10-ton steam hammer, made by Messrs. B. and S. Massey for the Mersey Forge, Limited. There are some things, both in the hammer and in the description accompanying it, upon which, with your permission, we shall make a few observations.

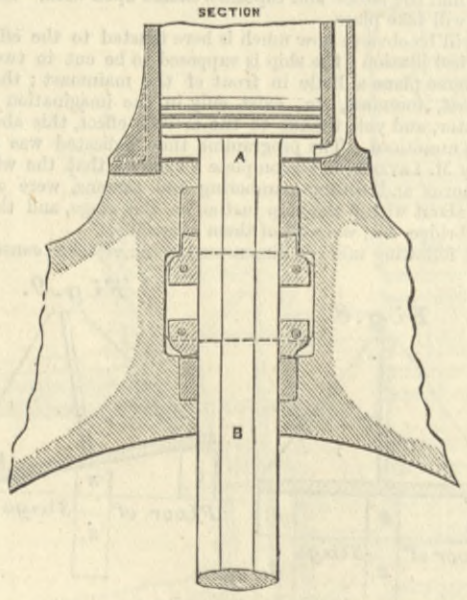
The illustration, both in general outline and in detail, is a reproduction of hammers designed by us twenty-three years ago, and made in great numbers ever since. The inclosed lithos, thrown off many years ago and largely circulated, will show you the general appearance of those hammers, and the truth of the foregoing remarks. This preface is rendered necessary by the nature of the printed explanation accompanying the illustration of Messrs. Massey's hammer.

It is stated that "the hammer presents some important improvements as compared with those usually constructed of this form." The explanation then proceeds to state that "in such hammers the opening in the framing under the cylinder through which the piston-rod passes below the gland, being larger than the piston-rod, of course does nothing to steady it; the result is that in such hammers the piston-rod is only guided by the fittings of the piston in the cylinder with such aid as can be given by a gland stuffing-box, which consists only of castings dressed off by hand." The description then goes on to explain that in Messrs. Massey's hammer the packing gland is fitted accurately into the stuffing-box, &c. Now as we are the original designers, and, so far as we know, the sole makers of "hammers usually constructed of this form," it follows that the graphic description of this rude construction must apply to our practice. That being so, we beg to state that when we commenced to make double-frame steam hammers on the bridge principle, more than twenty-five years ago, we fitted the packing glands into the stuffing-boxes for the purpose of forming a guide to the hammer piston, precisely as now adopted by Messrs. Massey, and pointed out by them as "an important improvement." A few years' experience showed us that to fit a large and heavy gland tightly into a stuffing-box might make a good guide but a very bad packing gland, as it was liable to get fixed, and become a source of great trouble. If, on the other hand, it was fitted easy, its efficiency as a guide was destroyed. In these circumstances we devised a method of getting over the difficulty and at the same time securing a much more efficient and durable guide. The section on enclosed tracing shows this arrangement, which, curiously enough, was first applied to three 6-ton steam hammers made by us twenty-two years ago for the Mersey Forge Company, the very company for whom Messrs. Massey have just erected the 10-ton steam hammer which has called for our remarks.

We observe that Messrs. Massey have copied with great fidelity the general design and even the outward details, to the very number and position of brackets on side frames, of those hammers erected more than twenty years ago. If they had extended their investigation to the interior they would have discovered that the hammer pistons are guided precisely as shown on the section we have referred to, and which we trust, Sir, you will produce when you find a corner for this letter. You will observe that the



hammer piston works through guides or glands at A and B truly machined out of the solid metal to fit the section of the piston-rod; those guides are situated at the extreme top and bottom of centre piece, and are, therefore, in the very best possible position for the purpose. The packing glands are also machined inside to fit the piston-rod, but are purposely kept ¼in. clear of the sides of the stuffing-box. They thus fulfil their true use—that of keeping the hammer steam and water-tight—while they are preserved from jar



and liability to fracture, which contact with the sides of stuffing-box entail. We have said the packing glands keep the hammers steam and water-tight; the upper gland prevents the steam from passing, but with rods of large section water will force through. The lower gland prevents this condensed water getting down to the anvil; it is caught in a tray cast in the centre piece and drawn off through a waste-water pipe.

Glen and Ross.

Greenhead Engine Works, Glasgow,
February 12th.

WHAT IS FRICTION?

Sir,—Your article of last week on this subject comes when I have been for some time studying the special work of horses in mines. Into this question friction largely enters, and I have been struck with what I think is a mistake on the part of Morin, Rankine, and others, and now of yourself. A mistake certainly in words, and from which has followed an oversight in facts. A serious one I think it is, and consists in confusing adhesion and friction. They are not the same thing, and the hiding of the former under the term "statical friction" has led to the apparently anomalous results which have given occasion for your remarks.

When the Romans visited this country many years ago they left behind them a large number of words as well as noses. From them we get our word friction, which signifies "the rubbing of one body against another." And what is rubbing? this we are told is from the British word "rhubio," to move one body upon another. This being so, we cannot have statical friction, even between two surfaces initially at rest, any more than we can rub two bodies together without moving them—but we can and do have adhesion. And what is adhesion? In Ganot's work on "Physics"—a good work with a bad index—we are told: "The molecular attraction exerted between the surfaces of bodies in contact is called adhesion;" and referring to the adhesion between two pieces of glass, he says: "As the experiment succeeds in vacuo, it cannot be due to atmospheric pressure."

Although we cannot have statical friction, it is not necessary for two bodies to be at rest, at least actually at rest, to produce adhesion, although the attraction increases as the contact is prolonged. Time here is an element, and this induces me to think that adhesion has much to do with what has been classed solely as "rolling friction." My impression is that the only real rolling friction is that which arises from the want of coincidence of the surface of the cylinder or wheel with the surface it moves upon, and is described by a writer when he says: "Conical wheels or bent axles tend by the inequality of the speed at different points in the tire to produce a sliding on the road which increases the resistance." And Morin, in his work on the "Draught of Carriages," gives a table of the experiments made by Mr. Cumming upon conical wheels and cylinders. Here, I think, we have the secret of all the rolling friction, and beyond it all is adhesion; and although I do not claim to be a physicist, if time and means were at my disposal I should enjoy, as you suggest, working out this hypothesis. I have only to add that nearly all the observations now given as the work of Thurston, Kimball, Tower, and others were forestalled by Mr. Nicholas Wood in his work upon "Railways" more than fifty years ago, and he gives a sketch of an axle with the oil heaped up against it, and he says: "Although the axle was well oiled, yet unless the oil was kept constantly feeding upon the axle as it turned round, a maximum effect did not take place." He uses a more happy expression when he says: "The rolling resistance of the wheels is supposed to be equal to $\frac{1}{1000}$th part of the weight." When a body rolls upon another it is met by the resistance of adhesion; only in so far as it slides do we get friction.

Durham, February 26th. A. L. Steavenson.

Sir,—I have read with much attention and no small disappointment the article entitled, "What is Friction?" which appeared in the last number of The Engineer. I anticipated that Mr. Towers' researches would have had some practical value; but as far as I can see they might just as well never have been undertaken.

To certain minds I have no doubt that it may prove valuable to know that friction between dry surfaces is not the same thing as friction between oiled surfaces; but to the great body of engineers the statement is simply useless. It is really a matter of no importance whatever that frictional coefficients vary with the speed, because the fact cannot be usefully applied. Again, we gain absolutely nothing of any value from the discovery, if such it be, that the use of an oil bath diminishes friction enormously. We cannot use oil baths, and the fact is therefore of no importance.

It seems to be the fate of the Institution of Mechanical Engineers to always carry out investigations of no practical value to anyone. If Mr. Towers had told us something about the relative values of different materials for bearings he would have done good service. For example, cast iron is now being used instead of brass in marine crank shaft bearings. I should like to know if I may put it into stationary engine bearings. Again, take the case of footsteps; next to nothing is known about them, yet they give great trouble in centrifugal machines, Vapart's disintegrator, turbines, and centrifugal pumps. Why not let us know something about these things?

So-called scientific research is rapidly becoming nothing but a method by which considerable incomes may be earned in finding out things of no earthly use to any mortal. The Institution of Mechanical Engineers ought to keep clear of this sort of thing, and its money ought to be spent on inquiries likely to prove of practical value to its members. There is no lack of subjects for investigation.

J. C. H.

Birmingham, Feb. 25th.

[*For continuation of Letters see page* 171.]

RAILWAY MATTERS.

THE Governor of Queensland turned the first sod of the Mackay railway on December 21st, in the presence of 2000 people.

BELGIUM had the first railways on the Continent. State preparations for the celebration of the fiftieth year on the 1st of May are now being made.

THE Calcutta Tramway Company has now 38½ miles of single tramway, 150 cars, 800 horses, and 8 engines. Messrs. Parrish and Santtar are the contractors, and have also supplied the whole of the equipment. The whole of the work has been done under the engineer to the company, Mr. J. D. Larsen, Assoc. M.I.C.E.

ON Tuesday a number of the directors of the London, Brighton, and South Coast Railway, and others, went by special train from Victoria over two new routes to Brighton, which are in the form of additions to the existing lines, and have been constructed with the view to opening up a new tract of country in Surrey and Sussex. The routes will be open to public traffic on Monday.

THE Town Council of Vienna has formulated 20 conditions upon which it makes its consent to the construction of the Foggerty high-level railway dependent. It declares a double line of rails absolutely inadmissible. It will not sell the necessary land, but only lease it. The general principle of the conditions to be insisted upon has been settled by the Cabinet, and the Ministers are now elaborating them.

AT the meeting of the Bath and West of England Society and Southern Counties Association, on the 26th inst., the secretary reported that the facilities granted by the Great Western Railway and South-Western Railway Companies to members attending Council meetings were renewed for the current year; and on the motion of Mr. Moore-Stevens, seconded by Mr. Moysey, a vote of thanks was passed to the above companies.

THE following figures give the production of rails in 1883 as estimated:—United States, 1,303,000 tons, about 190,000 tons less than in 1882; Great Britain, 1,097,174 tons, about 140,000 tons less than in 1882. In looking into these figures it has to be borne in mind, that the United States absorb the whole of their own produce, whereas Great Britain had to find outlets for 773,509 tons, the difference for home consumption being 323,665 tons.

A CORRESPONDENT sends us a card which has been preserved since 1848, recording the fact that "the Great Western Railway broad-gauge engine Great Britain accomplished the fastest journey on record, viz., from Paddington to Didcot, 53¼ miles, in forty-seven minutes. The train was the 9.15 express to Bristol, and consisted of four carriages and vans, and was driven on May 11th, 1848, by J. Michael Almond, driver; Richard Denham, fireman."

THE death is announced of Sir Abraham Woodiwiss at Mentone. He had been suffering for some months, and on the 19th inst. he set out for Mentone, where he arrived on Saturday night. The deceased gentleman, who began life as a working mason, amassed a large fortune by railway and other contracts. He was Mayor of Derby in 1881-2, during which years the Royal Agricultural Show and the Church Congress visited the town. His great munificence and public spirit led her Majesty to confer on him the honour of knighthood.

FROM the official statement of the London and North-Western Railway it appears that the amount paid for Government duty on that line in the past half-year was £17,551 less than in the corresponding period of the preceding year. On the Great Western Railway the sum paid for Government duty for the half-year was £6255 less than in the corresponding period of the preceding year. On the Lancashire and Yorkshire Railway the sum paid for the half-year is about £3400 less than the amount paid in the corresponding half of the preceding year. The Midland Railway Company's saving amounts to about £8500. The Great Northern Railway saved £3285.

AN American paper says that "the west-bound train between Green River and Granger on the Union Pacific recently encountered a flock of 1200 or 1500 antelopes. The snow was quite deep and drifted in places, and the antelopes were running on the road-bed, finding that the easiest road to travel in. When they were first encountered many of them were killed, and the engineer, seeing at once that the train might be derailed unless it were slowed up, decreased the speed. The antelopes kept a short distance ahead of the engine, and were strung along the road for a quarter of a mile. They would occasionally get some distance from the engine, and then they would stop, turn round, and watch the headlight until the engine was fairly upon them. They delayed the train half or three-quarters of an hour." When we were young caterpillars delayed trains. Antelopes are new. Bisons have been utilised in this way, but not much.

THE construction of railways in Canada has been very rapid since 1870. In that year there were only 2497 miles open for traffic; in June, 1882, this had increased to 8069 miles, and in the last eighteen months another 1000 miles at least have been added. There are now, therefore, over 9000 miles in operation. The total amount of capital invested in the construction and equipment of railways in Canada, to the end of the fiscal year, 1882, was 389,285,700 dols. The Canadian Pacific Railway is nearly ready for operation from Montreal to Algoma Mills, on Georgian Bay, and is now being worked from Port Arthur, on Lake Superior, to the Rocky Mountains, a distance of nearly 1400 miles; and from Winnipeg south to the International boundary, where it connects with the United States Railway system. It is confidently expected that in 1886 there will be direct communication from the maritime provinces to the Pacific coast entirely through Canadian territory. There are about 2000 miles constructed at the present time, and the track has been laid during the past season at the rate of between two or three miles per day. The line when complete, will, including branches, be about 3300 miles long. It has been largely subsidised by the Government, and the work would have been an onerous one for a country with a much larger population than that of Canada.

IN a lecture delivered to the Lower Rhenish Architects' and Engineers' Association, Herr Jüttner lately gave some interesting particulars on French railway projects for the North-West of Africa. The Sahara Railway is intended to connect Algiers with Timbuctoo; but the obstacles in the way of its successful accomplishment are serious, the construction of these 1700 miles of railway being impeded by the climate, the scarcity of water, the dangers arising from sand-storms, and the hostility of the natives. The temperature of the Sahara is especially trying from the fact that the nights are extremely cold. For the purpose of supplying water an extensive system of water pipes is spoken of, which would cost £1600 a mile; but it is also remarked that there are in the Sahara underground watercourses, which, coming into view at certain spots, form oases. It is therefore argued that artesian borings would probably be successful, so that the pipe communication alluded to could probably be confined to various points. The only detailed plans in existence regarding the Sahara line are those which affect the portion in Algeria—about 250 miles in length. Of the remaining 1450 miles, about one-half would seem to have been roughly planned on the information of travellers, while the projects for the remainder of the line are of a vague character, being founded on unreliable information. The cost is estimated at £16,000,000, and the whole scheme is based on the material assistance of the French Government in its execution. The calculations of profit are partly founded upon the gain to be derived from the importation of salt into the Soudan, where it is worth from 9d. to 13d. per pound. The company working the line would have a monopoly for the sale of salt, and a revenue of £400,000 is looked for from this source. The import of various necessaries and the export of products of the Soudan are relied upon to supplement this return in an important degree, the rates being based on charges of 1½d. per ton per mile for most classes of goods, and ¾d. per passenger per mile.

NOTES AND MEMORANDA.

AT the Royal Observatory, Greenwich, the mean temperature was 43·4 deg., being 4·1 deg. above the average in the corresponding week of twenty years.

ACCORDING to "May's Press Guide" there are now published in Great Britain 69 halfpenny periodicals, 351 at 1d., 9 at 1½d., 95 at 2d., 54 at 3d., 36 at 4d., 125 at 6d., 70 at 1s., 23 at 1s. 6d., 17 at 2s., 25 at 2s. 6d., 8 at 3s. 6d., 3 at 4s., 9 at 5s., 8 at 6s., and 19 gratis.

IN London last week 2538 births and 1552 deaths—15 and 9·2 respectively per hour, or one in every 4 minutes and 6·5 minutes respectively—were registered, and the annual death rate was 20·2 per 1000. In twenty-eight great towns in Great Britain the average was 21·1 per 1000.

THE following are the principal scientific societies in Canada, and they all publish their transactions:—The Royal Society of Canada, the Natural History Society of Montreal, the Canadian Institute of Toronto, the Nova Scotia Institute of Science, the Natural History Society of St. John, New Brunswick, and the Scientific and Historical Society of Winnipeg.

DURING the week ending February 2nd, in thirty cities of the United States, having an aggregate population of 7,150,400, there died 2863 persons, which is equivalent to an annual death rate of 20·8 per 1000. In the North Atlantic cities the rate was 19·3; in the Eastern cities, 21·9; in the Lake cities, 15·7; in the River cities, 18·8; and in the Southern cities, for the whites, 22·7, and for the coloured 42·0 per 1000. The *Sanitary Engineer* says that of the total number of deaths 34·4 per cent. were under five years of age.

A NUMBER of redeterminations of atomic weights have recently been published. *Nature* gives the most important:—Thorpe, Ti = 48·0, *Berichte* xvi. 3014; Daubigny, Ni = 58·75, *Compt. Rend.* xcvii. 951; Daubigny, Cu = 63·46, *Compt. Rend.* xcvii. 906; Brauner, Te = 125·0, abstract in *Berichte* xvi. 3055 (original in Russian); Marignac, Bi = 208·16, *Archiv. des Sci. Phys. et Nat.* (3) x. 5; Marignac, Mn = 55·07, *Archiv. des Sci. Phys. et Nat.* (3) x. 5; Marignac, Zn = 65·29, *Archiv. des Sci. Phys. et Nat.* (3) x. 5; Marignac, Mg = 24·37, *Archiv. des Sci. Phys. et Nat.* (3) x. 5; Löwe, Bi = 207·33, *Zeitschr. Anal. Chem.* xxii. 489.

THE Francq system of boilers without furnace has been applied to the towage of boats on the Rhine and Marne Canal, for a length of 9 kilometres = 5½ miles, of which more than half is in tunnel. In the open, the engine works in the ordinary manner, that is to say, the steam is generated by a furnace, which also superheats a certain quantity of water in reservoirs to be utilised as steam while in tunnel. The tug, made at the Cail works, cost 120,000f. = £4800; and the consumption of coal is 9 kilogrammes per *cheval-vapeur*, or about 20 lb. per horse-power per hour. If nothing else recommends this tug boat, the fuel consumption would attract attention.

THE French Minister of Marine has caused a return to be published giving the sums disbursed up to the 1st of January last, under the law of the 9th of January, 1881, awarding premiums to owners of vessels for long voyages. The total sum expended in this way by the French Government has been 16,696,067 francs, of which rather more than 1,000,000 francs was earned by iron sailing vessels, nearly 4,000,000 francs by wooden sailing vessels, and the rest, that is to say, over 11,000,000 francs, by iron steamers. The total number of vessels earning the grants was 763, of which 529 were of French construction and 234 from abroad; of the latter 160 were built in England.

AT a recent meeting of the Paris Academy of Sciences, a paper was read on a new application of the mercurial level suggested by M. Renouf for calculating the altitude of the stars at sea when the horizon is invisible, by Admiral Mouchez. This ingenious contrivance, which is available on land as well as on sea, almost completely removes the difficulties hitherto experienced in obtaining altitudes within 4 min. or 5 min. at night or in foggy weather. The apparatus, made by M. Hurlimann, mechanician, has been for some time in use on board the Transatlantic steamers plying between France and the United States. M. Mouchez describes it as much simpler and more exact than any other system hitherto invented.

THE Bureau Veritas has issued a list of the marine losses of the world for the past year. Summarised, it may be said that the net tonnage of the sailing vessels of the world lost was 458,798, and that more than one-half of the vessels forming this tonnage were lost by stranding. British vessels gave nearly one-half of the loss; then followed American, Norwegian, German, Italian, in the order named, and others. Of steamers the losses were to the amount of 162,217 tons, five-eighths being British, and then following German, French, and American; and here again stranding is the cause of a large part of the loss—more than half in number. Most of the sailing vessels that are lost are of wood; most of the steamers that are lost are of iron. This would seem to suggest that the oldest vessels of both sorts are those of which most are lost.

ACCORDING to the *Comité des Forges*, seventeen works in Europe employed the Thomas-Gilchrist process between the 1st October, 1882, and the 31st March, 1883, and are thus distributed, with the quantities of steel made and the proportion borne to the whole of the production in each country:—Germany, nine works, 152,479 tons (54·5 per cent.); England, nine works, 57,900 tons (20·8 per cent.); Austria, three works, 37,476 tons (13·4 per cent.); Belgium, one works, 12,800 tons (4·6 per cent.); France, two works, 5960 tons (2·1 per cent.). The proportion of dephosphorised steel, compared with the total make of the steel works in each country, is 28 per cent. for Austria, 25 per cent. for Germany, 15 per cent. for Belgium, 8 per cent. for Russia, 5 per cent. for England, and 2½ per cent. for France.

IN some of the dyeing establishments in Germany water containing lime has been softened successfully by a new process. The principle of the invention is based on the fact that oxide of magnesia made red hot easily absorbs, after hydration, the free carbonic acid of natural water, and by thus depriving the water of the gas dissolved in it causes the carbonate of lime in solution to be precipitated. The magnesia itself is then dissolved, and joins the bicarbonate of magnesia which is in the water. At first the water cleaned in this way was blamed for attacking old boilers which were fed with it, and filling them with mud. It was, however, found that sulphate of magnesia in the pure water, when heated to a high degree, acted upon the carbonate of lime, of which the deposit in the boilers consisted, and formed gypsum and oxide of magnesia, so that the hard deposit was gradually transformed into mud. When this was blown off it not unfrequently happened that weak parts in the plates were exposed which previously were kept tight by the deposit, and this gave rise to the opinion that the plates were attacked. How erroneous this supposition was is clear from the fact that the always present hydrate of magnesia is alkaline, and counteracts the effects of acid, which would act corrosively. At first, stirring was considered indispensable, but it was found that by taking an excess of a mixture of hydrate of magnesia with a proper substratum serving as a filtering medium through which the water could pass continuously, the desired effect was obtained without any trouble. When proportionate quantities of finely powdered oxide of magnesia and sawdust are mixed with water it will be found that, under the action of heat, hydrate of magnesia is formed throughout the whole mass. After cooling, the hydrate of magnesia will be discovered so firmly united with the sawdust, so to speak crystallised into it, that it cannot be removed by mechanical means. This preparation possesses thus the quality of filtering matter in a high degree. By tightly filling cylinders of metal with this mixture, and forcing dirty water through, the water, it is said, leaves the first cylinder not only deprived of all lime, but quite clear, the carbonate of lime crystallising directly upon the sawdust. The action is so rapid that even water saturated to the fullest extent with lime or gypsum leaves the apparatus with these substances perfectly removed, it is said, after ten minutes' action.

MISCELLANEA.

IT is stated that a private company will shortly be formed for the establishment of a steamship service in the Sea of Aral.

MR. F. J. F. FLANNERY, naval architect, announces that he has taken Mr. R. Bagallay into partnership with him in London.

WHILE a steel shaft weighing 24 tons, one of the largest castings ever made in Scotland, was being cast in the Parkhead Forge, Glasgow, an explosion occurred and eight men were injured.

THE *English Illustrated Magazine* for March is just published, and maintains the high character of previous numbers for excellent engravings well printed, and supported by articles interesting to all.

WE understand that the Town Council of the borough of Nottingham are prepared to open negotiations with any company willing to light particular districts of the borough by electricity. Communications should be addressed to the town clerk.

THE Panama correspondent of the *Times* says: "M. Dingler, the son of the chief engineer of the Panama Canal Company, has died of yellow fever. Twelve fatal cases of the disease have occurred here lately, but only among fresh arrivals."

THE steamer Zafiero, the first steel vessel built in Aberdeen, went on her trial trip a few days ago. The Zafiero is intended for the passenger trade between Amoy, Hongkong, and Manila, and was built by Messrs. Hall, Russell, and Co. to the order of the China and Manila Company.

THE report of Colonel Sir Francis Bolton on the water supplied to the metropolis during January, in the new form, is very complete in all the particulars relating to the works, water, and extensions. From it it appears that the constant service supply is increasing very rapidly in the districts of some companies, and there are now no less than 927 miles of mains constantly charged.

WE have received from Messrs. F. L. May and Co., of Piccadilly, a copy of their now well-known "British and Irish Press Guide." As usual, it contains not only a complete list, or rather set of lists, of every newspaper, journal, or periodical publication issued in the United Kingdom, but it also contains a lot of statistics relating to the newspaper and periodical press. We have also received a copy of "May's Press Manual," which contains a list of all newspapers, reviews, and periodicals published in the United Kingdom.

ON Tuesday afternoon Messrs. Raylton Dixon and Co. launched from the Cleveland dockyard the steamship Capulet. She is 310ft. long, 37ft. beam, and 24ft. 6in. depth of hold, with a carrying capacity of 3100 tons, and is built considerably in excess of Lloyd's requirements for the North Atlantic trade, and has water ballast throughout in cellular bottom, iron upper and main decks, and capable of being arranged for carrying cattle. Her engines, which will be of 200 nominal horse-power, are being built by Messrs. T. Richardson and Sons.

AT the annual meeting of the North Staffordshire Mining Institute on Monday Mr. Treglown showed models of direct-acting centrifugal pumping engines, manufactured by Messrs. Tangye. Mr. W. Brown, of Rutherford, exhibited a patent safety catch for wire rope guides, and Mr. John Ruscoe, of Manchester, had on view a patent retort mouth-facing machine, which attracted much attention. The importance of thoroughly investigating the question of lighting mines was urged before the Institute by Mr. Lucas, the president-elect, in his inaugural address.

ONLY a few years ago our transatlantic, colonial, and even European buyers received the greater part of their bulky and heavy goods by sailing vessels, on account of lower freight, as compared with the high rates charged by steamers. On an average, Messrs. Bolling and Lowe say in their "Iron Trade Report," perhaps 10 per cent. of our whole yearly export in iron was then always on board ship, and the uncertainty of arrival further caused buyers to keep considerable quantities in their stores; but every year, and even every month, changes the position, and now we calculate the quantities on the seas do not amount to 5 per cent. of the total export. In fact, large stocks afloat and ashore are gradually becoming a thing of the past.

THE four canals which it is intended shall cross the peninsula from the Atlantic to the Gulf of Mexico are thus described by Captain Gambier:—The Atlantic and Gulf Coast Canal and Okeechobee Land Company proposes to make a passage for vessels from the navigable waters of the Calooshahatchie through Lake Okeechobee to the Atlantic. The second project is a canal from Charlotte Harbour, through Manatee and Brevard counties, to St. Lucie, on Indian River. The third, still further north, commences in Levy County, at the mouth of the Withlacokee, runs through the counties of Levy, Marion, and Volusia, to New Britain, on the Atlantic; and the fourth, being the one furthest north, and called the Florida, Atlantic, and Gulf Ship Canal, is from Cumberland Sound in the harbour of Fernandino, through the counties of Nassau, Duval, Clay, Bradford, Alachua, and Levy, or the route surveyed by General Gilmore from the St. Mary's River to St. Mark's.

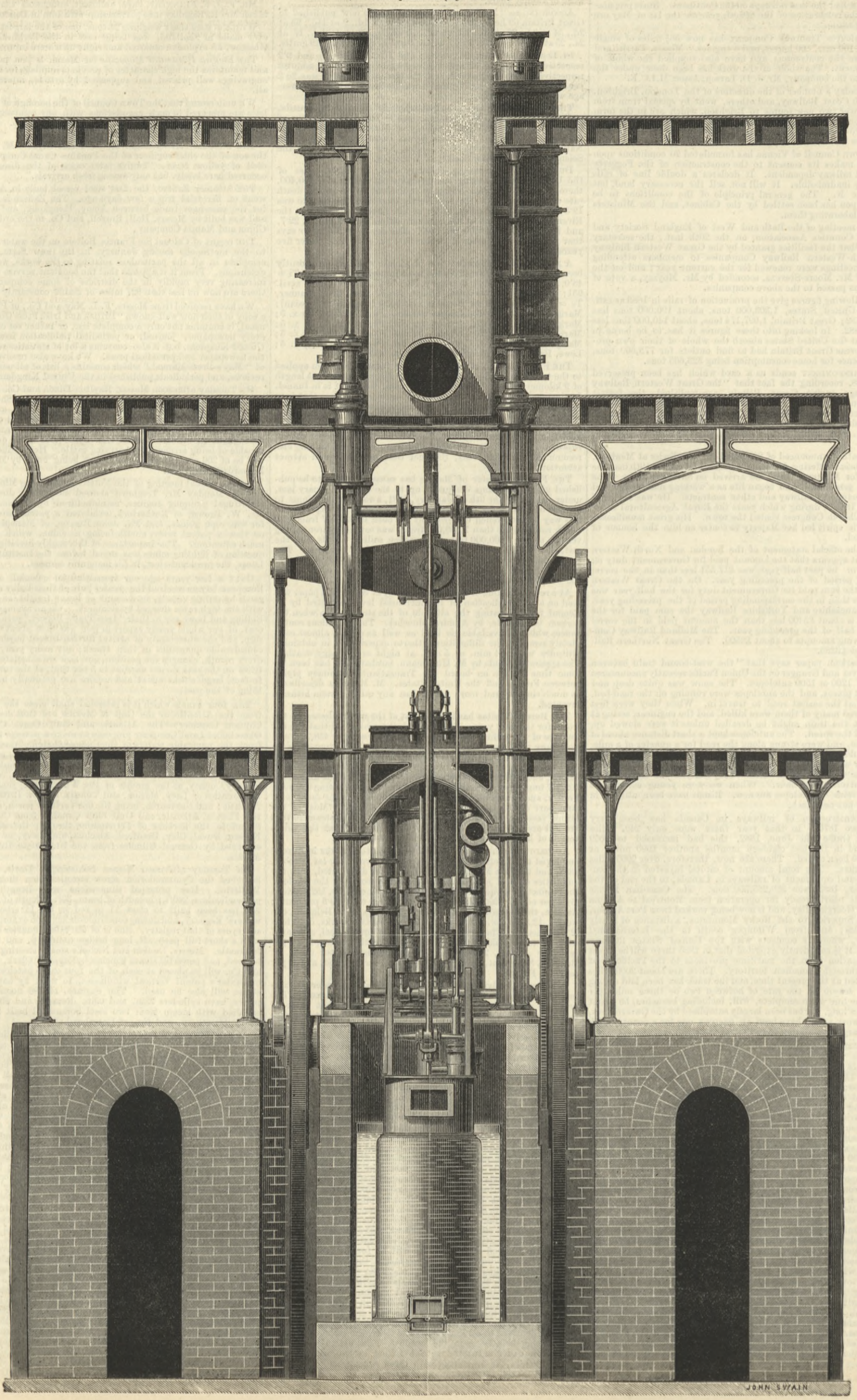
ON Tuesday afternoon Messrs. Schlesinger, Davis, and Co. launched the Cymmrodorion screw steamer from their yard at Wallsend. Her principal dimensions are:—Length between perpendiculars, 260ft.; breadth of beam, 36ft.; depth of hold, 19ft. She has been built to class A1 in red in the Liverpool Underwriters' Registry, and during construction has been examined by the surveyors of that registry. She is of the raised quarter deck type, with a short full poop aft, long bridge amidship, and topgallant forecastle. Messrs. Donkin and Nichol's steam steering gear is to be used, and powerful steam winches by Messrs. Clark, Chapman, and Co. will be placed at each of the four cargo hatchways. One of Baxter's patent vertical windlasses, to work by hand and by steam will also be used. The engines, of 180 nominal horse-power, have cylinders 33in. and 63in. diameter and 39in. stroke, supplied with steam from two steel boilers, all built by Messrs. Black, Hawthorn, and Co., of Gateshead.

ON the 15th inst. the members of the Leeds Association of Foremen Engineers and Draughtsmen, in number about 100, visited the works of the Leeds Forge Company, at Armley. Mr. Sampson Fox and Mr. W. Fox acted as guides. The company assembled in the testing house, a building in which all the materials are subjected to the mechanical tests. In one case the specimen was exhibited of an old-fashioned flue which had stood a test equal to a stress of 225 lb. to the square inch, whilst alongside it was a flue of exactly the same proportions, but which was corrugated. It had stood a test equal to 1020 lb. to the square inch. The plate mill was the next place of interest, and here some very large plates were being dealt with, which are intended for locomotive boilers, engine frames, also some plates intended for boilers for the Cunard Liners, which are being built by Messrs. Elder and Co. In the flanging shop the interesting operation of welding plates for large marine boilers to steel tubes by a mixture of gas and air was witnessed. Passing thence to Fox's patent corrugating mill, the company was able to see the process which has made the Leeds Forge so famous. The tube having been heated for about seven minutes in a large furnace, it is passed to the mill on a special carriage, and run to the corrugating rolls, which are worked by engines of 1500-horse power, made by Messrs. Tannett, Walker, and Co., Leeds, who are also the builders of the corrugating mill. The process of corrugating the tube only occupies two minutes, and it is then passed on to the flanging shop to be flanged. The electric light, which attracted a great deal of attention, has been laid down under the superintendence of Mr. Wilson Hartnell, of Leeds, and is supplied by Messrs. Crompton and Co., Chelmsford. The whole area of the shed—about 1½ acres—is lighted with this light, which has proved a great success. In fact, the managing director stated that, owing to the manner in which the light has been spread, this mode of illumination cost less money, all things considered, than Leeds gas at the present time. Making steel by the Siemens process was witnessed with much interest by the visitors.

BLOWING ENGINE, IRON AND STEEL WORKS, RESCHITZA, HUNGARY.

LA SOCIÉTÉ JOHN COCKERILL, SERAING, ENGINEERS.

(*For description see page 85 ante.*)



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

TO CORRESPONDENTS.

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

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

MR. G. RICHARDS.—*A letter awaits application by this correspondent.*

P. H. W.—*There is no remedy that will not involve relaying all the pipes. It is more than probable, however, that by constant flushing for a time the pipes will become quite clean. If they do not, then the water must contain some acid. Is your friend quite certain that the colour of the water is due to rust?*

G. H. P.—*Your order was quite too indefinite. If you had taken the trouble to send with it such a sketch as you have sent us, there would have been no mistake. The makers are clearly wrong in that the boss is not in any way it can be measured* 12in. *long, but as to whether the boss was to be all on one side, or half on one side and half on the other, there is nothing in your order to show.*

A SUFFERER.—*Your pipes are probably too small. They are certainly wrongly fitted if your sketch is correct. There is not sufficient circulation and the water boils in the boiler, steam is formed, and by coming in contact with cold water in the pipes it is condensed, and the water rushing into the vacuum strikes like a hammer, making a loud noise. Before you incur expense, alter the attachment of the pipes to the upper cistern, coupling the flow pipe near to the top of it and the return pipe to the bottom of it, which arrangement is just the reverse of that shown in your drawing—the pipes may go into the side of the cistern—and let us know the result.*

D. B. H.—*You can obtain from the Post-office a set of forms, consisting of a declaration and an application for provisional protection. The former has a £1 stamp on it. You must fill up the declaration according to the printed instructions on it, and then go before some person authorised to take oaths, as, for example, a magistrate, who will sign it and return it to you. You must write a short general description of your invention on the application for provisional protection form, and send the whole up by post to the Great Seal Patent-office, Southampton-buildings, Chancery-lane, London. You will then get in due course from the office a certificate of allowance, and your invention is then protected for twelve months.*

AYR HARBOUR SLIP DOCK.—Erratum.—*In our last impression the name of Mr. D. Davidson was incorrectly coupled with that of Mr. John Strain, M.I.C.E., Glasgow, as engineer of the work.*

MACHINES FOR MOULDING TRAM WHEELS, &c.

(*To the Editor of the Engineer.*)

SIR,—Will some of your readers kindly give me the names of the best makers of a machine for moulding steel castings, to save manual labour and to turn out clean work? H. W.

Newport, February 25th.

CONDENSED MILK MACHINERY.

(*To the Editor of The Engineer.*)

SIR,—A correspondent on the Continent asks us for information respecting the best firm to apply to as makers of machinery for the condensation of milk. He would give the preference to the firm who supplied machinery to the Anglo-Swiss Condensed Milk Company established in this country. Can any reader kindly supply this information?

London, February 26th. G. AND M.

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Advertisements cannot be inserted unless Delivered before Six o'clock on Thursday Evening in each Week.

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

MEETINGS NEXT WEEK.

THE INSTITUTION OF CIVIL ENGINEERS.—Tuesday, March 4th, at 8 p.m.: Ordinary meeting. Discussion upon the paper "On Hydraulic Propulsion," by Mr. Sydney W. Barnaby, Assoc. M. Inst. C.E. Monthly ballot for members.

THE SOCIETY OF ENGINEERS.—Monday, March 3rd, at 7.30 p.m.: A paper will be read "On the Defects of Steam Boilers and their Remedy," by Mr. A. C. Engert, the leading features of which are as follows:—Insufficient evaporative power, incrustation, imperfect combustion of fuel, smoke, and waste of heat, bad circulation of water, unequal expansion and contraction. Priming, its destructive effect on the engine and loss of power; the cause and prevention. Dangers of accumulated gases in boilers; suggested design and construction of boiler and the prevention of the above defects.

CLEVELAND INSTITUTION OF ENGINEERS. — Monday, March 3rd, at 7.30 p.m.: (1) List of elections since last meeting. (2) Discussion upon "The Haswell Mechanical Coal-getter," being paper by Mr. W. F. Hall, F.S.A., Fence Houses, and read at last meeting. (3) Paper "On the Wheelock Direct-acting Steam Engine, with Automatic Expansion Gear," by Mr. Daniel Adamson, Dukinfield, Manchester. (4) Discussion on the above paper.

CHEMICAL SOCIETY.—Thursday, March 6th, at 8 p.m.: Studies on Sulphonic Acids. No. I., "On the Hydrolysis of Sulph-compounds and on the Recovery of Benzine from their Sulphonic Acids," by Dr. Armstrong and Dr. Miller. "Note on the Behaviour of the Nitrogen of Coal during Destructive Distillation, and a Comparison of the Amount of Nitrogen left in Cokes of Various Origin," by Mr. Watson Smith. "Note on some Experiments to Determine the Value of Ensilage as a Milk and Butter-producing Food," by Mr. Thos. Farrington.

SOCIETY OF ARTS.—Monday, March 3rd, at 8 p.m.: Cantor Lectures. "Building of London Houses," by Mr. Robert W. Edis, F.S.A. Lecture III. Fittings, planned furniture, constructive decoration. Wednesday, March 5th, at 8 p.m.: Thirteenth ordinary meeting. "The Progress of Electric Lighting," by Mr. W. H. Preece, F.R.S. Sir Frederick Abel, Chairman of Council, will preside. Friday, March 7th, at 8 p.m.: Indian Section. "The New Bengal Rent Bill," by Mr. W. Seton-Karr. Sir George Campbell, K.C.S.I., M.P., will preside.

THE ENGINEER.

FEBRUARY 29, 1884.

LABOUR AND MACHINERY.

IF our readers will turn to page 143 of our last impression they will find in the second column a statement which deserves very careful perusal. "Last year we alluded to the telling effect that labour-saving machinery was having on the requirements of firms to manipulate their work in place of hand labour. In addition to this, all possible means are taken to strengthen parts of engines and machinery by introducing steel where iron was formerly used. This can be done at little extra cost for material; yet the risks of breakages or replacements are reduced to the lowest limits, and all with the one object of reducing cost, which means loss to the workman. Whilst, however, all this dispensing with labour is taking place, we see that a far greater percentage of work is being completed. To define a remedy for these grievances would be to solve a social problem that is occupying the attention of many people at present; but, as an important factor, we believe the production would be best reduced by a general reduction in the hours of labour. Our forefathers gained for us the ten hours' limit; we reduced the hours to fifty-four twelve years ago; and if we are combined and united in our opinions we can assist to further alleviate the struggles of our class, and to hand down to our children that which they will appreciate in all its beneficial effects." This is the utterance of a body of men, very influential in their way, on a very important question. The Engine Makers' Society point out that the introduction of machinery and of improvements in the design and construction of engines and the adoption of steel tend daily more and more to diminish the demand for labour, and to lower the status, in a commercial sense, of the artisan. He is no longer well off, or even moderately comfortable. It is as much as he can do to keep the wolf from the door, and this although our exports have enormously increased within the last few years. He lacks employment because machinery does what he used to do, and also because machinery is now so much better made, and of such superior materials, that chances of getting repair jobs are small. He can see but one way out of the difficulty, which lies in reducing the hours of labour—need we add without reducing the rate of wages? In this way things can be improved and his condition rendered more comfortable. It is more than probable that many of our readers will treat the statements of the Engine Makers' Society with contempt; in doing so they will be wrong. The arguments the leaders of the body have put forward deserve, as we have said, attention, notwithstanding that they may be very unpalatable.

It has always been contended by political economists that the extension of machinery, and the supercession of manual labour by it, must add to the happiness and prosperity of a community. It has always been held, on the other hand, that machinery must prove prejudicial to the interests of the working man—and the working man has done his best, to give him his due, to push his theories into practice. The Luddite riots do not stand isolated examples of a destructive policy carried to the bitter end. In this, as in all other things, truth lies between the two parties. The political economist is only right in a sense, not in all senses; and the same holds good of the men who broke up looms when once they got the chance. When the political economist contends that the introduction of machinery does good, he means to the community at large; and so long as he confines his argument to this groove we shall not care to dispute the soundness of his teaching. But to argue that the men whose labour is no longer wanted are also benefitted by the introduction of machinery is to talk nonsense. Everyone who dives below the surface knows that the adaptation of machinery to new processes has ruined large bodies of men. There is scarcely an industry in Great Britain which has not suffered in this way. The consumer is regarded by a certain school as everything; the producer and his interests as next to nothing, so long as things are to be had cheap all must be well. Thinkers of this class can hardly understand how it is that men can pay long prices for that which they consume, and yet be prosperous, contented, and happy. There is an old story which will bear repeating here, because it puts a great economic truth in a nutshell. An emigrant was boasting that in England he could buy a loaf for 4d., while he had to pay twice as much for one in his new home; thereupon he was asked why he did not stay in the land of plenty, and his reply was that it made very little matter whether bread was 4d. a loaf or not, seeing that he could not earn 4d. to pay for it; while the result of his emigration was that he could easily earn 8d. In like manner it is of little use to assure a carpet weaver that boots, and coats, and carpets, and window glass are all cheap, because hand labour has been supplanted by steam power, if he is unable to earn any money wherewith to buy boots and coats, to put a carpet on his floor, or mend his windows. The nailmakers of Staffordshire are vanishing before machinery. The fact is not perhaps to be regretted, but the manner of it is deplorable. The next generation may be better off. The present generation can starve slowly to death. The Engine Makers' Society have more method in their madness than may appear at first sight to the political economist. To them machinery has not been an unmixed blessing.

When, however, we come to consider the nature of the remedy which they propose to adopt, we confess we stand amazed that any sensible body of men should advocate a policy so fatuous. They apparently entirely forget that the artisans of Great Britain do not live in an enchanted isle to which the access of aught inimical is strictly forbidden. No doubt by reducing the hours of work to, say, six hours a day, they might increase the demand for labour. The master would then be compelled to keep two gangs of men at work instead of one, or else to let his machines stand idle one-half the day; but the result would obviously be so disastrous that we are astonished that the engine makers cannot see that it would mean ruin for the trade by which they live. The result would be that the cost of steam engines made in England would be so great that purchasers would have to go elsewhere for them. They have apparently forgotten that engines are still running on the Great Eastern Railway which were built at Creusot in France. In a word, they have taken no thought for foreign competition; and yet that very competition is at this moment threatening every industrial class in Great Britain. A Frenchman or a Belgian will work twelve or thirteen hours a day; our men grumble at nine hours. A good bricklayer is glad to earn a shilling a day in Italian cities, and a somewhat similar scale of pay exists in many places and in all sorts of trades. It is still assumed that an Englishman in nine hours can do as much as a Frenchman in thirteen hours. There never was a greater mistake. The speed at which work is done depends not on the man in the present day but on the machine; and even if this were not the case, no one who has seen the foreign artisan at work will be prepared to underrate him. The Englishman will find that shortening hours will not improve his position, but will, on the contrary, render it much worse. It must never be forgotten that every rise in wages is a stimulant to induce the manufacturer to dispense with manual labour as much as possible; and this is, of course, just what the artisan does not want. It is said that at this moment there are 10,000 carpenters starving in Paris, and it is added that this is the result of a movement by which carpenters' wages were raised not long since. This stimulated German and Austrian competition. It is this matter of foreign competition which really most concerns the Engine Makers' Society. While it exists nothing they can do will much improve their position. To restrict output, whether of steam engines or anything else, is a very ticklish matter. It would present no difficulties at all if all men were united all over the world. But it is now a two-edged sword. Let us suppose, for example, that the engine makers of the world agreed that they would make no more engines for two years. Can it be doubted that the price of engines would rise enormously? But is it certain that upon the whole we should be the better of it? The engine makers and the capitalists who employ them would find it no easy matter to live for two years without earning anything. A reduction of output would come to the same thing extended over several, instead of a few, years. There is, however, not the least chance of unity on this point, and it is scarcely worth while further to discuss it. While, however, we regard restriction of output as a delusion, we are opposed to that system of taking orders at impossible prices, which has done much harm. To supply, and that fully, a proper demand is one thing; to flood a market with cheap wares which no one wants is quite another thing. If only the engine makers could see their way to restrict trade to its legitimate limits they would do well perhaps; but in the attempt to do this the chances are all that they would do much mischief, and give the foreigner opportunities of which he would not fail to avail himself. On the whole we fear that the engine makers are not sufficiently powerful to greatly modify the march of events. They may console themselves with the reflection that they do not stand alone in this. The whole British nation could not achieve what is virtually an impossibility. Foreign competition will always settle prices now.

THE PRESENT PHASE OF FIRE INSURANCE.

THE business of fire insurance at the present time is in a very peculiar state, and much anxiety is felt in some quarters as to the course which the principal fire offices are taking with regard to the insurance of property, especially where manufactures and merchandise are concerned. A few years ago the fire offices were making large profits, and appeared to be charging premiums in excess of the real risk incurred. The prospect was a tempting one, and new competitors rushed into the field, offering terms that were easier than those demanded by the old-established companies. Rather than lose business the veteran offices lowered their rates, and thus, in the matter of premiums, the public were for a time benefited all round. Fire insurance became cheap, and it is a curious fact that when insurance is cheap, fires are more abundant. Certain it is that during the last two or three years the fire offices have suffered severe losses, especially in the districts of the cotton manufacture; and at the same time warehouse fires in London have been extremely costly, although the "serious fires" appear as only 8 or 9 per cent. of the total in Captain Shaw's annual reports. Even the quiet and generally profitable business to be done in the insurance of dwelling houses has been injuriously affected, owing to the burning down of numerous large country mansions—a species of disaster which has appeared almost epidemic of late. Altogether the effect has been such that some—if not all—the older offices have been compelled to draw upon their reserve funds: while the younger offices, filled with ambition to obtain customers, have been almost crushed, and some of them completely so. Those that bear up against the storm suffer quite enough, as in the case of one with a balance of £50,000 on the wrong side of the book. The days of prosperity have thus been followed by a period in which a feeling has been generated well-nigh amounting to panic. The companies are now reviewing the situation, and are revising their rates. The older offices consider that the young aspirants who have come across their path, have both gone astray themselves and led others astray after them. The old rates must be revived, and apparently there is a tendency to rise to something even higher. Extreme caution is being manifested in accepting risks, and there is a disposition to decline custom altogether where the circumstances are deemed unpropitious. This is a very awkward state of things for all parties, and it is not certain yet how far the reaction may go. It is a serious matter for a sugar refiner to find that he must pay 1 per cent. on a stock of sugar valued at £30,000. It is even worse when he has a doubt as to getting insured at all, or as to his being permitted to carry on certain processes necessary to the full development of his business.

The settlement of this question, so far as it can be

settled, naturally rests with what are called the "tariff offices." These are the fire offices which act in concert, and agree among themselves as to the rates which they shall charge for different classes of risk. The "non-tariff" offices act without concert, each taking its own course. Practically these companies have studied the rates adopted by the tariff offices, and have sought success by going a little below them. To promote the interchange of ideas and facilitate their arrangements, the tariff offices formerly had two committees or associations, one in the North of England and the other in the South. The two committees are now merged in one, and we believe this body is now engaged in the careful consideration of the circumstances peculiar to the period. Each class of property has its own special rate, and the divisions are very minute. An office can soon see whether any particular class fails to be remunerative at the existing rates, and, if necessary, the rates are raised. The rate for the insurance of sugar will vary according to the place where the sugar is stored. If it is in immediate contiguity to a sugar refinery the rate will be high. If the building in which the sugar is stored is detached from the refinery, the rate of insurance will be lower, and the more so if the distance is considerable. A Manchester warehouse lined with match-boarding will be charged a higher rate than one which dispenses with such decoration. Here we may at once observe that changes have come over the style of mercantile architecture which are not favourable to economy in the matter of fire insurance. In the days of the old Royal Exchange, Mr. Braidwood, then director of the London Fire Engine establishment, declared that if ever that building caught fire no efforts of his could save it. Spacious galleries ran round the building, and these Mr. Braidwood considered would so expedite the progress of the flames as to render all attempts at their suppression useless. So the event proved; the building caught fire, and was utterly destroyed. The internal style of building which characterised the old Royal Exchange has unfortunately been adopted to a large extent in the warehouses of the City. Safety is thus sacrificed to convenience, and the special danger is so clearly discerned by the fire offices that a warehouse so constructed is subject to a higher rate of insurance. Another evil consists in the enormous height to which mercantile buildings are now carried. Examples of this nature abound in the City, and are also to be met with in other parts of London. The value of land induces this Alpine style of architecture, and the difficulty of coping with a fire at the top of such edifices seems to be disregarded. Even if water be thrown to the summit, there is a certainty of great damage being done to the contents of the building by the descent of the water to the lower storeys.

Another element of danger in the construction of modern buildings of the commercial type is the great amplitude of the windows. Daylight is both precious and cheap—that is to say, it is more useful than any other kind of light and costs nothing. The tendency now is to make all the uncovered walls of a house of business as transparent as possible. Front and back, all that appears outside is little else than an array of windows, placed as close together as possible. When once a fire begins to rage inside the structure the windows are fractured by the heat, and an immense draught is set up. Flames also rush forth in great volumes, threatening the security of adjacent buildings which have windows of the same construction. The firemen are likewise embarrassed in their operations by the masses of flame which pour out of the burning building at all altitudes. A fireman bearing a hose at the summit of a ladder suddenly finds his retreat cut off, except at the cost of a dash through the flames which shoot out from the window below him, and which will very soon make havoc of the ladder. The idea that fire-proof structures will in all cases lessen the amount of the fire risk is eminently fallacious. Under some circumstances the system may prove serviceable, but very often the results are the reverse of what could be desired. Walls, floors, and roofs may be rendered incombustible; but the merchandise within is often highly inflammable, and the heat of the burning goods will reduce a fire-proof structure to a perfect wreck. A brick building with wood floors may be gutted by a fire, but a so-called fire-proof building will often go literally "all to smash." It cannot, therefore, be said that the fire offices are altogether benefited by the introduction of iron and stonework into buildings as substitutes for timber. The fact that buildings are on the whole much larger than formerly makes the case so much the worse. The Metropolitan Building Act limits the size to 216,000 cubic feet; but that capacity is sufficient to hold a stock of merchandise of immense value. When the late Sir William Tite was a member of the Metropolitan Board, he was anxious to get an Act passed which should prescribe a narrower limit than that which was subsequently adopted for the warehouse class of buildings. He also proposed regulations as to the height and situation of timber stacks; but he failed to get his views accepted; and so far as timber stacks are concerned, we see them now in London assuming any degree of magnitude in area and height.

The organisation of the Metropolitan Fire Brigade naturally forms part of the subject which we are now discussing. Here it might be supposed the fire offices would find some consolation, so far as the metropolis is concerned. Things are vastly altered since the days—now rather more than fifty years ago—when the London fire offices amalgamated their fire-engine arrangements so as to form one establishment, the whole force comprising eighty men and nineteen stations, as compared with a brigade of 600 men in the present day, and steam fire-engines of extraordinary power. But even here we meet with objections. In 1866 the fire offices handed over all their engines and appliances to the Metropolitan Board. Down to that date the fire-engine arrangements were directed to the saving of property, and in putting out a fire as little damage was done as possible. Now it is alleged that the Brigade aim at putting out a fire, irrespective of any damage the water may do. A fire may be drowned out; whereas the practice formerly was rather to "beat it out." So the fire offices say, and to protect themselves they have established the Salvage Corps, who cover up the salvable goods with waterproof cloths, and carry off as much as they can from a burning building. On the occasion of the great fire in Wood-street the Salvage Corps carried out of reach of the flames some thousands of pounds' worth of silks and other articles of merchandise, which but for their exertions would most likely have been sacrificed. The Bill which the Metropolitan Board have brought into Parliament this session for increasing the revenues of the Fire Brigade will be resolutely opposed by the fire offices, unless the contribution to be furnished by the latter is left without increase, except so far as the existing scale may augment the actual sum. The position of the fire offices is rather singular in this respect. They consider that the arrangements for the protection of the City against fire are inadequate; but they are not disposed to pay on a higher scale to defray the cost of a more perfect system. They have arguments on their side which deserve attention, and will doubtless receive due consideration in Parliament. But pecuniary considerations would seem to demand that the fire offices should consent to an additional burden which must be light compared with the enormous loss accruing from one destructive fire. Perhaps they are afraid lest London should be taken as an example for the provincial towns, where as yet the cost of maintaining the fire-engine establishment either falls wholly on the rates or is met by a voluntary fund. They ask, Why should London be made an exception to the general rule of the whole country, and why should those who insure their property be made to pay twice over, making one contribution to the Brigade through the fire offices, and another through the rate collector? Whatever contribution is paid by the fire offices is, of course, a virtual tax on the insured. This tax the uninsured escape. The logic on either side may not be very perfect, but the fact that the fire offices once tried to put out fires at their own cost goes for something. Putting logic aside, the offices are willing to contribute according to the compact made when they handed over their plant in 1866; but if anything more than this is pressed upon them, they may be expected to offer a stubborn resistance.

THE EDUCATION OF DRAUGHTSMEN.

The difficulty of procuring good mechanical draughtsmen is often matter of complaint amongst engineers; and when a vacancy not very subordinate in its nature occurs in a drawing office, it is not easily filled up satisfactorily. On the other hand, manifold are the complaints amongst young engineers and their parents that, after the former have served a term of four or more years, they find that their own time and their fathers' money has been thrown away, as they can obtain no employment. Competition has something to do with this, but other things affect the conditions as well. The present system of educating young engineers is defective. The popular plan with parents who desire to make their sons engineers, and especially mechanical engineers, is to give them a good English education in the first instance, at the best school they can afford, and when this is completed, they pay a considerable sum as premium to apprentice one either to a civil engineer in good practice or else to a firm manufacturing machinery. If the position of the young man's place of business admits of it, he lives with his family; if at a distance, his father makes him a yearly allowance for his support, and is to a great extent justified in the impression that he has done his best for his son's future as an engineer. As we have said, however, the system is defective, one of the defects being the supposition that an engineer's office is a school where an actual course of teaching is pursued. Such is not the case. The gentleman apprentice has, to a limited extent, opportunities of learning; but the number of these opportunities depends greatly on the young man himself. For example, if he is industrious, is a good time-keeper, and shows a fair amount of aptness and quickness, whether he is in the drawing-office or the shops, he will be given good jobs, and will be shown how to do them. More than this is required; not only must he be shown how to do a thing, he should also be taught why it is done. If the young man be idle, a bad time-keeper, coming in late or absenting himself for days, neither he nor his parent has any right to complain if he gets inferior jobs, while it matters little when or how they are done. Premium or no premium, the apprentice goes to a place where money is to be made by the manufacture and sale of machinery. The heads of the firm have no time to do schoolmasters' duty; and heads of departments have not much, and what little they have will naturally be given to those most likely to seek for it and give a return, in the shape of useful work. Thus a foreman will give a steady apprentice a valuable lathe or shaping machine, and put him in charge of a good workman to help him when he gets into a difficulty; but in any case the machine must be kept at work, and if the apprentice be not there to run it, he will be quickly superseded. The same in the drawing-office. The men in the shops cannot get on without drawings, therefore the drawings must be ready; and if the apprentice wants to get out practical working drawings, or to be taught how to make them, he must be punctual and quick.

It is unfortunate that any misunderstanding should exist on the part of parents as to what they pay their premium for. The premium represents more a character or reputation fee than a fee for instruction. Many firms will not take premium apprentices, considering that they are more trouble than they are worth, and most of the firms who do, honourably endeavour, as far as circumstances admit, to teach or see to the instruction of their pupils; but competition is too keen and business pace too fast to admit of engineers' offices or works being thorough schools of instruction. But defective as they are in this respect, young men can, and do, learn, because they have resolved that they will learn in spite of obstacles; but a large proportion of apprentices, having done nothing to win the confidence of their employers, are allowed to leave when their term expires; they then seek for employment, and being, as a rule, delicately nurtured, look for work in the drawing-office, but seldom succeed in keeping it, owing to their own incompetency, and this is one of the causes why good draughtsmen are hard to get. Excellent draughtsmen also rapidly move on to the higher branches of the profession.

No men in the profession are so poorly paid or work harder than draughtsmen; they represent the brain of the works in which they are employed, if they are not the brain itself. They put into shape the ideas of their employers, and the really first-class head of a drawing-office is all but invaluable. On their shoulders rests by far the largest share of the responsibility; and they are considered by the foremen of the shops as the fit and proper persons to bear the blame of all mistakes, those of others as well as their own; and hence there is little to induce them to remain draughtsmen. To increase the supply of good men and to give apprentices proper instruction, some species of school is needed; and if schools — not night, but day schools — were established in our leading manufacturing towns, devoted exclusively to practical technical instruction—and it was possible to give the apprentices time to attend them one or two days a week—it would tend to improve and advance the whole profession. Apprentices should attend these schools two days a week, attending the works where they are apprenticed the remainder of the time; they should also be encouraged to make notes of any points of difficulty that they have encountered in either shop or drawing-office, and, taking these to the school, receive instruction about them. Periodical examinations, both in theory and practice, ought also to be held in connection with them. The schools which have already been established in most of our great manufacturing towns, have done a great deal of good, but they are not sufficiently accessible or numerous, and their extension in numbers is much to be desired.

THE CLAYTON BRAKE AGAIN.

The report of Major Marindin on the accident which occurred on the 3rd January at Wincobank, on the Midland Railway, has just been issued, and some such accident is not at all unlikely to be reported pretty often if the Midland Company continues to use the automatic vacuum brake. It seems that the 10.5 p.m. up night mail from Leeds, consisting of engine, tender, and thirteen vehicles, came into collision, when running at considerable speed, with an empty wagon train which was shunting at Wincobank, some two miles north of Sheffield, and which was fouling the up main line. The engine, tender, and first five vehicles left the rails and ran nearly 100 yards before coming to a stand. It appears that the signals at the north end of the station were at danger, and this led the driver to apply the continuous brake. The signalman thinking the driver had got his train well under control, lowered the home signal when the mail train was still some 300 yards away, and the driver thereupon released his brakes and put on steam again; but, either not seeing the signals at danger at the south end of the station, or trusting that they would be taken off in time, he did not again attempt to make full use of his brakes until passing the platform, the centre of which is 190 yards from the point of collision. Major Marindin says that, judging from the distance which the engine ran after leaving the rails, the speed when the collision occurred was about twenty-five miles an hour, and that the continuous brake, though it seems to have been of service in keeping the train in line, "cannot be said to have acted well or quickly," and adds: "I very much doubt whether after repeated applications, and with only 11in. of vacuum showing on the dial, as stated by the driver, the effect of this brake is very quickly felt at the rear of the train." We should say not. With the recollection of the collisions with the buffer stops at Portskewet Pier, the Central Station Liverpool, at Northampton, and other places, Major Marindin does not speak without good reason. We have ourselves repeatedly called attention to the vital defect in the automatic vacuum brake in use on the Midland and Great Western railways, viz., that it is practically of no use in an emergency for a second or third application. When this brake has been fully applied once, the power quickly leaks away without the driver's control, and a further full and effective store of power cannot be created under from one and a-half to two minutes, and, as has been frequently shown, anything under 15in. of vacuum is practically useless. Moreover, although perhaps the driver may see this amount registered on the gauge pretty quickly, there may at the same time be scarcely any power in the reservoirs throughout the train, and this is indeed a common and very unpleasant experience. The Midland Company has been exceedingly fortunate hitherto, but it is clearly only a question of time before a really disastrous collision occurs. There are numbers of places, such as crowded junctions or termini where many sets of signals have to be obeyed in the last mile or half mile, and given the conditions which would render several applications and easings of the brake necessary, the driver is then utterly powerless to stop if emergency arises. It is possible that the new Railway Bill about to be introduced by Mr. Chamberlain may put an end to this makeshift, and by so doing avoid the terrible calamity which otherwise will certainly have that effect later on.

THE DISTRIBUTION OF CHEAP DRIVING POWER.

Engineers will await with interest the result of the action of the Corporation of Birmingham, touching a compressed-air power scheme. Upon the recommendation of their Public Works Committee, the Town Council sanctioned the proposal of the Birmingham Compressed-Air Power Company to supply at certain charges, from a common centre, by mains, to users of machinery in three wards in the south-east of the town, compressed air in substitution for steam and gas. The Public Works Committee had first obtained the favourable opinion of Sir F. Bramwell, and of Mr. H. J. Piercy, of Birmingham. The promoters urge that under their system of supply, compressed air is, for engines under 30 horse-power, cheaper than steam, especially when intermittent power is needed, and they point out that the air can afterwards be used for ventilation. They also assert that it is 20 per cent. cheaper than gas. Mr. Piercy's calculations, however, lead him to the belief that the cost of gas and of compressed air would be about the same. But he correctly points out that the compressed air could be applied to existing engines, whilst to use gas new engines would have to be bought. The scheme will be carried out upon the lines of the electric light supplies. As in those cases, so also in this, the Corporation will protect themselves touching damage to streets, and powers to purchase, by inserting the requisite clauses in the Bills for Parliamentary powers which the company is about to submit. It is of good augury to the company that out of 270 power users consulted, 170 declared themselves in favour of the

trial. We see no reason why the advantages of compressed air, hitherto confined chiefly to tunnelling and boring operations, should not be supplied, in the form of cheap driving power, by the mere turning on of a tap, to our multifarious workshops. To some extent this has been found practicable enough in the United States. It is not without reason that the company proclaims that amongst the subsidiary benefits stand out the lessening of the smoke nuisance, and the minimising of boiler explosions. It remains to be seen if it can be made to pay, and there will be some little difficulties in the way of ice to be got over, concerning which the company has not been specially demonstrative.

THE LOAD-LINE COMMITTEE.

THE Load-line Committee began its labours at Hull, and thence its members passed to West Hartlepool. In the former place, practically no evidence was offered; in the latter, which is the headquarters of steamers of the "well-deck" type, a mass of evidence bearing on the grievances of the owners of this class of vessels was given which must be held to be of a character and of a volume sufficient to make its careful consideration needful. A very close criticism of the Board of Trade load-line was ventured by Mr. Edward Withy, whose opinions were that the load-line was inconsistent, and that it was unfair to vessels of the well-deck type. He was followed by a number of other gentlemen interested in well-deck steamers, and in their assurance, and the facts they gave as to the results of the working of these vessels, and of their assurance, seemed to impress the committee considerably. Indeed, this question of the relative load-line of the well-deck and of the flush-deck types of vessels occupied the attention of the committee for the whole of the sitting at West Hartlepool; and the evidence, alike of the assurers, the owners, and the captains there, was in favour of the safety and the seaworthy qualities of a type of vessels that it has been supposed that the Board of Trade looked upon with disfavour. It is to be borne in mind that the bulk of the time was spent in the reception of evidence rather than in its criticism, and that the sifting process must follow; but there did seem a *prima facie* case made out against the load-line that now holds good. One fact was very clearly brought out—the Well-deck Assurance Club—the society for the insurance of well-deck steamers at West Hartlepool—has cost far less than a neighbouring club that is not so confined to that type of vessel. Indeed, the cost of the insurance on the mutual principle of that type of vessel was stated by the secretary of the club to be less than one-half of that of the general club—a fact that in itself speaks much for the safety in working of that type of vessel. It will be most interesting to watch the results of the visits of the committee, which has now fairly entered upon an arduous work from which great good may result.

LITERATURE.

Fuel and Water, with Special Chapters on Heat and Steam Boilers: A Manual of the Users of Steam and Water. From the German of Franz Schwackhöfer, Professor at the Imperial and Royal School of Agriculture, Vienna. Edited by Walter R. Browne, M.A. London: Charles Griffen and Co. 1884.

[FIRST NOTICE.]

As Mr. Browne has edited this book, he is no doubt in a sense responsible for the statements made in its pages; but as far as can be gathered from it, his work seems to have principally consisted in making an excellent free translation of what Professor Schwackhöfer has written. The volume contains nothing new, but it is in many respects a good sound treatise on fuel and water, with, we need hardly add, many of their applications to the useful arts. It is much to be regretted that Mr. Browne has in no case translated into English the metrical numbers, dimensions and quantities used by Professor Schwackhöfer. In fact, he could not have taken a more certain way to limit the utility of the volume; and we must enter our protest against the attempt which is being made to force on English engineers a method of measurement which possesses no real advantage whatever over our own. The metre is not more convenient in any way than the foot; the centimetre has no advantage over the inch; Joule's equivalent, 772 foot-pounds, is at least as easy to work with as its metrical analogue; and the British heat unit of one degree Fahrenheit per pound of water is preferable to the French calorie and kilogramme. If, however, it could be shown that the French system possessed the greatest possible advantages, it would be none the less certain that its adoption or retention would be wrong in a book intended for ordinary English users of steam and water, who are, as a body, entirely averse from the French system, and unable to handle it without trouble. To tell such men of 424 calories being equal to a kilogramme-metre of work conveys to them no idea whatever; and before they can understand what is meant they have to translate the figures given into the English equivalent, viz., 772 foot-pounds per pound degree. In saying this it must be understood that we are expressing no opinion for or against a decimal system. We only assert that French units are out of place in a work intended for English readers who are entirely untrained in the use of foreign units. Mr. Browne would find the crith and the dyne about as acceptable to those for whom the volume is stated to be intended.

The book begins with an introductory chapter in which we notice one or two slips. It has been written wholly by the editor, and we are disposed to agree with a statement made in the preface, and say that this is the most succinct exposition of the theory of heat ever put into print. The explanation given of the nature of heat is, at least, as satisfactory as any other yet given to the world, and it has the merit of being extremely lucid. Of course, it must be understood that we can only guess at the nature of heat; but the vibratory theory is, on the whole, an extremely satisfactory guess, which may be regarded with a good deal of complacency. But the difficulties connected with the subject are too great to be entirely overcome, and Mr. Browne's definition on the second page supplies an example of one of the slips to which we have just referred, "A body is hot when its constituent particles are in a state of rapid vibration, and the quantity of heat is determined by the intensity of the vibration and the mass of the body." This definition leaves everything to be desired. In the first place, there are numerous forms of vibration which are not heat vibrations; and, secondly, the quantity of heat is not determined by the mass of the body and the intensity of vibration. Thus, for example, a pound of iron at a bright white heat—1900 deg. or thereabouts—only contains as much heat as a pound of boiling water at 212 deg., while it would seem that the intensity of the vibration in the iron must be much greater than it is in the water. It is not possible that what Mr. Browne meant to say is that "intensity of heat is determined by the intensity of vibration, &c.;" for in that case he would not have alluded to mass. In dealing with the specific heat of bodies, it will be found that the sums of the quantities and the temperatures always agree. Thus the specific heat of iron being one-ninth, in round numbers that of water, in order that as great a quantity of heat may be got into the iron as into the water, weight for weight, we have to raise the temperature of the iron to nine times that of the water. In this case either the range of the vibrations, or their rapidity, or both, must be augmented in the iron as compared with the water; and this being the case, Mr. Browne's definition is apparently wrong. Indeed, he gives no satisfactory explanation of the meaning of the words "quantity of heat" as distinguished from "intensity of heat." He supplies, it is true, a formula for measuring or estimating quantity; but in order that any definite idea may be attached to the words, he has to bring in something more than the vibratory theory; and thus, instead of heat being a mere motion or excursion of particles, as in the case of a fiddle-string, we may also have a direct motion of the particles themselves further from each other, as by expansion. But besides this, if we slightly paraphrase Mr. Browne's definition, we shall find that quantity of heat means quantity of vibration; but the quantity of vibration can only be expressed in terms of range of excursion, or of number of excursions, or of both. Yet it would appear that these are functions of temperature, and not of quantity. Thus, it is well known that the quantity of heat in a body cannot possibly be increased without increasing its temperature at the same time. On this point it is but fair that Mr. Browne should be allowed to speak for himself, so we reproduce his words:—

> Hitherto, we have merely laid down the general principle that heat is due to rapid motion of the particles of a hot body; we must now examine more clearly how such heat is to be estimated and measured. Since heat is due to motion, it is subject to the laws of motion; in other words, all we have to do is to apply the principles of ordinary mechanics to the particular case. Now we know that any body having a simple motion of translation has in virtue of this a power or capacity of doing work upon other bodies which may be brought under its action. The power of doing work is called its kinetic energy, and is measured by the quantity $\frac{m}{2} v^2$ where m is the mass of the body and v its velocity. The quantity of heat, therefore, in such a particle, say, of a gas is or should be measured by the product of its mass and half the square of its velocity, and the quantity of heat in any weight of such a gas is measured by taking the sum of the kinetic energy thus calculated for every particle contained in it. This may be called the absolute mode of measuring heat.

This means, of course, that the quantity of motion in the hot body is the measure of its quantity of heat. While we are not disposed in any way to dispute this theory, we may point out that if matters began and ended with Mr. Browne's definition, it would be impossible to measure quantity of heat at all; for it is clear that it would be necessary to know the number of particles in the hot body, which is simply impossible.

Temperature Mr. Browne defines to be a function of the velocity of the vibrating molecules or particles. This is what he means, but, unfortunately, he again uses the word quantity in a very misleading way. Surely it is incorrect to speak of "quantity of temperature." "The temperature of a gas," says Mr. Browne, "is a quantity varying with the velocity of its particles independently of their mass. The same applies to solids and liquids." But we have already been told that quantity of heat means quantity of motion. If this be so, when we augment the velocity of the particles of a body, we increase the quantity of heat in it as well as its temperature; and this being the case, quantity and temperature are synonymous terms. We cannot think that Mr. Browne means this, but this is the legitimate deduction from his statements. It is, perhaps, as well to add that Mr. Browne's is not the only explanation of temperature which has been given. Another is that the thermometer measures nothing but the force with which the molecules of a vibrating body strike against its bulb. It may, of course, be said that the force depends on the velocity, and that the two definitions are alike; but there is a difference, and temperature is certainly not a measure of quantity of heat. The total quantity of heat in 2 lb. of water, at 212 deg., is just twice as great as the quantity of heat in 1 lb. of water; but the thermometer takes no cognisance of this truth.

We are sorry to see that Mr. Browne has dug up and uses the form "potential energy." If he does not like to admit that all energy must of necessity be kinetic or dynamic, he might at least have contented himself with the words "energy of position."

We believe that we have now said all that need be said in the way of finding fault with Mr. Browne's introductory chapter, and we have the far pleasanter duty of adding now that, even with the blemishes we have pointed out, the chapter is an admirable little treatise on heat—one of the best, and, as we have said, most lucid ever written. We are sorry that it is so short, because we think Mr. Browne has not done himself justice, and that the endeavour to be concise has involved a little obscurity of definition.

We have had so much to say concerning Mr. Browne, that we have not left ourselves space to deal with Professor Schwackhöfer this week. We shall return to the consideration of his work in an early impression.

PRIVATE BILLS IN PARLIAMENT.

In the House of Lords on Tuesday the Standing Orders Committee of the House of the Lords sat under the presidency of the Earl of Redesdale to consider the non-compliances reported by the Examiners in the cases of several Bills. After hearing the explanations tendered by the several agents, their lordships agreed to dispense with the Standing Orders in the cases of the Edinburgh Northern Tramways Bill, the Folkestone, Sandgate, and Hythe Tramways Bill, the London, Chatham, and Dover Railway (Further Powers) Bill, the Mersey Railway Bill, the Metropolitan District Railway Bill, the Scarborough and Whitby Railway Bill.

In the House of Commons the Select Committee on Standing Orders also sat on Tuesday, Sir John Mowbray presiding. Eleven cases stood in the list for consideration of the Examiner's report, and the first matter which occupied the attention of the Committee was the London, Reigate, and Brighton Railway Bill, which had been adjourned from the last meeting. The Examiner had reported non-compliance as regards six points, of which the first four related to the neglect of the promoters to enter in the books of reference certain property-holders. As to these matters, the promoters submitted that they had spared no pains to secure that the books of reference should be correct; but they pointed out that in covering such an extent of country as that in the present case it was almost impossible to obtain absolute accuracy. The Examiner also found that there had been a breach of the Standing Orders, inasmuch as the statement of persons to be displaced by this line was inaccurate. This inaccuracy had arisen in consequence of the reference-taker having counted each child under twelve years of age as half an adult, with the result that the list showed fifty-eight less persons to be affected than would have appeared if the proper course had been pursued. The explanation offered by the promoters was that, as the intention of the Standing Orders was to discover the number of persons who would be inconvenienced in going to and from their employment, and as children under twelve were usually at school, it had been considered that justice would be done by counting two children as one adult. It was further stated that the promoters had subsequently presented an amended statement in accordance with the decision of the Examiner. The last point of non-compliance consisted in the omission from the list of occupiers of the names of certain occupying lessees and owners. In their statement, the promoters pointed out that no one was injured or deceived by this neglect, as all the names were included in one or other of the lists. After deliberating for some time on the Examiner's report and the explanations of the promoters, the Committee decided that the Bill might proceed. A similar decision was recorded with respect to the Tooting, Balham, and Brixton Railway Bill, the Plymouth, Devonport, and District Tramways Bill, the Basingstoke, Alton, and Petersfield Railway Bill, the Metropolitan Outer Circle Railway Bill, the Manchester, Bury, and Rochdale Tramways (Extension) Bill, and the Hendon Railway Bill. During the course of the week the Examiner has found that the following Bills have complied with the further Standing Orders:—Teign Valley Railway Bill, Belfast and Northern Counties Railway Bill, Metropolitan District Railway Bill, London and South-Western and Metropolitan District Railway Companies' Bill, Golden Valley Railway Bill, West Lancashire Railway (Capital) Bill, West Lancashire Railways (Extensions) Bill, Metropolitan Railway (Parks Railway and Parliament-street Improvement) Bill, Metropolitan Railway (Various Powers) Bill, Gravesend Embankment Landing Stage and Railway Bill, Rosebush and Fishguard Railway Bill, Rotherham and Bantry Railway and Bantry and Trent Dock and Railway Companies' Bill.

The time allowed by Standing Order for the deposit of petitions against private Bills has now expired in many cases, the provision of the Standing Order being that all such petitions shall be deposited within ten days after the first reading of the Bill. Many of the memorialists named below do not object to the principles of the measures in respect of which they have given notice of opposition, and in most of these cases satisfactory terms will be arranged either before or in Committee; and in other instances petitions have been presented as a matter of precaution. In the majority of cases, however, the opposition is real, and will lead to fighting in the Committee rooms. As usual, the railway companies figure largely in the petition list, the Great Western Railway Company being especially prominent.

House of Lords.—Ballyclare, Ligonel, and Belfast Junction Railway Bill—Petitioners against: Belfast and Northern Counties Railway Company. Colne Valley and Halstead Railway Bill—Petitioners against: Colne Valley and Halstead Railway Company. Limerick and Kerry Railway Bill—Petitioners against: Earl of Listowel, and others. Manchester Ship Canal—Petitioners against: Sir Humphrey de Trafford, Manchester Racecourse Company, Garston Land Company, Mersey Docks and Harbour Board, Leeds and Liverpool Canal Company, Trustees of the Duke of Bridgwater and Earl of Ellesmere, Highway Board of the Daresbury Division of the Hundred of Bucklow, Runcorn Improvement Commissioners, Runcorn Union Rural Sanitary Authority, Upper Mersey Navigation Commissioners, Mersey and Irwell and Bridgwater Navigation Companies, London and North-Western Railway Company, London and North-Western and Great Western Railway Companies, Shropshire Union Railways and Canal Company, Corporation of Liverpool, Corporation of Bootle-cum-Linacre, Trustees of the River Weaver Navigation, Garston Local Board, Corporation of Warrington, Adelaide Watt.

House of Commons.—Athenry and Ennis Junction, and Midland Great Western of Ireland Railway Company's Bill—Petitioners against: Great Western Railway Company, Waterford and Limerick Railway Company. Aldershot, Farnham, and Petersfield Railway Bill—Petitioners against: London, Brighton, and South Coast Railway Company. Avonmouth and South Wales Junction Railway Bill—Petitioners against: Bristol Port Railway and Pier Company, Corporation of Bristol, Great Western Railway Company, Midland Railway Company, Charles Waring, and others. Barrmill and Kiliwinning Railway Bill—Petitioners against: Glasgow and South-Western Railway Company. Bishop's Castle Extension to Montgomery Railway Bill—Petitioners against: Cambrian Railway Company, Bailiffs and Burgesses of Montgomery, Bishop's Castle Railway Company. Blackpool Railway Bill—Petitioners against: Wm. Birley, Manchester, Sheffield and Lincolnshire Railway Company, West Lancashire Railway Company, Corporation of Preston, Lancashire and Yorkshire, and London and North-Western Railway Company. Barry Docks and Railway Bill—Petitioners against: Great Western Railway Company, Tudor Crawshay, Rhymney Railway Company, Taff Vale Railway Company, Rhondda Junction Welsh Coal Company, Limited, Lewis's Merthyr Navigation Colliery Company, Limited, Pontypridd, Caerphilly, and Newport Railway Company, Alexandra (Newport and South Wales) Docks and Railway Company, Newport (Alexandra) Dock Company, Limited, Marquess of Bute, owners and masters of coasting and trading vessels and tugboats, and also of pilots trading in the Bristol Channel, Corporation of Cardiff. Cardiff and Monmouthshire Valleys Railways Bill—Petitioners against: Brecon and Merthyr Tydfil Junction Railway Company, Lord Windsor, Great Western Railway Company, Rhymney Railway Company, London and North-Western Railway Company, Taff Vale Railway Company, Pontypridd, Caerphilly, and Newport Railway Company, Alexandra (Newport and South Wales) Docks and Railway Company, and the Newport (Alexandra) Dock Company, Marquess of Bute. Cork, Bandon, and Clonakilty Extension Railway Bill—Petitioners against: Reginald

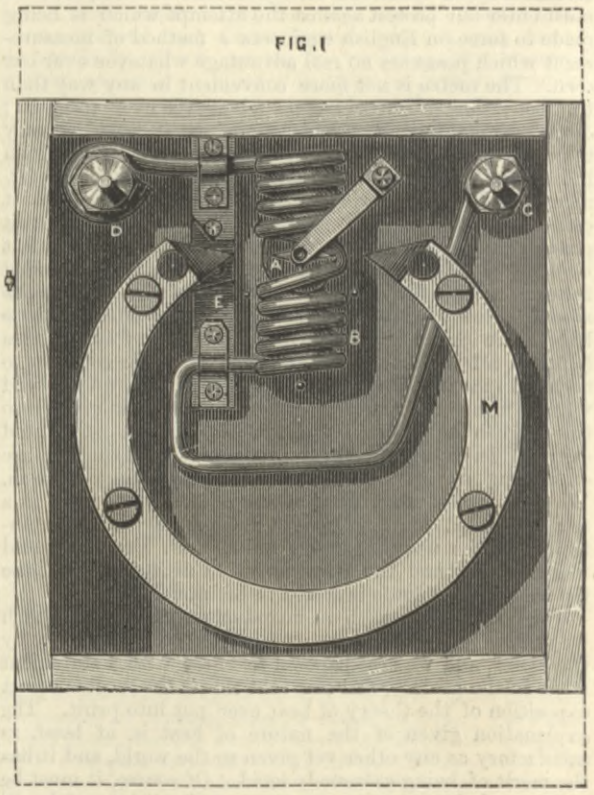
Bence Jones and others, Clyde Steamship Company, Steamship Owners' Association, Thos. Douling. Glasgow and South-Western Railway Bill—Petitioners against: Sir Michael R. Shaw Stewart, Caledonian Railway Company, Duncan Darnoch, Trustees of the Port and Harbours of Greenock, Corporation Board of Police and Water Trust of Greenock. Caledonian Railway Bill (No. 2)—Petitioners against: Sir M. R. Shaw Stewart, Glasgow and South-Western Railway Company, Corporation of Police and Water Trust of Greenock, Trustees of the Port and Harbours of Greenock, owners of property in Greenock, F. D. Morrison. Caledonian Railway (No. 1) Bill—Petitioners against: County Road Board of the County of Renfrew, County Road Board of the County of the Lower Ward of Lanark, Town Council of Dundee, and other public bodies, County Road Trustees of Stirling. Cleveland Extension Mineral Railway Bill—Petitioners against: Loughborough East District Highway Board. Dare and Chinley Railway Bill—Petitioners against: E. Hall, Manchester, Sheffield, and Lincolnshire Railway Company, E. Firth, Midland Railway Company, Duke of Rutland. Central Wales and Caermarthen Junction Railway Bill—Petitioners against: S. G. Shappard and others, Great Western Railway Company and others, London and North-Western Railway Company, Milford Haven Dock and Railway Company, Milford Docks Company. Cranbrook and Paddock Wood Railway Bill—Petitioners against: Owners, lessees, and occupiers, on and near line of railway. Croydon and Kingston Junction Railway Bill—Petitioners against: London, Brighton, and South Coast Railway Company, Kingston Highway Board, London and South-Western Railway Company, Duke of Cambridge, Jas. Innes, and John Innes. Croydon Central Station and Railways Bill—Petitioners against: Corporation of Croydon, London, Brighton, and South Coast Railway Company, South-Eastern Railway Company. Croydon Direct Railway Bill—Petitioners against: Corporation of Croydon, Metropolitan Board of Works, London, Brighton, and South Coast Railway Company, South-Eastern Railway Company, Great Western Railway Company, Thos. Sharland, M. A. D. Du Breuil, and others, Governors of Dulwich College, London, Chatham, and Dover Railway Company, promoters of the Croydon, Norwood, Dulwich, and London Railway Bill, promoters of the Croydon Central Station Bill, promoters of London, Reigate, and Brighton Bill. Denbighshire and Shropshire Railway Bill—Petitioners against: Lord Brownlow, Cambrian Railway Company, Thos. Cloyd Fitzhugh, Great Western Railway Company, Corporation of Liverpool, owners, &c., on line of proposed railway. Eastern and Midlands Railway Bill—Petitioners against: Corporation of Nantwich, Great Eastern, Midland, and Great Western Railway Companies, Henry Bullard, and others. East London Railway Bill—Petitioners against: Metropolitan Board of Works, Metropolitan Railway Company, Metropolitan District Railway Company. Dundee Suburban Railway Bill—Petitioners against: Vice-Admiral Stirling, and others, Provost, Magistrates, and Town Council of Dundee, and other public bodies. East of London, Crystal Palace, and South-Eastern Junction Railway Bill—Petitioners against: John Forster, London, Brighton, and South Coast Railway Company, Metropolitan Board of Works, South-Eastern Railway Company, Metropolitan Railway Company, East London Railway Company, London, Chatham, and Dover Railway Company, London and Provincial Land Association, Limited. Great Western Railway (No. 1) Bill—Petitioners against: John Bayly, R. F. Loosemoore, Bristol and North Somerset Railway Company, Briton Ferry Local Board, J. C. Hanbury and others, London and North-Western Railway Company, Commissioners of Sewers for the Levels of Caldicott and Wentlodge, Chas. Morrison and James Latham, Alexandra (Newport and South Wales) Docks and Railway Company, and Newport (Alexandra) Dock Company, Limited, Pontypridd, Caerphilly, and Newport Railway Company, Messrs. Crawshay Bros., Birmingham Canal Company. Great Western Railway (No. 2) Bill—Petitions against: Swindon and Cheltenham Extension Railway Company. Great Northern Railway Bill—Petitioners against: Wm. Thompson, East and West Yorkshire Union Railway Company, London and North-Western Railway Company, owners, lessees, and occupiers, Trustees of the County Fire Office. Great North of Scotland Railway Bill—Petitioners against: Highland Railway Company, Earl of Seafield, Hugh Davidson, Arthur Thos. Malkin, Jane and John MacCullum, E. W. Mackintosh, Mackintosh Farr Fund Trustees, Inverness County Local Board, Inverness District Road Trustees, Inverness Town Council, Naith County Road Trustees, the Mackintosh of Mackintosh, Eneas Mackintosh, Badenoch District Board Trustees, Heritors of the Parishes of Moy and Dalarossie, Great Northern and North-Eastern Railway Companies, Duncan Forbes, and Trustees of Arthur Forbes. Great Southern and Western Railway Bill—Petitioners against: Grand Jury of the County of Kildare, Cork Harbour Commissioners. Easton and Church Hope Railway Bill—Petitioners against: Portland Railway Company, Stewards and Co., Limited, Great Western Railway Company, London and South-Western Railway Company. Halifax High Level and North and South Junction Railway Company's Bill—Petitioners against: Henry Moseley, John Todd, Hull, Barnsley, and West Riding Junction Railway and Dock Company, H. E. Rhodes, A. Wilson, John Crossley and Sons, Ovenden Worsted Company. Hendon Railway Bill—Petitioners against: Vestry of St. John, Hampstead, Margaret Pryce, Andover and Wyhill Horse Company, Limited H. H. P. Cotton and others, L. H. Isaacs, Metropolitan Board of Works, Grand Junction Waterworks Company, London and North-Western Railway Company, Midland Railway Company, London, Hendon, and Harrow Railway Company. Highland Railway (New Lines) Bill—Petitioners against: North British Railway Company, The Mackintosh of Mackintosh, Midland Railway Company, Caledonian Railway Company, Glasgow and South-Western Railway Company, Great North of Scotland Railway Company, Great Northern and North-Eastern Railway Company, Duncan Forbes and trustees of Arthur Forbes. Henley in Arden and Great Western Junction Railway Bill—Petitioners against: Great Western Railway Company. Highland Railway (Northern Lines Amalgamation) Bill—Petitioners against: Caledonian, Midland, Great North of Scotland, Great Northern, and North-Eastern Railway Companies. Hull, Barnsley, and West Riding Junction Railway and Dock Bill—Petitioners against: Dock Company at Kingston-on-Hull, North Eston Railway Company, Trustees of the Hessle, &c., Inclosure Act. London and South-Western and Metropolitan District Railway Companies' Bill—Petitioners against: Andrew Duncan, W. S. T. Sandiland, Surbiton Improvement Commissioners, Duke of Cambridge, F. C. and T. H. Bryant, Wimbledon and West Metropolitan Junction Railway Company, owners, lessees, and occupiers. London and South-Western Railway Bill—Petitioners against: Andrew Duncan, Conservators of Barnes Common, Tom Black, Rev. J. T. Jemmett, Metropolitan Board of Works, John Brett, Midsomer Norton Local Board, Great Western Railway Company, Surbiton Improvement Committee, Kingston Highway Board, Radstock District Local Board, Duke of Cambridge, Gas Light and Coke Company, Wimbledon and West Metropolitan Junction Railway Company, H. Doulton, J. H. Hodgson. Kilsyth and Boningbridge Railway Bill—Petitioners against: Wm. Forbes, North British Railway Company, Caledonian Railway Company, Great Northern and North-Eastern Railway Companies, Lady Elphinstone. Liverpool, Southport, and Preston Junction Railway Bill—Petitioners against: Lancashire and Yorkshire Railway Company, Southport Waterworks Company, West Lancashire Railway Company, Justices of the Peace for the County Palatine of Lancaster, Cheshire Lines Committee, Corporation of Southport, Southport District Highway Board, Trustees of the will of the late Charles Scarisbrick, Southport and Cheshire Lines Extension Railway Company. London and North-Western Railway Bill—Petitioners against: Salt Chamber of Commerce, Corporation of Liverpool, Henry Fraser Curwen and Wm. Alex. Wooler, E. R. Vernon, Corporation of Stockport, Wm. Titherington and the Rock Life Assurance Company, G. W. Brown and others, Vestry of St. Leonard, Shoreditch, Metropolitan Board of Works, Justices of the Peace for the County of Chester, South Lancashire and Cheshire Coal Association, the Traders of Brighton, Manchester, Sheffield, add Lincolnshire Railway Company, Cheshire Lines Committee, Northwich Local Board, Vestry of St. Pancras, Middlesex, Baron Delamere and others, Duke of Beaufort, Usk and Towry Railway Company, Great Western Railway Company, Lancashire and Yorkshire Railway Company, Great Northern Railway Company, &c. London, Brighton, and South Coast Railway Bill—Petitioners against: M. A. Godlee and others, Wandsworth District Local Board, Corporation of Lewes, Oxted and Groombridge Railway Company, Waring Bros., South-Eastern Railway Company, East London Railway Company, London, Chatham, and Dover Railway Company, Metropolitan Board of Works. London, Chatham, and Dover Railway Company's Bill (Shortlands and Nunhead)—Petitioners against: Mary Agnes Drake, John Forster, Metropolitan Board of Works, London, Brighton, and South Coast Railway Company, Henry Ficher, Beckenham Local Board, Land Development Association, Limited, H. Wood, owners of property on proposed railway, Jas. Whitehead, Corporation of the City of London, South-Eastern Railway Company. Leominster and Bromyard Railway Bill—Petitioners against: Great Western Railway Company, London and North-Western Railway Company. Lancashire and Yorkshire and London and North-Western Railway Company's (Preston and Ware Railway) Bill—Petitioners against: James Sykes, Corporation of Preston, Right Hon. Sir R. A. Cross and Rev. J. E. Cross, J. and J. L. Birley, owners and occupiers of property at Medlanwith, Wesham, and Kirkham. Lancashire and Yorkshire Railway Bill—Petitioners against: Corporation of Liverpool, Southport Waterworks Company, Jonathan Sheard, Joseph Lightowler, R. Formby, Duke of Bridgewater's Trustees' Corporation of Ashton-under-Lyne, Westhoughton Local Board, Southport Highway Board, Ashton Gas Company, Corporation of Salford. London, Tilbury, and Southend Railway Bill—Petitioners against: West Ham Local Board, Lands Allotment Company, Limited, Great Eastern Railway Company, East and West India Dock Company, Robert Ingram, John Harris, Metropolitan Board of Works, Whitechapel District Board of Works. Milford Dock (Junction Railway) Bill—Petitioners against: Great Western Railway Company, Milford Haven Railway and Estate Company, Milford Haven Dock and Railway Company, Sir Chas. Whetham and others, F. Mowatt and F. D. Grey, S. Lake, merchants, shipowners, and others of Milford, John Helcon, H. Spain, and Geo. A. Cape. North-Eastern Railway Bill—Petitioners against: Corporation of Gateshead, Corporation of Sunderland, Lord Londesborough, promoters of the Scarborough and East Riding Railway Bill, Bolckow, Vaughan, and Co. London Central Electric Railway Bill—Petitioners against: Board of Works for the St. Giles' District, H. Walkley and John Milnes, Holborn District Board of Works, Metropolitan Board of Works, owners, &c., on line of proposed railway, Corporation of the City of London, Commissioners of Sewers for the City of London, Credit Company, Limited. Metropolitan Railway (Parks Railway Parliament-street Improvement) Bill—Petitioners against: Vestry of Paddington, Grand Junction Canal Company, Receiver for the Metropolitan Police District, Edward Lloyd, West Middlesex Water Company, Right Hon. A. J. B. Beresford Hope, Grand Junction Waterworks Company, Gas Light and Coke Company, Chas. Butler and E. L. Raphael, Metropolitan District Railway Company, Vestry of St. Marylebone, Westminster District Board of Works, Metropolitan Board of Works, owners, lessees, and occupiers of land on proposed railway. Metropolitan Railway (Various Powers) Bill—Petitioners against: Col. Philip Smith, Aylesbury and Buckingham Railway Company, C. N. Lewis Nicoll and others, Margaretta, Lady Rose, and others, Vestry of St. Pancras, Hendon Rural Sanitary Authority, Trustees of Pinners' Schools, Gas Light and Coke Company, Metropolitan District Railway Company, Whitechapel District Board of Works, Metropolitan Board of Works, Westminster District Board of Works. Metropolitan District Railway Bill—Petitioners against: Metropolitan Railway and Great Western Railway Company, Whitechapel District Board of Works. Northampton and Daventry Railway Bill—Petitioners against: Grand Junction Canal Company, Corporation of Northampton, London and North-Western Railway Company, Midland Railway Company. Midland Railway Bill—Petitioners against: Vestry of St. John, Hampstead, Thos. Rich. Devereux Bingham, H. H. Powell Cotton, and others, Vestry of St. Pancras, Bristol Port Railway and Pier Company, Wm. Schaverell Coke, Chas. Wering, and others. Lincoln and Skegness Railway Bill—Petitioners against: Earl of Scarborough, Manchester, Sheffield, and Lincolnshire Railway Company, Bennet Rottes Langton, Great Northern Railway Company. Manchester, Sheffield and Lincolnshire Railway (Chester to Connah's Quay) Bill—Petitioners against: Earl of Kilmorley, Corporation of Chester, River Dee Commissioners, Sir T. G. Frost, R. A. Rasbotham, and others; River Dee Company, Great Western Railway Company, London and North-Western Railway Company, Credit Company, Limited, Shropshire Union Railways and Canal Company, Hawarden Embankment Trustees, River Dee Commissioners, merchants, shipowners, and others trading on the river Dee, G. A. Dickson, and others. Manchester, Sheffield, and Lincolnshire Railway (Additional Powers) Bill—Petitioners against: Trustees of Clarke's Charity, Manchester, Baron Lilford, Corporation of Stalybridge, Earl Manners, West Lancashire Railway Company, Corporation of Ashton-under-Lyne, John Preston, London and North-Western Railway Company, Corporation of Preston, Thos. Bayley, Leeds and Liverpool Canal Company, London and North-Western and Lancashire and Yorkshire Railway Companies, Corporation of Manchester. Ruthin and Cerrig-y-Drundion Railway Bill—Petitioners against: Rev. J. R. Owen and C. W. Farbridge. Scarborough and East Riding Railway Bill—Petitioners against: Hull, Barnsley, and West Riding Junction Railway and Dock Company, Midland Railway Company, North-Eastern Railway Company, and Scarborough and Whitby Railway Company. South-Eastern Railway (Various Powers) Bill — Petitioners against: Messrs. Measure Bros. and Company, Metropolitan Board of Works, Conservators of the River Medway, John Pugh, Sir J. R. Fergusson, F. Preston and T. Dance, Conservators of the River Thames, Anglo-American Brush Light Corporation, London, Chatham, and Dover Railway Company, &c. South-Eastern and Channel Tunnel Railway Bill—Petitioners against: Channel Tunnel Company, Corporation of Dover, London, Chatham, and Dover Railway Company. Sutton and Willoughby Railway Bill—Petitioners against: Alford and Sutton Railway Company, H. S. Cropper, H. Mallett, Strathspey, Strathdon, and Weeside Junction Railway Bill—Petitioners against: Highland Railway Company, Earl of Seafield, Badenock District Road Trustees, Great North of Scotland Railway Company. Stockton Carrs Railway Bill—Petitioners against: Messrs. Head, Wrightson, and Co., and others. Swindon and Cheltenham Railway Bill—Petitioners against: Lord Elder, Great Western Railway Company, Banbury and Cheltenham Direct Railway Company. Taff Vale Railway Bill—Petitioners against: Corporation of Cardiff, Marquess of Bute, Great Western Railway Company, Rhymney Railway Company. Treferig Valley Railway Bill—Petitioners against: Marquess of Bute, Great Western Railway Company. Usk and Toway Railway Bill—Petitioners against: Neath and Brecon Railway Company, Brecon and Merthyr Tydfil Junction Railway Company, Llanelly Railway and Dock Company, and Great Western Railway Company, London and North-Western Railway Company, Midland Railway Company. Uxbridge and Rickmansworth Railway Bill—Petitioner against: Mrs. Mary Anne Lambert. West Lancashire Railway Bill—Petitioners against: R. Parkinson Treffall, Corporation of Blackpool, Manchester, Sheffield, and Lincolnshire Railway Company, Corporation of Preston, Leeds and Liverpool Canal Company, Lancashire and Yorkshire and London and North-Western Railway Companies, St. Anne's-on-the-Lee Land and Building Company, and owners, lessees, and occupiers. Wisbech Dock and Railways Bill—Petitioners against: Arthur W. English and others, Sutton Bridge Dock Company, H.M. Commissioners of Sewers for the Hundred of Wisbech, Great Eastern Railway Company, Midland Railway Company, Eastern and Midlands Railway Company. Wirral Railway Bill—Petitioners against: Corporation of Birkenhead.

ELECTRICAL FITTINGS.

We have received from the Consolidated Electric Company samples of several of the electrical apparatus or fittings manufactured by the company, as well as drawings of the stands made by it for carrying a complete secondary battery of eighteen boxes, each containing eleven electrodes. The secondary battery and the arrangement of master cell we recently

AMMETER, FRONT VIEW.

described. All these fittings are made at the company's works for what is called the B. T. K. system, the works and the construction of the apparatus being under the control of Messrs Taylor and King. One of these fittings is a mechanical cut-out, capable of being adjusted to any quantity of current up to 50 ampères, and serving the purpose of a fusible plug without



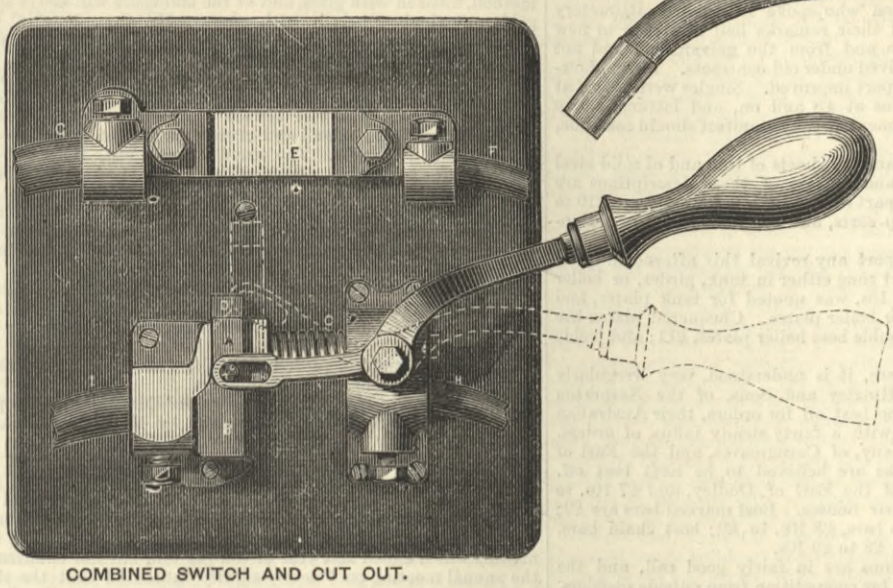
AMMETER, INTERNAL ARRANGEMENT.

their disadvantages. In it an electro-magnet acts upon an armature, which controls an arm having fingers which dip into two mercury contacts. When the current is too great the armature releases the contact piece from a catch and the current is cut out. It is claimed that it can be used as a metre under the quantity clause of the Provisional Orders; but it must be fixed where it will not be subject to vibration. Turning to our engravings, Figs. 1 and 2 illustrate a cheap form of ammeter. The pointer finger is fixed on the same spindle as the little magnet A in the coil. Its action as affected by this coil and the magnet M will be obvious. The permanent magnet M tends to keep the magnet A in the position shown, but the current passing through the coil B tends to place it normal to that position. We have also received a main

ELECTRIC LIGHT FITTINGS.

THE CONSOLIDATED ELECTRIC COMPANY, LONDON, MAKERS.

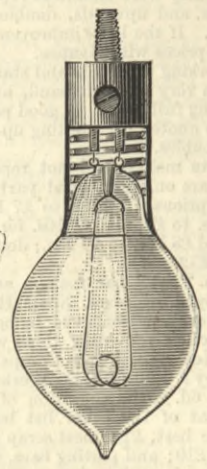
FIG. 3



COMBINED SWITCH AND CUT OUT.

FIG.3

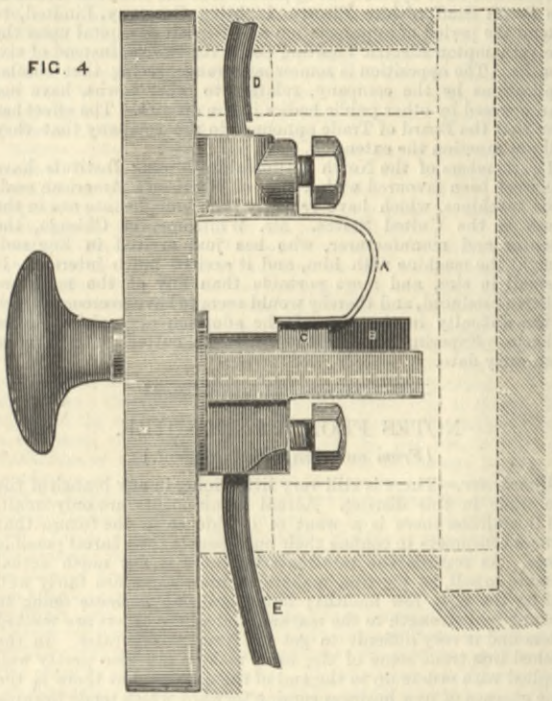
FIG.7



LAMP MOUNT.

switch, which can be moved in only one direction to take heavy currents of high electro-motive force. It possesses the special advantage by breaking the current at two points of a much larger and powerful switch. It must be either fully on or off, and the contacts are self-cleaned. The moving part of the contacts, however, leaves the fixed part in such a way that a

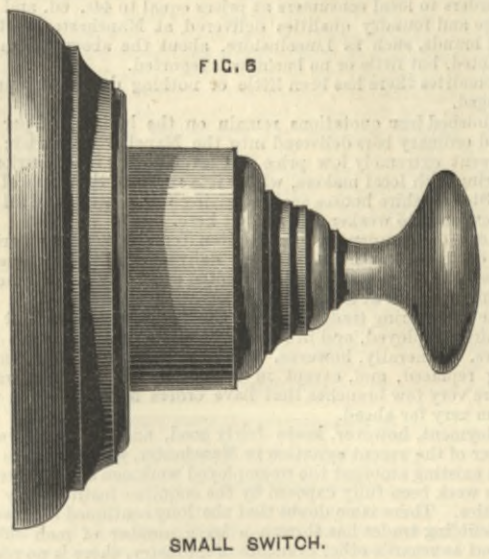
FIG. 4



WALL SWITCH FOR SEVERAL LIGHTS.

mere edge touches, so that sparking must be damaging. A combined switch and cut-out, which can be used for controlling special groups of lamps, is shown at Fig. 3. In this the contact piece is worked by the handle, so that the part B of vulcanite or the brass part are between the surfaces in circuit with the wires H, &c. The movement of the contact piece may be very quickly made, and with a guide to it the sparking may be innocent. In the position shown the brass part of the

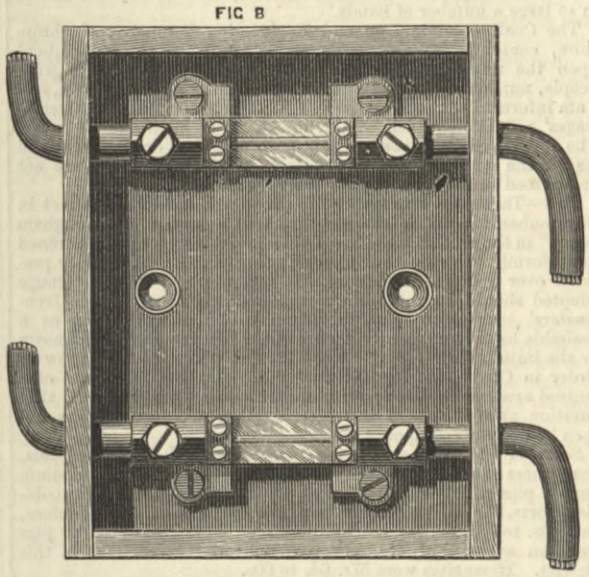
FIG. 5



SMALL SWITCH.

contact piece is between the contact faces; but when the handle is in the position shown by dotted lines, the vulcanite part B cuts off the circuit. The cut out fuse piece E is of foil. The piece of insulated wire, Fig. 3, shows the method of fixing a short piece of brass tube to the ends of the wires, so that contact in the boss of any of the apparatus shall be good, and as stipulated by Major Armstrong, for the Board of Trade. Fig. 4 is a wall switch, the box of which is bedded in the wall, for controlling a small number of lights. This is one of the best of the switches, as the contact surface of the brass spring piece A is fairly lifted off the surface of C, and fairly dropped on again by the push or pull of the handle and its spindle carrying the piece of vulcanite B. Fig. 5 is another description of wall switch, which is fixed flush with the wall, a cardboard case acting as a mould for the cement to form around. In this switch the contact is made by four brass spring pieces A and the cylinder D on the end of the handle spindle, the part C being of ebonite. Fig. 6 is a similar switch, but fitted with a casing of spun metal to protect the mechanism from damp. Fig. 8 represents the terminal poles and fuses as required by the regulations of the Board of Trade under the Provisional Orders. Fig. 7 shows a new form of lamp mount, which firmly and neatly

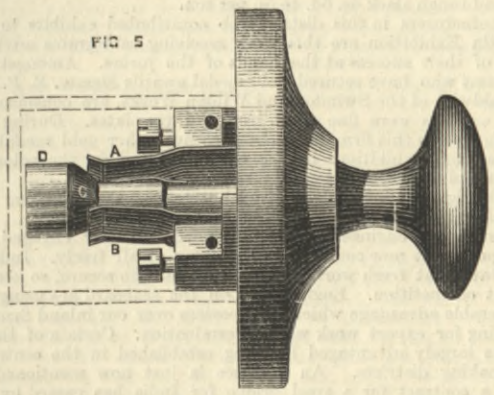
FIG 8



TERMINAL POLES AND FUSES.

holds the lamp while protecting the connections from dust. The piece provided with hooks, presses against the spring within the tube, the bell-mouth of which fits the lamp. This makes a very neat fitting and prevents accidents, such as have

FIG 5



SMALL FLUSH SWITCH.

happened in drapers' shops. These fittings, secondary battery, &c., are being used by the South-Eastern Brush Company for the house-to-house lighting of Colchester.

ELECTRICAL ENGINEERING.—The seventh of the series of lectures on "Electrical Engineering," by Mr. John C. Fell, was delivered on the evening of February 25th, in the reading room of the Society of Engineers, 6, Westminster-chambers, Victoria-street, S.W.; Mr. Jabez Church, past-president, in the chair. The lecturer commenced with the subject of the application of electricity to motive power. He dealt with the essential forms of electrical motors, illustrated by large diagrams, and by a special model. He explained that a motor was only an electrical generator reversed, subject to certain refinements and modifications of lead and mass to suit the altered conditions. He then proceeded to describe some of the different systems of electrical traction which at present have been put into experimental effect. Messrs. Siemens' electrical railway was explained by the aid of diagrams, and also an ingenious overhead system of electric wire railways, as put forward by the Telpherage Company, under the patents of Messrs. Ayrton and Perry and Professor Fleeming Jenkin. The lecturer laid stress upon the importance of electrical traction, and observed that probably a few years hence would show a large development of this class of industrial enterprise, in the form of light railways for colonial and other pioneering purposes.

LETTERS TO THE EDITOR.

[*Continued from page* 164.]

A NEW STEEL.

SIR,—Under this heading Messrs. G. Bennet and Co., in your last number, tell the world that they too have made a steel that requires no hardening to do its work as a cutting material, and that therefore there is nothing new in Messrs. Hadfield and Co.'s steel, or in their using 7 to 20 per cent. of ferro-manganese. I have, no doubt in common with many of your readers, been much interested in the peculiar steels now made, and I should like to be allowed to say that there is nothing new in such a steel as Messrs. Bennet and Co. describe, that they tell us nothing of the quantity of manganese their 7 to 20 per cent. of ferro-manganese puts into and leaves in the mixture; nothing of how the mixture is made; that the steel they describe is not a steel which can be cast into adzes or other cutting tools and taken from the sand and ground for work, and that, hard as their steel may be, there is one thing that shows its physical difference from that made by Messrs. Hadfield's process, namely, it has high magnetic capacity, while the Hadfield steel has none.

M. E. W.

Sheffield, February 25th.

THE EFFICIENCY OF FANS.

SIR,—I have had my attention called to Mr. Aland's letter respecting some remarks I made on the performance of a fan at Messrs. Haland's works, the figures given seeming to me incorrect, which now seems the case. I see that Mr. Aland's new fan was the one referred to. I was not aware that I had ever met that gentleman, but we had some form of correspondence, as he gave notice of opposition to a patent of mine last year, and—contrary to advice—I wrote a friendly letter saying it was a pity to proceed to opposition, as I was acquainted with his complete specification, which related to a different matter to that in my patent. I see he makes use of this letter. With regard to his remarks about the little open fan, which I lent in the experiments at Plaistow, it was a very light one with wings in 18 gauge metal. The fan wheel weighed about 70 lb. It was sent with directions that it was not to run over 1000 revolutions. The power required to clear the tube 18in. square and 1400ft. long came as a surprise to all concerned. Instead of a water gauge of 4in. or 5in. being sufficient, it required 12in. to 13in. water gauge, and a power in the engine which was simply surprising. Mr. Aland's 4ft. fan—a fan of Lloyd type with eight narrowed tips—was run as high as 1460 revolutions, or 17,500 blade tip speed. I believe I am right in saying that three indications of the engine showed over 50-horse power exerted on the fan. The useful effect worked by ordinary mine formula was just over 40 per cent.; by the formula $\frac{M V^2}{2g}$ about 11 per cent. I am not aware my little open fan was ever run so high as 1250 revolutions, but even at that speed it would have been unable to cope with the drag in the tube; had the fan been strong enough to run at high velocity, it would have done its work with ease, and with a power which would have astonished Mr. Aland. As for his statement that 14-horse power was used by the 3ft. fan, I can only say he is mistaken. Apart from it being contrary to what was communicated to me at the time, such a power would have crushed the 18 gauge metal of the fan or torn it to ribbons. He will perhaps be surprised to hear that it was a 3ft. fan of stronger make, and 16in. wide, of the same open type which gave the high air speeds and quantities in the trials of November last in Birmingham, which results have caused so much discussion. The trial of a 5ft. fan on February 7th, when made public, will, I fear, not settle the controversy. The air tube in this case was 32in. diameter. A 6ft. fan of my new construction will have a 4ft. inlet and cylinder. The collapse of the 2ft. 6in. square zinc tube by the 6ft. fan on which Mr. Aland lays much stress was a matter of certainty, if the fan could get up 5in. water gauge. Each foot run would have a surface of 10 square feet, the water gauge pressure would be 31·2 lb. on the square foot, or 311 lb. per foot run of tube, a pressure which no flat-sided zinc tube could bear. The sum of the experiments to which he alludes was the statement made in the Parliamentary Committee on the District Railway ventilators:—"If the ventilation was done by fans, a 6ft. fan would be required every quarter of a mile, driven by an 88-horse power engine." This opinion has, I find, since been modified by reference to colliery ventilation. The "smash" of the anemometer, to which he jokingly alludes, was by no means due to the velocity of the air current, which I checked with the stop the moment it happened, and which measured about 6000ft. per minute, but to the shower of gravel and grit falling into the open air channel made through a gravel bank. The frame of the anemometer still bears the scratches of the gravel. The 4ft. fan was running over 1400 revolutions at the time. Mr. Aland despises comparative tests—I do not; and I could if I chose give some comparisons in actual work between fans of the new construction, 14in. less diameter than the type he makes, running at less blade tip speed, and doing more work with far less power. He evidently thinks my fans are merely experimental. He is mistaken. I have fans working for forced draught in steam vessels burning smokeless coal, fans blowing smiths' fires, melting in cupolas, drying hops with splendid success in Kent, exhausting dust, drying grain and cooling stacks in agriculture, and drying by heat process. It is an old saying, that Rome was not built in a day; but I venture to remark that, considering the patent was first connected with agriculture, it is not a bad sign of its vitality that in eighteen months after it was first lodged it has, spite of much bitter opposition, got into these various uses. I am not the least concerned about the future of the fans; where they are known, their usefulness will be recognised by the practical and unprejudiced. I shall certainly not expect to obtain my credentials from fan makers, but from fan users, to whom, after all, the matter will be referred.

G. M. CAPELL.

Passenham Rectory, Stony Stratford,
February 19th.

THE QUALITY OF SCOTCH G.M.B. IRON.

SIR,—The committee of the Scotch Pig Iron Trade Association has hitherto declined to answer the anonymous articles and letters which have appeared in the public journals, attacking the quality of certain Scotch g.m.b. irons, but has been more desirous to ascertain, if possible, the origin of these charges, which have certainly not come from either those who use the iron or those who buy and sell it. In this it has been unsuccessful. As representing the pig iron merchants of Glasgow, who deal largely in the brands referred to, this committee begs to state that there never have been fewer complaints than of late regarding the quality of these irons, and it is convinced that these recent charges of a depreciation in quality emanate from interested parties, and are unfounded in fact. It is insinuated that cinder iron has only lately been introduced into the manufacture of g.m.b., but all conversant with the trade are aware that it has been in use for the last twenty years—not only in Scotland, but also in Cleveland—and that during that period changes have been introduced all round in the composition of Scotch pig iron, as is evidenced by the increased importations of foreign ores.

It has never been the custom of merchants and brokers to concern themselves regarding the process of manufacture, but only with the quality of the pig iron produced. The iron merchants and brokers, now incorporated as the Scotch Pig-iron Trade Association, have in times past decided what irons shall be accepted in the trade as g.m.b.; and this committee is satisfied that the iron now in store, whether received lately or years ago, is equal in quality to the iron delivered direct from the makers, at the same time to shippers and consumers, and regarding which no complaints have been made; and the storekeepers, Messrs. Connal and Co., make it their business to take stringent precautions against inferior qualities of iron being admitted into their yards.

Neither Scotch nor Cleveland iron is sold by analysis. The manner of determining the quality, and of assorting the iron into its various numbers, has been to break the pig, and to judge it by the appearance of the fracture. If it be true, as this committee is driven to infer, that the present attacks upon the quality and composition of certain g.m.b. irons originate with a section of the iron-masters, who have now appointed themselves a committee to inquire into the truthfulness of their own allegations against the quality of the produce of their competitors in trade, the result of their investigations will not carry much weight.

It has at all times been open to operators and investors in iron warrants, if they wish a particular brand, to stipulate for it; but such stipulation must be made before purchasing; otherwise any of those brands recognised by this association as g.m.b. must be accepted in implement of the contract. In the opinion of this committee, none of the brands now in store have forfeited the position which they have so long held as g.m.b.'s.

Robert Donaldson, Chairman.
Glasgow, February 22nd. William Wilson, Secretary.

CLIMBING TRICYCLES.

Sir,—It is not often I trouble you, but seeing an article in The Engineer on tricycles, I must protest against the opinion there expressed. Had you given the laurels to the "Monarch" instead of the "National," I should not so much condemn, but surely you may have tried other machines for hill climbing that would eclipse both. Anyone with the smallest amount of knowledge as to stability of wheeled carriages must see that the rider is in about the worst possible position on a "National," and I think it is one of the worst of all tricycles for speed or power. Simplicity is not everything in a tricycle, neither does extreme lightness mean ease of propulsion.

I cannot prolong my note to demonstrate the best machine, but I do say that as a mechanical judgment, the writer of the said article needs to look further into the laws and requirements of tricycling before he expresses himself in the matter. I can only add that my own practical experience leads me to very different conclusions, and I certainly expected to find equal or better opinions expressed by a paper of such high mechanical repute.

Oxford-street, Reading, H. A.
February 23rd.

TENDERS.

For sea defence works at Hove, Sussex. Sir John Coode and Mr. Ellice-Clark, engineers.

	£	s.	d.	Time for completion. Months.
Budden and Co., Gloucester	38,639	12	7	18
W. Webster, London	33,723	0	0	22
J. Harrison, Brighton	30,966	0	0	20
J. T. Chappell, Pimlico	29,861	0	0	24
C. Dickenson, London	27,315	0	0	15
W. J. Doherty, Dublin	27,261	0	0	15
McCrea and McFarlane, Belfast	26,659	12	7	18
G. Lawson, Glasgow	26,272	4	10	20
G. Cheesman and Co., Brighton	25,904	0	0	24
H. Lee and Sons, Westminster	25,720	0	0	24
J. G. Marshall, Brighton	25,671	4	4	17
J. Longley, Crawley	25,189	0	0	24
W. Hill and Co., Gosport—accepted	23,946	0	0	12
Taylor and Sharp, London	23,000	0	0	12
Hill Bros., Wycombe	20,948	11	4	10

For connecting sewers and flushing tanks at Hove. Mr. Ellice-Clark, engineer.

	£	s.	d.
Anscombe, Brighton	4872	0	0
Bottrill, London	4601	0	0
Dearle, Hastings	4401	0	0
Marshall, Brighton	4330	0	0
Cowderoy	4056	0	0
Hill and Co., Gosport	4116	0	0
Peters, Horsham	4045	0	0
Cheesman and Co., Brighton	3840	0	0
J. H. Etheridge, Croydon	3804	0	0
Reynolds, jun., Hove	3497	0	0
Longley, Crawley	3272	9	0
Parsons, Hove—accepted	3107	0	0

The Knibbs Valve Patent Suits.—It is expected that the old Philadelphia, the first steam fire engine, which was recently taken to Boston as evidence in an important patent suit against that city, will be returned to its owners, the Insurance Patrol, at once. The suit was by Marcus P. Norton and others, assignees of James Knibbs, of Troy, New York, who claimed to hold the original patent for a relief valve which was extensively used upon its steam fire engines by the city of Boston and elsewhere throughout the country. In the former city alone the royalties claimed by the plaintiffs amounted to 450,000 dols. The part taken in the case by the old engine, Philadelphia, was interesting. It seems from the statement of those who accompanied her to Boston that she was wanted to prove that the valve for which the complainants claimed the patent right had been used on her two or more years before the patent was issued. During the trial the court and jury adjourned to the Boston Common to witness a practical comparison of the working of the valve of the old engine with that of one of the latest construction. The result, it is said, was amazing, as the old engine, which many feared could not stand the strain, threw a larger stream with two pieces of hose than the other did with one. The valves, it was stated, was shown to be the same, to the satisfaction of the jury, and a verdict for the city of Boston was rendered. Among those who testified with reference to the valve of the Philedelphia was Jacob Neaffie, builder of the engine, and member of the firm of Neaffie and Levy; Joseph L. Parry, the designer; Richard Warren, an engineer of the present Fire Department; and George Kurtz, the original engineer of the Philadelphia, who conducted the practical test at the trial, and who managed the engine over twenty years ago, when her usefulness was exhibited in the city of Boston, near the same spot, and a prize of 600 dols. won.—*Philadelphia Ledger.*

Newcastle Steam Boiler Insurance Company, Limited.—The fifth annual ordinary general meeting of the shareholders of the Newcastle-on-Tyne Steam Boiler Insurance Company, Limited, was held at the offices of the company, 34, Grey-street, Newcastle, on Tuesday afternoon, February 19th. The chairman of the company—Mr. Councillor Thomas Gray—presided. The report as presented to the shareholders was received and confirmed. On the motion of the chairman, seconded by Mr. Campbell, a dividend at the rate of 10 per cent. on the paid up capital of the company, free of income-tax, was carried unanimously. The retiring directors, Mr. Robert Fell and Mr. George Davidson, were re-elected. On the motion of Mr. G. R. Brewis, seconded by Mr. George Davidson, Mr. J. A. Baty and Mr. Thomas Gillespie were appointed auditors of the company for the ensuing year. The report showed that the business of the company had considerably increased during the past year, notwithstanding the keen competition which at present exists, and that the directors had been able to place a substantial balance to the reserve fund. The engineer, Mr. W. B. Campbell, reported that accidents had occurred to four of the insured boilers. The first was a vertical boiler in a screw wherry, the uptake of which collapsed from overheating, caused by shortness of water. The second was a vertical boiler in a screw wherry, the uptake of which collapsed from overheating caused by shortness of water through priming. The third was a Cornish boiler, the flue of which collapsed over its internal furnace from overheating, caused by severe scaling. The fourth was a Lancashire boiler, both flues of which partially collapsed over their internal furnaces from overheating, caused by shortness of water through a defective feed pump. The compensation for the above accidents has been paid out of revenue. A vote of thanks to the chairman, directors, and officials terminated the proceedings.

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

(*From our own Correspondent.*)

The gradual approach of the shipping season is bringing out a slight increase of orders for manufactured iron. There were sheet makers on 'Change this afternoon—Thursday—in Birmingham, and yesterday in Wolverhampton who spoke in a more satisfactory manner of the demand, and their remarks had reference to new orders from the middlemen and from the galvanisers, and not merely to specifications received under old contracts. Prices, however, they were unable to report improved. Singles were priced at £7 10s. and upwards, doubles at £8 and on, and lattens, £9 to £9 5s. If the little improvement already manifest should continue, these prices will advance.

Working up sheets and stamping sheets of iron and of mild steel are in very good demand, and makers of these descriptions are running full time. A good part of the work is for export. £10 to £11 is quoted for working up sorts, and £13 to £13 10s. for stamping doubles.

Plate makers did not report any revival this afternoon. The mills are only employed part time either in tank, girder, or boiler descriptions. £7 10s. to £7 15s. was quoted for tank plates, and £8 10s. to £9, and £9 10s. for boiler plates. Chequered plates are quoted £8 15s. to £9 15s.; double best boiler plates, £11; and treble best, £12.

The "list" bar makers are, it is understood, very irregularly employed. Messrs. Noah Hingley and Sons, of the Netherton Ironworks, are believed to be best off for orders, their Australian connection providing them with a fairly steady influx of orders. The New British Iron Company, of Corngreaves, and the Earl of Dudley's Round Oak Works are believed to be next best off. £8 2s. 6d. is the quotation of the Earl of Dudley, and £7 10s. to £7 that of the other list bar houses. Best marked bars are £9; double best, £10; best scrap bars, £8 10s. to £9; best chain bars, £9 to £10; and plating bars, £8 to £9 10s.

Iron of engineering sections are in fairly good call, and the demand would be larger but for competition from outside districts. Ordinary rivet iron is quoted £7 5s. to £7 10s., marked £9 to £9 10s., and double best £10 nominal. Tee iron is quoted £7 to £7 10s., and marked sorts £9 to £10.

Hoops here and there show a little more life. Export orders are coming to hand somewhat better. Ordinary sorts are £6 10s., superior sorts £6 15s. to £7s., and marked qualities £8 per ton.

Little is heard this week of the suggestion in some quarters of two or three weeks back that an attempt should be made to limit the output of finished iron by a combination amongst the makers. Mr. Benj. Hingley, chairman of the Ironmasters' Association, at the annual meeting of that body last week, showed that such a scheme was impracticable in this district, where the production is in so large a number of hands.

The Coalbrookdale Iron and Engineering Company, of Shropshire, contemplates closing its Horsehay Ironworks, consequent upon the unprofitableness of present business. All the work people, numbering several hundreds, are under notice to leave, and I am informed that the company states that it is not a matter of wages' reduction which would induce it to continue at work. The operatives are, however, willing to accept a drop if it would lead to the withdrawal of the notices. Happily, the firm are not understood to have yet arrived at a final decision.

This—Thursday—afternoon the sheet and hoop makers met in Birmingham to define the meaning of the words "Birmingham gauge" in the resolution of last December, when it was determined to uniformly work to that gauge in future. Mr. B. Hingley presided over a large attendance. It was resolved that the gauge adopted should be that drawn up some while ago by the Ironmasters' Association, and submitted to Mr. Chamberlain as a desirable legal standard for flat metals. The gauge will be known by the initials "B. G. W." It was further resolved to apply for an Order in Council to legalise the standard. The advocates of a mutual arrangement for restricting the make of sheets raised that question at the close of this meeting; but nothing definite could then be determined upon.

Sales of pig iron are taking place this week in limited lots. Consumers are still unprepared to buy forward heavily. Medium quality pigs sell most. Native all-mines were to-day 80s. for cold-blast sorts, 62s. 6d. to 60s. for hot-blast, 50s. to 45s. for part-mines, and 40s. to 38s. 6d. for cinder qualities. Foreign part-mine pigs were an average of 45s. per ton, delivered at stations in this district. Hematites were 57s. 6d. to 60s.

Coal of all sorts was in large supply at low prices. The joint stock colliery concerns, by throwing great supplies upon the market at a time when the demand is limited, are keeping prices at an almost profitless level. The Sandwell Park Colliery, for instance, is turning out somewhere about 1000 tons a day, and is now running four and three-quarter days a week. The list price of furnace coal on which wages are being paid is 9s. 6d. to 10s. per ton, and rough slack 4s. 6d. to 5s. per ton.

Manufacturers in this district who contributed exhibits to the Calcutta Exhibition are this week receiving cablegrams advising them of their success at the hands of the jurors. Amongst the iron firms who have secured gold medal awards Messrs. E. P. and W. Baldwin, of the Swindon and Wilden Works, are conspicuous. Their exhibits were fine sheet iron and tin-plates. During the past few years this firm have obtained five other gold medals at international exhibitions on the Continent and in the colonies, besides diplomas of merit and first awards of merit.

In the lighter trades of the district certain of the japanners and enamellers have obtained gold medals at Calcutta.

Constructive engineers, although mostly steadily engaged, do not report that new contracts are arriving at all freely. Indeed, they state that fresh work is scarce and hard to secure, so keen is current competition. Engineers upon the seaboard are using the considerable advantage which they possess over our inland firms in tendering for export work with determination. Certain of them, too, are largely advantaged by being established in the centre of steel-making districts. An instance is just now mentioned in which a contract for a steel bridge for India has passed by our manufacturers, and settled in the North of England, where a lower price was tendered. The value of the order is mentioned as £11,000, which would mean, probably, a 700 or 800 ton job.

I have this week seen some fine bridge work in the engineering yard of Messrs. Cochrane and Co., of the Woodside Ironworks, Dudley, which is under construction for the Government of New South Wales in completion of contracts accepted some time back, and the largest portion of which has been shipped some months since. The contracts embraced a lattice girder bridge to cross the Georges River for a single line of railway; four road bridges, one of which is to be thrown across the Manilla creek; and a roof for the new locomotive shops at Eveleigh, in the Sydney district. The whole of the work is of iron, the only steel used being the four sets of steel rollers and the cast steel rocker plates which allow for the effects of the climate upon the railway bridge in the matter of contraction and expansion. This structure continues over three openings, and is made up of six spans, 150ft. each in length by 15ft. high by 15ft. wide in the clear. The lattices are set 7ft. apart, and each span weighs about 150 tons. Forming part of the bridge are twelve large pilasters and caps in cast iron in imitation of moulded stone work, which act as sham piers, and will give to the structure when erected a handsome appearance. The bridge will be carried on cast iron cylinders, made by a firm in the North of England.

In the road bridge contract there are four bridges, namely, one bridge of two spans of about 126ft. each, another of five spans of 126ft. each and six spans of about 60ft. each, a third of six spans of 126ft. each, and the fourth of two spans of about 90ft. each; all are of the lattice girder type with buckle plate flooring, and to be carried on iron cylinder piers. The bridges are 10ft. high by 20ft. wide, and in the longest spans the lattices are set 10ft. apart. The total weight is between 1600 and 1800 tons.

The roof for the locomotive shops, which has already been despatched in its entirety, is of the arch type in three spans of 100ft. each, the length of the building being 300ft. The main arches spring from the ground, and rise a clear height of 37ft. from the rail level to the crown of the rib on the underside. The weight of this contract is between 1000 and 1200 tons. The actual roofing will be of galvanised corrugated iron on the ridge and furrow method, filled in with glass, and at the end there will be six special gable principals filled in with glass. Mr. Jno. Fowler, C.E., London, is the engineer for the bridges, and the roofing has been planned by an engineer in the colony.

The anvil and vice trades are devoid of much activity, and the most favourably situated firms are not making more than four or five days a week. The vice branch has of late been the best, the demand from New Zealand and Australia, and on home account, having been very fair. The anvil department, that has been depressed for some time, and in which heavy stocks have accumulated in makers' hands, shows a little revival at the moment, the United States demand having improved. The Canadian demand, whether for anvils or vices, is unusually tame, but it is hoped that with the advance of spring, new orders will arrive from this important market.

The operative nut, bolt, and spike makers of Black Heath have determined to form a branch of the National Amalgamated Association of Nut and Bolt Makers, with the view of improving their position.

The Wolverhampton plate-lock makers have given a fortnight's notice for 10 per cent. advance in wages.

The Institute of Iron and Steel Works' Managers had a paper before them on Saturday, at Dudley, by Mr. John Davies, of Wednesbury, on "The Various Means and Appliances for Indicating the Water Line or Level in Steam Boilers Generally." Mr. Davies pointed out that shortness of water was, in the great majority of cases, the cause of boiler explosions, and showed how difficult it was to obtain a really safe guide as to the water line.

The Hamstead Colliery Company made a profit during the three months which ended last year of 6d. per ton, but the chairman at the annual meeting on Tuesday rightly intimated that the shareholders would not be satisfied with such a profit in the future. The output last week was 2700 tons, but the chairman said that the directors would not rest until it reached 4000 or 5000 tons a week. The two shafts which had been sunk to a depth of 615 yards, where a seam of coal 24ft. in thickness had been come upon, would in the opinion of the directors suffice to enable them to meet an extraordinary demand.

The General Purposes Committee of the Wolverhampton Corporation have opposed the application to the Board of Trade of the South Staffordshire Electric Lighting Company, Limited, to extend the period of appropriation and deposit of capital upon the Wolverhampton Electric Lighting Order for twelve, instead of six, months. The opposition is somewhat strange, seeing that similar applications by the company, relating to other towns, have not been opposed by other public bodies in the district. The effect has been that the Board of Trade announce to the company that they will not sanction the extension.

The members of the North Staffordshire Mining Institute have this week been favoured with a view of Harrison's American coal-mine machines, which have recently been brought into use in the mines in the United States. Mr. Whitcome, of Chicago, the inventor and manufacturer, who has just arrived in England, brought the machine with him, and it excited much interest. It is small in size, and more portable than any of the machines hitherto produced, and thereby would seem to have overcome much of the difficulty in the way of the adoption of such machines hitherto. Experiments with the American cutter are to be made at an early date.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—There is still very little doing in any branch of the iron trade in this district. Actual requirements are only small, and in addition there is a want of confidence in the future that induces consumers to confine their purchases to their barest possible wants. As regards the raw material there is not much actual pressure to sell, as pig iron makers in most cases are fairly well sold for the next few months; but there is no business doing to give any real strength to the market, and where orders are wanted sellers find it very difficult to get the present full rates. In the finished iron trade some of the local makers are also pretty well supplied with orders up to the end of the quarter, but there is the same absence of new business coming forward which tends towards weakness. Taking the iron trade generally, the prospects, so far as the immediate future is concerned, are not at all hopeful, and they certainly seem to encourage buyers in their view of the situation that they have more to gain by waiting than by giving out orders just now, although present prices are now undoubtedly low.

There was only a very dull market at Manchester on Tuesday, with scarcely any business doing in either pig or manufactured iron. Quoted prices nominally were unchanged, but so far as values could be tested, the tendency was towards weakness. Lancashire pig iron makers during the week have booked a few small orders to local consumers at prices equal to 44s. 6d. and 45s. for forge and foundry qualities delivered at Manchester, and for district brands, such as Lincolnshire, about the above prices are also quoted, but little or no business is reported.

In hematites there has been little or nothing doing, with prices unchanged.

For finished iron quotations remain on the basis of £6 per ton for good ordinary bars delivered into the Manchester district; but the present extremely low price of Cleveland bar iron is seriously interfering with local makers, whilst it is reported that some of the North Staffordshire houses are also giving way a little, and all this has a tendency to weaken the market here.

Rather more enquiry for finished iron for shipment is reported, chiefly on Indian account, and for delivery at Liverpool special qualities of bar iron for export are quoted at £6 7s. 6d., with hoops for baling purposes at £6 10s. per ton.

In the engineering trades, most of the works in this district are kept fairly employed, and in some special branches they are full of orders. Generally, however, work is running out faster than it is being replaced, and, except in the locomotive building trade, there are very few branches that have orders in hand which will see them very far ahead.

Employment, however, keeps fairly good, and the exaggerated character of the recent agitation in Manchester, with regard to the distress existing amongst the unemployed workmen in the district, has this week been fully exposed by the enquiries instituted by the authorities. There is no doubt that the long continued depression in the building trades has thrown a large number of men out of work, but as regards other branches of industry, there is no really exceptional distress existing for want of employment. So far as the engineering trades union societies are concerned, they have held aloof altogether from the agitation, which has been based upon gross misrepresentation as to facts.

In the coal trade business continues quite as depressed as ever. For all classes of round coal the demand is extremely small, and not more than sufficient to keep the pits going about three or four days a week; where they are working more time than this stocks are being put down. The small quantity of round coal now being screened is naturally causing slack to be rather scarce, and this is tending to give a steady tone to engine fuel, but the actual demand is only moderate. With the close of the month there is a downward movement in prices. The leading Manchester firms are reducing their delivered rates 10d. per ton on house coal and 5d. per ton on other classes of fuel, but with the exception of slight

modifications here and there pit prices are unchanged. In other districts, although there is no generally announced reduction, lower prices are in come cases quoted, and there is an absence of any really fixed rates. At the pit mouth prices average 9s. 6d. to 10s. for best coals, 8s. for best seconds, 7s. 6d. for ordinary seconds, 6s. common house coal, 5s. 6d. to 6s. steam and forge coal, 4s. 6d. to 5s. burgy, 3s. 9d. to 4s. 3d. best slack, and 3s. to 3s. 6d. ordinary qualities.

Barrow.—The tone of the iron trade of this district is unchanged. The improvement noted in the demand a few weeks ago is fully maintained, and there is still a good request for all qualities of Bessemer. I hear that some good contracts have come to the hands of makers during the past few weeks, and that the present brighter state of affairs is likely to become permanent. Greater confidence is put in makers, who consequently maintain a firmer attitude. The foreign trade has also seen an appreciable improvement. Stocks are still large, and shipments are not heavy; but fair deliveries have been made by rail to inland towns. Prices are firmer, and large quantities of Bessemer samples have changed hands at the following current prices:—No. 1 Bessemer, 49s. per ton net at works, prompt delivery; No. 2, 48s.; and No. 3, 47s. per ton, while the demand for No. 3 forge is fairly maintained at 46s. 6d. per ton. The steel trade has seen a slight improvement, and the future looks much brighter. Makers are busy in the merchant departments, but there is not a very active state of things so far as steel rails are concerned. The present quotations for these are very low and unprofitable, the ruling prices being from £4 10s. to £5 per ton. Shipbuilders, it is reported, have booked some good contracts, but the rumour wants confirmation. Iron ore steady at from 9s. 6d. to 12s. per ton. Stocks heavy. Coal and coke quiet. Shipbuilding dull.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

I OBSERVED this week in the Belgian *Moniteur* that our townsman, Mr. R. Schott, managing partner of Messrs. Seebohm and Dieckstahl, Dannemora Steel Works, and Vice-Consul of Sweden and Norway, has been appointed Consul of Belgium in Sheffield.

The honours from Calcutta begin to drop in upon Sheffield exhibitors. Last week Messrs. James Dixon and Sons, Cornish-place, received intimation that they had been awarded a gold medal for their splendid exhibit of silver and electro-plated ware. On Tuesday Messrs. Brookes and Crookes, of the Atlantic Works, had a message to the effect that a gold medal had been awarded to their case of cutlery. Messrs. Brookes and Crookes did not prepare any goods for the Exhibition, but simply made up their case from the goods in stock.

Messrs. Edward Lucas and Son, of Dronfield Foundry, near Sheffield, who have the sole right of manufacturing Wallace's entrenching tools, have received a large order for their useful implements to be used in the Soudan should the war continue. A very fine business is now being done in these tools, which are highly spoken of in military quarters, and were found of great service in the last Egyptian campaign.

Messrs. Edgar Allen and Co., steel manufacturers, Wellmeadow Works, have taken on a lease the extensive works formerly occupied by the Albion Iron and Steel Company, Limited. They are now in possession, putting things in order for commencing operations at the new place on the 1st of July.

At the Midland Iron Company's meeting, on Friday, it was stated that the profits were just about the same as last year. Competition had been felt to be excessively severe, the large sales having only been effected by very great exertion on the part of the company's officials, who had to compete with some concerns which paid no dividends at all, being practically carried on for the benefit of those employed at the place. The chairman, Mr. David Davy, spoke of the competition of those concerns as "absurd." They neither lived themselves nor permitted anyone else to do so. He explained the reduced profit by the difference in the selling price, as compared with 1882, which was 4s. 8d. per ton, which, on 16,000 tons of iron, was a large item. An advantage in the reduced price of pig iron, and 6d. per ton less in wages, had enabled them to make up some of the loss that had otherwise gone in the reduced selling price. The output in 1879 was 10,847 tons; in 1880, 12,683; in 1881, 13,856; in 1882, 16,524; and in 1883, 16,454. The company could turn out from 1000 to 1500 tons more. As to the state of trade, the company was at present turning out more iron than in any of the months of last year; but prices kept exceedingly low, and competition had not lessened. He hoped, if business continued in something like its present state, the directors would be able to meet the shareholders at the next annual meeting with quite as satisfactory results. The dividend was 7½ per cent. This company, on its formation in 1872, paid 62½ per cent.; in 1873, 30 per cent.; in 1874, 15 per cent.; and in 1875, 8 per cent. Then for three years there was no dividend. In 1875 the company resumed position as a dividend-paying concern, and has paid 7½ per cent. ever since.

The coalowners are in no great hurry to comply with Mr. Pickard's request to meet another deputation of himself and colleagues, to discuss a scheme of regulating wages, the first article of which is that miners shall be paid 10 per cent. more. The secretary of the coalowners—Mr. C. E. Rhodes—replied to their application that he would bring the matter before the Coalowners' Committee, and he will—when the committee meet to discuss anything else. It is somewhat aggravating to have such a request made when they know the coalowners, though very anxious for an amicable method of settling wages' disputes, have clearly decided that they will not grant 10 per cent. or any advance at present.

Another mining enterprise—the Miners' National Orphanage—is making headway. At a meeting held in the park here on Monday night Mr. Emerson Bainbridge, the managing director of the Nunnery Colliery Company, presided. He said that the total number of miners employed in the country was about half a million, the exact number for 1882 being 495,477. If only one half of these agreed each to have 6d. per quarter, or 2s. per year, taken from his wages, a sum of £25,000 per annum would be obtained. If they got this amount for three years, one half of the sum could be spent in building two or three orphanages, and the other half invested in funds and partly in the maintenance of those orphanages. The total number of deaths in 1882 from accidents was 960, and for 2s. per head from half the miners of the country they could provide for all those rendered orphans by those disasters which from time to time took place. He counselled Mr. Pickard to turn his attention to this point rather than to agitations for impossible advances in wages.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THE Cleveland pig iron trade has changed but little during the past week. Prices are well maintained, and are scarcely likely to be lower, as the threatened blowing out of blast furnaces has been commenced in earnest. It is estimated that the reduction of output will be 30,000 tons per month. At the market held at Middlesbrough on Tuesday makers were asking 37s. per ton for No. 3 g.m.b. for prompt delivery, but would not sell very far ahead at any price. Merchants, who, however, had but small quantities to dispose of, were accepting 36s. 9d. per ton. Forge iron could not be had for less than 35s. from producers; but merchants were selling small parcels at 34s. 9d. per ton.

Warrants are rarely asked for. The price generally quoted is 36s. 9d., but there are holders who would probably accept 3d. per ton less.

Messrs. Connal and Co.'s stock of Cleveland pig iron at Middlesbrough amounted on Monday to 61,285 tons, being a reduction of 58 tons for the week.

Shipments of pig iron from the Tees to the 25th were 54,477 tons, being about 11,000 tons more than in February, 1883, and 2000 tons more than in January, 1884, other things being equal.

It is several years since the manufactured iron trade was in such a depressed condition as at present. Several works are idle for want of orders, and prices are ruinously low. Ship plates are offered at £5 5s. per ton; shipbuilding angles at £4 15s., and common bars, £5 2s. 6d., free on trucks at works, cash 10th less 2½ per cent.

The directors of Messrs. Bolckow, Vaughan, and Co., Limited, recommend that a dividend of 5 per cent. be paid for the year ending December 31st last, £40,000 will also be written off capital account and £8000 carried forward.

The strike amongst the Cumberland ironworkers at Maryport, Workington, and other places, is now at an end, the men having consented to return to work at a reduction of 10 per cent. in wages. The strike lasted about seven weeks.

The Cleveland blast furnace men have agreed to accept their employers' terms, and consequently there will be no strike. The sliding scale was signed by the employers and delegates from eighteen works on Monday last. It will be in force for another eighteen months, except in so far that the employers will not take off the 1½ per cent. to which that would already entitle them until after the expiration of the current quarter. At two or three works outside the Association the difficulty is still unsettled.

The iron shipbuilders of Stockton, Middlesbrough, and the Hartlepools arranged with their men last week for a reduction of 10 per cent. on all platers' and caulkers' wages, and 7½ per cent. on those of rivetters. The platers' helpers, however, refuse to submit to a proportionate reduction on their wages, and all work is stopped in consequence. The helpers are willing to accept a 5 per cent. reduction, which would leave them about 25s. per week; but the platers, who are their immediate employers, demand 10 per cent., without guaranteeing to find them full employment.

Messrs. Palmer's Shipbuilding and Iron Company, Limited, has paid off a great number of men at the Howdon and Jarrow yards. The rolling mills are only working half time, and fifty puddlers were paid off on Saturday last.

Messrs. Sadler and Co., Limited, are pushing forward their new chemical works buildings at Middlesbrough, and will soon be ready to commence operations. The additions to the old works cover an area of about eight acres, and upwards of 800 more workmen will be required.

The defendants in the cause "Marley *v.* Jackson and others," have applied to have execution of judgment stayed, as they demand a new trial. The case will come on again in the course of a few days, and meantime the application is granted.

A meeting of the shareholders of Sadler and Co., Limited, was held on Tuesday at Middlesbrough. The directors announced that they desired power to amalgamate their works with those of Messrs. Forbes and Abbott, of Old Ford; of Forbes, Abbott, and Co., of East Greenwich; and of the Sussex Chemical Company, of East Greenwich and Shoreham. They desired to increase the total capital to half-a-million, and to change the present name to Sadler, Forbes, Abbott, and Co., Limited. The power sought for was unanimously given. This is held to be an attempt to make the manufacture of Turkey red and other dyes from tar products into a gigantic monopoly. It is said that the new company will possess contracts entitling it to obtain, at a low price too, almost all the tar and other suitable materials for dye-making produced in the whole country. If, however, any competitor should arise notwithstanding, and get hold of an undiscovered supply, he would probably be able to make a big fortune, either by competing with or selling his venture to the new Sadler monopoly.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THE iron market has been depressed since last report, and the prices have shown a tendency to decline still further, warrants having been down to 42s. per ton. The controversy as to the quality of the pig iron sent into store still goes on, and until a thorough understanding is arrived at on the subject the market will continue to be affected by it. At the close of last week the committee of the Scotch Pig Iron Trade Association issued a manifesto on the question, in which they declared that the iron sent into store was of good quality. They have since made the further official intimation that of the only three brands of which any part went into store during 1883 the aggregate production was in that year 169,000 tons. Of this quantity 131,000 tons were consumed locally or shipped, and only 31,000 tons stored, the balance of 7000 tons having accumulated in the hands of the makers. The committee add that the iron stored is identical with that delivered for consumption, and the whole of the above 131,000 tons has been received by consumers or sent abroad as g.m.b. This is a very important statement, and it must be admitted that it disposes of much of the opposition that has been raised. It only requires a declaration as to the precise quality of the iron sent into store to set the matter at rest. The past week's shipments were rather heavier than those of the preceding week, and there is a fair enquiry from abroad, but the demand for home consumption is at the moment comparatively poor.

Business was done in the warrant market on Friday at 42s. 3½d. to 42s. 5d. cash. On Monday forenoon the market was flat at 42s. 4d. to 42s. 1½d. cash, 42s. being quoted in the afternoon. The transactions on Tuesday were at 42s. to 42s. 1½d. cash. Business was done on Wednesday at 42s. 1½d. to 42s. 5½d. cash, and 42s. 4d. to 42s. 7½d. one month. The market was dull to-day, the quotations being 42s. 4d. to 42s. 3½d. cash, and 42s. 5½d. one month.

The values of makers' iron are quiet, as follow:—Gartsherrie, f.o.b., at Glasgow, per ton, No. 1, 53s. 6d.; No. 3, 51s.; Coltness, 57s. 6d. and 51s.; Langloan, 54s. 6d. and 51s.; Summerlee, 52s. 6d. and 48s. 6d.; Calder, 54s. and 48s.; Carnbroe, 52s. 6d. and 48s. 6d.; Clyde, 48s. and 45s. 6d.; Monkland, 44s. and 41s. 6d.; Quarter, 43s. 6d. and 41s.; Govan, at Broomielaw, 44s. and 41s. 6d.; Shotts, at Leith, 53s. 6d. and 52s.; Carron, at Grangemouth, 48s. 6d.—specially selected, 54s.—and 47s. 6d.; Kinneil, at Bo'ness, 46s. and 45s. 6d.; Glengarnock, at Ardrossan, 52s. 6d. and 46s. 6d.; Eglinton, 46s. 6d. and 46s.; Dalmellington, 49s. and 46s.

Nearly every branch of the manufactured iron trade continues dull, and inquirers among hardware makers and merchants discern the fact that business has sunk into a backward condition. Among the shipments of iron manufactures from Glasgow in the past week were £32,550 worth of machinery, £2700 sewing machines, and £33,000 iron and steel goods. These shipments are considerably below the average in amount, and would of themselves be sufficient to indicate that the different branches of the manufacturing trade are not at present in a very satisfactory state.

The coal trade in the West of Scotland is inactive just now; but some merchants have been, nevertheless, securing fair orders within the past week or two. A number of contracts are in course of being fixed, and it is reported that for annual bargains the figures do not materially differ from those current at this time last year. There have been some fair shipments from Glasgow in the course of the week for the Continent. Full time is not obtained at a number of the Lanarkshire collieries. At Troon 4757 tons of coals were shipped, and there have also been good cargoes despatched from some other ports.

The Monkland Iron Company has begun to make pig iron with coke at the Calderbank works, and it is stated that by the process, which is patented, it effects a saving of from 2s. to 4s. per ton on the iron produced.

The men employed in many of the foundries in the neighbourhood of Glasgow are now having their wages reduced, in some cases about 2s. per week, in others more, and less.

The reductions of miners' wages are proceeding all over the mining districts. In some places—as at Maryhill, for example—the men came out on strike, but they are now returning, and submitting to reductions varying from 10 to 25 per cent.

The Bathgate Oil Company has made arrangements for sinking two mines for working the shale on the Seafield estate. The shale is said to be of excellent quality and ample extent.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

CONSIDERABLE feeling was expressed at Swansea this week consequent on the rumour that the London and North-Western Railway Company was going to abandon its Mumbles Bill. For the interests of the port I hope that the rumour is unfounded. The foreshore belongs to the Duke of Beaufort, but though little has been done in the past in improvement of the Mumbles, such a movement as this, which would enhance the importance of Swansea as a port, would surely not be opposed by the lord of the manor.

Good work is being done by the Rhymney Railway Company at the new line connecting Cyfarthfa with the Rhymney and Great Western sections, and, judging from the progress made, this year will see its completion. Cyfarthfa has entered into arrangements with this line for the conveyance of its traffic, coal from No. 3 seam, Rhondda to Cyfarthfa, and steel rails and iron bars to Cardiff.

The translation of Cyfarthfa from an old-fashioned bar and rail works, with not even the change to loftier furnaces, which was generally adopted before the steel era, is now fast approaching completion, and I confidently expect the blowing-in of some portion during March. The arrangements are upon a large and most complete scale, and there has been no faltering, even though the outlook is discouraging.

A slightly better tone, it is true, prevails in the iron and steel trade, and the association of England, France, and Germany may be expected to do some good. Only one important firm, I hear, has refused to combine in this effort to bring about a higher and better standard of price for all rails above 30 lb. per yard. At the same time the low rate of Cleveland iron and the depreciation of Glasgow g.m.b. pig are not encouraging. The total quantity of manufactured iron sent away from Newport last week was 2600 tons; destination principally New York, Gothenburg, Smyrna, and Toulon. There are still some fair orders to be executed.

The sister industry—coal—continues to flourish, and there is no abatement in enterprise at Cardiff.

The Dumfries Dry Dock, promoted by Messrs. Clark and Standfield, is one of the last. The site is on the eastern side of the harbour, on the fairway of the channel, between the pier head and the Bute Docks. The slipway is on a pontoon, which is sunk by the introduction of water; the vessel is then hauled into position broadside on, which is only one side to the dry dock, and the water being pumped out, the vessel is then high and dry and open to the severest scrutiny. There are also mechanical shores for effectually gripping the wooden or iron ship.

The steam coal trade is now so strongly established and progressive that Cardiff has taken the honourable position of excelling even Newcastle, and now stands at the head of the ports of the world. Mr. Cory—Alderman—states that it is his confident opinion that in the next three years there will be an increase of five million tons in the coal business of the port. The coal trade of Cardiff by that time will have reached its maximum, for every acre of coal land in the Rhondda is taken, and the Swansea Bay, Caerphilly, and other lines will come into practical operation. While the state of things is thus so satisfactory in the steam coal districts I am sorry to state that in the house coal neighbourhoods a considerable degree of slackness prevails, and prices are vacillating. Coke and small coal are dull, but pitwood is in good demand, and market firm. Tin-plate remains about the same, prices ruling rather low. Orders, for instance, have been booked for as low as 14s. 6d. ordinary coke and 14s. 9d. and 15s. are average prices.

I am informed that Mr. H. Martin, formerly of Japan, succeeds Mr. Abraham as coal manager at Dowlais. Messrs. Mattos, a Cardiff firm, have purchased the Great Eastern, I hear, in order to use it as a coal hulk at Gibraltar.

The annual meeting of the South Wales Colliery Company was satisfactory, and a dividend of 3 per cent. would have been made but for the resolution to build a number of cottages and form a fund for contingencies.

Mr. C. D. Phillips, of Newport, has carried out some most successful experiments with his fire extinguisher.

Things were not so brisk at this port as one could wish, and the new line, which was to give the place the advantage of Rhondda coal, is still incomplete.

One of the Plymouth collieries is on stop this week.

I saw the returns of a week's good work at Clydach Vale last week—some days as much as 1400 tons of coal. One singular fact is to be noted—that, on account of a funeral held one day, work was ended earlier, and the result was 400 tons less coal sent to bank; a rather costly matter for men and masters.

NO MORE CATS OR FERRETS.—The examination system at the United States Patent-office does not appear to deserve unmitigated praise. At all events Mr. D. L. Johnson, of Kalamazoo, has been permitted to get a patent for a "process of exterminating underground animals," which seems to us not to be quite new. Mr. Johnson's claim is for "the process of exterminating ground-burrowing animals, which consists in firmly plugging up the mouth of the branch holes to the burrow, excavating the earth at the main entrance for a suitable distance on a line with the burrow, inserting a torpedo with fuse into the burrow beyond the terminus of the excavation, carrying the fuse to the surface of the earth, refilling the excavation, and firmly packing down the replaced earth, and in igniting the fuse, all substantially as set forth. No model." We should imagine that Mr. Johnson and the Patent-office examiners have lived all their lives in cities and never dealt with a wasp's nest. We can answer for it that wasps' nests have been proceeded against precisely as Mr. Johnson directs, and it would be a nice point to argue whether insects could be taken to cover the word animal in an argument on priority and prior user. We can, however, admit that the way to blow up a rat hole has never been more tersely or precisely described than in the words we have quoted.

THE INVENTOR OF THE LOCOMOTIVE.—A beautiful memorial window has just been erected in Newburn Church to the memory of the late William and Thomas Hedley, the one the inventor of the locomotive engine, who was born at Newburn, and the other his son, the practical founder of the Bishopric of Newcastle. The subjects chosen by the artist are "Noah and his three sons building the ark," illustrating the genius given by God to man, and the parable of the talents, tipifying the good use of the genius and wealth that man is blessed with. Above the first group is a scroll with the text, "And thus did Noah according to all that God commanded him," and above the other, "Well done, thou good and faithful servant." The work has been executed by Mr. W. H. Atkinson, of this city. At the base of the window is a large brass plate, engraved by Mr. A. Reid, of this city, bearing the following inscription:—"The above window is dedicated by William Hedley, of Newton, in this county, to the glory of God, and in loving remembrance of his relatives interred in the adjoining churchyard, amongst whom are his father, William Hedley, of Newton and of Burnopside Hall, near Lanchester, Esquire; and his brother, Thomas Hedley, barrister-at-law, also of Newton, Esquire. By the inventive genius of the former, the locomotive engine was first brought into successful operation, A.D. 1812 and 1813, at Wylam; and chiefly through the munificent bequest of the latter the Bishopric of Newcastle-on-Tyne was created in 1882." At the bottom of the plate is the representation of a railway engine, and underneath are the words, "Drawing of the first locomotive invented by William Hedley, originally placed in Kensington Museum."—*Northern Evening Express.*

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.

19th February, 1884.

3539. Mechanical Horses, S. Pollard, Nottingham.
3540. Mechanical Horse Toys, S. Pollard, Nottingham.
3541. Hanging Coats, H. C. Macdonald, Southsea.
3542. Preventing Corrosion, J. Clark, Glasgow.
3543. Printing Woven Fabrics, R. Ritchie and J. Grant, Renton.
3544. Compound Steam Engine, W. K. Swaddle, Gateshead-on-Tyne.
3545. Dumb-bells, J. Southall, Worcester.
3546. Automatic Flushing Apparatus, J. Deeley, Birmingham.
3547. Breech-loading Fire-arms, W. J. Matthews, near Birmingham.
3548. Utilising Atmospheric Electricity, E. A. Williams, near Lymington.
3549. Fastening Bicycle Saddles, &c., W. P. Thompson.—(*C. E. Duryea, St. Louis, U.S.*)
3550. Checking Apparatus, J. N. Deiner, Austria.
3551. Electric Telephones, A. A. Campbell-Swinton, Newcastle-on-Tyne.
3552. Propellers, G. T. Dickinson, Newcastle-upon-Tyne.
3553. Diffusing Gases through Liquids, &c., H. McGillivray, Clayton.
3554. Toy Horses, T. Harvey, Wigan.
3555. Paring Linseed, &c., T. Fenn, Liverpool.
3556. Carding Engines, T. S. Whitworth, Manchester.
3557. Engines, S. Robinson, West Bromwich.
3558. Extracting Nickel from Ores, J. Clark, Glasgow.
3559. Cistern Float Valves, A. Waters, Croydon.
3560. Transmitting Electric Currents, F. Bosshardt.—(*Messrs. Hermitte and Payroulou, France.*)
3561. Spray Diffusers, H. Gumtow, Berlin.
3562. Ships' Berths, C. J. Fox, Birkenhead.
3563. Brakes for Tram-cars, F. R. Ellis, Liverpool.
3564. Soap-slabbing Machine, W. Forshaw, Warrington.
3565. Furnaces, T. Singleton, Over Darwen.
3566. Holders for Gas Burners, T. Singleton, Over Darwen.
3567. Water Taps, &c., T. Singleton, Over Darwen.
3568. Hydraulic Organ Blowers, J. Binns, Bramley.
3569. Racks for Transmitting Motive Power, B. Dodd, Bearpark, Durham.
3570. Dynamo-electric Machines, J. H. Greenhill, Belfast.
3571. Dynamo-electric Machines, J. H. Greenhill, Belfast.
3572. Railway Vehicle for Absorbing Shocks in Collisions, R. Hill and J. Darling, Glasgow.
3573. Absorbing Shocks in Railway Vehicles during Collision, R. Hill and J. Darling, Glasgow.
3574. Finishing Hexagon Nuts, J. Leyland, Atherstone, and W. Leyland, Bolton.
3575. Stirrups, J. S. Crowley, Manchester.
3576. Outward Form of Ships, W. Harvey, London.
3577. Salve or Ointment, H. Killick, London.
3578. Filters, F. B. Hill, London.
3579. Casting Plates for Secondary Batteries, H. J. Haddan.—(*C. F. Brush, Cleveland, U.S.*)
3580. Extracting Castings from Moulds, H. J. Haddan.—(*C. F. Brush, Cleveland, U.S.*)
3581. Lubricating Metal Moulds, H. J. Haddan.—(*C. F. Brush, Cleveland, U.S.*)
3582. Weather Strips, H. J. Haddan.—(*J. H. Hummel, New York.*)
3583. Fleece-dividing Attachment to Carding Machines, H. J. Haddan.—(*H. F. and L. A. Letalle, Beauvais, France.*)
3584. Anti-friction Bearings, H. J. Haddan.—(*M. Sar, Bayonne.*)
3585. Water-heating Apparatus, G. Shrewsbury, London.
3586. Punching and Rivetting Machine, W. F. Gilmer, Gosforth.
3587. Horseshoes, D. A. Lowthime, London.
3588. Joining Lead Pipes without Solder, A. Ince, London.
3589. Taking Measurements of the Human Body, J. Pratt, Maidstone.
3590. Bobbins for Lace Machines, &c., J. Jardine, Nottingham.
3591. Combination Locks, B. J. B. Mills, London.—(*J. Guyot, Lyons.*)
3592. Filters, A. Wilson and R. Bradshaw, London.
3593. Purification of Water, W. R. Lake.—(*J. W. Hyatt, Newark, U.S.*)
3594. Oil Lamps, J. Roots, London.
3595. Automatic Winder for Sewing Machines, A. J. Boult.—(*P. I. Winson, Belgium.*)
3596. Autographic Indicators, J. Wicksteed, Leeds.
3597. Motors, &c., A. J. Boult.—(*P. E. G. Jacomy, Tarbes, France.*)
3598. Frilling, M. and L. Moore, Nottingham.
3599. Reducing Ores, A. J. Boult.—(*G. and A. Raymond, Chicago, U.S.*)
3600. Packing Flour, &c., A. M. Clark.—(*J. and B. C. Frysinger, Rock Island, U.S.*)
3601. Shipbuilding, J. Mitchell, London.
3602. Lawn Tennis Bats, M. F. J. Mann, London.
3603. Tamping Blast Holes, J. Thomas, Abergavenny.
3604. Kitcheners, A. Hohlhofer and P. Gerlach, London.
3605. Fare-registering Apparatus, W. R. Lake.—(*M. Hoefer, Madrid.*)
3606. Locks of Double-barrel Guns, J. H. Apted, Lower Norwood.
3607. Hansom Cabs, A. C. Argles, London.
3608. Apparatus for Containing Tickets, &c., G. A. Weston and H. R. Prockter, Croydon.
3609. Fitting Rooms Occupied by Poor Families, A. W. Blyth, London, and R. Greene, Berry Wood.
3610. Producing Ornamental Designs, F. Bauder, London.
3611. Cutting Tobacco Leaves, A. M. Clark.—(*O. Hammerstein, New York, U.S.*)

20th February, 1884.

3612. Knitting Machines, T. Coltman, Leicester.
3613. Checking Apparatus, A. Horne, Walton, and J. Mancor, Kirkdale.
3614. Appliances used by Compositors for Setting up Type, G. Middleton, Ambleside.
3615. Treating Cotton Seed, &c., Oils, R. Baynes and A. Bigland, Liverpool.
3616. Rotary Steam Engines and Pumps, G. Weston, Sheffield.
3617. Fastenings for Boots, A. Watkins and C. Hatton, Hereford.
3618. Grate Bars, C. Gill, Bradford.
3619. Founders' Ladles, C. McNeil, jun., Kinning Park, Renfrew.
3620. Umbrellas, &c., H. Cardell, Plymouth.
3621. Driving-gear of Tricycles, S. Collier, Bolton.
3622. Pickpocket Proof Watch Protector, G. Howitt, Sunderland.
3623. Tricycles, W H. Copas, Egham.
3624. Folding Steps, C. Tarling, Swansea.
3625. Perambulator Head Rests, J. W. Saunders, D. T. Davies, and J. A. Macdonald, Birmingham.
3626. Cleaning Animal Intestines, J. Husnik, Derby.
3627. Sweeping the Surfaces of Lawns, J. Davis, Hempton.
3628. Pocket Knives, A. B. Ball, Sheffield.
3629. Gassing Frames, J. T. Fletcher and T. Quinn, Stockport.
3630. Roving Intermediate and Slubbing Frames, F. Rosskothen, Accrington.
3631. Throstle and Ring Spinning Frames, G. Tattersall, Gee Cross, Chester.
3632. Compressing Green Crops, &c., T. Potter, Alresford.
3633. Pencil Sharpener, &c., A. F. Durward, Birmingham.
3634. Brooches, &c., A. E. Parkes, Birmingham.
3635. Driving Velocipedes, W. Cooke, jun., Beckenham.
3636. Valve Gear, A. E. Marston, Enderley.
3637. Hoisting Apparatus, T. Sudron, Hull.
3638. Fastening Umbrellas, &c., J. Hicks, London.
3639. Galvanic Cells, S. H. Emmens, O. March, and the United Patents Corporation, Limited, London.
3640. Relief Decorations for Walls, E. Surr, London.
3641. Cranks for Velocipedes, H. W. Godfrey, Staines.
3642. Furnaces for Calcining, &c., Cement, P. M. Justice.—(*C. Dietzsch, Malstatt, Germany.*)
3643. Grooming Brushes, P. M. Justice.—(*A. Harvey, Ottawa, Ontario.*)
3644. Preventing Incrustation in Steam Boilers, M. A. F. Mennons.—(*R. de Martino, Meta, Italy.*)
3645. Washing Wool, G. Meyer, Switzerland.
3646. Generating Steam, J. C. Williams-Ellis, Blisworth.
3647. Carding Machines, S. and A. H. Mitchell, Rochdale.
3648. Pianoforte Silencing Stop, A. Dimoline, South Clifton, Bristol.
3649. Cartridges, J. H. Dunn and J. R. Shearer, London.
3650. Removing Short Hairs in Seal, &c., Skins, H. W. Covert, Brooklyn, U.S.
3651. Hand Pumps, A. Mechesney, Dundee, N.B.
3652. Firing off Guns, C. Wood, Middlesbrough.
3653. Cake for Feeding Cattle, F. C. Matthews, Driffield, and G. H. Ogston, London.
3654. Maintaining Torpedoes, &c., at a Constant Depth Below the Surface of the Water, R. M. Ruck, Chatham, and E. Jones, Wallington.
3655. Preventing Flow of Water, H. T. Crewe, Lewisham.
3656. Treating Liquid, J. B. Alliott, London.
3657. Antiphone, J. M. Plessner, Stuttgart, Germany.
3658. Propelling Ships, &c., E. H. Clark, Devon.
3659. Abdominal Supporter, J. Glendening, London.
3660. Non-conducting Composition, J. Buser, France.
3661. Raising Rails, C. D. Abel.—(*F. Westmeyer, Germany.*)
3662. Targets, F. Clayton, London.
3663. Necktie Supporters, H. H. Lake.—(*B. B. Scully and J. F. Vella, Lynn, U.S.*)
3664. Umbrella Frames, B. J. B. Mills.—(*MM. A. Teste père fils et Pichat, Lyons, France.*)
3665. Clocks, H. H. Lake.—(*H. L. Naremore, U.S.*)
3666. Electric Log, P. and A. T. H. Scott, London.
3667. Cutting Coal, T. Nicholson, Hexham, and J. Burn, Sunderland.

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3668. Giving Individual Calls, J. Stephen, Edinburgh.
3669. Giving Fire Alarms by Electric Current, J. Stephen, Edinburgh.
3670. Steel-pinned Lagging for Jute and other Cards, T. W. Harding, Leeds.
3671. Glass Tablets, S. Pollard, Nottingham.
3672. Sewing Machines, S. Lovett, Nottingham.
3673. Soda and Chlorine, C. Wigg, Liverpool, and J. W. Pratt, Runcorn.
3674. Brooches, W. H. Collins, Birmingham.
3675. Steam Washing Machine, R. Foxcroft, Mytholmroyd.
3676. Ovens, W. F. Mason, Manchester.
3677. Self-adjusting Metal Heel, J. Perry and J. Aldous, Colchester.
3678. Scotch Bonnets, A. Goold, Hawick, and W. Wylie, Stewarton, N.B.
3679. Slide Steels for Stays, A. Hartnell, Bristol.
3680. Abatement of Fog, T. W. Rossiter, Dublin.
3681. Detachable Drive Chains, J. Harrison, Thirsk.
3682. Propelling Boats, L. Bellefonds, London.
3683. Gravity Balance Fire and Frost Alarm Thermometer, C. J. Henry, Kingstown, Ireland.
3684. Furnaces, J. E. Stafford and J. T. Pearson, Burnley.
3685. Cutting Champagne Wires, H. H. and G. H. Taylor, Sheffield.
3686. Manufacturing Liqueur out of Milk, H. Gerhartz, Cologne.
3687. Belts or Bands, S. Rowbottom, Glossop.
3688. Bicycles, &c., W. E. Hurrell and D. Hammond, London.
3689. Stud Eyelets for Braces, &c., H. Dowler, Aston.
3690. Vessels for Containing Liquids, H. Hatch, Oxford.
3691. Open Fireplaces, W. Rocke, Manchester.
3692. Trawling Apparatus, S. Kemp, London.
3693. Gas-burners, J. and W. Goodson, London.
3694. Tablets, J. and W. Goodson, London.
3695. Apparatus to be Used with Billiard, &c., Tables, J. Hargreaves, Rawtenstall.
3696. Looms, H. Hanson, Cumberworth.
3697. Polishing Powder, J. Miles, London.
3698. Rubber Coverings, A. Browne.—(*W. D. Hutchanson, Germany.*)
3699. Socking Boots, &c., T. Lilley, London.
3700. Opening, &c., Cab Doors, C. Kahn, London.
3701. Barrels, F. Andrew, Burnt Ash.
3702. Motive Power, R. D. Sanders, London.
3703. Hydraulic Engines, T. J. Taylor and W. Speight, Leeds.
3704. Electric Arc Lamps, H. J. Haddan.—(*E. Boettcher, Leipzig.*)
3705. Tension Apparatus for Loom Beams, J. Imray.—(*P. Paris, France.*)
3706. Lamps, B. Cars, London.
3707. Gas-burners, D. W. Sugg, London.
3708. Twine and Rope, A. V. Newton.—(*J. Good, U.S.*)
3709. Ships' Capstan, L. G. Moore, Northampton.
3710. Friction Joints, H. W. Ferris, Merton.
3711. Ornamenting Wire Gauze, &c., J. C. Mewburn.—(*V. du Caurroy, Paris.*)
3712. Fumigating Plants, W. S. Simpson and G. Smith, London.
3713. Portable Railways, W. E. Gedge.—(*A. Haarmann, Osnabrück.*)
3714. Transmitting Sounds, &c., J. K. D. Mackenzie, London.
3715. Joining Railway, &c., Rails, J. M. Burke, Inchicore.
3716. Couplings, J. Kaye, London.
3717. Sifting Machines, J. T. Bower, Sittingbourne.
3718. Holders for Use in Carving Meat, &c., W. R. Lake.—(*L. Chevalier and L. Graillot, Paris.*)
3719. Applying Movable Handles to Saucepans, &c., H. Parr, London.
3720. Marking, &c., Games, J. Harper and T. McLean, London.
3721. Registering Apparatus, F. H. F. Engel.—(*W. F. Nedler, Hamburg.*)
3722. Changing Sensitive Plates in Photographic Cameras, J. Sturrock, Dundee.
3723. Salicylic Acid, W. L. Wise.—(*Chemische Fabrik vormals Hofmann and Schoetensack, Germany.*)
3724. Clocks, F. A. L. de Gruyter.—(*G. Wintermantel, Friberg.*)
3725. Ventilator, G. Crapper, London.
3726. Preparing Fish for Cure, J. Ross, Muchalls.
3727. Carts, J. Gledhill, London.
3728. Braces, F. Tew, London.
3729. Stoppers made of Cork, &c., C. T. Kingzett, London.
3730. Steam Boilers, W. Workman, Belfast.
3731. Brace Webs, &c., J. Wright, Loughborough.
3732. Hydro-pneumatic Valve, J. S. Starnes, London.
3733. Separating Mixed Gases, A. K. Huntington, London.

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3734. Combs for Looms, &c., W. Carruthers, Heywood.
3735. Dipping Matches, E. Fitch.—(*G. H. Millen, J. H. Mantion, F. La Belle, and T. A. Cook, Ottawa, Quebec.*)
3736. Taking off the Volatile Products from Coal, &c., W. A. Byrom, Wigan, and J. A. B. Bennett, King's Heath.
3737. Bricks, C. and W. Cooper, Great Crosby.
3738. Fittings and Bins for Tea-dealers, W. Parnall, Bristol.
3739. Oil Can, J. and H. Lucas, Birmingham.
3740 Glass Coffins, G. H. Hirst, Staincliffe, W. Pickles, Batley Carr, and C. Horsfield, Dewsbury.
3741. Door-locks, J. Parker, Birmingham.
3742. Ticket-holders, J. H. Bailey, Barnsley.
3743. Children's Chairs, W. Bendall, Aston.
3744. Accommodation Ladders for Ships, J. McCallum, Lemington-on-Tyne.
3745. Steam Draining, A. Achurch, Great Stukely.
3746. Nut Crackers, T. White, Birmingham.
3747. Dabbing Brushes, H. Priestman and J. Robertshaw, Bradford.
3748. Operating Dabbing Brushes, H. Priestman and J. Robertshaw, Bradford.
3749. Rotary Printing Machines, G. A. Wilson, Liverpool.
3750. Thermometry, G. T. Beilby, Midcalder.
3751. Curing Phthisis, A. McGuffie, Glasgow.
3752. Loom Dobbies, J. and J. Ward, Blackburn.
3753. Polishing Reed Wire, J. Noble and W. Jackson, Rochdale.
3754. Attaching Water-closet Basins to their Traps, H. Conolly, London.
3755. Water-waste Preventers, H. Conolly, London.
3756. Holding up Venetian Blinds, W. Johnson, Plumstead.
3757. Screw Stoppers for Bottles, E. L. Tasker, London.
3758. Gas Motor Engines, S. Griffin, Bath.
3759. Scissors and Shears, C. Ibbotson, Sheffield.
3760. Waterproof Cloth, I. Frankenburg, Salford.
3761. Stitching Machines, J. Watson, Oldham.
3762. Dobbies for Looms, R. Lowcock, Salford, and W. Skerratt, Lower Broughton.
3763. Horticultural Buildings, C. and W. Allen, Chester.
3764. Lock Nuts for Screw Bolts, &c., G. Brown, Dukinfield.
3765. Burners of Oil Lamps, &c., E. C. Bellamy, Birmingham.
3766. Condensation of the Products of Combustion of Coal Gas, &c., H. H. Hazard, London.
3767. Steam Engine Valve Apparatus, H. Tipping, Greenwich.
3768. Service Supply Valves, W. Carr, London.
3769. Preventing Accidents from Circular Saws, E. de Pass.—(*G. Peliny, Paris.*)
3770. Electric Couple for Producing Electricity, G. Przibram, Vienna.
3771. Jet Photometers, A. Thomas, West Cowes.
3772. Game of Skill, W. Sapte, jun., and J. Oakley, London.
3773. Grabs, Skips, &c., W. Pitt, Bath, and J. H. Wild, Devonport.
3774. Preparing Decoctions of Coffee, E. A. Brydges.—(*W. Fischbach, Berlin.*)
3775. Safety Railway Rail Flange, F. Taylor, Clapham Junction.
3776. Velocipedes, S. F. Pichler, London.
3777. Strained Wire Fences, J. and T. Kennon, Dublin.
3778. Gas Motor Engines, A. Davy, jun., Sheffield.
3779. Hoisting and Steering Gear, A. M. Clark.—(*J. Q. Maynard, Brooklyn, U.S.*)
3780. Uninflammable Paper Pulp, L. M. Dulfus.—(*J. Ponty, Brussels.*)
3781. Coal Receptacles, J. Peddle, Brixton.
3782. Galvanic Batteries, T. Rowan, London.
3783. Metallic Rollers, W. T. Garnett, Bradford.
3784. Buoyant Fabric, J. Sexton, London.
3785. Deck Seat for Vessels, J. Sexton, London.
3786. Rendering Objects Incombustible, L. M. Dulfus.—(*J. Ponty, Brussels.*)
3787. Sewing Machine Appliances, &c., H. S. Paget, Potter's Bar.
3788. Corking Bottles, J. J. H. Schultz, Hamburg.
3789. Roller Mills, E. L. H. Bauermeister, Hamburg
3790. Preserving Fibrous Materials, &c., H. W. Knemeyer, Germany.
3791. Food for Cattle, &c., W. Linden, London.
3792. Lagging for Covering Steam Boilers, W. L. Thompson and J. C. W. Stanley, London.
3793. Eyes for Hook-and-eye Fastenings, H. H. Lake.—(*L. Peyrard, Paris.*)
3794. Furnaces for Bakers' Ovens, G. Dilliway and E. Newman, Burnham.
3795. Telpherage, F. Jenkin, Edinburgh.
3796. Trucks and Locomotives for Telpher Lines, F. Jenkin, Edinburgh.
3797. Electrical Belt, J. E. Spratt, London.
3798. Purifying the Components of the Washings of Wool, A. M. Clark.—(*A. M. Hall, New York.*)

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3799. Perambulators, &c., T. Jefferies, Birmingham.
3800. Churn, R. W. Anderson, Liverpool.
3801. Destroying Weeds, C. Barton, Coventry.
3802. Oil Lamps, T. Taylor, Hanley.
3803. Perforating Pattern Cards, W. P. Thompson.—(*J. Taffin, France.*)
3804. Expansion Joints, A. McD. B. Fraser, Liverpool.
3805. Foresight of Fire-arms, W. J. Tooley, Great Yarmouth.
3806 Cooking Potatoes, &c., W. Payne, Birmingham.
3807. Black Lead, F. Pidduck, Heywood.
3808. Artificial Stones, F. Wirth.—(*L. Rosenthal, Frankfort-on-the-Maine.*)
3809. Buttons, F. L. Niedermeyer, near Magdeburg.
3810. Cyclometers, C. V. Boys, London.
3811. Cattle Food, J. A. Fawcett, Wakefield.
3812. Metallic Framework of Bags, J. Brown, Manchester.
3813. Fastenings for Gloves, &c., P. Ockenden, Walthamstow.
3814. Drain Traps, W. H. Tylor, London.
3815. Tip Wagons, P. Dietrich, Berlin.
3816. Looms, G. H. Hodgson, Bradford.
3817. Paper Makers' Cotton Drying Felts, J. Crossley, Bury.
3818. Razors, C. Ibbotson, Sheffield.
3819. Roses for Watering Cans, &c., J. Ludlow, Birmingham.
3820. Pressing Cartridges, L. R. Bodmer, London.
3821. Gas Engine, T. H. Johns, London.
3822. Tools for Straining Fence Wires, &c., J. Dick, Glasgow.
3823. Dividing Butter, T. Stevens, Bristol.
3824. Propelling Navigable Vessels, P. M. Crause, Ramsgate.
3825. Fountain Pens, J. Hodges and W. B. Warren, London.
3826. Brake Attachment, J. Dewrance, London.
3827. Asbestos-packed Cocks, J. Dewrance and G. H. Wall, London.
3828. Saws, J. Brendon, jun., G. D. Brendon, and J. Huggins, Callington.
3829. Portable Shepherd's Hut, W. Allen, Newport.
3830. Flower Holder, T. Woodcock, Birmingham.
3831. Spades, &c., R. W. Cowen, near Carlisle.
3832. Frames for Suspended Lamps, C. Quitmann.—(*T. Herrmann, Dresden.*)
3833. Low-pressure Steam Motor, H. Davey, Leeds.
3834. Brakes, J. Imray.—(*P. A. Gambaro, Paris.*)
3835. Telephones, G. W. von Nawrocki.—(*A. J. W. Münch, Berlin.*)
3836. Oxidising Sulphites and Hyposulphites, J. and J. Addie, Glasgow.
3837. Metal Cylinders having Polished Surfaces, E. Edwards.—(*H. Crowan, Paris.*)
3838. Corking Machines, F. G. Riley, London.
3839. Bricks, Paving Blocks, &c., G. Patchett, Stockton-on-Tees, J. Dixon, Skelton-in-Cleveland, and R. Teasdale, Darlington.
3840. Cleaning Tobacco Pipes, M. M. Fuchs, London.
3841. Alarm Clocks, F. Wirth.—(*A. Winterhalder, Baden, Germany.*)
3842. Treating Malt Husks, F. Wirth.—(*P. Ammann, Munich, Germany.*)
3843. Preserving Beer, W. T. Read, London.
3844. Machine or Battery Guns, H. Maxim, London.
3845. Cleaning Ships' Hulls, A. M. Clark.—(*J. O. Cooper, Portland, U.S.*)
3846. Air-heating Apparatus, W. J. Mason and G. Swann, London.
3847. Casings for Electric Wires, A. M. Clark.—(*R. Wylie, Napa, California, U.S.*)
3848. Extracting Juice, &c., from Sugar-cane, A. M. Clark.—(*T. B. Yale, Columbia, U.S.*)
3849. Collecting, &c., Waste from Spinning Machines, A. M. Clark.—(*W. A. & C. A. Delmage, U.S.*)
3850. Hoisting and Steering Gear, A. M. Clark.—(*J. Q. Maynard, Brooklyn, U.S.*)

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3851. Tea-pots, &c., J. Hall, Sheffield.
3852. Compasses, T. W. Bruce, Liverpool.
3853. Fusible Plugs, J. Dewrance, London.
3854. Secure Letter-box, F. J. Candy, Cambridge.
3855. Taking-off Gas from Gas Retorts, J. King, jun., Manchester.
3856. Internal Stoppers for Bottles, H. Benson, Nottingham.
3857. Hanging Lamps, W. S. McLewee, New York.
3858. Kettle Stand, C. Darrah, Manchester.
3859. Swimming Gloves, T. Williamson, Pollokshields.
3860. Furniture Castors, E. Wright, Handsworth.
3861. Portable Elevators, G. F. and A. G. Lyster, Liverpool.
3862. Ladies' Saddle, E. C. L. Close, Clitheroe.
3863. Buckles, F. J. Candy, Cambridge.
3864. Punching, &c., Machine, J. Binns, Rawdon.
3865. Phototype Blocks, T. James, Liverpool.
3866. Head Rests, J. W. Saunders, D. T. Davies, and J. A. Macdonald, Birmingham.
3867. Ball Bearings for Bicycles, &c., J. D. Smith, South Bank, York.
3868. Heels of Boots, T. Consterdine, Worksop.
3869. Lamps, W. S. McLewee, New York, U.S.
3870. Purifying Coal Gas, J. F. Belfield, Exeter.
3871. Trousers Presser, J. Walsh, London.
3872. Self-threading Needle, H. G. James, Bristol.
3873. Concrete Mixing Machine, J. Powell, Belfast.
3874. Trawl Heads, J. P. Hall, Sheffield.
3875. Preventing Explosions in Steam Boilers, G. Brockelbank, Anerley.
3876. Umbrellas, J. Koppel, Leytonstone.
3877. Filtering Apparatus, E. Capitaine.—(*Dr. Moeller, Kupferhammer, Germany.*)
3878. Water-closets, J. Smeaton, London.
3879. Spectacles, N. Korshunoff, Paris.
3880. Anchors, J. H. Barry, London.
3881. Registering Apparatus, J. H. Barry, London.
3882. Starch, E. Capitaine.—(*Drumm & Co., Germany.*)
3883. Carriage Door Spring Lock, E. T. Murphy, Dublin.
3884. Carbon Electrodes, H. Liepmann, London.
3885. Electric Arc Lamps, W. Geipel, London.
3886. Gas Purifier, F. A. Walker, Milton.
3887. Pianoforte Actions, A. Squire, London.
3888. Boot and Shoe Maker's Shave, R. Dawkins, London.
3889. Boot and Shoe Maker's Tool, R. Dawkins, London.
3890. Puddling and Reheating Furnaces, J. W. Ellis, Coatbridge.
3891. Stretching Warp in Weaving, G. A. M. Malleval, France.
3892. Towel Rail, W. Smeaton, jun., London.
3893. Gas Motor Engines, H. P. Holt, Openshaw.
3894. Puddling Furnaces, H. H. Lake.—(*K. Kuepper, Duisburg, Germany.*)
3895. Extinguishing Candles, W. H. Beck.—(*L. Cordier-Pinel, Paris.*)
3896. Button Fasteners, H. J. Haddan.—(*D. F. Baxter, Rochester, U.S.*)
3897. Drill Plough, H. J. Haddan.—(*A. Chardin, France.*)
3898. Spinning Jute, &c., A. Carrie, J. Meekison, and D. Ogilvie, Dundee.
3899. Food for Animals, R. Griffiths, Aston.
3900. Stockings, J. H. Cooper, Leicester.
3901. Electric Arc Lamps, F. Thornton and O. Romanze, London.
3902. Railway Chairs, H. H. Lake.—(*C. Mark, U.S.*)
3903. Ships' Anchors, W. H. Gales, London.
3904. Oil-lamp Suspensions, A. Martin, Birmingham.
3905. Buttons, E. F. Lulham, London.
3906. Filters, G. Haycraft, Dorset.
3907. Fastening the Ends of Driving Belts, J. Moxon, Sheffield.
3908. Ash-pan, J. Leedham, Sheffield.
3909. Ornamenting Leather, F. Wirth.—(*J. Delleyer and Co., Bonames, Germany.*)
3910. Metal Cleats, &c., G. Rockliffe, Sunderland.

ABSTRACTS OF SPECIFICATIONS.

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

2543. Incandescent Electric Lamps for Artistic Illumination, *B. Keeling and J. D. Mucklow, London.*—*22nd May*, 1883.—(*Not proceeded with.*) 2*d*.

A semi-transparent glass cylinder, of the same tint as the ordinary wax candle, is surmounted by a small incandescent lamp.

2609. Neckties and Collars, *H. S. Stiffe, London.*—*25th May*, 1883.—(*Provisional protection not allowed.*) 2*d*.

This consists in combining with a collar a necktie, which when the collar is secured to the shirt can tie in a bow or knot.

2972. Fastenings for Shirts and Collar Studs, &c., *H. Owen, Birmingham.*—*15th June*, 1883. 6*d*.

The stud consists of a front and a back part, one part having a stem with notches and the other a sleeve to fit over such stem, and having springs projecting inwards to engage the notches in the stem.

3067. Tricycles, *W. Jackson, London.*—*20th June*, 1883. 6*d*.

This relates to the construction of the frame and also the arrangement of the driving gear. Two steering wheels are employed, and their axles are preferably arranged in a sleeve so as to reduce the width of the machine when necessary.

3084. Treatment of the Products of Combustion or Destructive Distillation of Coal, &c., for the Purpose of Utilising the Ammonia contained therein, *J. A. Darby, Denbigh.*—*21st June*, 1883.—(*Void.*) 2*d*.

The object is to condense the ammonia in furnace and coke oven gases by introducing a mixture of sulphurous anhydride gas and gaseous oxides of nitrogen, and also steam into a flue leading to a condensing tower. The sulphurous anhydride is converted into sulphuric anhydride or acid, which combines with the ammonia and water, and condensing on the coke trickles to the bottom.

3108. Grinding Apparatus having Traversing Grinders, *J. S. Dronsfield, Oldham.*—*22nd June*, 1883.—(*Not proceeded with.*) 2*d*.

This relates to the apparatus for grinding card cylinders and cards known as the Horsfall roller, and it consists in the use of two or more grinding rollers on one shaft, and also in the means for removing and inserting the fork, which engages with the screw to traverse the rollers.

3110. Apparatus for Raising and Lowering, *H. Reichardt, London.*—*22nd June*, 1883.—(*Void.*) 2*d*.

As applied to a fire-escape the invention consists of

jointed levers carrying platforms, means being provided to raise or lower the latter by expanding or contracting the levers.

3122. GENERATING AND STORING CERTAIN GASES AS A SUBSTITUTE FOR STEAM, &c., *C. F. Pollak, London.*—*23rd June*, 1883.—(*Not proceeded with.*) 2*d*.

Water is used to absorb certain gases, which, when the water is heated, are again liberated and can be used to produce motive power or pressure. Special apparatus is described to free the gases by heat and to cool the liquid which has given up its gas, and then re-absorbed the gas after it has done its work.

3124. BOTTLE FILLING MACHINES AND BOTTLE STOPPERS, *C. A. Day, London.*—*23rd June*, 1883.—(*A communication from E. L. Lloyd and C. C. Joly, Philadelphia.*) 6*d*.

The improvement in the filling machine consists in forming the plunger so that the cork or plug of the bottle can be applied while the lower end of the plunger is above the mouth of the filling tube. The stopper is grasped by the end of the plunger which forces it through the filling tube. The stopper can be detached from the bottle, and yet when opening the latter remains secured to its neck.

3126. APPLICATION OF GOVERNORS OR APPARATUS FOR MAKING AND BREAKING CONTACT BETWEEN ELECTRO-MOTORS, &c., *Sir D. Solomons, Bart., Tunbridge Wells.*—*23rd June*, 1883. 6*d*.

This relates to a governor for completing the circuit to an accumulator when the generator has reached a predetermined speed. The governor may also be employed "to vary the resistance in a current," either for lighting purposes or for motors having varying loads.

3132. MINERS' SAFETY LAMPS, *J. Wetter, New Wandsworth.*—*23rd June*, 1883.—(*A communication from H. Friemann, Germany.*) 6*d*.

To prevent explosion of light hydrocarbons when used in safety lamps, the whole oil receptacle is filled with absorbent material, and into it extends a wick-tube of wire gauze, its height being adjustable. An igniting mechanism operated by an external push piece is arranged to explode a charge carried by a band which is automatically fed to a position over the wick. A lock for preventing the lamp being improperly opened can only be actuated by approaching a strong magnet to the case so as to move a lever, and thereby allow a pawl to be disengaged by means of a key from a ratchet wheel secured to the case, after which the cap closing such case can be unscrewed.

3151. FIREPROOF BUILDINGS, VAULTS, AND SAFES, AND COMBINATION OF DOORS THEREWITH, &c., *W. Corliss, Providence, U.S.*—*26th June*, 1883. 6*d*.

The door is formed with plates which, when the door is shut, are moved so as to extend across the joints, such plates being actuated through the medium of double toggles.

3157. TILES, SLABS, PANELS, AND PLATES FOR WALLS, FLOORS, HEARTHS, &c., *T. H. Rees, London.*—*26th June*, 1883. 4*d*.

This relates to slabs of glass to which designs are transferred from paper, and then varnished. A backing of slate, glass, wood, or paint is then applied and covered with a cement, thus completing the tile, slab, panel, or plate.

3170. APPLIANCES FOR STARTING TRAMWAY CARS, &c., *J. Gemmell and T. Archibald, Paisley.*—*26th June*, 1883.—(*Not proceeded with.*) 2*d*.

The first pull of the horses is caused through the draw bar to actuate a lever which acts on the wheel axle to turn the wheels and so give motion to the car.

3171. COUPLINGS FOR AUTOMATICALLY COUPLING AND UNCOUPLING RAILWAY ROLLING STOCK, &c., *J. T. Roe, London.*—*26th June*, 1883. 6*d*.

The automatic working of the coupling consists in the entry of the shackle of each half coupling into the corresponding jaw or hook of the other half coupling, caused by the force of the railway wagons in motion towards each other. The jaws or hooks are formed so as to facilitate the entry of either shackle.

3174. SAWS, *J. H. Johnson, London.*—*26th June*, 1883.—(*A communication from F. A. Froemé-Becker, Paris.*)—(*Not proceeded with.*) 2*d*.

Consists in combining saws with means for planing or smoothing the surface of the wood.

3180. MANUFACTURE OF LACE, *W. Birks, Nottingham.*—*26th June*, 1883. 6*d*.

The object is to produce an imitation "pusher" lace.

3183. ORNAMENTATION OF POTTERY OR EARTHENWARE, *J. Bevington, Hanley.*—*27th June*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to treating the moulded articles with felspar, and firing them, and to applying gold or bronze or other ornamentation.

3185. TELEPHONIC TRANSMITTERS, *C. F. Pollak, London.*—*27th June*, 1883.—(*Not proceeded with.*) 2*d*.

The platinum and carbon points of the "Black system" are fixed in such a manner that they can only press on, and not rub against each other.

3187. MACHINE FOR MANUFACTURING CANDLES, *W. H. Beck, London.*—*27th June*, 1883.—(*A communication from La Société Anonyme des Machines à Bougies et Chandelles Système Royau, Paris.*) 6*d*.

Relates partly to the construction of the box, the moulds, and the means of cooling.

3192. VALVES AND VALVE GEAR FOR MOTIVE POWER ENGINES, *A. F. and R. F. Craig, and R. Motion, Paisley.*—*27th June*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to improvements in the arrangement of admission and exhaust valves of motive power engines, and in the construction of valve gear for operating the admission or expansion valves of such engines, to cut off the steam or motive fluid at any part of the stroke.

3203. FACILITATING THE LOADING OF OCEAN-GOING STEAMERS, *G. Taylor, Penarth.*—*27th June*, 1883. 8*d*.

Relates partly to machinery or apparatus consisting of portable staiths travelling on an elevated staging, having railways laid on it and a twisting and lowering apparatus for transferring the wagons to and from said staging, whereby one hoist is able to serve for more than one staith.

3215. WARPING MACHINES, *W. Marshall and J. Holt, Ravensthorpe.*—*28th June*, 1883.—(*Not proceeded with.*) 2*d*.

The object is to keep each length of thread at the same tension, and prevent the formation of "slack" when the machine stops.

3219. DISTRIBUTION OF ELECTRIC CURRENTS, *H. E. Newton, London.*—*28th June*, 1883.—(*A communication from A. J. Gravier, Warsaw, Poland.*)—(*Not proceeded with.*) 6*d*.

The object is to charge a network of distribution with high potential currents, and transform these into "currents of low pressure through the expansion of the electricity." The inventor explains the system by aid of mathematical formulæ.

3227. FASTENINGS FOR ARTICLES OF DRESS, JEWELLERY, &c., *G. P. Lempriere, Balsall Heath.*—*29th June*, 1883. 6*d*.

Relates to the arrangement of a spring fastening.

3253. MACHINES FOR WASHING, WRINGING, AND MANGLING FABRICS, *J. Kenyon, J. Barnes, and R. W. Kenyon, Accrington.*—*30th June*, 1883. 6*d*.

Relates principally to the construction of the framework.

3231. INDICATORS FOR SHOWING THE CORRESPONDING TIME OF DAY AT VARIOUS PRINCIPAL PLACES, *S. Goodacre, Liverpool.*—*20th June*, 1883. 6*d*.

The inventor claims the indicators for showing what is the corresponding time of day at various principal places, consisting of a series of dials grouped together, each having a hand or hands worked from a common centre or centres of motion by means of one or two knobs, keys, handles, or their equivalent, so as to travel synchronously with each other, but set at different angles so as to show, when the right time for one place is depicted on its own dial, what is the right time for all the other places for which the apparatus is designed, on their respective dials.

3256. TRICYCLES, &c., *C. Mather, Manchester.*—*30th June*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to the arrangement of the driving gear for the purpose of obtaining any required ratio of power or velocity between the treadle and the driving wheel, and thus gaining either power or speed as may be found advisable.

3260. TRICYCLES AND OTHER VELOCIPEDES, *W. T. Eades, Birmingham.*—*2nd July*, 1883.—(*Not proceeded with.*) 2*d*.

Consists of the construction and arrangement of the parts connected with the main driving gear, or propelling mechanism, whereby ordinary toothed wheels or drums and their driving chains for transferring the motion generated from the pedals to the driving wheels are dispensed with.

3265. APPARATUS FOR WINDING OR PREPARING SLIVERS FOR COMBING MACHINES, *W. Terry and J. Scott, Bradford.*—*2nd July*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to apparatus for winding the wool upon a cylindrical core, so as to form the same into a ball or bobbin ready for feeding the combing machine.

3270. BASSINETTE OR PERAMBULATOR BODIES, *M. R. and R. F. Cook, London.*—*2nd July*, 1883.—(*Not proceeded with.*) 4*d*.

Relates to the general construction of the bodies.

3271. TELEPHONIC APPARATUS, *A. J. Boult, London.*—*2nd July*, 1883.—(*A communication from C. S. Steele, Washington, D.C., U.S.A.*) 6*d*.

The vibrating plate, placed at an angle with the axis of the electro-magnet, is secured at one point on its periphery only, and rests on two or more fixed supports. In a microphone the pencils are given the form of paddle wheels, or that of a propeller, and are constructed so as to rotate easily when the air waves impinge on them.

3272. GAS MOTOR ENGINES, *G. J. Kirchenpauer and L. H. Philippi, Hamburg.*—*2nd July*, 1883. 6*d*.

The cylinder or cylinders are joined with their back parts to a receiver containing compressed air or other gases, which, on the opening of the valves at the beginning of the upstroke, enters the cylinder through a canal containing apparatus to mix the air with gaseous or liquid hydrocarbon, whereby it is rendered explosive and impels the piston until the admission valve is closed, when the charge is exploded and completes the stroke. The momentum of the fly-wheel effects the down stroke, during which air is drawn into the fore part of the cylinder, and is compressed at the next upstroke, for use behind the piston at the next upstroke.

3273. CORSETS, &c., *J. H. Johnson, London.*—*2nd July*, 1883.—(*A communication from G. F. Levieux, Paris.*) 6*d*.

This consists in enclosing ribs in a casing of fabric, which is then sewn to the corset.

3274. CLASPS OR FASTENERS FOR CORSETS, &c., *H. M. Dyson, London.*—*2nd July*, 1883.—(*Not proceeded with.*) 2*d*.

The opening in one busk to receive the rivet secured to the other consists of two holes of different diameter connected by a slot of a width just sufficient to allow the passage of the shank of the rivet, while one hole is large enough to allow the free passage of the head of the rivet, and the other prevents the same passing through it.

3275. ELECTRICAL RAILWAYS AND TRAMWAYS, *W. A. Traill, Portrush, Antrim.*—*2nd July*, 1883. 6*d*.

Contact is made by an elliptic spring furnished with a shoe or wearing piece, on its convex side, adapted to form contact with the conductor. Where the conductor is mounted alongside the track it is placed on the underside of an insulating and protecting rail, the contact maker being caused to press upwards against it.

3276. CLOCKS, *A. M. Clark, London.*—*2nd July*, 1883.—(*A communication from V. E. Versepuy, Paris.*) 6*d*.

This relates to a clock in which the gong, or both the gong and striking barrels, are wound up by one and the same arbor situated at the centre of the dial, and about which the hour and minute hands revolve without being affected by the rotation of this arbor in winding up.

3277. ELECTRICAL RAILWAYS AND TRAMWAYS, *W. A. Traill, Portrush, Antrim.*—*2nd July*, 1883. 6*d*.

The conductors are carried on internal bridge pieces in a tubular case by having an upwardly projecting longitudinal flanged mouth, which reaches to the surface of the ground. The contact makes one of the elliptic spring form, and are protected by sheathing.

3278. ELECTRIC CONDUCTOR FOR TELEGRAPHIC, TELEPHONIC, OR SIMILAR PURPOSES, *H. H. Lake, London.*—*3rd July*, 1883.—(*A communication from T. H. Dunham, Boston, Mass., U.S.*) 6*d*.

The wires are placed between two laps of raw cotton, the fibres of which are cemented together by tar, the laps being compressed around the wires by suitable rollers.

3279. MACHINERY AND APPARATUS FOR COATING AND FINISHING TIN, TERNE, OR OTHER METALLIC SHEETS, &c., *C. Stuart, Fenny Stratford.*—*3rd July*, 1883. 6*d*.

The inventor claims, First, the fitting a metal bath with the switches for the purpose of automatically controlling the travel of the plates; Secondly, the employment of asbestos planishers and rollers in the manufacture of tin, terne, and other metal plates; Thirdly, the combination, in a metal bath, of the switches, planishers, finishers, and indicator.

3280. GAS ENGINES, *W. Foulis, Glasgow.*—*3rd July*, 1883. 8*d*.

Relates, First, to an apparatus for mixing in measured quantities the air and gas which are burned in the cylinders of such engines; Secondly, to the burner or igniter. Several other improvements of details are described.

3281. MOULDS FOR PRODUCING IRON AND STEEL CASTINGS, *J. McLaren, Stenhousemuir.*—*3rd July*, 1883. 6*d*.

Consists in forming hollow spaces in the sand of the moulds, so as to enable cool air to circulate through the moulds.

3282. TRANSPORTING BOXES OF FISH FROM FISHING VESSELS TO VESSELS BY WHICH THE SAME ARE TO BE CARRIED TO HARBOUR, &c., *J. Scott, Granton, N.B.*—*3rd July*, 1882. 6*d*.

Boxes loaded with fish will float, and this fact is utilised to enable such boxes to be taken from one vessel to another without the vessels having to approach near to each other. The boxes are attached at intervals to a rope and thrown into the sea, when the rope is seized and attached to a derrick on the vessel to transport the boxes to harbour, and then drawn on board.

3283. SAFETY VALVES, *A. Turnbull, Glasgow.*—*3rd July*, 1883. 5*d*.

Consists in connection with a safety valve directly loaded by a helical steel spring of the application and use of an elastic protector between the bottom of the spring and the diaphragm or horizontal partition, through which the spindle passes down to the valve.

3284. CONSTRUCTION OF VESSELS EMPLOYED FOR DYEING, MILLING, SCOURING, WASHING, AND BREWING PURPOSES, *J. Woodcock, Huddersfield, and J. Coulter, Batley.*—*3rd July*, 1883. 6*d*.

Relates to the construction of vessels having their inner surfaces composed of enamelled or glazed bricks.

3285. STOPPERING BOTTLES, JARS, &c., *A. Kempson, Tunbridge Wells.*—*3rd July*, 1883. 6*d*.

The stopper consists essentially of a coarse screw (or its equivalent) for fitting into a corresponding female screw (or its equivalent) in the mouth of the bottle, and a fine screw for receiving a screw cap or cover provided with an elastic washer.

3286. APPARATUS EMPLOYED IN SPINNING, DOUBLING, AND TWISTING FIBROUS SUBSTANCES, *J. H. Clapham, T. R. Whitehead, and T. W. Wheelwright, Bradford.*—*3rd July*, 1883. 6*d*.

This relates to "cap frames," and consists in constructing caps with bottom projecting surfaces and flanges, Over the bottom projecting surface of each cap and on the top of the flange is placed a wire ring which is kept in working position by the bottom end of a tube which is passed over the cap. The yarn passes from the cap to the hook eye or twirl of the wire ring, and over the edge of the flange to the bobbin or spool.

3287. BOILER OR DIGESTER FOR EFFECTING CHEMICAL OR OTHER OPERATIONS, *G. Knowles, London.*—*3rd July*, 1883. 6*d*.

The boiler or digester is constructed with an inner and an outer vessel, having water or other liquid in the space between them, the upper part of the outer vessel forming a steam dome with which the inner vessel freely communicates, and the inner vessel being provided with means for heating the contents thereof.

3288. BUSK AND OTHER FASTENINGS, *H. A. Lyman, London.*—*3rd July*, 1883.—(*A communication from W. A. Nettleton, Bridgeport, U.S.*) 6*d*.

Relates to the employment of a snap plate so as to prevent the corset from opening by the flexure of the body.

3290. CAPS FOR AXLE-BOXES, &c., *E. Dugdale, Liverpool.*—*3rd July*, 1883.—(*Not proceeded with.*) 2*d*.

This consists in fitting caps of axle-boxes, &c., with a nipple valve, plug, or equivalent device, through which lubricating oil can be supplied without removing the cap.

3291. MANUFACTURE OF ARSENIC OF SODA, *F. C. Blythe, Accrington.*—*3rd July*, 1883. 2*d*.

This consists in decomposing common salt with arsenic acid by means of heat.

3292. MARINE DANGER SIGNALS, *Major D. Porter, Boston, U.S.*—*3rd July*, 1883.—(*Complete.*) 6*d*.

This relates to apparatus for producing audible signals by currents of steam or other fluid through a whistle or fog siren, and it consists in the use of a steam engine and suitable mechanism for regulating the position of a valve, whereby the passage of the fluid, and consequently the sound produced and its duration, are regulated as required, so as to produce a code of signals.

3293. SELF-ACTING PNEUMATIC INDICATOR FOR RAILWAY TRAINS, APPLICABLE TO ADVERTISING, &c., *F. G. G. Lines and J. Kendall, London.*—*3rd July*, 1883.—(*Not proceeded with.*) 2*d*.

The object is to afford means whereby passengers may be kept informed as to the next station, the name being indicated inside the carriage, and attached to the indicators, advertisements may be displayed.

3295. PACKING AND PRESERVATION OF FATS, *W. McDonnell, Limerick.*—*3rd July*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to the cleaning, pulping, and packing of fats.

3296. WINDOW FASTENINGS, *E. M. Loe, London.*—*3rd July*, 1883.—(*A communication from W. C. Loe, Paris.*) 6*d*.

Relates to the construction of window fastenings, so arranged as to draw together and hold securely without shake the two sashes of a window, and to prevent the fastening to be unfastened by a blade inserted from without through the divisions of the sashes.

3297. FORGING RAILWAY SPIKES, &c., *C. D. Abel, London.*—*3rd July*, 1883.—(*A communication from A. Urban und Söhne, Vienna.*) 6*d*.

Relates to forging the spikes, &c., by subjecting the blanks to the successive action of a heading die and lateral dies operating thereon in combination with a hollow die and mandril.

3298. SIGNALLING DEVICES FOR BAROMETERS, *H. O. Christensen, Isle of Wight.*—*3rd July*, 1883.—(*Not proceeded with.*) 2*d*.

As applied for nautical purposes a mercurial barometer is hung in gimbals, the tube being enclosed in a case with an opening near the top, through which is seen the usual scale and the top of the mercury column. Lower down the case is another scale, and an index can be adjusted to any position thereon. When the mercury falls an electric circuit is completed by the rise of the mercury in the return portion of the tube, and a bell is sounded.

3300. APPARATUS AND MACHINERY FOR USE IN THE MANUFACTURE OF SPRINGS, *W. R. Lake, London.*—*3rd July*, 1883.—(*A communication from C. Mace, Philadelphia.*) 8*d*.

This relates to a machine provided with cam wheels in combination with feed rollers and other devices, whereby sheets or strips of steel are brought each into a continuous coil, being softened by passing through a heating chamber preparatory to the coiling operation, and afterwards passed through the machine and heating and chilling chambers, and subjected to a proper heat continuously for tempering them.

3301. FURNACE DOORS AND FRONTS, *W. Douglass, Blaydon-on-Tyne.*—*3rd July*, 1883. 6*d*.

Relates, First, to an improved mode of manufacture of the doors and fronts of furnaces; and, Secondly, to certain mechanical appliances for closing the doors or setting them open to any required extent.

3304. MACHINERY FOR SPINNING AND DOUBLING FIBROUS MATERIALS, *J. Farran, Manchester.*—*4th July*, 1883. 8*d*.

This relates to and consists in combination and arrangements of mechanism for spinning and doubling, principally designed for spinning yarn or thread in the "cop" form on to the "bare" spindle, though also applicable for spinning and winding the yarn or thread on to bobbins or spools.

3305. FOG HORNS, &c., *F. G. Fleury and T. J. Noakes, London.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to fog horns and similar instruments constructed on the "reed" or vibratory tongue principle.

3306. THEODOLITES, *A. L. E. H. Holmes, Bengal.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

The object is to render the graduation of the instrument independent of its circumference.

3308. AUTOMATIC SWITCH FOR ELECTRIC LIGHTING, *C. F. Pollak, London.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

This relates to a switch for automatically bringing fresh candles into circuit as the preceding ones are burnt.

3309. APPARATUS FOR PREVENTING WASTE OF WATER IN WATER CLOSETS, URINALS, &c., *A. Tylor, London.*—*4th July*, 1883.—(*Void.*) 2*d*.

Relates to the construction and arrangement of syphon cisterns.

3310. MACHINERY FOR CUTTING BY MEANS OF CIRCULAR SAWS, *A. W. McMurdo, Carlisle.*—*4th July*, 1883. 6*d*.

Relates to the combination of an oscillating frame, a longitudinally guided saw, and driving and transmitting pulleys and bands.

3311. FLUSHING APPARATUS, *D. G. Cameron, Lambeth.*—*4th July*, 1883. 6*d*.

Two upper chambers are provided in a tank and supplied with water by a ball valve. Each chamber communicates with a lower one by a pipe whose lower end is sealed by water in the lower chamber, whilst the upper end rises some distance up within the upper chamber. An inverted cup having at its upper part a valve, fits over, and when in its lowest position closes the pipe in each upper chamber. The two cups are connected to a lever fulcrummed between them, and one arm of which is connected to a pull, so that when actuated the cup that is raised causes the water in the corresponding tank to flow by a syphon action up inside the cup and down the tube pipe to lower chamber, thus producing the flush, while when the pull is released the other cup is raised, and a similar action produces the after flush.

3312. CONSTRUCTION OF VELOCIPEDES, &c., *J. White and J. Asbury, Coventry, and F. G. Francis, Folkestone.*—*4th July*, 1883. 8*d*.

Relates, First, to means for retaining the back steering wheels of velocipedes in contact with the ground, and thereby ensuring their proper action as steering wheels; Secondly, to the construction of the saddle.

3313. COUNTING AND REGISTERING APPARATUS FOR TILLS, *J. Imray, London.*—*4th July*, 1883.—(*A communication from H. Pottin, Paris.*) 8*d*.

Relates to improvements in the general construction and arrangements of the parts so as to register the amounts paid.

3314. MANUFACTURE OF WADS FOR CARTRIDGES, *C. Günther, Berlin.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

The inventor dispenses with the loose discs of card usually employed, and covers both sides of the felt wad with saturated paper or other gas-tight materials

3315. FIRE GRATES, KITCHEN RANGES, &c., *W. Wade, Crewe.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

Consists in an arrangement of fire-place with a bottom capable of being raised and lowered through an enclosed space or short shaft below, and in other apparatus connected therewith.

3316. MACHINES FOR TURNING AND SHAPING THE ENDS OF BOLTS, STUDS, &c., *W. R. Lake, London.*—*4th July*, 1883.—(*A communication from G. W. Bruce, New York.*) 6*d*.

The object is to provide devices or appliances for carrying the bolts or other articles, holding the same while their ends are being turned, and delivering them, and for applying and withdrawing the cutting tools.

3317. APPARATUS FOR THE SEPARATION OF IMPURITIES FROM CHINA CLAY, UMBER, OCHRE, &c., *A. S. Chinnock, St. Austell, Cornwall.*—*4th July*, 1883. 6*d*.

Relates to the arrangement of rollers, over which an endless sheet of wire gauze passes, and also to the arrangement for a supply of water.

3318. HORSE GIRTHS AND ROLLER BANDS, *J. C. Odell, Coventry.*—*4th July*, 1883. 6*d*.

Relates to the employment of elastic web.

3319. APPARATUS FOR SAVING LIFE AT SEA, *J. H. Johnson, London.*—*4th July*, 1883.—(*A communication from P. T. Ramakers and F. X. Nyer, Paris.*)—(*Not proceeded with.*) 2*d*.

The apparatus consists of a float or buoyant sphere of cork or other equivalent material containing an air chamber or chambers combined with a belt or girdle.

3320. MANUFACTURE OF ANTI-FOULING PAINTS OR COMPOSITIONS, *A. M. Clark, London.*—*4th July*, 1883.—(*A communication from C. Dubois, Marseilles.*) 2*d*.

Consists in the combined employment of the sulphocyanides of copper, and the arseniates of mercury in any kind of paint or composition for marine purposes.

3321. PROMOTING AND IMPROVING THE FERMENTATION OF WINE, BEER, &c., *F. Wirth, Frankfort.*—*4th July*, 1883.—(*A communication from A. Reiblen, Stuttgart.*) 4*d*.

Relates to the employment of vegetable fibres as ferments.

3322. ROTARY ENGINES, *G. W. von Nawrocki, Berlin.*—*4th July*, 1883.—(*A communication from L. d'André, Riga, and L. Loewe and Co., Berlin.*) 6*d*.

The engine is mounted on a bed-plate, and consists mainly of a steam cylinder in which the piston is keyed excentrically on to the revolving horizontal shaft. The piston is provided with a port entering it from one end, and which in the interior opens into a steam passage passing to the circular circumference.

3323. MACHINE FOR CUTTING CORKS, *J. Hix, London.*—*4th July*, 1883.—(*Not proceeded with.*) 2*d*.

This relates to the construction and arrangement of the cutting knives and to the means of sharpening the same.

3324. SIGNALLING APPARATUS FOR USE ON RAILWAYS, *R. Chidtey, London.*—*5th July*, 1883. 6*d*.

An arm on the engine in passing over the apparatus strikes a lever which causes a bell or gong to be sounded.

3325. TRACTION ENGINES, PLOUGHING ENGINES, AND STEAM ROAD ROLLERS, *R. H. Abbott, Dewsbury.*—*9th July*, 1883.—(*Not proceeded with.*) 2*d*.

The principal object is to construct the traction engines, ploughing engines, and steam road rollers in such a manner that no water can enter the cylinder or cylinders when descending steep inclines.

3327. TOY PISTOL FOR PLAYING A GAME AT NUMERICAL HAZARD, *A. C. Henderson, London.*—*5th July*, 1883.—(*A communication from E. Barbé, Paris.*) 6*d*.

Relates to the general construction of a toy pistol, which when fired rings a bell and displays a certain figure or number.

3328. FRAMES FOR PRESERVING THE EDGES OF BOOKS, &c., *A. C. Henderson, London.*—*5th July*, 1883.—(*A communication from H. T. Brunet and J. C. Devize, Paris.*) 6*d*.

Relates to the construction of a metallic frame.

3329. APPARATUS FOR BORING AND DRILLING HOLES IN COAL AND LIGNITE, *G. E. Vaughan, London.*—*5th July*, 1883.—(*A communication from J. Werndl, Steyr.*) 8*d*.

Consists partly of a hollow column with a movable bracket arranged thereon.

3332. PORTABLE OR FOLDING COTS OR HAMMOCKS, &c., *G. H. Needham, London*—*5th July*, 1883. 6*d*.

Relates to the construction of cots, &c., so that they may be folded up without taking them to pieces.

3333. ELECTRIC ARC LAMPS, *A. L. Lineff.*—*5th July*, 1883.—(*Not proceeded with.*) 2*d*.

Relates to a lamp controlled by a train of wheel work. The armature of an electro-magnet in the lamp circuit engages one of the wheels, on completing the circuit, and so raises the rack rod and upper carbon. The last or escape wheel of the train is controlled by the brake armature of a high resistance shunt magnet.

3334. ROCK PERFORATING MACHINES, *M. Macdermott and W. Glover, London.*—*5th July*, 1883. 6*d*.

Relates partly to the means of rotating the drill and partly to the feed gear.

3335. APPARATUS FOR THE COLLECTION AND CONDENSATION OF VAPOURS EVOLVED IN THE MANUFACTURE OF INDIA-RUBBER GOODS, &c., *C. A. Burghardt, Manchester.*—*5th July*, 1883. 6*d*.

Relates to a condenser composed of sections or shells united together by means of partitions, each composed of two, three, or more sheets of wire gauze larger than the said sections or shells, so that when the condenser is in action the said partitions extend into the surrounding water.

3336. GAS MOTORS, *H. Holden, Manchester.*—*5th July*, 1883. 6*d*.

Relates to the arrangement of gas and air inlet ports and mixing chamber, igniting ports, explosion chamber, draught chamber in a partially rotating disc or slide for the purpose of insuring a greater certainty of firing, and igniting a combustible mixture of gas and air in the cylinders at the right moment.

3337. MANUFACTURE AND CONSTRUCTION OF HORSE-SHOES, &c., *T. H. Heard, Sheffield.*—*5th July*, 1883. 6*d*.

Relates partly to rolling a bar of iron with a rib or projection to form the heel or toe, and also to the means of forming the shoe.

3339. AUTOMATIC FEED FOR ROLLERS AND PURIFIERS, &c., *J. Shackleton, Blackburn.*—*5th July*, 1883.—(*Not proceeded with.*) 2*d*.

The regulating board is pivotted and adjusted by a thumb-screw, and regulated by a screwed stud or lever and other suitable mechanism.

3338. APPARATUS FOR PURIFYING WATER, *A. Goldthorpe, Wakefield.—5th July*, 1883.—(*Not proceeded with.*) 2*d.*

Relates to an apparatus for heating the water by steam.

3340. ELECTRICAL ACCUMULATORS OR SECONDARY BATTERIES, &c., *W. R. Lake, London.—5th July*, 1883.—(*A communication from C. Dion, Montreal, Canada.*)—(*Not proceeded with.*) 4*d.*

The acting ingredient is chloride of sodium, which is used in connection with amalgamated zinc plates. The electrolytic fluid is protochloride of iron.

3341. MANUFACTURE OF METAL CASKS OR DRUMS FOR OILS, &c., *A. Dunn and A. Liddell, London.—5th July*, 1883. 4*d.*

Relates to the particular formation of the head and end, or one of them only, recessed and flanged, within which the ends or edges of the barrel are secured.

3342. EXTRACTING FERRO-CYANIDES FROM SUBSTANCES CONTAINING SAME, *Dr. H. Kunheim, Berlin, and H. Zimmerman, Werseling.—5th July*, 1883. 4*d.*

The inventors claim, First, the extraction of ferro-cyanide of calcium and ammonia by boiling and neutralising the lyes containing ammoniacal ferro-cyanide of calcium which result from the treatment of the mass containing ferro-cyanide with caustic lime or with milk of lime; Secondly, the extraction of ferro-cyanide of calcium and potassium by precipitation in ferro-cyanide of calcium lyes by means of chloride of potassium.

3343. MANUFACTURE OF ARTIFICIAL FERTILISERS, *T. W. B. Mumford, London.—5th July*, 1883. 4*d.*

Relates to the production of a superphosphate containing a high percentage of soluble phosphoric acid.

3345. BOOTS AND SHOES, *J. B. Rogers, Leicester.—5th July*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to remedy the defects caused by the seams of the "golosh" and "leg" becoming unstitched.

3346. HOLDERS FOR KNIFE BLADES, FILES, TOOTH PICKS, &c., *J. H. Johnson, London.—5th July*, 1883.—(*A communication from J. Reckendorfer, New York.*) 6*d.*

Consists of a handle, a slotted and notched tubular receiver fixed to the said handle, a slotted guide tube free to turn in the said receiver, and a follower free to slide therein or thereon, which follower is in some cases solid and really the tang of a knife, toothpick, or file, or the like, and sometimes tubular, so as to receive a lead or the like, and the said follower is provided with a tooth or detent fastened thereto and projecting from the follower through the slots both in the guide tube and the receiver.

3347. DIFFERENTIAL VALVE GEAR FOR PUMPING ENGINES, &c., *H. Lawrence and R. M. Ogle, Durham.—5th July*, 1883. 6*d.*

Relates to the combination of three or more bevelled toothed wheels geared together and revolving freely upon the cross-shaft and rocker lever.

3348. LOOMS FOR WEAVING, *R. L. Hattersley and J. Hill, Keighley.—6th July*, 1883. 8*d.*

The inventors employ a double set of toothed wheels and levers at each end of the loom, when operating the shuttle-boxes at each end of the loom independently or at one end only when working the said shuttle-boxes connected, one lever being mounted upon a stationary stud or fulcrum, whilst the other one, which is the proper shuttle-box lever, is mounted upon a stud or fulcrum fixed upon the first-mentioned lever.

3349. MACHINERY FOR CUTTING PAPER, *T. G. and J. Dawson, Otley.—6th July*, 1883. 6*d.*

This relates to a clamping apparatus whereby any thickness of paper or other material is held whilst being cut, and a considerable amount of the power exerted for clamping and raising the knife bar is partly utilised for the cutting of the paper.

3353. REELS FOR SHIPS' HAWSERS, *H. Cheesman, Hartlepool.—6th July*, 1883.—(*Not proceeded with.*) 2*d.*

Relates to improvements in the construction of reels for stowing or holding ships' hawsers so as to dispense with the usual crank handles.

3354. APPARATUS FOR AUTOMATICALLY PREVENTING WASTE OF GAS IN GAS BURNERS FOR COOKING, &c., *N. Stevenson, London.—6th July*, 1883.—(*Not proceeded with.*) 2*d.*

Consists in attaching to the supply tap a lever, in such a way that when the pot or vessel is put on the burner, it turns on the gas supply, and keeps it so turned on as long as it remains *in situ*.

3355. APPARATUS FOR AND MODE OF MANUFACTURING MIRROR, WINDOW, OR OTHER FORMS OF GLASS, *W. P. Thompson, Liverpool.—6th July*, 1883.—(*A communication from Baron F. del Marmol, Bruxelles.*) 6*d.*

Relates to an apparatus and process for the production direct of mirrors, window glass, and other articles of polished glass, by the aid of a new system of melting.

3357. MACHINES FOR FLUTING OR GROOVING CYLINDRICAL SURFACES, *W. Robertson, Johnstone.—6th July*, 1883. 6*d.*

The fluting or grooving is effected by imparting a slow motion of rotation to the roller or other body being operated upon, while the cutting tool is traversed longitudinally.

3363. COFFEE-POTS, *E. Boyes, London.—6th July*, 1883. 6*d.*

Relates to the construction of a coffee-pot in which the liquid is boiled in one vessel by steam generated in and conducted thereinto from another vessel.

3365. CUTTING OUT AND CONSTRUCTION OF STAYS AND CORSETS, *A. Whitehorn, Bristol.—6th July*, 1883. 6*d.*

The stays and corsets are cut in a series or number of lateral pieces or belts in such a manner as to encircle or run round the figure, and joined together by lateral seams, which also encircle the figure in the same way as the pieces or belts.

3367. LIFE BELTS, &c., *M. Bauer, Paris.—6th July*, 1883.—(*A communication from A. Harivel, Lisieux, France.*)—(*Not proceeded with.*) 2*d.*

The belt is made of india-rubber cloth and can be inflated.

3368. SEPARATING OR SCREENING GRAIN AND OTHER SEEDS, *C. Cadle, Dublin.—6th July*, 1883.—(*Partly a communication from J. T. La Du, Rochester, U.S.—(Not proceeded with.*) 2*d.*

Relates to a peculiar construction and arrangement of double separator or screen.

3371. CHILLED IRON ROLLERS, &c., *T. Miller, Edinburgh.—6th July*, 1883. 6*d.*

The inventor claims, First, the method of casting chilled iron rollers in moulds consisting of a sufficient number of cylindrical chills, each equal in length to a single cylinder, the chills being separated by narrow cylindrical moulds of sand or other non-conducting material; Secondly, also in combination with such method of casting chilled iron rollers, the use of parallel or chambered central cores.

3372. SEGMENT AND STAR TEMPLES AND THEIR FIXINGS, *F. Oddy, Bradford.—7th July*, 1883. 6*d.*

Consists partly in the construction of a segment temple barrel combining parallel segments and rings and tapering segments and rings, in combination with the placing of the rings in the tapering part of the temple barrel at reducing angles towards the centre of the cloth. Other improvements are claimed.

3374. TIP WAGONS AND TIP CARTS, *A. G. Margetson and W. S. Hek, Bristol.—7th July*, 1883. 6*d.*

Consists, First, in effecting the tipping of the wagon or cart by means of a vertical screw, and in so arranging this screw that it adjusts itself to the curve in which the wagon body moves as it is tipped; Secondly, in hinging the tailboard at the bottom and connecting thereto a lever, which extends along the side of the wagon, and terminates in a handle within reach of the driver, so that he can by means of the lever, and from the front of the wagon, unfasten the tailboard, and draw it close up under the bottom of the wagon.

3377. CONSTRUCTION OF RAILWAY SLEEPERS, TANKS, &c., *J. Imray, London.—7th July*, 1883.—(*A communication from J. Monier, Paris.*) 6*d.*

Consists in constructing railway sleepers, tanks, and other vessels, bridges, floors, drains, and other structures by wiring together longitudinal and transverse rods or wires, so as to form a skeleton, which is filled in and covered with cement.

3378. FEED APPARATUS FOR STEAM BOILERS, *J. Imray, London.—7th July*, 1883.—(*A communication from Count A. de Dion, G. T. Bouton, and C. Trepardoux, Paris.*) 6*d.*

Relates to the use of a feeding vessel arranged vertically against the steam boiler, with which it communicates at water-line by a cock so arranged with passages as in one position to establish the communication between the feeding vessel and the boiler, and in another position to establish the communication between the feeding vessel and a supply cistern at a higher level.

3381. FOLDING LIFE-RAFT, *G. F. Redfern, London.—7th July*, 1883.—(*A communication from E. A. Hayes, New York.*)—(*Not proceeded with.*) 2*d.*

Consists in the use of two or more floats or buoys constructed preferably with air chambers; in the use of devices to connect the same together; in the combination with the same of a metallic float, provided with devices suitable for the storage and distribution of oil.

3394. WOOD WORKING OR MOULDING MACHINERY, *A. A. Cook, Eastbourne.—9th July*, 1883. 6*d.*

The object is to enable inside curved mouldings to be cut as well as outside curved and straight work. On a table a carrier is fixed, and in adjustable bearings therein works a spindle carrying the cutters. Under the table in adjustable bearings is a vertical spindle which can be raised through a hole in the table when required.

3396. DOOR SPRINGS, *D. and S. Timings, Birmingham.—9th July*, 1883. 6*d.*

The object is to enable the tension of barrel springs to be regulated as desired, and it consists in mounting the spindle in the barrel so that it can be turned to tighten or loosen the spring, and then fixed in position.

3397. PROCESSES FOR DEFECATING OR CLARIFYING SACCHARINE LIQUORS, &c., *H. H. Lake, London.—9th July*, 1883.—(*A communication from H. A. Hughes, New Jersey, U.S.*)—(*Complete.*) 4*d.*

This consists in providing a mixture of sulphurous acid gas and cream of lime for treating saccharine liquors, and subsequently treating such liquors with an aqueous solution of acid.

3402. STEAM BOILERS OR GENERATORS, *A. H. B. Sharpe, Lincoln.—10th July*, 1883.—(*Not proceeded with.*) 2*d.*

This consists in arranging in steam boilers a horizontal, cylindrical, conical, or elliptical water tube containing fire tubes.

3405. TRICYCLES, &c., *J. M. M. Viney, Birmingham.—10th July*, 1883.—(*Not proceeded with.*) 2*d.*

The treadles are fixed to the bottom of pendulum rods, and on discs on these rods spring catches or pawls are placed and engage toothed wheels.

3407. GRINDING GLASS TUMBLERS, BEER MUGS, &c., *W. R. Lake, London.—10th July*, 1883.—(*A communication from O. W. Minard, Johnsville, U.S.* 6*d.*

The object is to ensure a uniform pressure of all parts of the article upon the grinding disc, and it consists in the use of a weight which rests inside and on the bottom of the article to be ground.

3408. PORTABLE OVENS FOR BAKING BREAD, &c., *J. H. Johnson, London.—10th July*, 1883.—(*A communication from L. Dathis, Paris.*)—(*Not proceeded with.*) 2*d.*

This relates to the employment of a special arrangement of deflecting and radiating plates and reflecting or reverberating surfaces for regulating and distributing heat equally over the articles to be baked.

3410. INDIA-RUBBER SPRINGS FOR RAILWAY AND TRAMWAY ENGINES AND CARRIAGES, *G. Spencer, London.—10th July*, 1883. 6*d.*

This relates to the combination of metal rings with india-rubber to form springs, and consists in the use of cup or surrounding rings in conjunction with nozzle or inner rings, all parallel to one another, but arranged in different planes of the rubber spring.

3413. MANUFACTURE OF MATERIAL FOR ELECTRIC INSULATION, *W. V. Wilson, London.—11th July*, 1883. 4*d.*

Consists of wood or vegetable tar consolidated by nitrocellulose and one of its solvents, such as methylic alcohol.

3416. POINTS AND CROSSINGS FOR TRAMWAYS, &c., *P. U. Askham, Sheffield.—11th July*, 1883.—(*Not proceeded with.*) 2*d.*

This consists, First, of a pawl fitted to the point so as to form a locking arrangement; and Secondly, in forming points with movable faces where they are most likely to wear.

3418. DESKS AND BENCHES FOR SCHOOLS, &c., *T. Laurie, London.—11th July*, 1883.—(*Not proceeded with.*) 4*d.*

A metal standard at each end forms supports for a desk and bench, the desk being swivelled to the standards, so that it may be turned back and form the back of the next bench.

3419. CARPETS, *T. Tempest-Radford, Kidderminster.—11th July*, 1883. 4*d.*

This consists in the combination of parti-coloured warp printed or dyed in sections, and of dyed or self-coloured warp in the production of the pile or other wearing or ornamental surface of carpets and other fabrics.

3421. ALLOYS OF TUNGSTEN, *F. M. Martino, Sheffield.—11th July*, 1883. 4*d.*

This relates to the production of alloys of tungsten with copper, tin, and zinc, and consists in the use for this purpose of phosphide of tungsten made either by the fusion of phosphide of calcium or other earthy or alkaline phosphides with metallic tungsten, or by the fusion of red or more amorphous phosphorus with metallic tungsten, or by the fusion of tungstic acid with amorphous phosphorus in presence of carbonaceous matter.

3422. FIXING COLOURS ON FABRICS AND APPARATUS CONNECTED THEREWITH, *A. W. Kirk, Halifax.—11th July*, 1883. 6*d.*

The colours are fixed on fabrics and prevented from fading by taking them after they have been dyed and washed into a drying chamber, where they are acted upon by a current of cold air while being moved slowly backward and forward over rollers.

3423. APPARATUS FOR APPLYING ELECTRICITY FOR CURATIVE AND OTHER PURPOSES, *J. N. Aronson, London.—11th July*, 1883. 6*d.*

Relates to a hair brush and battery, the circuit of which is completed by a small contact piece held in the hand. Other appliances are described.

3434. MEANS OR APPLIANCE FOR ATTACHING LABELS TO ENDS OF ROLLS OF DRAWINGS, &c., *H. N. Maynard and H. J. Cooke, Westminster.—12th July*, 1883. 6*d.*

A spring band is attached to a disc by cords (preferably elastic), and when the band is slipped over the roll the disc which forms the label will be held firmly over the end thereof.

3435. BLEACHING OZOKERIT AND OTHER SOLID HYDROCARBONS AND RENDERING THEM AVAILABLE AS SUBSTITUTES FOR WAX, *J. Imray, London.—12th July*, 1883.—(*A communication from G. C. O. Chemin, Paris.*) 4*d.*

This consists in bleaching ozokerit by melting in hot water, distilling with addition of sulphur, separating by pressure or washing the oily ingredients, casting with addition of amylic alcohol, and finally pressing the product and digesting and filtering with animal charcoal.

3470. APPARATUS FOR CONVEYING CASH, PAPERS, OR GOODS BETWEEN THE COUNTERS AND DESKS OF A STORE OR OFFICE, *H. J. Haddan, Kensington.—13th July*, 1883.—(*A communication from H. H. Hayden, New York.*) 1*s.* 2*d.*

This relates to a system in which cars or carriers travel between the different parts of the store, and it consists in improvements in the supports for the carriers, in means for directing their movements, and in the construction of the carriers.

3553. ELECTRIC METERS, *G. Hammersley and C. H. Worsey, London.—19th July*, 1883. 6*d.*

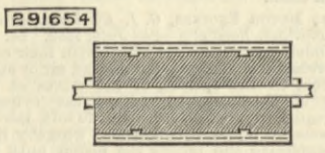
Clockwork, moving at a uniform speed, has connected to it a pair of levers for working the reciprocating pawl of a counter. A pin, movable along slots in the two levers, so as to approach the fulcrum of the one as it recedes from that of the other, is moved by the core of a controlling solenoid excited by the current to be measured. The one lever being caused to reciprocate by the clockwork, causes the other lever to give to the counter at each stroke an amount of feed proportional to the current passing through the solenoid.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

291,654. ROLLER FOR GRINDING MILLS, *George Van Name, St. Louis, Mo.—Filed April 26th*, 1883.

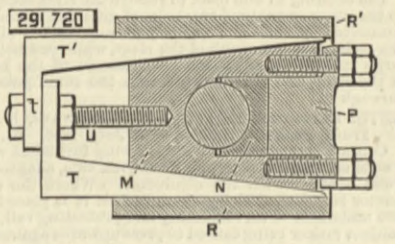
Claim.—A grinding roller for mills, the surface of which is composed of alternate series of thin steel blades and softer material, secured in the cylinder



by dovetailed grooves in the surface of the cylinder, and keyed together by key blades lengthwise of the roller, substantially as and for the purpose described.

291,720. CRANK PIN SLIDE OR DIRECT-ACTING STEAM PUMPS, *Jno. P. Griscom, Pottsville, Pa.—Filed November 16th*, 1883.

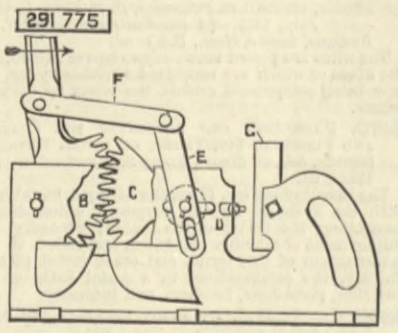
Claim.—(1) A crosshead slide in which the body M and block N are combined with the follower P, and with bolts for confining the follower to the body and for adjusting the said block N, substantially as set forth. (2) The combination of the body M, the plates R R¹, the taper keys T T¹, with devices for the adjustment of the said keys substantially as specified.



(3) The combination of the body M of the slide and the plates R R¹, with the taper keys T T¹, having heads *t*, that of one key overlapping the other, and with a stud bolt U, substantially as described. (4) The combination of the body M of the slide, the adjustable taper keys adapted to grooves in the edges of the body, and the plates R R¹, having lugs between which fit the said keys, substantially as set forth.

291,775. COMPOUND METAL WORKING MACHINE, *Nicholas J. Rice, Vernon, Crawford County, Pa.—Filed May 9th*, 1883.

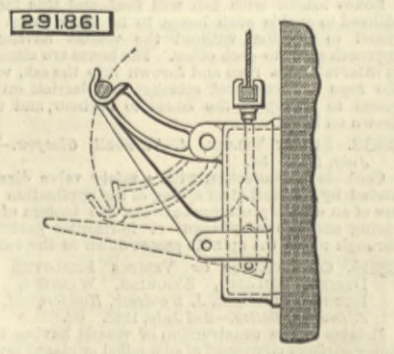
Claim.—(1) The combination, with the frame having suitable fixed die or tool, of the excentric B, provided with a handle, the excentric C, pivotted on sliding bolt, the tool holder connected also to said bolt, and suitable connecting devices, whereby the holder and



excentric C are drawn back, all substantially as described. (2) The combination, with the frame having suitable die or tool G, of the excentric B, having handle, excentric C pivotted with holder D on sliding bolt, the levers E and connecting bar F, all substantially as described.

291,861. SHAFT BEARING FOR TRAVELLING CRANES, *Chas. James Appleby, Southwark, County of Surrey, England.—Filed October 22nd*, 1883.

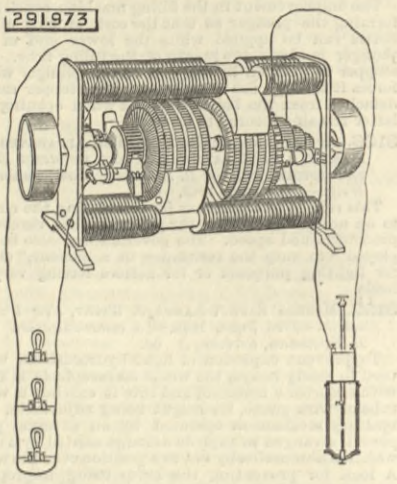
Claim.—(1) In combination with a pivotted bearing for a rotary or other shaft, a counterbalanced rocker arm supporting said bearing, and a rod or bar connected to said rocker arm for actuating the same, substantially as and for the purposes set forth. (2) The



combination of a pivotted bearing for a rotary or other shaft, a rocker arm supporting said bearing, a rod or bar connected to said rocker arm, and a moving or travelling cam operating said rod, whereby said bearing is automatically depressed and elevated, substantially as and for the purposes set forth.

291,973. DYNAMO-ELECTRIC MACHINE, *Charles E. Ball, Philadelphia, Pa.—Filed October 9th*, 1883.

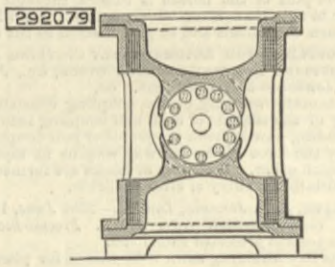
Claim.—(1) The combination, in a dynamo-electric machine, of two armatures, one of which is wound for quantity and the other for intensity, the quantity armature being in circuit with the field, the intensity armature not being in circuit with such field, though designed and adapted to be energised inductively thereby, substantially as set forth. (2) The combination, with a dynamo-electric machine having two armatures, one of which is wound for quantity and the other for intensity, the former being in circuit with the field and the latter not in such circuit, of two external circuits, which include, respectively incandescent lamps and arc lights, the former embracing the quantity armature and the



latter the intensity armature, substantially as set forth. (3) A dynamo-electric machine having two field poles and two armatures, each of which is located and adapted to be rotated in the field of force of only one of said poles, one of said armatures being wound for quantity and the other for intensity, the quantity armature being in circuit with the field and having connections for an external incandescent circuit, and the intensity armature not being in circuit with the field, but having connections for an external arc circuit, substantially as set forth.

292,079. DYNAMO-ELECTRIC MACHINE, *Jonas Wenström, Orebro, Sweden.—Filed December 7th*, 1882.

Claim.—(1) In dynamo-electric machines, the field-magnets arranged on both sides of the armature, enveloping the two energising helices *w w* by iron housings, whereby all the excited magnetism may be collected and transmitted, the magnetic field confined within the machine, and a firm connection obtained between the pole pieces and bearings. (2) The field-magnets of a dynamo-electric machine, composed of one or more annular energising helices *w w*, arranged



concentrically about shaft *a*, and inclosed in iron shells *m c*, from which project alternate pole pieces, and which serve at the same time as a rigid frame for the machine, as described. (3) In dynamo-electric machines, an armature provided with grooves in the core of the armature, for receiving the electrical conductors, which grooves are arranged in such a manner that narrow slits are formed in the surface of the core, which slits are filled with diamagnetic material, substantially as herein shown and described, and for the purpose set forth.

CONTENTS.

THE ENGINEER, February 29th, 1884.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—W. A. Betts, engineer, to the Orwell, vice Brown; John Baillie, engineer, to the Pembroke, vice Betts; R. G. Callaway, engineer, to the Flirt; and G. W. Hudson, assistant engineer, to the Defence, vice Callaway.