THE IRON AND STEEL INSTITUTE.

In our last impression we gave an account of the proceedings of the Institute on the two days—Tuesday and Wednesday. Four papers were read on the latter day, and the time left for discussion was taken up by Dr. Siemens and Sir Henry Bessemer, and by a brief reply by Colonel Maitland. In the afternoon the members visited the Woolwich Arsenal. On Thursday morning the discussion on the papers read on the previous day was reopened, Mr. C. Markham being the first speaker. He thought that it was to be regretted that Dr. Siemens and Sir H. Bessemer had made the papers of Mr. Butter and Colonel Maitland a pretext for showing that the Woolwich authorities had not always treated inventors fairly. Mr. Vickers said the remarks which had been made on Wednesday were not in any way personal, but only described what had been done by Colonel Maitland's predecessors. He said that the Vickers steel referred to by Colonel Maitland was made in furnaces which had been materially modified, and might be called Siemens-Vickers' or Vickers-Siemens' furnaces. In 1862 some 20-pounder guns of solid steel were sent to the Arsenal, and tested with service charges of powder and shot, commencing with 20 lb., and increasing by that quantity up to 200 lb. Three guns burst, one was slightly injured, and two uninjured. In one gun the permanent expansion was 0·008in., and another 0·0125in. Though such good results were obtained, it was more than ten years before they received any orders for their steel for such purposes. Mr. J. Head referred to that part of Mr. Butter's paper which described the gun carriages built up of plates and angle iron as better than those made of fewer pieces by the use of large channel and other rolled sections, and elicited the fact that the iron was in both cases of the same quality, which showed that the built-up structure was much more capable of elastic flexure than the solid structure. He also referred to the importance of ascertaining the elastic limit of materials employed, and to the low limit which Professor Kennedy's recent paper read before the Institution of Mechanical Engineers had shown to be common. He was interested in this subject, and had recently written to a number of bridge builders, and found that they knew very little as to the elastic limit of the material used. He had lately caused a number of test pieces to be sent to the Tees-side Ironworks Company's works to be tested for this purpose; but the results were not yet made known. Mr. Head referred particularly to the strain at which permanent set, as indicated by accurate experiments and minute readings, seemed to take place, and not so much to the strain at which destructive extension commenced. The latter is the strain always taken to be the elastic limit for structural purposes, and we may remark that unless the experiments to be made for Mr. Head are conducted with great accuracy and care, very little trustworthy information will be obtained as to what we may call incipient permanent extension, as indicated by Professor Kennedy's experiments, and some others that had preceded his, by Mr. E. A. Cowper.

Mr. Chas. Cochrane said he had found the elastic limit in Staffordshire iron to be as low as from 6 to 8 tons, and in best Yorkshire iron lower than this. With respect to specifications issued by many engineers, he said it was often impossible to carry them out. Testing and inspection became almost a personal matter, as to whether the material should be accepted or rejected. Such breaking loads as 27 tons, which were mentioned in one of the papers, were perfectly nonsensical, and could not be fulfilled under any circumstances.

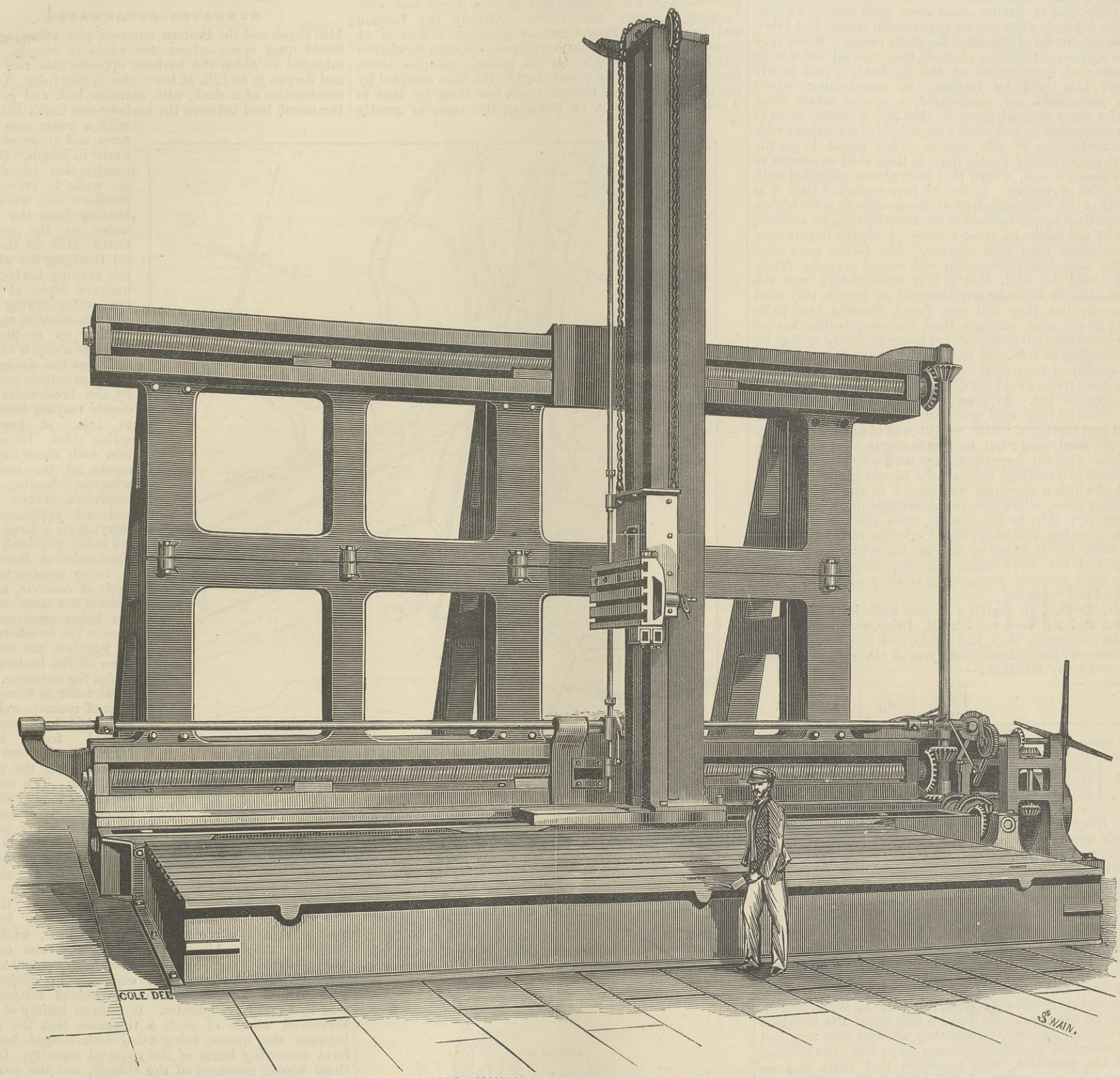
Mr. I. Lowthian Bell remarked that Col. Maitland had failed in the historical part of his paper, but he agreed to a great extent with the caution shown by the authorities in the adoption of steel, for it was not adopted very rapidly outside Woolwich Arsenal.

Mr. Snelus, referring to Col. Maitland's paper, said that the figures therein given showing the great difference in the strength of different parts of steel ingots, remarkably confirmed the discovery announced by Mr. Stubbs. Mr. Joseph Whitley said that many years ago he had made steel tires solid by having "neither top nor bottom to the ingot," the tire ingot moulds being made to revolve at a speed of about 2000ft. per minute.

Mr. D. Adamson thought Sir Henry Bessemer and Dr. Siemens were right in calling attention to the treatment they had received at the hands of the Woolwich authorities. He had made some experiments on hardening steel in oil, and had found that with some steel it was destructive. Hardening in oil put the greatest possible amount of work on the steel in the least possible time. The outside was cooled and contracted in a liquid not a good conductor, while the inside, unable to get rid of its heat, resisted the contraction of the exterior, and thus caused great final internal strains. He thought that a rather high ductility was of more importance than great ultimate strength, and as the highest tensile strain was accompanied by lower ductility, great ultimate strength was not a desirable quality for steel to be used for guns. The test pieces used at Woolwich were, he thought, much too small—mere toys—and gave an untrustworthy and too high a result. He compared the Woolwich system of placing a comparatively hard tube inside wrought iron rings of material which would only carry at most 22 tons per square inch, as like covering them with shoddy. He could not see why the diameters of the Woolwich guns should increase by such great jumps, for it was quite certain that the pressures to which they were subject by the powder gases did not decrease from breach to muzzle by jumps which would warrant such sudden changes in the thickness in the reinforce rings. He was of opinion that steel was much improved by the Whitworth process of compression, and would be by the stirrer described by Mr. Allen.

Mr. E. A. Cowper said with respect to specifications prepared by civil engineers, and especially some Great George-street engineers, that absurd conditions were stipulated. He had lately seen cold blast iron stipulated for gas and water pipes, but of course the contractors had ignored it. In the early days of steel at Woolwich a 3in. gun was tried with four shots without bursting it. It was then placed upon a piece of 3in. shafting, so that the gun became the projectile. The gun then burst and the steel gun was condemned.

M. Gautier considered Whitworth's process of compressing steel valueless, for it did not increase the specific gravity. In France, he said, the A tubes for guns were bored out by cutting an annulus out, thus leaving a solid



LARGE PLANING MACHINE IN MESSRS. MAUDSLAY, SONS, AND FIELD'S WORKS.—(*For description see page* 292.)

core instead of cutting the whole out in shavings, as was done at Woolwich.

Mr. Butter, in replying to the discussion as far as it referred to his paper, said it was true that Dr. Siemens had suggested the use of the hydraulic compressor, but what he had stated in his paper was that the necessary details for the apparatus were worked out in the department into a practical shape. He might, however, inform Dr. Siemens that shortly before he had made his suggestion to the Woolwich authorities, they had received a proposition for a hydraulic buffer from a Mr. Munroe, of Devonport. Referring to the specification question, he said that the specifications now issued only contained conditions which could be practically and fairly worked to, and all these conditions now laid down had to be fully carried out. The building-up system for gun carriages had been adopted in preference to making them out of solid bars, as was done in Germany, because they thereby attained much higher elastic flexure; one of the carriages on their system having stood over 2000 rounds without being injured, while one on the German system had taken a permanent set of 2in. after the sixth round. When they first commenced the use of steel, they carried out a large number of experiments at Mr. Kirkaldy's, and nearly drove him mad by insisting on ascertaining where the permanent set commenced, a matter which occupied a great deal of time, so that Mr. Kirkaldy came to the conclusion he had made a remarkably bad bargain with the authorities in this matter. They aimed to get the same proportion of elastic limit in their steel structures as was found in oak, where that limit almost coincided with the point of rupture. It may be here remarked that it is not that the Woolwich authorities are able to get a higher elastic limit by one method of construction than by another, but by one method a greater range of elastic flexure may be obtained than with another. Mr. Butter gave some rather surprising information with regard to rivets. They had found, he said, that B B B Staffordshire was the most suitable to their requirements as long as they used iron only, but they had now found Siemens steel to be fully 20 per cent. stronger than the iron, besides having the important advantage of not being so easily spoiled by overheating as iron, and they also observed that the lower the quality of the iron the more it deteriorated by overheating. Steel rivets would not do if rivetted over cold, they must be rivetted hot. At present almost three-fourths of all the material they used was iron, and one-fourth steel; in field gun carriages, where weight was of importance, they always used steel; but in garrison gun carriages, where weight was not important, they used wrought iron. He referred to a carriage axle shown in one of the diagrams, and of which a specimen was placed in the lobby of the meeting room, which was an exceedingly difficult forging, being very thin in the middle, with thick heavy ends; such a forging, if made in best Yorkshire iron, would most probably break owing to the jar, but with Siemens steel they had not had a single fracture, although they had been most severely tested by travelling over very rough ground at Dartmoor.

Mr. Thomas, in replying to the remarks made on his paper, said Mr. Bell and Mr. E. Riley were both correct in the statements they had made, and he showed this by reference to the following analyses of the rails previously referred to by Mr. Bell:—

		C.	S_1.	S.	P.
Acid process		0·434	0·065	0·091	0·053
Basic process		0·451	0·094	0·095	0·053
Acid	Sheffield	0·338	0·055	0·090	0·056
	Darlington	0·457	0·047	0·057	0·047
	Bolckow & Vaughan	0·521	0·083	0·107	0·053

Mr. Riley had spoken of steel made on the Continent which was much purer, particularly in silicon. Messrs. Bolckow, Vaughan, and Co., for economical reasons, introduced a small quantity of silicon, which was not any disadvantage when the steel was used for rails. He said he had received several semi-private inquiries about the cost of the process, but had specially omitted introducing that question into his paper from motives of expediency and propriety, as he considered it was much better for his readers to judge for themselves from the facts mentioned in the paper. This concluded the discussion.

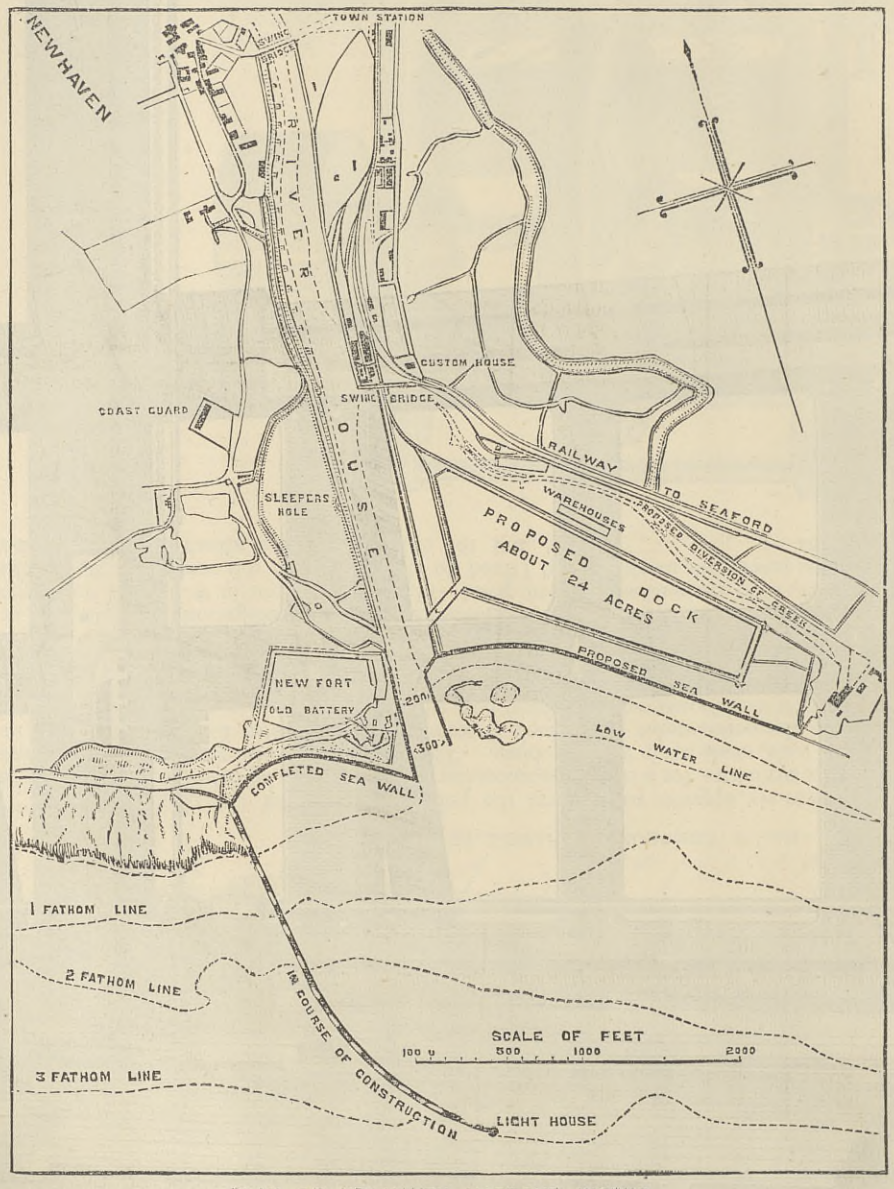
It was then announced that a paper on certain physical tests and properties of steel, by Mr. E. W. Richards, would be next read. So large a number of the members and visitors, however, immediately showed that they had had enough of papers, by getting up to leave the theatre, that the president, who remarked that there was no reason why more papers should be read if members were tired or did not want them, immediately proposed cordial votes of thanks to the authors of the papers, which were warmly seconded, as well as to the Lord Mayor for the hospitable manner in which he had entertained the Institute, and also to the War-office and South Kensington authorities for the facilities they had given them for seeing the establishments at Woolwich and Enfield, and for holding the conversazione. The Local Reception Committee, the South-Eastern, the Brighton, and the Great Eastern Railways were also accorded votes of thanks for the parts they had taken in making the meeting so successful.

On Thursday afternoon, after luncheon at the Westminster Palace Hotel, a visit was paid to the Enfield small-arms factory, which we described in our impression of the 30th September, and also to the Great Eastern Railway Works at Stratford, which we described in our last impression. On Thursday evening the Local Committee gave a *conversazione* at the South Kensington Museum, which was well organised, and, considering the very inclement weather, well attended. The visitors were received by Sir H. Bessemer, Dr. Siemens, and the president.

On Friday last an excursion was made by special train from Victoria at 9 a.m. to the Newhaven Harbour Works, and to the locomotive works of the London, Brighton, and South Coast Railway Company's Works at Brighton. The Harbour Works we described and illustrated in The Engineer for the 13th December, 1878, and give below some further particulars, and the locomotive works were described in our impression of the 7th inst.

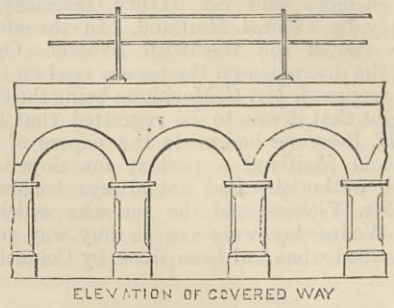
THE NEWHAVEN HARBOUR WORKS.

Since we described the Newhaven Harbour Works a great deal of the work has been carried out. The works are of great importance, and are interesting as the work of a private company, though the largest portion consists of a long breakwater, a work which has probably never before been attempted by other than national funds. It is believed that the Newhaven harbour and docks will constitute one of the most important sources of traffic for the London and Brighton Railway, as Newhaven is the nearest sea-port to London, and is in a direct line with London, Dieppe, and Paris. Already the London and Brighton Railway Company possesses a fleet of 11 steamers with a daily passenger service between Newhaven and Dieppe. Although the sea passage occupies about four hours, which is about double the time occupied by the shortest passage, though much less than by that to Antwerp, Rotterdam, or Flushing, the route is greatly



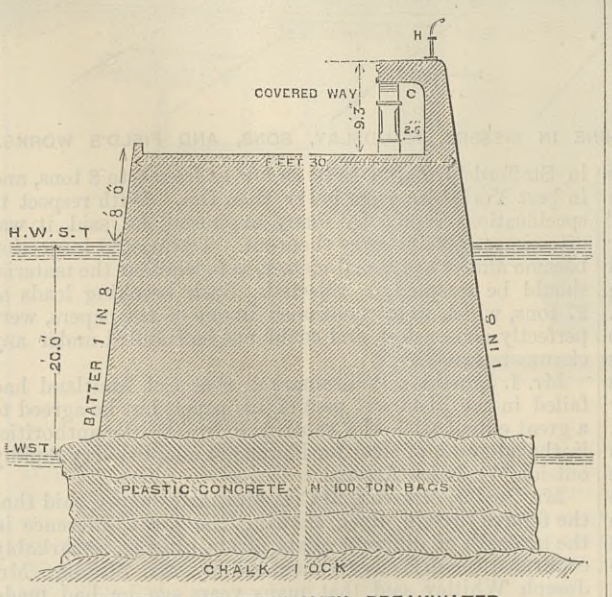
PLAN OF NEWHAVEN HARBOUR WORKS.

favoured, especially as it is much cheaper than by Dover and Calais. The works are being executed under the direction of Mr. F. D. Banister, M.I.C.E., engineer to the London, Brighton, and South Coast Company. The following are given as the chief features of the harbour works:—(1) A breakwater, about 1000 yards in length, to be run out seaward from the shore at Barrow Head, westward of the harbour, in a direction to protect the entrance of the harbour from the prevalent south-western and southern gales. About 300 yards of this breakwater are now completed. (2) The extension of the two entrance piers and widening the entrance from 150ft. to 250ft. (3) The construction of a new wharf, or quay, between the



NEWHAVEN BREAKWATER.

Mill Creek and the Eastern entrance pier, affording additional quay space—about 600 yards in length. It is intended to widen the harbour opposite this new quay, and deepen it to 12ft. at low-water spring tides. (4) The construction of a dock, with entrance lock and gates, on the marsh land between the harbour and Catt's Tide Mill, with a water area of 24 acres, and quays of about a mile in length. (5) The construction of durable sea walls to protect the foreshore and works, extending from the breakwater on the west to Catt's Mill on the east. (6) Dredging the whole of the existing harbour to a uniform depth of 6ft. at low water spring tides, and the entrance and new portion up to the Mill Creek to a depth of 12ft.; and also the dredging of the space outside protected by the breakwater to a depth varying from 12ft. to 18ft. at low-water spring tides. In connection with these improvements, all the necessary wharves, landing-stages, tramways, cranes, sheds, and all appliances for carrying on a large trade, are being provided. The breakwater at Newhaven is being constructed entirely of concrete, and sea walls of the same material are being constructed to protect the foreshores and to lengthen the entrance piers of the harbour and widen the entrance. The breakwater is founded on bags of concrete weighing each 104 tons, and deposited from hopper barges towed out and moored over the site of each bag. The concrete consists of four of shingle, three sharp coarse sea sand, and one of cement. When the bed is thus formed, the superstructure, which is also of solid concrete, is built as a monolith, the interior concrete being—five shingle, three sand, and one cement, while exterior is three shingle, two sand, and one cement. The concrete is mixed by machinery patented by Mr. A. E. Carey, resident engineer, in conjunction with Mr. E. Latham, which is capable of mixing 100 tons in twenty-five minutes. It consists mainly of three horizontal wheels of such a thickness that the spaces between the spokes, being fitted with hinged bottoms, form measuring boxes of the required capacity. One of these wheels measures off the shingle, and the next the sand, and as they revolve they drop their contents into the compartments of the lower wheel, where they become mixed together and with the cement, which is delivered into the same compartments by a creeper screw. The lower wheel delivers the whole into a cylinder which projects out from the stage, upon which the machinery is mounted over water, so as to deliver into the hopper barges. In this cylinder is a series of dash boards, water being added at the upper end, and the whole so arranged that the concrete is thoroughly mixed without an unnecessary charge of water, which is an important point for concrete to be dropped into the sea and fall through from 20ft. to 48ft. of water. The method of construction adopted has the advantage of being economical and requiring very little plant. The machine gives a very perfect double mixing—dry and wet—latter being about fifteen times over. As we have said, it mixes and delivers into the steam hopper barge 100 tons in 25 minutes. It is designed however to do this in 20 minutes, but one feeding platform only is now used instead of two. A second platform is to be brought into use when the works are recommenced after the winter. The only difficulty is in bringing up materials to the machine rapidly enough. The best result yet obtained in a single day was six blocks, or 600 tons concrete. The machine thus prepares the concrete fast enough to employ more hopper barges if from other considerations it became economical to do so. A machine for



SECTION OF NEWHAVEN BREAKWATER.

making concrete for the superstructure has also been designed by Mr. Carey. It is a light portable machine, intended to follow its work and deliver direct into the timber framing, within which the superstructure is built. It is designed to produce an output of 70 yards concrete per hour.

The position of the breakwater and other works is well shown in a perspective plan, published in The Engineer for the 13th December, 1878, but it may also be gathered from the small plan on the preceding page.

The breakwater has the section shown, and is a massive structure, which received, as far as completed, a considerable testing in the severe gale and heavy sea of the night of the 13th and morning of the 14th. The sea bottom at the shore end of the breakwater is 2ft. above low water. At the extremity of the breakwater it is 18ft. below low water. The roughness of the weather on Friday made it impossible for the visitors to inspect the piers and breakwater and the method of construction from barges, as they would have done if it had been fine. It was difficult to keep a footing on shore, and crowded barges would have been positively dangerous, and indeed could not have been used for any purpose in the heavy surf which was running. The dock will be constructed under considerable advantages, as much of the land is below mean sea level, and the excavated material will be sent away as ballast. One of the dredgers used was constructed by Messrs. Simons and Co., of Renfrew, and is capable of carrying 500 tons of spoil to sea per trip. In consequence of the enhanced cost of harbour work of this kind during winter, the construction of the breakwater will soon be stopped for the winter months.

PATENT LAW REFORM.

During the recent meeting of the British Association a report was read in Section G which we publish. This is the report of the committee, consisting of Sir F. J. Bramwell, Dr. A. W. Williamson, Professor Sir William Thomson, Mr. St. John Vincent Day, Dr. C. W. Siemens, Mr. C. W. Merrifield, Dr. Neilson Hancock, Mr. Abel, Captain Douglas Galton, Mr. Newmarch, Mr. E. H. Carbutt, Mr. Macrory, Mr. H. Trueman Wood, Mr. W. H. Barlow, and Mr. A. T. Atchison, appointed for the purpose of watching and reporting to the Council of the British Association on Patent Legislation. The report states that the Bill of this session 1881, by Mr. Anderson, Mr. Brown, Mr. Hinde Palmer, and Mr. Broadhurst, was read and considered.

This Bill which as it stands is a mere sketch, and not likely to prove a working piece of legislation, is identical with the Bill introduced last year by the same gentlemen, and referred to in the last report—*B. A. Report*, 1880, p. 318—of this committee. It was, however, read a second time in the House of Commons and subsequently reached a further stage than in 1880.

The Bill proposes the appointment of a Chief Commissioner and assistants. It would reduce the fees considerably, that on application to 10s., and on sealing to £1.

It extends the period of provisional protection to twelve months.

It gives a patentee power to add (apparently by way of supplement) to his original patent.

The committee certainly approve the proposal to appoint paid Commissioners.

They think the proposed reduction in fees much too large.

They approve the principle of letting a patentee amend his patent, but it would be necessary that proper provision should be made. The clause in the Bill would be quite unworkable.

The committee have also to report that a carefully prepared Bill had been published by the Council of the Society of Arts for discussion, with the view of its being introduced into Parliament next year.

The principal alterations in the law which would be made by the Society of Arts' Bill are shown in the following memorandum, which appeared in the *Journal* of the society for August 12th, 1881:—

Commissioners of Patents.—The Patent-office would be removed from under the charge of the present Commissioners, who are the Lord Chancellor, the Master of the Rolls, and the law officers. Three Commissioners would be appointed on account of their special knowledge.

Application for Letters Patent.—Method of granting same.—The method of application for a patent would be somewhat as follows:—The applicant would file a provisional specification, which would be referred to examiners appointed for the purpose. They would see that the invention was proper subject matter for a patent; that the specification fairly described the invention, and that it was generally intelligible and properly drawn. They would not inquire into novelty or utility. They would report, and their report would be shown to the applicant before being seen by the Commissioners. The applicants would then have an opportunity of conferring with the examiners as to any required alterations. Provisional protection would be granted immediately on receipt of the application, and would last for nine months. Before the end of that time the applicant would be required to file a complete specification, fully describing his invention. This would be referred to the examiners, and treated in the same manner as the provisional specification. The applicant would be enabled to amend his specification in accordance with the recommendation of the examiners, and on his doing so a patent would be granted. If the examiners reported that the application was in respect of matters which could not properly be made the subject of a patent, and if the applicant still persisted, a patent would still be granted, but the objections of the examiners would be endorsed upon the specification.

Duration of Patent.—The duration of letters patent would be increased to seventeen years—the duration being as now contingent upon the payment of fees at or before the expiration of each period.

Fees.—The fees would be half the present amounts, namely:—

	£	s.
Fee for provisional protection	2	10
Fee for grant	10	0
Fee at expiration of fourth year	30	0
Fee at expiration of eighth year	60	0

Existing System.—Under the present law there is practically no examination whatever. Applications for patents are referred to one of the two law officers, who reports whether a warrant may be issued for the granting of letters patent. The only point upon which the law officer decides is whether the invention is proper subject-matter for a patent, *i.e.*, whether it comes within the definition of the Statute of Monopolies—21 Jac. I., cap. 3—of being a new manufacture within this realm. The complete specification, upon which the patent is really granted, is never examined at all by anybody.

Subject Matter.—The following is the definition of "subject matter" adopted in the Bill:—(*a*) Any manufacture or any product not being a natural product; (*b*) Any machine or any means of producing any manufacture, product, or result; (*c*) Any process or method of producing any manufacture, product, or result; (*d*) Any part of a machine, means, process, or method of producing any manufacture, product, or result. At present the ancient definition of the Statute of Monopolies is in force, but, as a matter of fact, the question of subject matter depends wholly on the decisions of the courts.

Opposition.—Under the proposed Bill, opposition to the granting of letters patent would be limited to persons who could state that the applicant had obtained the invention from them by means of fraud. Under the present law any person can oppose, the general ground of opposition being that the person opposing already has a patent for the same or nearly the same invention.

Amendment.—The Bill provides that the inventor should be entitled to amend his specification after it had been first filed. Under the present system this power is very restricted.

Prolongation.—It is proposed to continue the system of prolonging patents in special cases, the Bill being framed in such a manner as to give greater facility for this than now exists. Under the present system, prolongations are granted by the Privy Council, and are considered a matter of special favour, whereas the effect of the new Bill would, it is hoped, be to give them as a right to any inventor who could show just cause for having his privilege prolonged, on the ground of his not having had sufficient reward, or the time having been insufficient to enable him to bring his invention into action, or similar grounds. The period for which a patent could be prolonged would be diminished by the three years which the Bill would add to its original term.

Obligatory Licences.—The Bill would compel a patentee to grant licences in cases where it could be clearly shown that the invention was not being worked in such a way as to supply the reasonable wants of the public; but the clause has been so worded as to prevent any improper interference with the rights of the patentee over what is considered to be his own private property.

Trial of Patent Cases.—The Bill would provide for the trial of patent cases in an entirely new manner. They would be tried, in the first instance, before one of the Commissioners, and an appeal would lie to the whole body. The Commissioners would have power to call in assessors, and would have such other powers as would enable them to try the cases fully. It is hoped that this would greatly simplify the patent litigation, and would prevent the enormous expense which is now incurred by having to bring complicated questions of law and fact before a jury, who are probably ignorant of the scientific or mechanical considerations involved. It may be noted that one great source of expense is the preparation of models, which are only necessary to illustrate mechanical questions to persons unaccustomed to deal with such questions. For experts in such matters, drawings would be sufficient; indeed, an engineer would generally much prefer proper drawings to any model of a machine.

Anticipation.—It is proposed that a mere publication more than thirty years old, unaccompanied by use within the thirty years, should not be considered sufficient to invalidate a patent. The object of this is to remove the hardship, which now not infrequently occurs, of a patent being invalidated, or a patentee being put to great expense in order to prove his claim, by the discovery of some ancient and probably incomplete description, a description which in many cases could not have been put into operation at the time it was made for want of necessary appliances to carry it into effect.

Patents to Foreigners.—It is proposed that patents should be granted to foreigners, or persons resident abroad, on precisely the same terms as those on which they are granted to British subjects resident in the United Kingdom. At present patents are granted to British subjects in respect of communications from abroad; that is to say, the theory is, a person travelling abroad sees a useful invention, brings it home, and patents it in England, such person not being, in any sense, the inventor. In practice, patents for communications from abroad are nearly always taken out by patent agents, whose clients are resident out of the country, and the patent, as soon as it is taken out, is assigned to the real foreign inventor. Cases of injustice have occurred through the action of this system, in which a patent had been granted to a person who had no moral right to it, but who anticipated the original inventor in obtaining the English patent.

Effect of Foreign Patents on English Patents.—At present an English patent lapses at the expiration of any foreign patent taken out by the same inventor for the same invention. It is proposed in the Bill that English patents should not in any way be affected by foreign patents.

The committee request that they may be re-appointed in order to watch the progress of this Bill through Parliament, as well as that of any other Bill for the amendment of the patent law which may be introduced.

The committee have not expended any of the sum of £5 placed at their disposal last year, but they would be glad to have the grant renewed.

ON THE ECONOMY OF METAL IN CONDUCTORS OF ELECTRICITY.*

The most economical size of the copper conductor for the electric transmission of energy, whether for the electric light or for the performance of mechanical work, would be found by comparing the annual interest of the money value of the copper with the money value of the energy lost in it annually in the heat generated in it by the electric current. The money value of a stated amount of energy had not yet begun to appear in the City price lists. If £10 were taken as the par value of a horse-power night and day for a year, and allowing for the actual value being greater or less—it might be very much greater or very much less—according to circumstances, it was easy to estimate the right quantity of metal to be put into the conductor to convey a current of any stated strength, such as the ordinary strength of current for the powerful arc light, or the ten-fold strength current—of 240 webers—which he—Sir William Thomson—had referred to in his address as practically suitable for delivering 21,000-horse power of Niagara for 300 miles from the fall. He remarked that—contrary to a very prevalent impression and belief—the gauge to be chosen for the conductor does not depend on the length of it through which the energy is to be transmitted. It depends solely on the strength of the current to be used, supposing the cost of the metal and of a unit of energy to be determined. Let A be the sectional area of the conductor; s the specific resistance—according to bulk—of the metal; and c the strength of the current to be used. The energy converted into heat and so lost, per second per centimetre, is sc^2/A ergs. Let p be the proportion of the whole time during which, in the course of a year, this current is kept flowing. There being $31\frac{1}{2}$ million seconds in a year, the loss of energy per annum is

$$31{\cdot}5 \times 10^6 \, p s c^2 / A \text{ ergs} \quad . \quad . \quad (1)$$

The cost of this, if E be the cost of an erg, is

$$31{\cdot}5 \times 10^6 \, p s c^2 E / A \quad . \quad . \quad (2)$$

Let V be the money value of the metal per cubic centimetre. The cost of possessing it, per centimetre of length of the wire, at 5 per cent. per annum, is

$$V A / 20 \quad . \quad . \quad . \quad . \quad (3)$$

Hence the whole annual cost, by interest on the value of the metal, and by loss of energy in it, is

$$\frac{1}{20} V A + \frac{31{\cdot}5 \times 10^6 \, p s c^2 E}{A} \quad . \quad . \quad (4)$$

The amount of A to make this a minimum—which is also that which makes the two constituents of the loss equal—is as follows:—

$$A = \sqrt{\left(31{\cdot}5 \, . \, 10^6 \, p s c^2 E / \frac{V}{20}\right)}$$

$$= c \sqrt{\left(63 \, . \, 10^7 \, p s E / V\right)} \quad . \quad . \quad (5)$$

Taking £70 per ton as the price of copper of high conductivity—known as "conductivity copper" in the metal market—we have £·00007 as the price of a gramme. Multiplying this by 8·9—the specific gravity of copper—we find, as the price of a cubic centimetre,

$$V = £{\cdot}00062 \quad . \quad . \quad . \quad (6)$$

and the assumption of £10 as the par value of one horse-power day and night for 365 days gives, as the price of an erg,

$$£10 / (31\tfrac{1}{2} \times 10^6 \times 74 \times 10^8) = \frac{1}{23 \times 10^{14}} \text{ of £1} \quad (7)$$

Supposing the actual price to be at the rate of $e \times$ £10 for the horse-power year, we have

$$E = \frac{e}{23 \times 10^{14}} \text{ of £1} \quad . \quad . \quad (8)$$

Lastly, for the specific resistance of copper, we have

$$s = 1640 \quad . \quad . \quad . \quad . \quad (9)$$

Using (8) and (9) in (5) we find,

$$A = c \sqrt{\frac{63 \times 10^7 \times 1640 \times pe}{23 \times 10^{15} \times {\cdot}00062}} = c \sqrt{\frac{pe}{1{\cdot}38}} \quad (10)$$

Suppose, for example, $p = {\cdot}5$—that is, electric work through the conductor for twelve hours of every day of the year to be provided for—and $e = 1$. These suppositions correspond fairly well to ordinary electric transmission of energy in towns for light, according to present arrangements. We have—

$$A = c \sqrt{\frac{1}{27{\cdot}6}} = \frac{c}{5{\cdot}25} \doteq {\cdot}19 \, c.$$

That is to say, the sectional area of the wire in centimetres ought to be about a fiftieth of the strength of the current in webers. Thus, for a powerful arc-light current of 21 webers, the sectional area of the leading wire should be ·4 of a square centimetre, and therefore its diameter—if it is a solid round wire—should be ·71 of a centimetre. If we take $e = \frac{1}{365}$, which corresponds to £1900 a year as the cost of 5250-horse power—see Presidential Address, Section A—and if we take $p = 1$, that is, reckon for continued night and day electric work through the conductor, we have—

$$A = \frac{c}{\sqrt{381}} \doteq \frac{c}{19{\cdot}5} :$$

and if $c = 24$, A = 1·24, which makes the diameter 1·26 centimetres, or half an inch—as stated in the Presidential Address. But even at Niagara it is not probable that the cost of an erg can be as small as $\frac{1}{2500}$ of what we have taken as the par value for England; and probably therefore a larger diameter for the wire than half an inch will be better economy if so large a current as 240 webers is to be conducted by it.

* Paper read before the British Association by Sir W. Thomson.

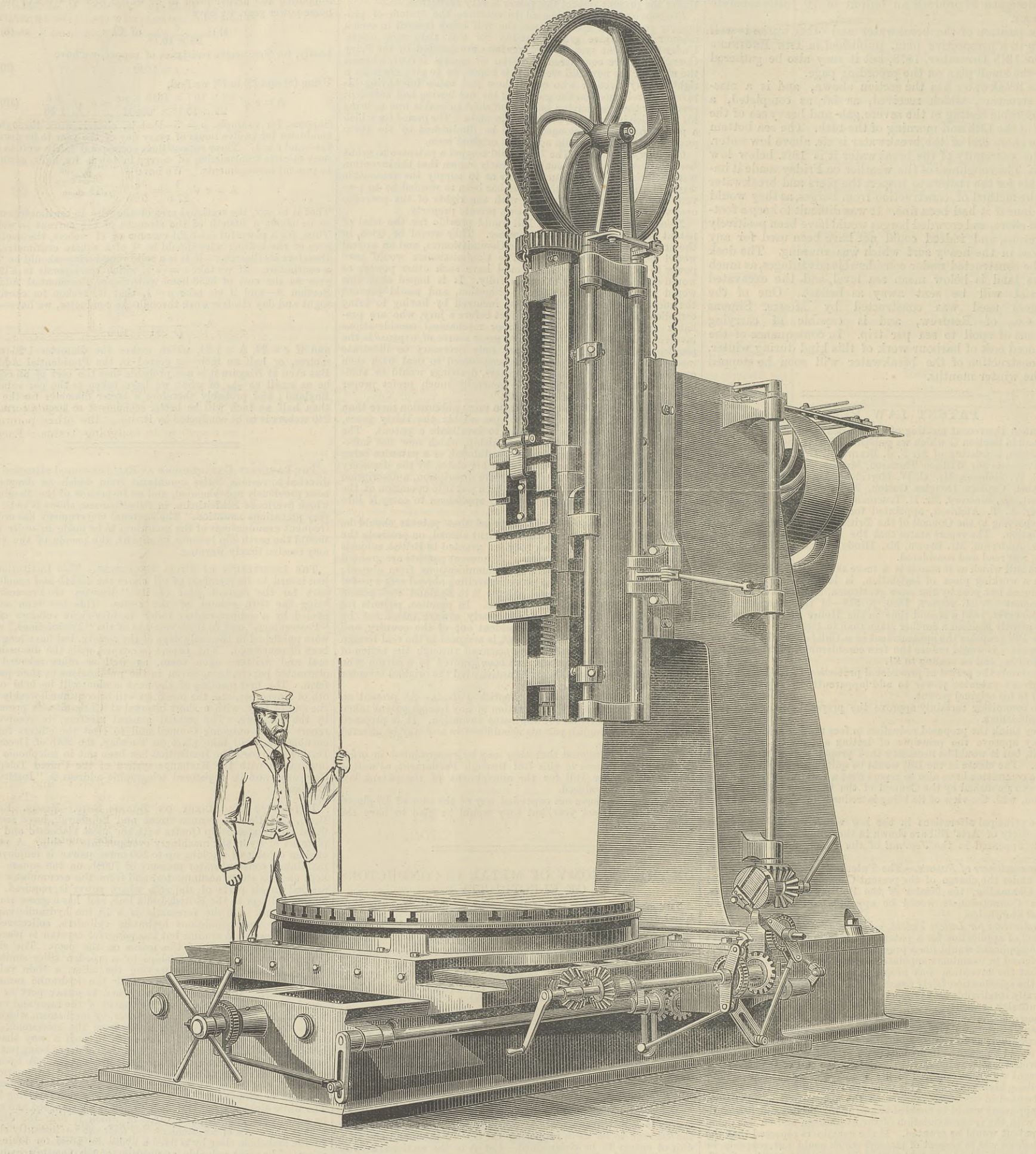
The Landslip Catastrophe at Elm has caused attention to be directed to various Swiss mountains from which no danger has been previously apprehended, and an inspection of the Berghalde, which overlooks Schleitheim, in Schaffhausen, shows it to be in a very precarious condition. The cantonal Government has ordered frequent examinations of the mountain to be made in order that, should the earth slip become imminent, the people of the valley may receive timely warning.

The Institution of Civil Engineers.—This Institution has just issued to its members of all clases the fourth and concluding part for the current year of its "Minutes of Proceedings," being the 66th volume of the series. This has been accompanied by a subject-matter index to fifty-eight volumes of the "Proceedings," and to three volumes of the "Transactions," which were published in the early days of the society, but have long since been discontinued. The papers *in extenso*, with the discussions—oral and written—upon them, as well as other selected and abstracted papers, being given in the publications in their present form. The first meeting of the next session will be held on the 8th of November, and the meetings will be continued weekly until the end of May, with a short interval at Christmas, as prescribed by the bye-laws. The annual general meeting, to receive the report of the outgoing Council and to elect the officers for the ensuing year, will take place on Tuesday, the 20th of December. During the recess the Institution has been put in telephonic communication with the Exchange system of the United Telephone Company, and its registered telegraphic address is "Institution, London."

Hydraulic Machinery on Board Ship.—Messrs. Brown, Bros., and Co., of Cannon-street and Edinburgh, have recently fitted up the steamship Quetta with the most elaborate and complete set of hydrauiic machinery ever put into a ship. A pair of engines capable of working up to 100-horse power is employed to maintain a constant water pressure of 700 lb. on the square inch, kept under a steam accumulator, and from the accumulator pipes are led to all parts of the ship where power is required. The Quetta belongs to the British India line, and has a gross tonnage of 3302 tons. On the forecastle is a 15 ton hydraulic capstan driven by four pendulous hydraulic cylinders, collectively of 50-horse power. A similar but less powerful capstan is placed at the other extreme end of the mains on the poop. The ship is steered from the bridge amidships by a wooden tiller similar to that of a small yacht. By moving the tiller, a slide valve is opened, which is in connection with the hydraulic rams and cylinders aft. When the valve is opened to either port or starboard cylinder, a corresponding movement of the rams and rudder takes place, strictly controlled, however, by mechanism which prevents the helm from running away from the steersman. The rudder itself is connected with the rams in such a way that the latter obtain an increasing leverage as the rudder is being put hard over, when this leverage is, of course, most needed. A hydrauiic cylinder with a similar arrangement of valve and automatic controlling levers is applied to the main engines, by which they can be reversed or stopped in three seconds by a single reversing lever. The water-tight door of the shaft tunnel is also opened and closed by a hydraulic cylinder, the valve of which is near the deck, so that in the event of an accident this door can be instantly closed. In the stokehole close by is fixed a hydraulic hoist for lifting the ashes. The most valuable application of the Quetta's hydraulic machinery is to the loading and unloading of the cargo. It may be mentioned that at Colombo, in the course of the single voyage which the Quetta has already made to Calcutta and back, 1250 tons of rice were discharged in ten hours. On the Quetta's deck there are four hatches. Those at the extreme ends fore and aft are fitted with single hydraulic hoists, the two main hatches having double hydraulic hoists. Each of these hoists is capable of raising a ton and a half through a height of 70ft., at a speed of 5ft. per second. The hoists consist of hydraulic rams, fitted into cylinders, and working through stuffing boxes. Each ram is connected to three chain pulleys, while the other three are carried by the cylinder base-plate. A foot of rise in the ram raises the load 6ft. The water is admitted to the cylinder by a slide-valve worked by a single lever, whereupon the load is lifted; while, by reversing the lever, the water is allowed to escape and the load to descend. An ingenious arrangement prevents the load from running from one extremity to the other, through the unskilfulness of the driver, and thus risking damage to the cargo. A wholly inexperienced man can thus work the apparatus without any danger. The hoists will discharge cargo at the highest speed of 5ft. per second and be brought to a state of rest automatically at any position required. To summarise the advantages of the Quetta's hydraulic machinery, a pair of engines in one place do, with no noise and half the consumption of fuel, the work usually performed by, perhaps, a dozen donkey engines; while about £30 or £40 a voyage is saved in wear and tear. The increase of speed obtained in loading and discharging cargo practically insures a quicker voyage. The rapidly-working machinery necessitates double gangs of men in the hold; but, though the hands are more numerous, they are paid for a shorter time; and the cost of labour per ton of cargo is thus less than usual. The prime outlay is considerably greater than under the ordinary system; but it is calculated that in at most three years the extra expense will have been saved.

VERTICAL SLOTTING MACHINE.

MESSRS. SMITH, BEACOCK, AND TANNETT, LEEDS, ENGINEERS.



In our impression of the 7th inst., we shortly described the machinery in Messrs. Maudslay, Sons, and Co.'s Works, in view of the visit which some of the members and visitors of the Iron and Steel Institute would probably pay them. We spoke of some new tools of large size, of which we gave an illustration of one only, namely, a screwing machine to screw up to 5½in. at one cut. We now give illustrations of two other machines, prepared from photographs furnished us by the makers, Messrs. Smith, Beacock, and Tannett, of Leeds. The largest of these machines is the vertical and horizontal planing machine shown on page 298. This machine planes vertically 17ft. 6in., and horizontally 21ft.; the one motion can be changed for the other in half a minute. The work is secured to a base plate, which is so fastened to the framing of the machine that the strain of a large cut at any part of this large surface is effectually resisted. The various slides and their supports have been accurately fitted and secured at right angles to each other, so that the bed-plate columns and cylinders of a very large engine have been put together from this machine with the accuracy which must be obtained to satisfy Messrs. Maudslay, Son, and Field. It will be seen that while one job of moderate size is being planed, another may be fixed ready for the tool to come to it, and the loss of time in setting and re-setting, which ordinary planing machines incur, is in this machine avoided. The finishing cut, which may be as much as 1½in. at a stroke, is put on by hand, but we understand that Messrs. Smith, Beacock, and Tannett, now include a patent broad feed which obviates dependence on the attendant. This machine is driven by a special double-cylinder wall engine. Another machine for dealing with large forgings is the slotting machine with a 4ft. stroke, illustrated above. The vertical slide of this machine is adjustable, so as to deal with the various thicknesses of the work to great advantage. The slides which carry the table of the machine are worked by double screws to prevent the springing of the work away from the cut. One great advantage of this machine is that the workman can change the stroke from 4in. to 4ft. in a few seconds.

A very fine tool which has recently been fixed is a self-contained vertical cylinder boring machine, in which the attendant from below can raise and lower the socket on the bar at a quick speed, or with a feed, or without for facing, while the bar itself lifts up out of the way to put in or take away the work. There are two screws to the bar to secure steadiness and accuracy. A special treble-geared lathe, 25in. centre, which we have not noticed, is for dealing with shafting up to 24in. diameter, with four tools, each capable of cutting a 4 per inch feed, takes in 38ft. between centres, and finishes the couplings and body of a shaft in a very short time. The driving pinions of this lathe are of wrought iron, and the teeth are cut from the solid. There is also a large universal double boring, drilling, and tapping machine, with two heads, each having a range of 10ft and 15ft. apart. This is a very fine tool, and most useful for drilling the holes in condensers and bed-plates, and for drilling and tapping the holes for and for screwing in the studs of cylinders. There are also two of Barrow's patent screw-cutting and turning machines, one for work up to 3½in. diameter, and the other up to 5½in. diameter, which we noticed in our last impression.

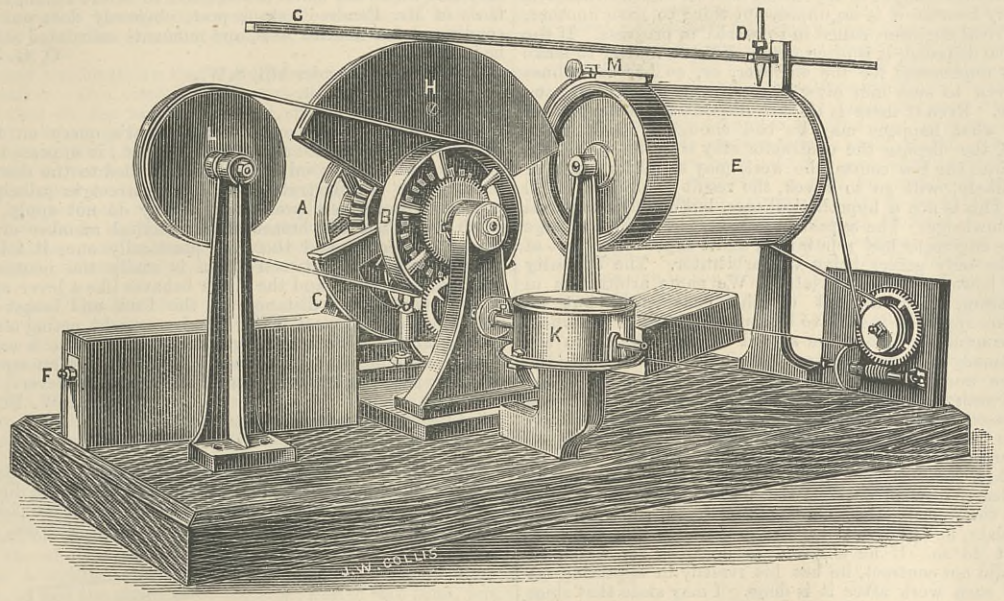
These and other tools are covered with a very powerful travelling crane by the same makers, to lift up to 40 tons, and which is driven by a square shaft with bearers which fall automatically as the crane passes, rising again, and locking into position either way in a very effective manner, swinging bearers being dispensed with. This crane is driven by a couple of small cylinders, 5in. bore and 10in. stroke, by Messrs. Tangye Brothers.

THE PARIS ELECTRICAL EXHIBITION.

No. X.

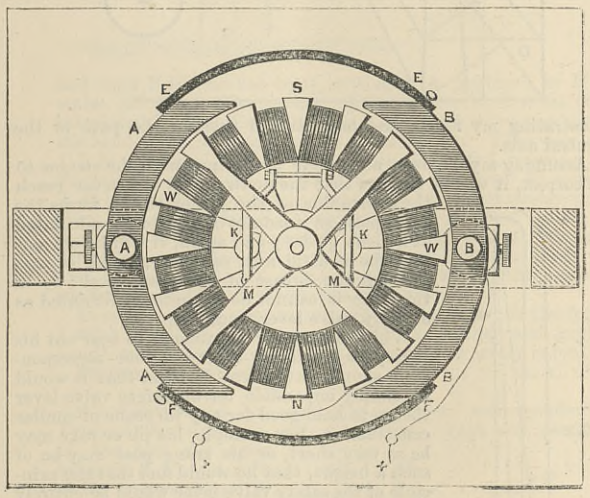
The Italian section has been conducive to surprises. We have taken considerable credit to England as having been the home of Cooke and Wheatstone, the pioneers in telegraphy. Italy, however, shows that her children had in 1837 produced better work than the cumbrous five-needle instrument of these inventors, and in the more modern development of the application of electricity to electric light purposes, Italy again shows that the modern magneto-electric machines were first devised in that sunny land. Dr. Antonio Pacinotti in 1860 constructed for the physical and technological cabinet of the University of Pisa an apparatus which has attracted probably more attention at Paris than any other machine of its kind. A description of this machine was printed in June, 1864, in the Italian scientific paper, *Il Nuovo Cimento*. Of course the designers of the various dynamo and magneto-electric machines in the Exhibition are very energetic in pointing out that their machines do really differ fundamentally on some point with that of Pacinotti or any other inventor. It nevertheless is a fact that the majority of visitors did not hesitate to openly remark that they could see no

SMITH'S DYNAMOMETER.



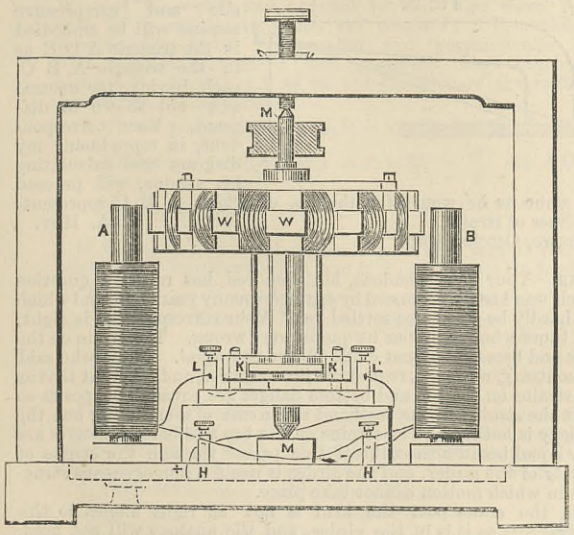
difference in principle, and hardly any in detail, between the machine of Pacinotti and some of more recent construction. Whether this arose from a too cursory examination and comparison is not for us to say; the decision will some day or other be pronounced legally from the tribunals of the country. Meanwhile it will need little elaboration of detail to enable each reader to judge for himself. Among the most important machines of this description in the Exhibition are those of Pacinotti, Gramme, Schuckert, Brush, Weston, Bürgen, Hopkinson, Andrews, Jüngerson, Meritens, Edison, Siemens, Jablockkoff, Ball, and Gülcher.

The machines of Pacinotti are models, the others are on a working scale. We do not know that Pacinotti ever constructed a working machine, but the question is more one of principle than of size. In his description, as a special feature of the apparatus, he pointed out the peculiar form of the movable electro-magnet, namely, a circular



PACINOTTI'S DYNAMO MACHINE.

iron ring, in which, contrary to the case with the armatures previously in use, the magnetic poles did not remain stationary at a particular point in the iron, but moved, so far as concerned the ring, assuming in it successively all possible different positions. This movable ring of iron had the shape of a spur wheel of sixteen teeth, and was firmly secured to the axis of the machine by means of four strips of brass M M. Small wooden wedges W W were placed upon the teeth of the ring, and the space



PACINOTTI'S DYNAMO MACHINE.

formed between two successive wedges filled up regularly with insulated copper wire. These spools were all wound in the same direction, and the terminal end of the one was soldered to the beginning of the one next to it, so that the whole system of sixteen spools virtually formed a single coil of wire surrounding the ring in a regular manner and returning upon itself. Wires were soldered to the separate points of junction, and were led parallel to the axis of rotation, to an equal number of insulated pieces of brass mounted in two rows upon, and slightly projecting from the surface of a disc, was firmly secured upon the axis.

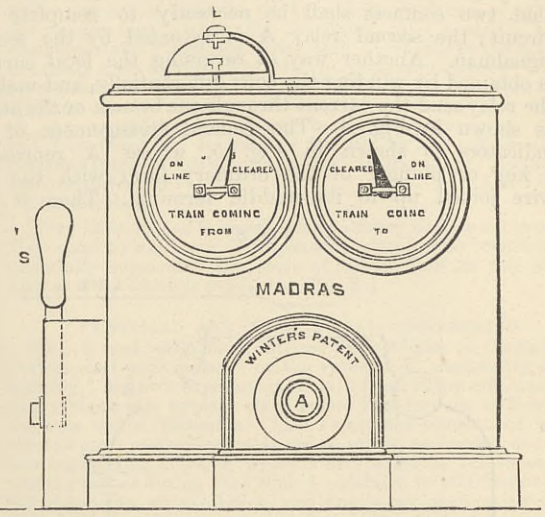
The iron ring with the bobbins wound upon it in the manner already described was mounted in a horizontal position between the two legs of a powerful electro-magnet, the distance of which from the ring could be adjusted at pleasure by means of a set screw and a slot in the lower connecting cross piece. Contact rollers K K were made to press one on each side of the axis against the lower wooden disc carrying the strips of brass, so that during the rotation of the ring all of the latter were brought successively into contact with them. When, therefore, the terminal posts H H^1 are placed in connection with the poles of a battery the current will pass, supposing it to enter at H (+) by way of the binding post L to the roller K and through the strip of brass on the disc, against which the roller may happen to press at the time up the two wire coils of the armature, whose point of juncture is in connection with this strip of brass. The current here divides, each portion passing in an opposite direction through the coils surrounding each half circumference of the ring, to meet again to form one current at the left contact roller K, whence the united current passes to L^1. From here the current passes through the coils of the electro-magnet, passing then by H^1 to the negative pole of the battery. Magnetic poles thus become developed in the ring at the points N S. In order to obtain the best effect from the electro-magnet, Pacinotti provided the two poles with soft iron extensions A A A, B B B, which were made to surround the ring very closely for over two-thirds of its circumference. Strips of brass E E, F F were attached to these pole pieces to give them greater rigidity. In the elevation of the machine here shown the pole pieces are left out in order to show the ring more clearly. Pacinotti indicated, in the article above mentioned, the way by which this machine might be made into a magneto-electric machine, to produce continuous currents of a constant direction.

On substituting for the electro-magnet A B a permanent magnet, and on rotating the ring armature, the poles induced in the ring by the proximity of the magnet will always be found at the extremities of the diameter passing, when produced, through the poles of this exterior magnet; so that the coils alone may be taken as rotating, while the poles produced by induction remain at rest. The current induced in any particular coil will, in the motion of the latter from N to S, preserve the direction it has on leaving N, until it reaches a point midway between N and S. Here a reversal in the direction of the current takes place, which new direction is preserved till the coil arrives at a point midway between S and N, when a reversal to the former direction occurs. The currents are then best collected by brushes upon the commutator at right angles to the magnetic axis of the rotating armature.

In the British section Mr. Paterson shows the transmission dynamometer of Professor Ayrton and Perry, which has been so recently illustrated in our columns that it is unnecessary to refer more to it. Another transmission dynamometer is shown by Mr. F. J. Smith, of Taunton. The construction of this instrument is as follows :—The two pulleys A B, each carrying a bevel wheel, and running loose on the same fixed shaft, are in gear with a third bevel wheel, the axis of which is carried at right angles to the axis of the other two by the sector-shaped casting C. This casting, while carrying the intermediate wheel, is capable of angular displacement, this displacement being controlled by a spiral spring within the case F, which spring is attached to the sector in such a manner that its pull always acts tangentially to it. An upper sector of wood H, fixed to the under sector and counterpoiser, carries on its edge a light rod G D, attached to the sector by two cross cords. At D a tracing point records on the drum E an ordinate, which is a measure of the extension of the spring. The drum is driven by a screw and tangent wheel at a given ratio to the speed of the pulleys A or B. A counter K is used to record the number of revolutions. The force transmitted during the investigation is known by finding the area of the diagram. The wheel and handle L is connected to the pulley B by a bell, to show how the apparatus works. The tracer D indicates the tension of the belt. The time during which the investigation lasts is shown by a lever M, which carries a tracer. The lever is actuated by an electro magnet connected to a seconds pendulum, so that the record is given in seconds. The dynamometer shown at Paris is a model, suited only for simple laboratory work, but the constructor states that other instruments similar in design have been used to transmit from 5 to 10-H.P.

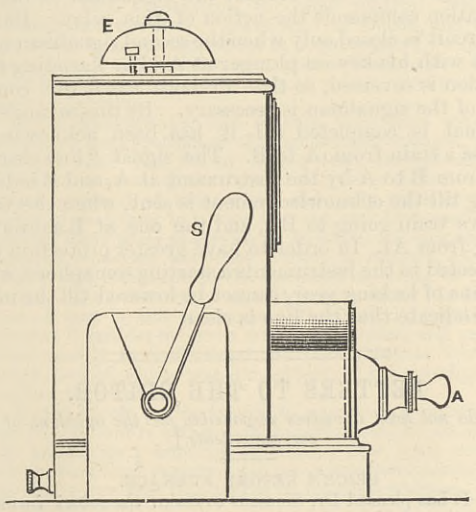
In a previous article we described Saxby and Farmer's block signalling apparatus. Messrs. Clark, Muirhead, and Co. show a system of single-line block apparatus, designed by Mr. C. W. Winter, telegraph engineer to the Madras Railway, for use on the Indian railways. The apparatus consists of an indicator, of which Figs. 1 and 2 show a

Fig. 1.



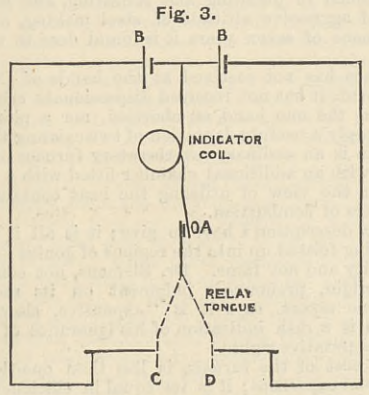
front and side view. This indicator has two dials and two pointers, the pointer to the left-hand is painted red, and refers solely to incoming trains; the other pointer is painted black, and refers to outgoing trains. Each

Fig. 2.



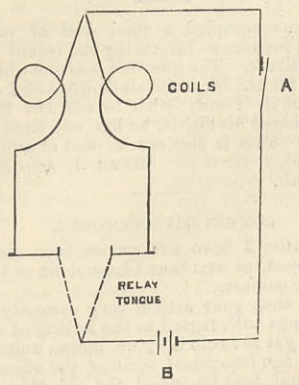
needle has two positions, namely, "cleared" and "on line." Underneath the one needle are the words, "Train coming from," while underneath the other are the words, "Train going to," the name of the station to which the instrument is connected completing the sentence. It

Fig. 3.



may be here stated that the lines for which this system is devised are principally single lines, the semaphore instruments of Mr. Preece having been adopted on some of the double lines. Winter's indicator has a plunger handle A, by means of which the contact is made to give the signal to the distant station; a bell E, to receive

Fig. 4.

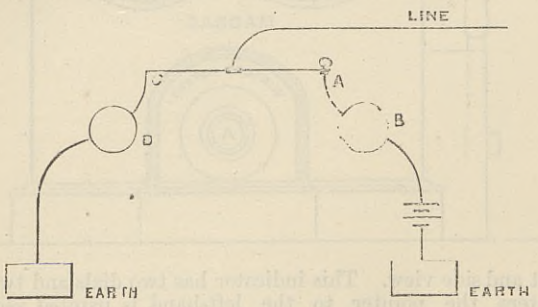


signals; and a switch handle S, by means of which the signalman controls the movements of the pointer indicating the incoming train—also that referring to the outgoing train.

The pointers are deflected by means of a local battery. The circuit of this battery is closed by the action of relays. In order to obtain the opposite deflections of the needle the direction of the current through the coils must be changed. This Mr. Winter can do by two or three

methods. Thus Fig. 3, B B, are two equal parts of the battery connected by opposite poles to the relay tongue, which makes contact either at C or D, as shown by the dotted lines, and makes the apparatus ready for the current through the influencing coil, the direction of the current depending on which contact is made. In order to secure the joint action of the signalmen Mr. Winter arranges that two contacts shall be necessary to complete the circuit; the second relay A is actuated by the second signalman. Another way of reversing the local current is obtained by winding the coils differentially, and making the relay send the current through one branch or the other, as shown in Fig. 4. The general arrangement of the indicators is shown in Fig. 5, where A represents a key or plunger of the ordinary form with the line wire joined up to its middle terminal. Then if the

Fig. 5.



polarised relay for reversing the direction of the outgoing train indicator is placed at D between the back contact which is always chosen when the key is at rest and the earth, it is evident the signalman at the distant station commands the action of this relay. But the local circuit is closed only when the second signalman makes contact with his key on plunger at A. For incoming trains the action is reversed, so that in both cases the conjoint action of the signalman is necessary. By this arrangement no signal is completed till it has been acknowledged. Suppose a train from A to B. The signal "line clear" is given from B to A by the instrument at A, and B indicates nothing till the acknowledgement is sent, when the one at A shows train going to B11, and the one at B shows train coming from A1. In order to have greater protection there is connected to the instruments a starting semaphore, which, by means of locking gear, cannot be lowered till the instruments indicate that the line is clear.

LETTERS TO THE EDITOR.

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

PRICE'S RETORT FURNACE.

Sir,—It has pleased Dr. Siemens to claim the retort furnace as an emanation of his, and to characterise the steel furnace now at work in the Royal Gun Factories as a Siemens furnace, from which circumstance I should say the retort system is in luck. When this system was first discussed, Dr. Siemens did not avow its paternity, but regarded it as an abortion, allowing it neither claim nor consideration, but deemed it a thing safe in the regions of experiment and without hope of a future. Since then it has accomplished much in puddling and reheating, and has reached the daring and aggressive altitude of steel making, and after a practical existence of seven years it is found dear to the soul of Dr. Siemens.

If this furnace has not received at the hands of Dr. Siemens reckless treatment, it has not received dispassionate criticism; for it is neither on the one hand an abortion, nor a piracy on the other. It is simply a useful adaptation of two existing things for a set purpose. It is an ordinary reverberatory furnace of the most common type, with an additional chamber fitted with a retort and air pipes, with the view of utilising the heat contained in the escaping products of combustion.

This is all the description I have to give; it is all it merits. I object to its being foisted up into the regions of genius; its highest pretence is utility and not fame. Dr. Siemens, not content with claiming its origin, pronounces judgment on its merits, and, according to one report, says it is "expensive, slow, and uncertain." This is a rash indication of his ignorance of that over which he claims putative rights.

I affirm the cost of the furnace is less than one-third of the Siemens for equal capacities; it is its equal in efficiency even for high temperatures, and of greater fuel economy. It is not my place to reply to the narrative of the Siemens furnace in the Gun Factories; suffice it to say the correct one has yet to be written. Enough for me that I assert the retort furnace had no existence for years after the stoppage of the Siemens furnace, and was not permitted a chance until other experiments had been exhausted.

I conclude by saying I never hoped to encounter the charge that the retort is the outcome of a Siemens furnace. Wm. Price.

2, St. John's-terrace, Jarrow-on-Tyne,
October 18th.

Sir,—Dr. Siemens occupied a good deal of valuable time in claiming the Price furnace as his during the recent meeting of the Iron and Steel Institute. The question was one which possessed no interest whatever for Dr. Siemens' audience, and I do not propose to say much about it. I only wish to ask Dr. Siemens why, if Mr. Price has infringed his rights, he has not sued him long since in the law courts? This is the crucial test of a man's belief that he has been injured. Memb. I. and S. Institute.

London, Oct. 20th.

COMPETITIVE TENDERS.

Sir,—I regret that I have not sooner been able to read your article on this subject, as now that I have done so I am tempted to address you on the subject.

While I admit that your article very correctly represents the actual state of things with regard to the letting of contracts in the majority of cases, yet the rule is by no means universal. My own firm several years ago recognised most of the objections you have pointed out to what may be called the old style of specification, and I venture to suggest that a general adoption by Civil Engineers of the practice I am about to describe would almost entirely meet the wants of the case. In the first place it may be taken for granted that an engineer who shirks his responsibilities is not worth his salt, and if it is desired to have work done fairly and well, and to avoid disputes, it is necessary to be fair to the contractor and not bind him by conditions which are obviously unjust or one-sided. For these reasons my firm years ago abandoned the practice of making ourselves sole arbitrators. An engineer cannot be an unbiassed referee unless he knows there is a court of appeal. I do not mean to say he will naturally lean towards his employers—indeed, in many cases his anxiety to be fair to the contractor will lead him to be hard upon his employers. On the other hand, the very fact that a final court of appeal is provided, acts as an incentive to the settlement of disputes. The main reason why engineers object to appointing another man arbitrator, is most probably because it is an unpleasant thing to have another, and perhaps rival engineer, called in to works in progress. If the arbitrator is so disposed, it is often not a difficult matter to make matters very unpleasant for the engineer, or, as has sometimes happened, even to oust him altogether—the arbitrator slipping into his shoes. Even if there is no such disposition on the part of the referee, what happens may be bad enough. Pending the settlement of the dispute the contractor may stop the works, the case may go into the law courts, the work may stand for years, or as is more likely, will go to wreck, the result being loss to all concerned. This is not a hypothetical case, but actually occurred within my knowledge. The appeal to law, cost both sides a large sum, and the engineers lost reputation, and I expect also part of their fees, the only gainer being the arbitrator. The difficulty suggested is, however, easily obviated. We name arbitrators in the specification, with consent of the contractor; but we provide that no appeal to them is to be commenced until the whole contract is completed. Thus the appeal can only be as to the amount of money due; the arbitrator cannot interfere with the conduct of the work, and there is a direct incentive given to the contractor to push on the work. If by this means the cost of the work is increased beyond the estimate, that is a matter entirely between the engineer and his employers. Having employed him they ought to be bound to trust him till the work is done, and then if they have fault to find they can dismiss him. It is clearly for their interest that they should not be allowed to fight until the work is safe. On the other hand, the contractor cannot complain, he has agreed to work under a certain engineer, and he must do so. If he is asked to do work for which he considers he did not contract, he has his remedy in appealing for the value of such work after it is done. I may state that since adopting these principles we have carried out a large number of contracts of large and small amounts, and in no case as yet have we had an arbitration. Acting on the same principle of recognising our own responsibilities, we do not throw the risk of the quantities being correct on the contractor. The work is measured finally from the plans as they may have been amended by order, and the contractor is paid according to such measurement, irrespective of the original quantities.

The only other important point in your article to which I wish to refer is with regard to very low tenders, and here it is only necessary to state my firm's practice. As you say, there is always a disposition in employers to accept the lowest offer, and indeed it is right that they should do so, provided that the offerer is a man of good standing. In the event of such an offer being materially below an estimate, we return the schedule and quantities to the contractor, asking him to satisfy himself that he has made no mistake, and at the same time call his attention specially to such items as may be prominently at variance with our own ideas. Of course, until his reply is received he is not told the amounts of the other tenders.

In giving you, Sir, at greater length than I originally anticipated, the results of my own experience, it is not my desire to claim any special merit or "patent" for the ideas expressed, as I believe our practice, or something like it, is that of many other engineers; but there can be little doubt that it would be all the better for the profession if it were more generally adopted. C. E.

Glasgow, October 6th.

LONDON, BRIGHTON, AND SOUTH COAST RAILWAY.

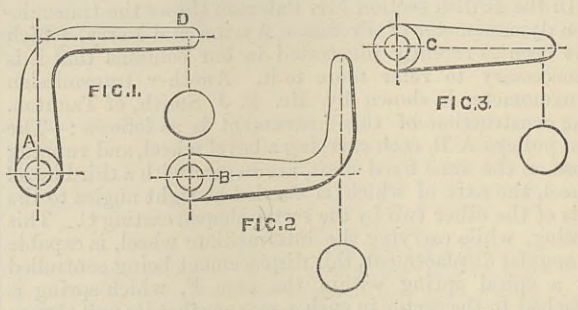
Sir,—Your descriptive account of these workshops, and the accompanying information respecting the several engines undergoing repairs, to which your attention was directed, are all highly interesting matters to me, inasmuch that the accredited result of the engine first built by Mr. Stroudley far outstrips anything I have ever witnessed or before heard of. Your report states:—"This engine commenced to work in 1871, it has performed continuously ever since, almost without cessation, and has not had any renewals except new leading axle brasses, new connecting rod end brasses"—whether large or small not stated—"and new stays round the lower part of fire-box. The ferules have not been taken from the tubes, nor have any other repairs worth mentioning been effected."

If Mr. Stroudley will kindly furnish to The Engineer some description and—if not asking too much from that gentleman—a section or sections of axleboxes and brasses, whether of passenger or goods class, and how coupled, he would confer a favour upon many of your readers which, no doubt, would be highly valued by many, but by none more so than by Foundryman.

11th October.

STRAINS ON CRANE POSTS.

Sir,—Your correspondent, Mr. Pendred, asks for an expression of opinion, and therefore will not object to being told that his view of the case is wrong. Let him imagine his crane post to be a bent lever, as in Fig. 1, communicating strain to a rocking shaft. Then referring to Fig. 2, he will probably see at once that the altered form of the lever does not alter the amount or character of the strain at the root B, and that this will be the same as for A in Fig. 1, for the vertical leverage is the same. Passing to Fig. 3, cutting off the leg of the lever will leave the strain at C the same as it previously was at B, the vertical length of lever being still the same, and we now have a clear case of a girder supported at



one end. This Mr. Pendred would treat as he did the strains on D, and quite properly. But C = B and B = A, therefore *a* and D are similarly situated.

The error made by your correspondent arises from an assumed analogy between the crane post and the safety valve system, which does not really exist. In calculating the strain upon the fulcrum pin of the valve lever, the head of the valve is taken as an axis. For the strain upon the head of the valve, the pin is taken as an axis. Applying this to his crane post, Mr. Pendred takes the front flange of the post as an axis to calculate the strain upon the back flange; but when the breaking strain is approached, if the front is to be an axis it must be so strong that it will resist strain beyond the limit at which the back fails. Similarly, to calculate the strain upon the front flange, the back flange is taken as an axis; and if it is so to act it must resist strain beyond the limit at which the front flange fails. This is "every man as good as another, and better too."

But Mr. Pendred doubtless intended both his flanges to fail—or reach their limit of elasticity—simultaneously; and then evidently neither could act as an axis for the other, for both would be moving about an axis lying somewhere between them—midway if the post were properly designed.

For the purposes of design the neutral axis should be assumed to be in the centre, as leading to the best distribution of metal. It should be borne in mind that the neutral axis of any girder or cantilever, as implied by the term, is a line where the material is subjected to no strain of extension or compression, and is the line of demarcation between the two classes of strain. About this axis all the moments of strain and resistance must be calculated. Any line where the metal is subjected to severe strain, such as the faces of Mr. Pendred's crane post, obviously does not fulfil the condition of a neutral axis, and moments calculated about it will be incorrect. C. G. Major.

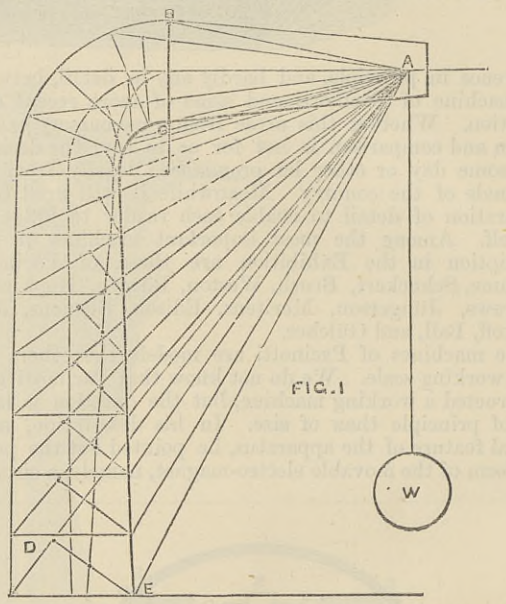
Treke-road, Lavender-hill, S.W.,
October 7th.

Sir,—In reply to your correspondent's query on the above subject, in The Engineer of the 7th inst., it appears to me that Mr. Pendred's safety valve simile, as applied to the description of crane which he illustrates, would be correct in principle if the valve conditions were present; but they do not apply, for inasmuch as the back and breast of the vertical member or mast are rigidly connected, and therefore practically one, it follows that half the distance between them is really the neutral axis or imaginary fulcrum, and the girder behaves like a lever of the first order, *videlicet* the distances of the back and breast from the neutral axis or fulcrum being equal, a weight acting on the jib—or long arm of the imaginary lever—will produce a compressive strain on the breast, which must be balanced by an equal tensile strain on the back or short arm of the imaginary lever.

Edward W. Furrell.

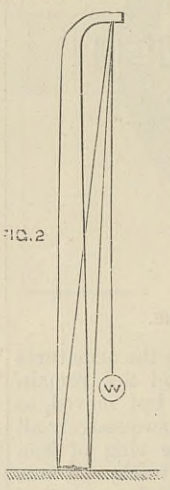
6, Cowley-street, Westminster, October 8th.

Sir,—My attention was attracted by a letter in your last week's issue on the above subject, and having considered the directions of the strains to which the box girder forming the crane post and jib will be subject, I have constructed the annexed diagram, Fig. 1.



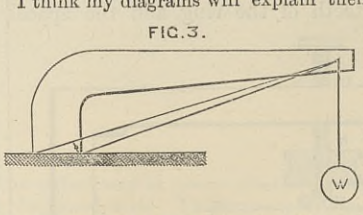
illustrating my result, and have traced thereon the path of the neutral axis.

Assuming my diagram and mode of dealing with the strains to be correct, it will be obvious that the neutral axis can never reach the centre line of the girder which forms the crane post, so it cannot be altogether calculated as a bent girder; and again, it will be obvious that the neutral axis can never touch or pass through the breast of the crane post; so in this case it cannot be altogether calculated as a safety valve lever would be.



Whilst advancing arguments to bear out his theory to his fellow-engineer, your correspondent should have borne in mind that it would be simply impossible for his safety valve lever theory to hold good for any jib crane of similar construction. For example, his jib or rake may be so very short, or his crane post may be of such a height, that he would find that the principle of the safety valve lever would be entirely lost at the bottom of the crane post—Fig. 2. So, also, his opponent in argument should have borne in mind that an opposite case may happen which would almost entirely overthrow his theory of the neutral axis and the centre line of crane post, being one and the same. For example, the jib of the crane may be so very long, or the crane post so very short, that it would be almost absurd to calculate it in any other manner than as your correspondent suggests, viz., as a safety valve lever—Fig. 3.

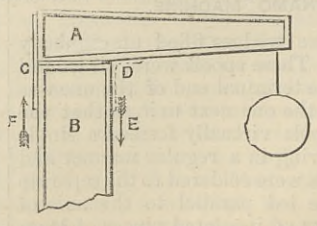
I think my diagrams will explain themselves. The same principle as regards the tensile and compressive strains will be embodied in the triangle A D E as in the triangle A B C, each having its neutral axis—not shown in diagram. Your correspondent, in reproducing my diagram and calculating his strains, will proceed the same as he would for the jib, of which A B C represents the lines of strains. H. A. Hoy.



Crewe, October 10th.

Sir,—Your correspondent, Mr. Pendred, has raised a question which was keenly discussed by engineers many years ago, and which can hardly be said to be settled yet. Your correspondent is right, and those whose opinions he quotes were wrong. The strain on the back and breast of a bent crane jib are not equal. Those who said the contrary, no doubt, regard the jib as a girder, and point out that as the strains on the top and bottom flanges are equal and opposite so must the strains on the back and the breast of a crane jib; but the analogy is not fair. The strains on the top and bottom flanges are only equal because the neutral axis passes through the centre of gravity of the girder, and the girder is itself a homogeneous structure in which motion cannot take place.

In the crane post the load is not at right angles to the neutral axis as it is in the girder, and the analogy will not hold.



Let us suppose that a crane jib is made as in the sketch. B is a vertical box girder, A is another box girder, at D is a liner of hard iron, C is a covering plate rivetted on to A and B. It is clear that in this arrangement the strain on the breast of the crane in the direction of the arrow E is greater than the strain at the back of the post, shown by the arrow F. I do not think this will be disputed. If, now, while the maximum load is on the crane, a heavy angle iron, shown by dotted lines, were put in place and bolted firmly to the jib A and post B, we should have a so-called

rigid connection made between the two, but the conditions so far as the strains are concerned would remain unaltered, and the breast of the crane would carry more strain than the back.

In a word, the assumption that the strains on the back and breast of a crane post are identical, is based on the theory that the two are absolutely homogeneous and rigid, conclusions which cannot possibly take place in a built-up crane, and are barely true of a cast iron bent jib.

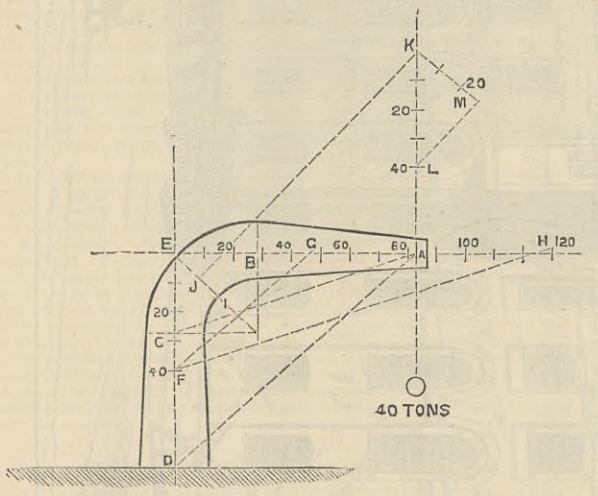
It may also be shown that the difference in strains in the case of the safety valve cited by your correspondent is purely statical, and exists on the assumption that the valve with its lever and weight is a homogeneous whole.

Consequently it is clear that in a crane in which any power of internal adjustment exists the result must be as supposed by your correspondent. It is, however, possible to show in theory that in a perfectly rigid homogeneous jib the strains on back and breast would be equal and opposite, but this is a theoretical, not a practical case, and in dealing with a practical case your correspondent reasoned accurately, and acted with propriety in preparing his design.

LOUIS SEGUIN.

Liverpool, October 10th.

SIR,—If your correspondent, Mr. Pendred, will examine the accompanying diagram of the strains on his 40-ton tubular crane, he will see that the post C D is as much a beam or cantilever as the jib A B, and subject to a cross bearing strain at right angles, induced by the load on the crane jib. The neutral axis then will occupy a similar position in either part. The diagram is constructed as follows :—From the point E, set down E F, representing 40 tons to any scale, join D A, and draw F G parallel to D A, cutting E A in G, then E G to the same scale as E F measures 47 tons. So the load of 40 tons hanging on the crane jib produces a strain of 47 tons acting along the line E A, and tending to overturn the whole crane. The section at D must then be calculated as for a cantilever, of length E D, loaded with 47 tons at E. Next, to find the strain at C, the lower end of the bend, join C A,

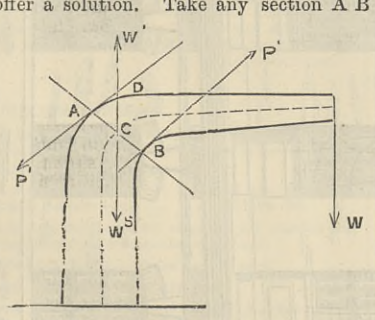


and draw F H parallel to it, cutting E A produced in H; E H scales 125 tons. The section of the girder at C must then be calculated for a strain of 125 tons acting with a leverage E C. In the bend the strains are of the same nature. Take any section E I, bisect it in J, draw J K perpendicular to D I, meeting A K in the point K; from K set down K L to represent 40 tons, draw K M L M perpendicular and parallel to J K and intersecting in M; then K M will be found to scale 28 tons, and the section at E I must be calculated to meet 28 tons, acting with a leverage J K. There is another and still simpler method by which these strains may be calculated, but I have preferred to use the above, as it renders the nature of the strains more evident.

In conclusion, if your correspondent comprehends the foregoing I think it will be hardly necessary to go further and explain at length why a tubular crane does not act like a safety valve.

Portsea, October 10th. A. C. PAIN.

SIR,—Respecting the difficulty of your correspondent, Mr. Pendred, I venture to offer a solution. Take any section A B of the post and draw tangents A P_1 and B P_1 at the points A and B. Assuming that the outer and inner plates take all the tensile and compressive stresses, and that the side plates simply take the shearing stress, the direction of the stresses at A and B will be in the direction of the tangents. Bisect A B at C, and introduce at that point two equal and oppositely directed forces W_1 and W_2 equal and parallel to W. The force W_1 forms with W a couple, to which the couple P_1 A B must be equal. Resolve the force W_2 parallel and perpendicular to A B. The parallel component will represent the shearing stress along A B. Taking A B to be the direction of the radius of the two curves, we have the—



Thrust perpendicular to A B = W sin. A C D;

Therefore, tension along $A P_1 = P_1 - \frac{W}{2}$ sin. A C D;

Compression along $B P_1 = P_1 + \frac{W}{2}$ sin. A C D.

If we take a horizontal section in a vertical part of the post, the angle A C D becomes 90 deg., and if P_2 represents the forces of the couple, the

$$\text{Tension along outer plate} = P_2 - \frac{W}{2}$$

$$\text{Compression along inner plate} = P_2 + \frac{W}{2}$$

Hence, so far as the vertical part of the post is concerned, and granted we may make the above assumptions, the analogy of the safety valve lever will hold; but it does not follow that the neutral axis coincides with the inner plate.

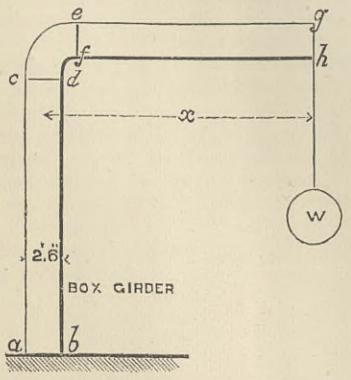
W. H. TOZER.

4, Palmerston-road, Ipswich, Oct. 11th.

SIR,—I am inclined to think that the proposed discussion on the above subject will be all on one side, as I doubt that your correspondent will find any one among your readers that will agree with him, and I am afraid the "eminent authority" was right after all. I should like to know where your correspondent would place the neutral axis of his crane supposing the post was solid, and not of the box form. As I understand him, he would place it at the edge of the post under the jib, the whole of the metal behind it being in tension; where then is the resistance to this tension to produce equilibrium? Your correspondent's idea would be correct—with the exception of the position of the neutral axis—if there were no side plates to connect the two members of the post. Being connected, the strains are exactly the same as in an ordinary girder. The illustration of the safety valve lever does not apply, as the lever itself is the crane post, and the fulcrum the point of support or the overturning point of the crane supposing it stood on the ground, or was made in halves and bolted together.

Merrion, Co. Dublin, October 11th. H. W. G.

SIR,—Your correspondent, Mr. W. H. Pendred, in your last week's issue, asks for some information respecting the strains in a certain description of crane. Perhaps the following brief statement may interest him :—For purposes of calculation, suppose the crane to be divided into three portions as follows :—(1) The jib, between *e f* and *g h*; (2) the rounded head, between *c d* and *e f*; (3) the mast, between *c d* and *a b*. The first portion is simply a cantilever, and the strains may be easily found. The second portion, or the rounded head *c d f e*, is somewhat more difficult to calculate accurately. However, it will be sufficient to make the web between *c e* and *d f* strong enough to resist the thrust caused by the flanges *c e* and *d f* tending to meet, + the shearing force due to the weight W. For the vertical portion, or mast between *c d* and *a b*, both Mr. Pendred and his friends have neglected the action due to the weight W, and the structure should certainly not be taken simply as a bent girder. Mr. Pendred would no doubt be correct in his "safety valve theory" if there were no web



between the back and breast of the mast; but as the section is a box girder he is not quite correct. He has, however, erred on the side of safety. The bending moment on the mast is the length x measured from the centre of gravity of the weight to the neutral axis of the mast, multiplied by the weight itself. The strains on the breast of the mast will of course be +, or compression, and on the back —, or tension. To these, however, must be added the strains caused by the weight, which may considerably modify those caused by the bending moments. Thus, calling A the area of the section of the mast, the strain per square unit from the weight will be $\frac{W}{A}$, and it will be uniform, or nearly uniform, in the mast, between *c d* and *a b*, and of course will be +, or compression. The amount per square unit so found must be deducted from the strain at the back of the mast and added to that at the breast caused by the bending moment. To take a numerical example—

Suppose the length $x = 16{\cdot}25$ft., suppose the weight W = 20 tons, suppose the section of the mast to consist of back and breast flange plates 20in. broad and 1in. thick, the web plates—two—each 28in. broad and $\frac{1}{4}$in. thick, and the four angle irons joining these plates together at the corners to be 4in. × 4in. × $\frac{1}{4}$in. each;

The bending moment will = W x = 20 × 16·25 × 12 = 3900 inch-tons;

The moment of inertia I = 11,814 inch-units;

The area of section A = 69 square inches;

The moment of resistance R of the section = $\frac{I}{B} \times 2 = 787$ inch-tons at 1 ton per square inch on the extreme fibres, B being the depth of the section and equal to 30in.

Therefore the strain on the back and breast of the mast from the bending moment alone = $\frac{W\ x}{R} = \frac{3900}{787} = 4{\cdot}95$ tons per square inch

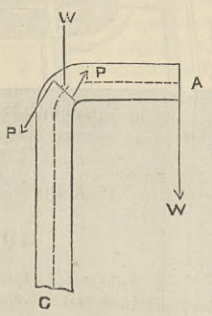
The compression caused by the weight—supposing the pressure to be uniformly spread over the entire section = $\frac{W}{A} = \frac{20}{69} = 0{\cdot}29$ tons per square inch.

And the total strain on the extreme fibres at the back and breast of the mast = 4·95 ± 0·29—being 4·66 tons per square inch for the back, and 5·24 tons per square inch for the breast. Mr. Pendred's values for the same parts would be somewhat different.

ALFRED FYSON.

13A, Great George-street, Westminster, S.W.

SIR,—The case proposed for investigation by your correspondent, Mr. Hamilton Pendred, seems to me a very simple one; and, notwithstanding the decisions of the authorities to whom he refers, I think he is perfectly right about the stresses.



Let B be any section normal to the centre line A B C, and inclined at an angle θ to a horizontal plane. Let x be the distance from the centre of section B to the vertical line AW. Let h be the distance between the lines of action of the resultants of stresses in each half-section of the post.

Now, the stresses at the section B must be in equilibrium with the weight W. These stresses must therefore supply a vertical reaction, − W acting at centre of section; but W and − W form a couple of moment Wx, and the remaining stresses at section B must form another couple of opposite kind and equal moment, in order that the weight and stresses may be in equilibrium. Let P and − P be the resultants of these stresses, having a moment—

$$Ph = Wx; \text{ therefore } P = \frac{Wx}{h}.$$

The resultants of the stresses at section B are P, − P, and − W; that is

$$\frac{Wx}{h}, \quad \frac{-Wx}{h}, \quad \text{and} \quad -W.$$

Let this latter be resolved into components tangential and normal to B; the former component gives a tangential resultant stress, − W sin. θ; and the latter a normal one, − W cos. θ. The former does not affect the normal stresses; these are therefore,

$$\frac{Wx}{h} - \frac{W \cos.\ \theta}{2} \text{ and } \frac{-Wx}{h} - \frac{W \cos.\ \theta}{2},$$

the negative sign indicating stresses due to compression, and the positive those due to tension. If the section B is vertical, θ = 90 deg. and cos. θ = 0. The resultant stresses are therefore,

$$\frac{Wx}{h} \text{ and } \frac{-Wx}{h}.$$

If the section is horizontal, θ = 0 and cos. θ = 1. The resultant stresses are therefore in this case—

$$\frac{Wx}{h} - \frac{\text{cos.}}{2} \text{ and } \frac{-Wx}{h} - \frac{W}{2}.$$

Glasgow, October 12th. J. H. H.

WIND PRESSURE.

SIR,—In your issue for 26th August, 1881, you publish the report of the committee to consider "The Question of Wind Pressures on Railway Structures," and on the 30th September you publish a paper read before the British Association by Mr. Thomas Hawksley "On the Pressure of Wind upon a Fixed Plane," with a table annexed to both report and paper. The difference in these tables is remarkable. As an instance—the committee which is composed of one or two leading engineers, state "that the wind with a velocity of 100 miles per hour gives a pressure of 100 lb. to the square foot," while Mr. Hawksley, who is also a leading engineer, states "that the wind with a velocity of 102 miles per hour only gives a pressure of 56·25 lb. to the square foot." This is a very considerable difference, and places a young engineer in a dilemma as to which to follow; if he takes the formula of the committee he may have an extravagant design, and if he takes Mr. Hawksley's formula he may not be safe. Is our knowledge on this subject still so vague, or can you account for this difference? A.M.I.C.E.

12th October.

[Very little indeed is known with accuracy about wind pressures. The report to which our correspondent refers cannot be said to have materially augmented the store of information on this subject, such as it is, which is available.—ED. E.]

PRACTICAL AND THEORETICAL ENGINEERING.

SIR,—I read with much interest your articles on Cooper's Hill College, and your remarks on the value of an engineering college training. My own experiences are still fresh in my mind, and you may perhaps care to place them before your readers, as bearing on the case under discussion. This experience commenced when I entered some mechanical engineering works, on leaving one of our first engineering colleges, where I had taken the full three years' course; and as during that time I obtained, in addition to a long list of honours, an exhibition, and finally my engineering degree, I think I am entitled to say that I made the most of my time.

From all the glories of being a third year man, I suddenly descended, to find myself a unit in large engineering works; small as it may now appear to me, the change was then a grievous one. My estimate of myself fell—and pretty considerably too, when on entering practical life, I compared myself with those with whom I had now to measure myself. I frankly admit my disappointment was great. I passed through the shops, then through the drawing-office, in each experiencing the same chagrin. Mechanics who probably had not even "heard tell" of Euclid, and whose brains had never wearied themselves in contemplating the properties of the various sections of the cone, possessed a knowledge of the laying down of centre lines, setting of valves, excentrics, &c., which was not yet mine.

Junior draughtsmen, who to save their lives could not have calculated the hypothenuse of a right-angled triangle, having given the two sides—but yet by laying down the triangle to a large scale, and measuring the hypotenuse, never failed to obtain it—I found possessed of those rough-and-ready rules of thumb, that power of designing to please the eye, and that confidence which enabled them to be of service in an office, my lack of these qualifications rendering worthless, almost to ridicule, all the mathematics and mechanics I was prepared to bring to bear on the design. Do I then regret my college education? In ten or twenty years I may be able to answer authoritatively. But even now I see that it enables me more readily to acquire, and most certainly more readily to understand, all that practical knowledge, the acquisition of which was the object of my entering mechanical engineering works.

Whilst I look to the future to answer my question, I cannot but believe that it will give me opportunities for utilising much of the knowledge I acquired at college, now lying unworked, and which when least expected will prove most serviceable to me, more especially now that it is backed by practical training. C. G. E.

October 17th.

PATENT LAW REFORM.—Efforts are being made in Manchester to form a society with the object of obtaining a reform of the patent law, and on Friday evening a meeting with this purpose in view was convened at the Cotton Waste Dealers' Exchange, Manchester; but the very small attendance which was got together did not afford much encouragement as to the success of the movement. A start, however, was made, and, under the presidency of Mr. G. Redson, resolutions were passed affirming the desirability of urging the Government to undertake, without delay, the reform of the patent laws; condemning the bill proposed by the Society of Arts, on the ground that it would place too much power of interference and control in the hands of a few officials; and recommending Mr. Anderson's bill, with certain modifications, as calculated to produce a satisfactory law.

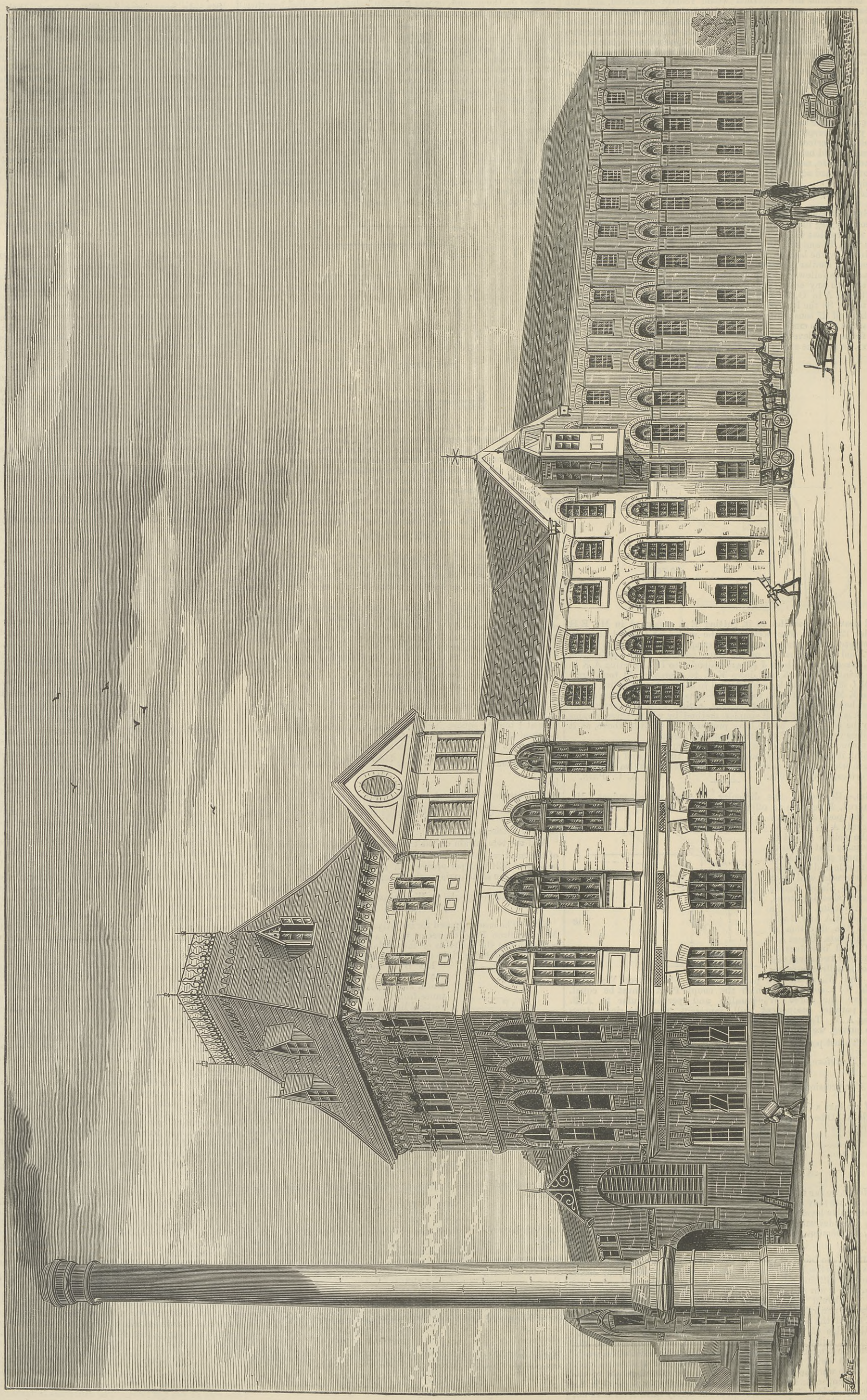
STEEL RAILS.—Some of our friends, says the Boston *Advertiser*, are unhappy about the duty on steel rails. It is a tax levied on transportation, they say. If we were to admit it for the sake of argument, what does it prove? Only this: that we choose one way of taxation, while other countries prefer another. For instance, Great Britain levies an excise tax upon all railways at the rate of 5 per cent. of their gross passenger receipts. This tax has brought in about 2,500,000 dols. in 1874, and must have increased to more than 3,000,000 dols. by this time. Such a tax laid upon American roads would have yielded 5,000,000 dols. in 1880. Ten million tons of steel rails would relay every rod of railroad in the United States with rails as heavy as those of the New York Central Road. The gross amount of tariff such a weight of steel would yield is 210,000,000 dols., which capitalised at 5 per cent. would bear interest only twice as much in amount as would be raised by direct taxation under the British system. As a matter of fact, however, only a small part of our railroad system is using steel rails, and in spite of the presumed heavy taxation the charges for freight and passenger business are very low.

SET RIVETTING.—At the recent convention of railroad master mechanics, Mr. Wells read a paper upon the subject of "set rivetting" as compared with "steam" and "hand" rivetting of locomotive boilers, an epitome of which we give. The plan of "set" rivetting consists in placing upon the inserted hot rivet a set, mounted upon a handle, as smiths' sets, flatters and hot chisels are, and having a cavity of the shape and dimensions of the desired head in its lower end, and "driving" the rivet by strokes from one or more sledges upon the other end of the set, a heavy holding iron being used to meet by its inertia the force of the sledges. The weight of the set described is 2½ lb. to 3 lb., of the sledges 9 lb. to 10 lb., while the holder or anvil placed upon the other end or head of the rivet is about 60 lb., and held firmly against the work by the short arm of a stiff lever of the first order. The work consists merely in properly placing the holder, holding the set squarely on the rivet and delivering fair blows upon its upper end. The first blows serve to upset the body of the rivet in the hole more effectually than blows struck with light hammers directly on the rivet point, and twenty-four blows in all, at the rate of about eighty per minute, finish the "setting" of the rivet, and half-a-dozen blows upon a "flatter" placed on the lap near the rivet completes one rivet, except a few blows more on the set to give the head a nice finish according to the taste of the workman. Thus are driven on the shell of a boiler thirty rivets per hour, or an average of twenty-two on all parts, including changing bolts, drifting holes, and adjusting the work. Hand rivetters average about 125 rivets per day of twelve hours and a-half, or ten per hour, under similar conditions. Mr. Wells' paper shows that the rivetting of a locomotive boiler containing 1722 rivets will occupy 65·85 hours, at a total cost for labour of 44·77 dols., or an average of 2·64 cents each rivet, against which stands 5·84 cents each for rivets driven by hand at the rate of ten per hour. The difference in favour of set rivetting is shown to be 54 per cent. in cost and 51 per cent. in time.

SIXTY-QUARTER BREWERY FOR MESSRS. H. MITCHELL AND CO., CAPE HILL, BIRMINGHAM.

MESSRS SCAMELL AND COLLYER, WESTMINSTER, ENGINEERS.

(For description see page 300.)



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TO CORRESPONDENTS.

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

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C. M. P.—*Messrs. Easton and Anderson, Erith Ironworks, Erith, Kent.*

J. W. C. G.—*You can obtain full particulars by writing to the Board of Trade, Whitehall, London.*

Doevis.—*If you think proper to tell us what your invention is, we shall be happy to give you an opinion on its merits.*

B. and J. (Bury).—(1) *We do not know who makes the boiler you name.* (2) *Apply to the Safe and Sure Steam Boiler Company, Birmingham.*

Q. E. D. (Middlesbrough).—*Messrs. Armstrong, Stevens, and Co.*, 15, *Whittall-street, St. Mary's, Birmingham; Messrs. Newall and Barker, Atlas Works, Warrington; Mr. F. Dixon*, 56, *Parker-street, Warrington; F. Baraclough*, 8, *King-street, Manchester; W. Causer and Co., Soho, near Birmingham.*

D. A. (Belfort).—*We have not published any addition to the French Dictionary issued as a Supplement to* The Engineer *in* 1868. *Tolhausen's "Technological Dictionary," English, French, and German, published in* 1874 *by Sampson Low, Marston, Low, and Searle, Fleet-street, will fully meet your wants.*

X.—*Drip condensers have been used in the north. One was fitted some years ago, if we are not mistaken, at the works of Messrs. Cochrane, Grove, and Co., Middlesbrough. Messrs. Pontifex, of Shoe-lane, used one for some years, and they have been employed in sugar works for exhausting the vacuum pans. We cannot endorse Sir F. Bramwell's favourable opinion of them.*

C. J. L.—*Nothing would be gained by publishing your letter. You are quite mistaken in your views. There is no loss of power incurred by using a crank, although the driving force varies continuously. You might as well maintain that there was a waste of power caused by the varying pressure in the cylinder. Power is calculated by multiplying pressure by space passed over. Thus, at one time, when the crank is nearly at right angles with the connecting-rod, the speed of a piston is, say,* 600*ft. per minute; the pressure on it is, say,* 10,000 *lb. Then power will be expended at the rate of* 181-*I.H.P., and steam will be used at a proportionate rate. When the crank is near the dead point the velocity of the piston will be but, say,* 1*ft. per minute, and power will then be expended at the rate of but one-third of an indicated horse-power per hour; but steam is taken from the boiler at but* $\frac{1}{360}$ *part of the previous rate. Thus there is no loss of power, the quantity of steam used being always proportionate to the piston speed, and that again bearing a direct relation to the crank angle and turning moment.*

MINERAL OIL FUEL.

(*To the Editor of The Engineer.*)

Sir,—Will any of your readers give me some information as to the use of petroleum under a steam boiler—say of 1-horse power—the most suitable boiler, and mode of burning the oil, and the quantity of water evaporated by the consumption of 1 lb. of fuel? I shall also be glad to know where I can find any recorded experiments on the evaporative power of petroleum, and the most approved mode of using it.

Oct. 19th. An Old Subscriber.

CUPOLA PRACTICE.

(*To the Editor of The Engineer.*)

Sir, –I am about fixing a new cupola, the casing of which is 3ft. 6in. diameter by 12ft. high. I shall be glad to know the most approved way of fitting it up, to melt, say, 30 cwt. of very hot iron at each blow. I am now using a 30in. Günther fan, and running it at 1600 revolutions per minute. I find I cannot, without a great expenditure of power and having tight belts, &c., run it much faster. I have two 6in. tuyeres to my present cupola, the internal diameter of which is 22in., and the iron comes out fairly hot, but not sufficiently for running very light castings. I should like to know what is about the best thing I can do to get it hotter. Some people would say, "use more coke," but that I have already tried. I think the only thing required is more blast, and I should like to know if a blower is a necessity in this case. I have heard many contradictory opinions respecting them, but have not seen them in use. A few lines from some one who can assist me will greatly oblige

Uttoxeter, October 15th. Ironfounder.

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ADVERTISEMENTS.

MEETING NEXT WEEK.

Institution of Mechanical Engineers.—Friday, Oct. 28th, the following papers will be read and discussed at the Manchester meeting:—"On Bessemer Steel Plant," with special reference to the Erimus Works, by Mr. C. J. Copeland, of Barrow-in-Furness. "On Compressed Air upon Tramways," by Mr. W. D. Scott-Moncrieff, of London. "On Meters for Registering Small Flows of Water," by Mr. J. J. Tylor, of London.

BIRTH.

On the 8th inst., at 15, Park-drive, Heaton, Bradford, the wife of Alexr. R Lin...., M. Inst. C.E., late Indian Public Works Dept., of a daughter.

THE ENGINEER.

OCTOBER 21, 1881.

TRAIN RESISTANCES.

At a very early period indeed in the history of railways, experiments were made to ascertain the resistance offered to traction by trains of various descriptions of vehicle. The first record of such an inquiry is to be found in Wood's "Practical Treatise on Railroads," and few investigations have been more carefully conducted. Wood, however, arrived at conclusions very different from those now accepted as correct. For example, he says that "the resistance by the rolling of the wheels is an uniformly retarding force, both with respect to velocity and weight." He carried out two sets of experiments. The first on the friction of railway axles. This he found to be constant, whatever the velocity, and amounting, in the most favourable cases, to one-twenty-third of the insistant weight. That is to say, the coefficient of friction was ·0434. Under less favourable conditions it was ·05. The second series of experiments determined the rolling resistance of wheels on straight, level rails; and this also he found to be constant at all velocities, and amounting to one-thousandth part of the load. Adding these together he arrived at the total resistance. Thus in a table he gives such figures as these—Weight of carriage, 8540 lb.; total resistance, 39 lb.; resistance of wheels on rails, 8·54 lb.; resistance of the axles by attrition, 30·46 lb.; and he gives the power required to drag any carriage along a railroad,

$$P = \frac{W}{f} + \frac{W^1}{f^1 \frac{d}{D}}$$

where $f = ·001$, or the 1000th part of W, the whole weight of carriage and wheels, $f^1 = ·01666$, the 60th part of W^1, or the weight resting on the axles. It is known now very well that train resistance is not a constant, but that it augments rapidly as the speed increases; but it does not appear that there is any incongruity between this fact and the result of Wood's experiments. Axle friction is no doubt very nearly a constant, and so is the rolling friction. Wood's conclusions are based on the theory that axle friction and rolling friction represent all the resistances to the movement of a train, which is not true. In 1838, Dr. Lardner induced the British Association to appoint a committee, and to appropriate funds to make a series of experiments on railroad resistances. The experiments consisted in despatching trains at high velocities down an inclined plane. According to the then existing theories the velocity of a train under such circumstances would continually increase. Of course it was found that nothing of the kind took place; the train moving more and more slowly until a certain velocity which remained constant was reached. "All these circumstances," writes Lardner, "supplied at once the conclusion that the principle generally received by engineers, that the resistance to railway trains was independent of the speed, was altogether erroneous, and that, on the contrary, that resistance varied in a very high ratio with the speed of the train." We think that the credit of first discovering and announcing this important fact is due to Lardner. As it is clear that axle friction is constant, and almost certain that rolling friction is constant, it is evident that the cause of the augmented resistance must be sought elsewhere than on the rails or the axle boxes. Lardner's further experiments, made by Lardner, Hardman Earle, and Edward Woods, showed that it is largely due to the air, and "established the general principle that the resistance of the atmosphere to railway trains, other things being the same, depends on the volume or magnitude of the loads." Those who wish to go further into this subject may consult the published Proceedings, of the British Association for 1838, page 197, and 1841, page 205. There are, however, other causes of resistance besides the air which vary with the velocity. All the jerks and jumps, and concussions and oscillations of a train represent waste of power and loss of tractive effort, and these no doubt increase in a rapid ratio with the speed. Into this question we do not propose, however, to go. Our object is to show that the question of train resistance has been closely investigated from a very early period.

We are not aware by whom the attempt was first made to fit a dynamometer between an engine and train to ascertain the pull of the former on the latter. At an early date, however, Babbage fitted up an experimental brake van with a dynamometer; this registered the pull on an endless paper band by means of a pencil, and several experiments were made with it on the Great Western Railway. Since then various experimenters have pursued the same line of inquiry. The most noteworthy experiments ever made in this connection were, no doubt, those of MM. Vuillemin, Guebhard, and Dieudonné, with which most of our readers are no doubt familiar. The most recent, and we may, perhaps, add, the most elaborate inquiry made has been carried out on the Chemin de Fer d l'Est, by Mr. M. L. Regray, locomotive superintendent of the line. The experiments have been made with the aid of a van fitted with special apparatus. This van was exhibited in Paris in 1878, and may now be seen in the Electrical Exhibition at Paris. The apparatus is very elaborate, and by the aid of electricity there is recorded in the van, when it is attached to a train, the hour, the place of the train on the line at any given moment, the pressure in the boiler, four diagrams showing the action of the steam on the four faces of the two pistons—the degree of opening of the regulator, the opening of the blast pipe, the number of revolutions per second, and the tractive resistance of the train. It is an open question, whether the advantages gained by the employment of the elaborate electrical apparatus used are worth the trouble and expense incurred. Those who wish for further information than we can find space for, concerning this van, will do well to procure a "Note on a First Series of Experiments undertaken by the Eastern of France Railway Company," published at 49, Quai Des Grand Augustins, Paris. Our attention is for the present confined to the results obtained.

The tables in which they are set forth are supposed to give the essence of the results of a series of observations made with engines 502 and 503; but the tables require very careful examination before anything can be made of them, and certain averages which they contain are not more trustworthy than averages generally are. The experiments were made with 118 trains, being for the greater part expresses running between Paris and Chaumont. As it was possible to compare with the greatest precision the diagrams taken at a given instant with the draught at the same moment, no difficulty has been met with in ascertaining how much of the work of the steam is expended in pulling the train, how much in overcoming the resistances of all kinds of the engine. We are not aware that this has ever before been done with such accuracy. It appears that engine No. 502 appropriated 34·2, and engine 503 as much as 35·6 per cent. of the whole indicated power. The engines are four-coupled. This waste is much higher than would be expected, and it is very desirable that the experiments should be repeated with other types of engine, to ascertain how far type affects the question. Thus, for instance, single and coupled engines might be compared.

As regards train resistance, M. Regray has a good deal to say, but he very prudently begins by telling us almost at the outset that "the causes of error are innumerable," which we can very well believe. Notwithstanding the elaborate character of the appliances at M. Regray's disposal, he has not succeeded in giving the world much information that is new concerning train resistance. A table shows, as the result of 381 observations, that the resistance of trains of 60 to 100 tons, running at 41 miles an hour, is 7·39 kilos., or 16·258 lb. per tonne of 2222 lb. Again, 365 experiments with trains of 100 to 120 tons, show that at 35·8 miles and more the resistance is 6·83 kilos., or 15·026 lb. per tonne; while with trains of 120 to 200 tons the resistance, ascertained from 164 experiments, at 35·3 miles an hour is 6·52 kilos., or 14·344 lb. per tonne. M. Regray deduces the following formula:—Let r = the resistance in kilogrammes per tonne; V the speed in kilometres per hour; P the weight of the train in tonnes. Then $r = 0·0843\ V + 2·34 - \frac{P}{200}$. It seems, however, that within the limit of weight dealt with by M. Regray, the influence of P is so small that it may be neglected, that is to say, the resistance *per ton* is practically independent of the number of tons in the train; therefore, $r = ·0843\ V + 1·83$, or this equation may be put in the form of $r = \frac{3\ (2\ V. + 43)}{71}$.

As M. Regray proceeds with his investigations he will, no doubt, accumulate more facts of value; but to go on simply testing train after train will do little good. Inquiries should now be directed to ascertaining what type of vehicle offers least resistance—how, for example, does bogie stock compare with four-wheeled ordinary stock; and how, again, does this compare with six-wheeled carriages. Furthermore, the investigations with engine resistance ought to be pushed on. A great deal may be learned in this way, and we are much mistaken in M. Regray if he suffers his ingenious experimental apparatus to rust for want of work. While the mere multiplication of observations, without any precisely defined object, can do no good, an inquiry into the comparative resistances of various kinds of rolling stock can hardly fail to possess very great value.

COLONIAL CONTRACTS.

It is a novelty to hear of such a point being in dispute as whether an agreement entered into for the construction of a railway at a cost approaching a million sterling, is one involving the payment of a certain fixed sum, or is to be interpreted as a mere schedule contract, under which the contractor is only to be paid for work really executed at certain specified rates. It seemed almost incredible to us, when reading the outline of facts recorded in *The Colonies and India*, that any legal document could be so drafted, after all these years of experience in railway matters, that there could arise a possibility of misapprehension on such a point; but, observing it to be gravely stated by our contemporary to be existent, we have devoted some pains to inquiring into the circumstances under which so curious a dispute has arisen, and we find them interesting and instructive.

A well-known firm entered into contract with the Government some two years back for the construction of an extension of a line of railway in a leading colony, on which the works are of a more than ordinarily heavy character owing to the mountainous nature of the country through which the railway passes. Considerable progress had been made by the contractors, when it was discovered that the provision made in the estimated quantities for the anticipated proportion of rock cutting that would have to be executed was considerably in excess of what proved to be requisite. Statements by the local press induce the belief that it was not until this fact became apparent that any question as to the nature of the contract was mooted, it being then intimated to the contractors' local agent that payments due would be calculated only upon the amount of work executed, and at the rate set forth in the schedule of prices attached to the contract for specific items in the event of extra works being ordered. To this the agent at once demurred, and reference to his principals elicited a statement of their surprise that such a decision had been arrived at. It will, of course, be apart from our purpose to discuss in this article who may be right or who may be wrong, and we should the more strictly abstain from expressing any opinion because it is at least possible that the matter in dispute may eventually have to be dealt with *sub judice*. We are only concerned with the principles of public procedure under which any contract admitting of such diversity of interpretation could have been made with a Government department. Should it eventually prove that the claim of the Government

is ill-founded, it will only be natural to ask in what quarter responsibility rests for a blunder, which, according to the contention of its officers, will entail a far heavier payment than was contemplated. We have seen the document which has given rise to this difficulty. For the reasons stated above, we shall abstain from any reference to its provisions beyond stating that it at all events contains a clause expressly setting forth that in the event of the contractors having, for the due execution of the works as designed, to do *more* rock-cutting than was surmised might prove to be necessary, they shall have no claim on the Government for remuneration for such extra work. The point that will have to be argued is, therefore, whether a contract which excludes remuneration for work done beyond a certain fixed and arbitrary sum, can be determined to be considered only as a schedule contract when the advantages are disposed in a reversed direction. The contractors' contention is, we believe, that from local knowledge obtained by inspection of the ground, they came to the conclusion that the quantity of rock-cutting provided for was in excess of what would be met with, and that they discounted that expectation by so pricing their estimate that their tender was accepted.

This short sketch of the circumstances brings us to the proper subject of this article, and we want to know who it is that draws up contracts for works of this nature in the colonies, or, at all events, what department is responsible for them, and we are the more urgent in this query, because, side by side with the voluminous document embodying the collective wisdom of our Government officials, we saw one containing the conditions under which offers were sought, for a line of very similiar character and length in a foreign possession, but for which an eminent engineer was alone responsible. It was less than one half the length of the Government contract. Is it not a fact that for all such railway contracts for our Crown Colonies the Crown Agents for the colonies are responsible? We cannot, of course, look to those gentlemen to possess personally the technical knowledge which may guard absolutely against any mistake, but the system under which they work seems to be one which is giving rise to much adverse comment just now. We hear, in fact, that they deal with contracts entrusted to them pretty much as the old representatives of close boroughs treated their constituents. There is no open calling for tenders. A selection is made of a few of the leading firms in any special branch, and to them are addressed applications for tenders. Naturally, this course is not followed in the case of large railway contracts, such as that taken as the text of this article, but the complaints made are too numerous to leave room for doubt, and special instances of favouritism have of late come under our own notice. In such, no advertisements, which should open the door to the whole trade interested, ever appeared. Indeed, none but a few privileged parties ever heard that certain supplies were needed.

It is not very long since we commented favourably on the Crown Agents' Department, and we believe now that it is diligent in its desire to faithfully serve the important constituencies it represents; but considerable changes have taken place in its *personnel* since we so wrote, and the task intrusted to it seems to be outgrowing its capacity. In these days our colonies are developing with marvellously rapid strides. But few of them are now in the long-clothes of infancy, and their wants are growing day by day to such an extent that agencies which formerly were adapted to their needs now no longer meet their requirements. The Crown Agents' Department, we fear, is somewhat over tasked. To a great extent circumlocution as to public affairs is not altogether an evil. It is, indeed, a safeguard, and may be of use when the heads of a department can so far control it that moderate dispatch is ensured, and questions in their passage do not altogether get lost sight of. But nearly every colonial paper we now take up speaks of works long sanctioned, and for which funds have been provided, lost in the limbo of uncertainty for months and months. "What has become of the matter?" "Oh! no one knows; the Colonial-office don't know; they say there that it is in the Crown Agent's hands." There is undoubted truth in the old adage, that "too many cooks spoil the broth." In the matter of a contract, everyone has a finger in the pie, and it seems to be no one person's special business to expedite its passage. When it leaves the consulting engineer it goes into the Crown Agents' Office; the gentlemen there send it on to the Colonial-office with some leading remarks, and it is—sometime or other—returned with a few observations in reply. This may continue for an indefinite period, backwards and forwards. Then the engineering department of the Crown Agents' Office does a little polishing up, or searches for flaws that may have escaped the observation of the consulting engineer. Following that operation, the solicitors to the Crown Agents tackle the subject, and these generally find matter for argument with the consulting engineer, whose life thenceforth becomes a wearisome burden, until, wrapped up in a mass of verbiage, the document returns to the Crown Agents, who in their turn forward it once more to the Secretary of State, which high official—when more grave matters admit of his doing so—affixes his signature by deputy to a communication with which it returns to the Crown Agents, who are then at liberty either to place the matter before the public, or, as we have stated above, to address the favoured few whom they choose to ask to tender suffrage.

Such, or very similar, is the course of such transactions with colonial contracts. No wonder that our brethren—north, south, east, and west—are calling out and that every colony possessing a responsible Government is establishing agencies of its own; and no wonder, also, that under such a system, important contracts are entered into giving rise to diverse interpretation, such as that we have referred to above. It really seemed to us, when reading the lengthy, and, to a great extent, recapitulatory provisions of that contract, as if every person into whose hands it had fallen during its circumlocutory career above described, had deemed that he would not be earning his salary if he did not add to it as many words as he could possibly by hook or crook introduce. Who can be surprised, therefore, at the muddle things have got into, and that when the contract left the consulting engineer's hands he had in contemplation a schedule contract, the result of all the scraping, and refining, and polishing it has had on the circumlocutory wheel is to render his bantling almost unrecognisable by himself? Such, at least, is the report current in this matter. One thing is certain. The difficulty has served to demonstrate that our colonies have some foundation for the complaints they are putting forth as to the delays which attend the carrying out of important public works.

VIENNA CITY RAILWAYS.

A PROJECT and plans for the "Wiener Gürtel Eisenbahn," or Vienna Circular Railway, was submitted to the Austrian Government in May last, and it is anticipated that the definite concession will shortly be obtained. The lines projected will supply a want long felt in Vienna, as there are at present no suitable provisions for the requirements of the city passenger traffic beyond tramways and omnibuses, and they will also effect connections with the six important railways at present terminating in Vienna. The main or "girdle" line will be a little over 8½ miles in length. It will run along the banks of the Donau Canal, which is a branch of the Danube flowing through Vienna, then by the river Wien to the new Gürtel Strasse, which is being formed on the line of the old fortifications, and back through an inferior part of the city to the Donau Canal. Very little private property has to be expropriated throughout, the railway being chiefly carried on ornamental iron viaducts, with spans of from 60ft. to 80ft., at an average height of from 18ft. to 20ft., although in some places the viaduct rises to as much as 36ft. in height. In the new Gürtel Strasse, on the western side of the city, the line will, owing to the rapid rise of the ground, be for the greater part in open cutting, with only a short length, about 400 yards, of tunnel. The line is to be served by means of nineteen stations, which are situated at the principal points of traffic, comprising a central station about 750ft. long by 250ft. in width, with six lines of rails, two important junction stations each 500ft. long, with four lines of rails, and sixteen ordinary stations, each about 360ft. long. There are several junction and branch lines projected to the terminal stations of the existing railways, which are inconveniently situated at a considerable distance from the central city or "Stadt Wien," viz., the Northern, North-Western, Southern, Western, Franz Josef, and States Railways, all of which will be thus connected with the circular line, so that their passenger traffic will be brought into the central station in the heart of Vienna, close to the Bourse. Eventually it is proposed that the trains of these important lines shall start from and run into the central station, thus preventing much present inconvenience and loss of time. The whole length of the circular line and the branches is about 20 miles; the estimate for their construction about four millions sterling. A provisional contract has been entered into with Messrs. Rothschild and Messrs. Guttmann Bros., of Vienna, joint proprietors of the Witkowitz Ironworks, of Austria, for the supply and erection of 70,000 tons of cast and wrought iron work. The period of construction is taken at three years. The scheme has been designed and supervised throughout by Mr. Joseph Fogerty, M.I.C.E., F.R.I.B.A., of 1, Westminster-chambers, London, aided by a large staff of English and Austrian engineers, who have been engaged thereon for over twelve months at the offices of the English Association for promoting and constructing the railway, 11, Volksgarten Strasse. The requirements of the Austrian Railway Department are so minute, that detail drawings of all the important structures and stations have to be submitted and approved even in the preliminary stages before steps are taken to grant the concession. We propose to give illustrations of some of these structures, which are novel in character and elegant in design, and to supply descriptive particulars from time to time. A "Trace Commission," consisting of over one hundred persons appointed by the Government and municipal authorities, has recently examined the proposed line on the ground. This commission was attended by the engineer and several representatives of the London Syndicate who are finding the funds for this most important project, which, if carried out, will be the largest and most complete elevated railway in the world. The design for the Central station includes many interesting features, the greater part of the space beneath being devoted to flower, spirit, and fish markets, with a covered playground for children, all well lit by reflecting lens lights in the vertical portions of the platforms. It is intended to work these lines by fireless locomotives on the Lamm and Franck system, with surface condensers. The whole scheme is at present under consideration before the Vienna Municipality, and excites intense interest in the city. The *Neue Freie Presse*, of 8th inst., devotes three columns to the subject, prints a map, and warmly approves of the scheme, which also has the support of the Government as well as that of the local railway authorities. We wish it every success.

ELECTRIC LIGHTING IN LIVERPOOL.

THE works in connection with the proposed lighting of the principal thoroughfares of Liverpool by means of the electric light do not appear to be making satisfactory progress. Nearly six months have elapsed since the whole was to have been completed, and at the present time only a few of the lamps have been lighted, and those only for experimental purposes, with the exception of a few on the pierhead, which have been used regularly. Great dissatisfaction is felt with this delay, and also with the unsatisfactory nature of the posts employed to carry the wires. These posts are formed of cast iron sockets let into the ground; they are only about 13in. square at the top, and into them are inserted four upright posts, presumably wrought iron tubes, 2½in. external diameter, connected by wrought iron collars 3in. wide, at intervals of about 2ft. 6in. In some instances these posts carry the lamps in addition to the wires, and in other cases they support the wires only. As many as thirty-four insulators are attached to one of the posts, but the greatest number of wires at present connected with any one post is eighteen, the number decreasing as the distance from the generating station increases. The height of the posts varies considerably, but the average appears to be about 30ft. Although the full number of wires which the posts are designed to carry has not yet been attached to them, they do not appear capable of supporting the strain to which they have already been subjected, and nearly all of them are out of the perpendicular, and where the base has resisted the strain the post itself is bent. No doubt this has been caused principally by the fact that the wires are not in a straight line, as is usually the case with telegraph wires on railways or public roads, but form frequently considerable angles at each post, and the owners of property very naturally object to stays being carried from the posts to their buildings; it seems strange that this difficulty should not have been foreseen by the authorities when the plans of the contracting company were approved of. Recently the wires had to be rapidly detached from a post in front of the Town Hall, which was in imminent danger of falling; and on another occasion the fire-escape, when being driven along the streets, came in contact with the wire, thereby obstructing the passage of the escape and deranging the wires. Had this occurred at night the consequence would have been serious. The recent gale did great damage to the wires, and had the electric system been in operation, and the gas lamps disused or removed, the town would have been in total darkness. What the effect of a heavy fall of snow will be is not difficult to prognosticate, and it is to be hoped that other towns will profit by the experience gained in Liverpool, before they allow an electric lighting company to disfigure the streets and endanger the lives of the inhabitants by erecting overhead wires in a similar manner to that adopted on the banks of the Mersey.

LITERATURE.

The Elements of Plain Analytic Geometry: A Text-book including numerous Examples and Applications, and especially Designed for Beginners. By GEORGE R. BRIGGS. New York: John Wiley and Sons. 1881.

Exercises in Analytical Geometry. By J. M. DYER, M.A. With illustrations. Macmillan and Co. 1881.

WE have carefully read the greater portion of Mr. Briggs' "Elements of Plain Analytic Geometry," and its perusal helps to convince us that in America there is being gradually compiled a series of school books that will compare favourably with any issued in England. De Morgan says the application of algebra to geometry, of which some instances have been given by Bonebelli, and many more by Vieta, grew into a science in the hands of Descartes—1596-1650. It drew the attention of mathematicians completely away from the methods of the ancient geometry, and considering the latter as a method of discovery, the change was very much for the better. But English mathematicians, as a rule, ignore the new science, looking upon it with suspicion, and doubting its accuracy. The methods of algebra, however, so far as expressions of the first and second degrees are concerned, apply with great facility to large classes of questions connected with straight lines, circles, and other cone sections We have a very strong impression that, although to many minds the study of algebra may be fascinating, the ordinary student finds greater delight in the subject when having obtained a fair knowledge of such books as Todhunter's "Algebra and Trigonometry," he commences analytic conics. He then finds that his simple or quadratic equation contains meanings utterly unknown to him before. He has hitherto looked upon a simple equation as a dodge to find the value of an unknown quantity, and till now has heard nothing of the equation to a line, nor has he understood that a line under conditions can be represented by an equation, and *vice versâ*. His idea upon the question of "position" becomes more definite, and it is here that in the course of his studies mathematical knowledge is really seen to be a powerful agent, and not merely an elaboration of unmeaning symbols. Mr. Briggs, writing of the problems treated in this branch of mathematics, says: "We shall see that this use of algebra shortens our work and generalises our reasoning."

He treats the subject in the natural order, commencing with the point, then passing respectively to the straight line, circle, and the conic sections. Even considering that this is intended for an elementary work, introductory to such as that of Todhunter or Salmon, we must credit the author with great clearness of expression and a judicious arrangement of the subject, as well as with a carefully-selected series of questions appended to each chapter to test the progress made by the student.

There is one point, however, about which we have a decided opinion, viz., in referring to other special books. We continously note such examples as—"The triangle B R P is a triangle of reference for γ ('Wheeler's Trigonometry,' sec. 22)"—*v.* p. 20; and "Now (*v.* 'Wheeler's Trigonometry,' sec. 22) O R M is always a triangle of reference for the angle Q O X, or $(-a)$," &c. We maintain that the student should be supposed to understand any reference to "a triangle of reference," or any similar trigonometrical definition, without naming a special book, which it is improbable that 1 per cent. of students out of a certain district will ever have heard mentioned, much less seen. Assume, then, that the reader has a fair acquaintance with trigonometry, and define where necessary any special terms used.

We presume that this is a first edition, and as such it would be wonderful if all signs, letters, and formulæ were found accurately printed. We have, however, detected but few errors of this description—much fewer than is ordinarily the case, and these all of such a relation as to cause little trouble, such, for example as $-\frac{B}{C}$ for $-\frac{C}{B}$ in the fourth line, p. 41. The faults we have indicated—if faults they are—must be considered of minor importance, the value of the work being in its simplicity and general arrangement.

The second work mentioned above is merely a collection of examples. It is well known that hardly any text-book gives, nor can it well give without becoming cumbrous and costly, a sufficient number of examples for the student to work out to test his knowledge of the principles of the subject. In almost all branches of mathematics books of questions only are compiled to be used with any text-book. Such a work is the one before us. We find generally that compilers are satisfied with giving one or two questions similar in nature and depending on the same principles for solution. This is insufficient. Frequently the pupil is shown how to solve one question, and he may have only one more like it to solve. The work now before us is good of its kind; the examples are fairly numerous, and sufficiently diversified to test the student's grasp of the subject.

RAILWAY MATTERS.

General Klapka's scheme for the construction of a railway from Constantinople to Bagdad has been revived, and is exciting a good deal of attention.

A third London and North-Western train in about a fortnight left the rails near Leeds on the 12th inst. The London and North-Western flanges are not so deep as those of some lines.

Sanction, in principle, has been given to the junction of the Servian and Turkish lines. The chief obstacle, which was that no binding assurance could be secured respecting the junction, appears now to be overcome.

The amended railway tariff of South Australia has been published, and contains several large reductions. The carriage of wheat is to be only 2d. per ton per mile for fifty miles, 1½d. for seventy-five miles, and 1d. only over seventy-five miles.

The French Government have accorded to the railways a further extension of time for the introduction of the block system, with an intimation that no further grace will be granted. In three months from this date every line on which the traffic shall attain a minimum of five trains an hour will be compelled to adopt the system.

A circular has been issued by the Oude and Rohilkund Railway Company intimating that the Secretary of State for India in Council has sanctioned the extension of the company's railway from Moradabad to Saharanpore to join the Sinde, Panjab, and Delhi Railway. Tenders are invited for the superstructure of a bridge over the Ganges at Benares.

The Minister of Victorian Railways has been revising the railway tariff. Considerable concessions are to be made to farmers and implement makers. Refrigerating cars are to be provided for carrying milk and meat to Melbourne, and, according to *India and the Colonies*, all sorts of dairy produce are to be conveyed at specially low rates. Our own railway managers may take a hint from this.

With the completion of the Forth Bridge and the construction of the line, which it is proposed should be made through Glenfarg Valley, the distance between Edinburgh and Perth, *viâ* Queensferry, would be reduced to about forty-seven miles, being twenty-three miles shorter than by the Caledonian route *viâ* Stirling, thus bringing Perth within an hour's journey of Edinburgh, as compared with two and a-half hours under the present arrangements, and holding out a great inducement to tourists to adopt the Queensferry and Glenfarg route to the Highland Railway.

In the United States there was a total of 129 railway accidents in August, whereby thirty-one persons were killed and sixty-seven injured. Twenty-one accidents caused the death of one or more persons; nineteen caused injury, but not death, leaving no less than eighty-nine, or 69 per cent. of the whole number, in which no serious injury is recorded. The *Railroad Gazette* record shows for the eight months of this year to August 31st a total of 937 accidents, 241 killed, and 977 injured; a monthly average of 117 accidents, thirty killed, and 122 injured. This monthly average is much greater than in the previous year.

The Manchester, Sheffield, and Lincolnshire Railway Company is being asked to support a scheme for constructing a tramway in North Lincolnshire and the adjacent district of Marshland in Yorkshire, on the principle already adopted in the few districts of the Great Eastern Railway Company. The tramway would act as a feeder to the Manchester, Sheffield, and Lincolnshire, as it would "tap" the agricultural produce of the Isle of Axholme, and the heavy potato traffic of the villages between Crowle and Goole. It is proposed to make the tramway commence at Swinefleet, about three miles from Goole, and continue it through Eastoft to Crowle, down through "the Isle of Axholme" to a suitable point on the railway system. The intention is to place the tram on the sides of the road, and to provide plant for passengers and goods.

The following accidents occurred upon the premises of the railway companies of the United Kingdom during the first six months of this year, in which the movement of vehicles used exclusively upon railways was not concerned, namely:—51 passengers injured whilst ascending or descending steps at stations; 18 injured by being struck by barrows, falling over packages, &c., on station platforms; 17 injured by falling off platforms; and 36 injured from other causes. Of servants of companies or contractors, 3 were killed and 469 injured whilst loading, unloading, or shunting wagons; 156 were injured whilst moving or carrying goods in warehouses, &c.; 1 was killed and 67 were injured whilst working at cranes or capstans; 1 was killed and 126 were injured by the falling of wagon-doors, lamps, bales of goods, &c.; 241 were injured by falling off, or when getting on or off, stationary engines or vehicles; 10 were killed and 125 injured by falling off platforms, ladders, scaffolds, &c.; 1 was killed and 126 injured by stumbling whilst walking on the line or platforms; 62 were injured whilst attending to stationary engines in sheds; 20 were injured by being trampled on or kicked by horses; 3 were killed and 280 injured whilst working on the line or in sidings; and 106 were injured from various other causes. 2 persons who were transacting business on the companies' premises were also killed and 51 were injured; making a total in this class of accidents of 21 persons killed and 1951 injured. The total number of personal accidents reported to the Board of Trade by the several railway companies during the six months amount to 518 persons killed, and 3960 injured.

A report on the collision which occurred on the 3rd ult., at Bow-road station, on the Stepney and Stratford branch of the Great Eastern Railway, has been made by Major-General Hutchinson. In this case, the 9.25 a.m. down empty carriage train from Fenchurch-street to Stratford—which had been stopped by the automatic Westinghouse brake fitted to the fourteen vehicles composing the train, but not to the engine—having by some accident been brought into action with the rear van about 115 yards outside Bow-road down home signal, and the engine about forty yards inside it, was run into by the 9.33 a.m. down passenger train from Fenchurch-street to Forest-gate, fitted with Clark's chain brake. Eleven passengers were returned as injured. The driver and fireman of the Forest-gate train died on the spot. In giving evidence the driver of the empty train said that soon after passing Stepney, he felt the train drawing more and more heavily, and was finally pulled up at Bow-road station against steam full on. It was then found that the brake-blocks had become applied to the wheels of each of the fourteen vehicles. Both guards stoutly deny having in any way made use of the Westinghouse brake. "There is no doubt if either of them had once applied the air brake, it could not have been again released from either van, and therefore it is extremely unlikely that it would have been applied intentionally. It is, however, possible that the tap in one of the vans may have been moved inadvertently sufficiently to have applied the brakes, though these taps are not in a position to render this probable. If the stoppage was not caused by the action of either of the guards, it must have been due to the occurrence of a leak. The Westinghouse brake is provided with a leakage arrangement which will allow of a small leak going on without causing the brakes to be applied, and a few days after the collision I made an experiment to try and ascertain whether a small leak, insufficient to set the blocks while the train was at rest, might cause them to become applied with the train in motion. With a leak not quite sufficient to set the blocks, the blocks remained off the wheels, although the air was nearly exhausted. It does not, therefore, seem probable that a small leak could have set the blocks on the occasion of the collision, whereas, had it been a large one going on for some length of time, the whole of the air would have been exhausted before the collision occurred. In the absence of any other explanation, it seems reasonable to suppose that one of the guards must have inadvertently moved the tap in his van, and applied the brake, which he was then powerless to release."

NOTES AND MEMORANDA.

Paper is being used in some Berlin restaurants for plates for dry and semi-dry articles of food. Possibly papier-maché, with a suitable glaze, may come largely into use for such purposes.

There are in Canada and the United States twenty-two match factories, which turn out 25,000 gross, or 3,600,000 boxes, of matches daily. The average is about 100 matches to a box, and the daily consumption is, therefore, 360,000,000 matches—a yearly average of 131,580,000,000 matches.

The average life of an English gold sovereign is about eighteen years; that is, this coin loses three-quarters of a grain in weight in about this length of time. It then ceases to be legal tender. It is said that of the one hundred millions sterling of our gold coinage, forty per cent. is in this condition.

At the Royal Observatory, Greenwich, the mean reading of the barometer last week was 29·60in. The mean temperature was 49·0 deg., and 2·8 below the average in the corresponding week of the twenty years ending 1868. The mean on Tuesday was 55·4, and exceeded the average by 3·5, whereas it was below on each of the other days of the week.

Borings at the Park-fields, Nantwich, in connection with the proposed sanatorium and salt baths scheme for Cheshire, have reached a depth of nearly 70ft. from the surface, and stone flag, under which lie the true brine streams, is being cut through. The strong flow of brine through an upper stratum of gravel already exceeds 300 gallons per day, and its strength is regarded as very satisfactory. There seems to be an unlimited supply.

Captain Belknap reports from Callao the details of soundings in the Pacific in a run of 112 miles off shore. At a distance of 102 miles he found a depth of 3368 fathoms, or nearly four statute miles, the deepest water yet found in the South Pacific or in the eastern margins of both the North and South Pacific. He stood ten miles further to the eastward, but only found 3168 fathoms. In both casts the cylinder brought up clay and greenish sand, and the bottom temperature of the deepest was 34·2 deg. Fah.

A paper was recently read before the Paris Academie des Sciencés, on the magnetic metals, by M. Gaiffe. He experimented with nickel and cobalt, obtained electro-chemically and variously treated before magnetising; some bars being kept hard, others annealed, and others annealed and forged. The figures show what a comparatively great coercitive force these metals—and especially cobalt—may acquire in a pure state, while pure iron, obtained by the same means, gives inappreciable deflections in the magnetometer. The annealed and forged samples produced the greatest effects—the annealed coming next. The weak coercitive force of the metals on issuing from the galvanoplastic bath is attributed to the presence of hydrogen in combination with them.

A "Medical hydrotelephone," contrived by Prof. Sabatucci is thus described by *Nature*:—Two lead cylinders—5 ctm. in diameter and ½ ctm. thick—are closed each with two very fine iron laminæ. To the anterior part of each is fitted a wooden mouthpiece—like that of a Bell telephone—connected to a caoutchouc tube, through which one may hear at a distance. The posterior part has a very sensitive electro-magnet communicating with a microphone and battery. One tube is applied to either ear. Words or sounds produced before the microphone, and heard but faintly, are rendered intense and distinct by introducing liquid into the cylinders—the less dense the liquid the better. Two sounds may be compared, and their intensity exactly measured, by varying the quantity of the liquid and noting the effects through the tubes. Various applications of the apparatus, in clinical medicine especially, are looked for.

M. Pictet has lately taken the magnetic power of seven varieties of steel, and finds that it depends on the presence of carbon in the iron, and the aggregation of these substances. One of the two steels giving the best results had ⅔th per cent. of carbon. Samples with 1⅓ and 1⅔th per cent. were inferior. German spring steel of poor quality made a good magnet; it had little homogeneity, and consisted of an intimate mixture of iron, and iron cemented with a small proportion of carbon. A too small proportion of carbon suppresses or weakens the sidual magnetism. M. Pictet also finds that the increase of magnetic power in a magnet through the mere presence of the armature in contact is a certain fact for some qualities of steel, but not for all. The first magnetic passes develope nearly the whole of the remanent magnetism in all artificial magnets. Detachment of the armature by the dynamometer seemed to have no action on the magnetic power, but *Nature* says the slipping of the armature when near rupture must be avoided.

The following figures relating to the diamond and mineral industries of South Africa are of some interest:—The gross weight of diamonds contained in packages passed through the Kimberley post-office in 1880 was 1440 lb. 12 oz. avoirdupois, the estimated value being £3,367,897. These figures compare with 1174 lb. and £2,846,631 in 1879; 1150 lb. and £2,672,744 in 1878; 903 lb. and £2,112,427 in 1877; and 773 lb. and £1,807,532 in 1876. The annual value of the mines in the Kimberley division owned at the end of 1880 by the Government and the London and South African Exploration Company is estimated as follows:—Kimberley, £4,000,000; Old De Beer's, £2,000,000; Du Toit's Pan, £2,000,000; Bultfontein, £1,500,000. At the end of last year 22,000 black and 1700 white men were employed at these mines. From the Kimberley and Old De Beer's mines alone diamonds to the extent of 3,200,000 carats are annually raised, while the other two mines above named yielded 300,000 carats last year. At the diggings on the Vaal River about 250 men were at work last year. The other important mining industries of the colony are the copper mines of Namaqualand, from which last year 15,310 tons of copper were exported, valued at £306,790. From the manganese mines in the Paarl division 206 tons were exported; while at the coal mines, according to *India and the Colonies*, in the Wodehouse and Albert divisions about 1000 tons were raised. The salt-pans in Simon's Town, Malmesbury, Piquetberg, Fraserburg, Uitenhage, and Cradock yielded about 9000 tons of salt. Mineral springs abound in the colony, many of them being well resorted to, though accommodation for visitors is, as a rule, indifferent.

The system of underground telegraphy devised by Dr. Stephan, Postmaster-General of Germany, is now completed. On the 14th March, 1876, the first line of cable from Berlin to Halle was commenced, and on the 26th June, 1881, the system was completed by laying the cable from Cologne to Aix-la-Chapelle. In fifty-eight months eighteen lines have been laid, comprising 3394 miles of cable, costing 30,200,000 marks, or £1,510,000. The eighteen lines connect 221 towns, including the most important places of commerce and chief fortifications of the German Empire. Ten of these lines were laid by Messrs. Felten and Guilleaume, of 101, Leadenhall-street, London, and of Cologne, and the remainder by Messrs. Siemens and Halske, of Berlin. The conductors in the 3394 miles of cable have a total length of 23,213 miles. The weight of the materials consumed in manufacturing these cables was 12,825 tons, consisting of 10,165 tons of iron, 823 tons of copper, 837 tons of gutta-percha and hemp, and 383 tons of asphalte. In the crossing of rivers seventy cables were required. The cables are of great strength, and, being of great carrying capacity, will probably do the whole of the telegraphic work for very many years. German main lines are now no longer subject to the effects of wind or snow, and are, in fact, out of reach of harm of any kind. In France a similar system is adopted for underground cables between Paris and Marseilles. The trenches for receiving the iron pipes in which the cables are laid are 1·20 metres—nearly 4ft.—deep. These cables contain three conducting cables, with seven conductors in each, giving twenty-one conductors altogether. Facilities for examining and repairing the cable are provided at every 500 metres distance. The work has not been all plain sailing, as forests have had to be cut through, and from time to time large rocks, which could not be removed in any other way, necessitated blasting operations.

MISCELLANEA.

The first sod of the new waterworks at Ringstone Edge for Wakefield has been turned this week.

A portion of the Mansion House is to be lighted by Messrs. Crompton and Co. with the Crompton arc and the Swan incandescent lamps.

A first prize has, we are informed, been awarded at the Adelaide International Exhibition to Messrs. Priestman Brothers for their patent dredger and excavator, which obtained similar awards at Melbourne and Sydney.

The Mayor of Wolverhampton, Mr. Jno. Jones, who has occupied the civic chair for three years in succession, has presented £500 to the town, to form a nucleus of a fund for an industrial exhibition to comprise specimens of the products of the staple arts and manufactures of the town.

At a meeting of the North Riding justices, held at Northallerton, on the 18th, for the transaction of county business, a resolution was passed, by 39 votes to 24, to the effect that the sum of £5000 should be contributed by the North Riding towards the cost of constructing the proposed new bridge at Stockton. This was the sum recommended by the Committee of the House of Lords, before whom the Bill was argued last session. The promised funds are still short by some £4000 or £5000 of what is required, and the deficiency will have to be defrayed either by the Stockton Corporation or by the Tees Conservancy Commissioners.

The aggregate amount of earnings from the Indian canals for the year 1879-80, after paying the working expenses, was £882,414, being at the rate of £7·9 per cent., on the capital outlay of £17,696,348. The results thus arrived at are, as in the case of the railways, exclusive of the charge for interest on the capital expenditure, which, in the accounts, is usually deducted from the receipts before they are accepted as net earnings. A recent report says:—"The present purpose is to show their actual earnings during the year, and not their financial position according to the system of accounts which has been adopted for the purpose of exhibiting, very properly, their losses and gains from the commencement. In the Madras Presidency the receipts were at the rate of 28·3 per cent.; in the North-West Provinces, which includes the Ganges and grand canals, they were £5·03, and in the Punjab 3·9 per cent.; but on the Bengal Canals they were only at the rate of ·4, and in Bombay there was a loss at the rate of £1·2 per cent."

The Great Eastern steamship was submitted to auction at Lloyd's Captains' Rooms, Royal Exchange, by Messrs. C. W. Kellock and Co., brokers, under instructions from the Great Eastern Steamship Company, on Tuesday, The first offer was £20,000, followed by one of £25,000. At this bid there was a pause, and the broker stated that if there was not an immediate advance he should withdraw the ship. Two offers of £26,000 and £27,000 followed, and the last bid made was £30,000. The broker then withdrew the ship, and expressed his readiness to receive offers by private treaty. There was a large attendance, but it was evident that "business" was not intended. This, in fact, seemed to be the opinion of Mr. Kellock, who was not long understanding his audience, the proceedings only lasting twenty-five minutes. It may be mentioned that the capital of the Great Eastern Steamship Company is £100,000, and that she stood in the books of the company at the close of 1880 at £86,715.

Returns are just issued by the local United States Consul on the trade between the United States and Birmingham and the surrounding district, including Redditch, Kidderminster, and Wolverhampton, during the last quarter of 1880 and the first three quarters of 1881. The total value of the trade during this period has been £875,322, a decrease on the previous year of £108,764. The figures for the four quarters respectively, in the order of chronological succession, are, £206,875, £209,513, £191,756, and £267,177. The decreases that affect the total occurred in the two middle quarters ending with March and June respectively. The last September quarter shows an increase on a year back of £33,265. Very nearly one-half of the total goods exported during the four quarters are classed under the two heads (1) "hardware, cutlery, steel, and iron," and (2) "guns and materials." Under the first head the value is £209,546, and under the second £190,196.

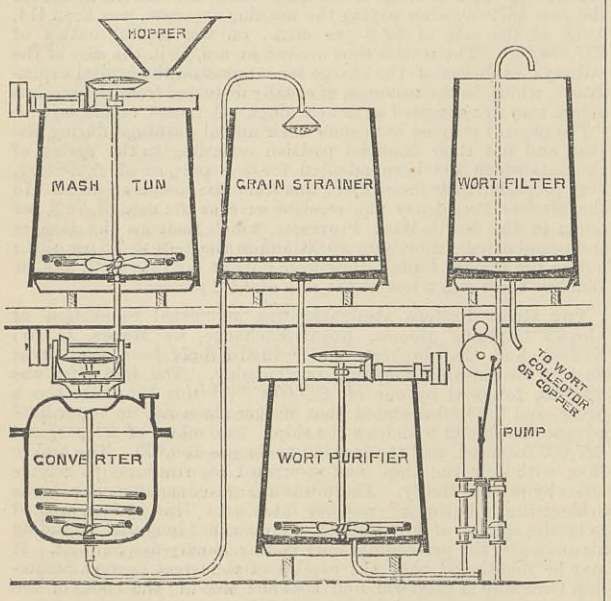
The Welland Canal, connecting Lakes Erie and Ontario, which was successfully opened on the 16th ult., by the passage of the steamer D. A. Dickenson, is an important event for the corn grower of Manitoba. The Dickenson is 300 tons burden, 150ft. long, 25ft. beam, and of 15ft. draught. As soon as the railway from Prince Arthur's Landing, Lake Superior, to Winnipeg has been completed, which will doubtless be next year, grain can be carried direct from the landing to Kingston. On the other hand it only requires the canals between the latter place and Montreal to be deepened to a uniform depth with the Welland Canal to enable Canadian shippers to send grain from Manitoba and the Canadian North-West territory to Europe in specially built vessels without transhipment. Such craft would traverse upwards of 2000 miles of inland navigation before entering upon their ocean voyage. The distance from Chicago to Montreal by the Canadian route is 150 miles less than that from Chicago to New York *viâ* Buffalo and the Erie Canal, and by the latter route there are sixteen more locks and 89½ft. more lockage than by the former.

The last sale of ivory at Liverpool was the largest which has taken place for a long time. Manufacturers who were present tell us that the prices realised showed an advance of from 20s. to 80s. per cwt. All the lots were sold. There were buyers not only from the English towns, but from America and the Continent. Ivory is very largely used in the Sheffield trades, more especially for hafting cutlery of all kinds. The demand for billiard and bagatelle balls, as well as for piano keys, has greatly increased of late years. One leading cutlery house made a calculation some time ago, which was suggested by a question put by a visitor. They estimated that to supply themselves with the ivory they needed for the handles of their cutlery, &c., they needed 1280 elephants every year, and that even on the basis that each tusk weighed 23¾ lb. In a magazine the question was recently put, "What becomes of the ivory waste?" There is no ivory waste. In the cutting of the ivory, the powder which comes away is sold for making jelly. It has long been used abroad, and is now getting pretty well known in this country. It is sold at 4d. per lb., made up into parcels, and is regarded as an excellent material for making jelly, particularly in the country, where calves' feet are not always procurable when required.

The Cork correspondent of *The Times*, writing on the 14th inst., says:—"The Inman steamer City of Rome, from Liverpool for New York, arrived at Queenstown about 4.30 this evening. She left Liverpool at 3 o'clock the previous day, and in the ordinary course she ought to have arrived at Queenstown in sixteen or seventeen hours. Her passage down Channel was, however, a boisterous one. About two this morning, when off Arklow Light, she encountered the full force of a fierce gale. The seas, which were very heavy, swept the decks, sending the spray over the bridge and funnels. Her speed was moderate, and for a short time she was only driven with sufficient power to keep her head to the sea The maiden trip of the new vessel has certainly been commenced under circumstances well calculated to test her sea-going qualities. Those who came over in the vessel for the purpose of noting carefully her movements state that the trial was perfectly satisfactory. The engines worked smoothly, she rolled but little, and behaved well. The vessel came to anchor at Queenstown between Carlisle and Camden Forts, and here embarked 59 steerage passengers, which, with the number already on board, made up a total of 1198 steerage and 238 cabin passengers. The total number of souls including the crew, was over 1600. The vessel was detained at Queenstown until 9 o'clock, to have some slight repairs effected in the electric light machine.

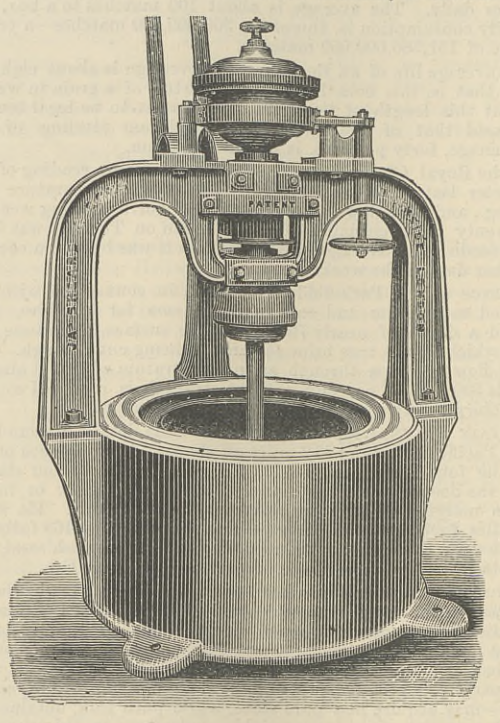
THE BREWING EXHIBITION.

The third annual exhibition and market of machinery and appliances used by brewers, maltsters, distillers, aërated water manufacturers and those who sell or use their productions, was opened on Monday at the Agricultural Hall, and remains open to-day and to-morrow. The whole of the ground floor and part of the gallery space is covered, and it is said that about 1100 more square yards of space are let than last year. In the first year of the exhibition it was calculated that 35,000 members of the beer, wine, and mineral water trades visited it, in addition to twice as many of the general public, and last year the number of visitors was far in excess of the previous year. On the present occasion 300 exhibitors are showing their products and manufactures, and they exhibit more than 2000 different kinds of articles. The frontage occupied represents over a mile, and the area exceeds 6660 square yards. The new methods of brewing introduced in consequence of the removal of fiscal restrictions last year are illustrated on a larger scale than in 1880, and they form an interesting feature. Malt is no longer taxed, the law does not prohibit the preparation of beer from untaxed substances, and the tax gatherer only looks to finished beer, whatever may have been used in its production. On the Continent the trade has been freer, or subjected to different restrictions from those imposed in England, and this perhaps explains the fact that two of the three processes shown by four



exhibitors are of foreign origin. M. A. Manbré exhibits a set of plant for brewing from raw grain. It is made by Messrs. Henry Pontifex and Sons, of King's Cross, and consists of a mash tun, converter, grain strainer, wort purifier, and wort filter. The progress of the materials through the process being in the order in which we have given these names of the vessels. A brewery is at work at Birmingham on this system.

The process is really very similar to Johnson's brewing apparatus, described in our impression for the 11th February, 1881, but it is carried out in a slightly different way, and with perhaps more simple plant. The plant as exhibited is illustrated in the annexed woodcut. The grain to be treated, maize or rice generally, is kibbled and charged into the mash tun. Here a small quantity of dilute acid is added to it, or some malt is mixed with the grain. A 4in. copper coil of two rings is heated by steam at the bottom, and a revolving screw propeller is employed as a rouser. After a certain length of time the mash is passed into the converter, which is a copper vessel containing a coil and rouser. In this vessel steam is admitted, and the starch that was contained in the raw grain is converted into dextrine and fermentable saccharine. From this converter the charge is passed to the grain strainer. The wort liquor runs from this to the vessel below, in which it is neutralised by a certain quantity of some reagent, as chalk, and boiled by steam, circulation being effected by the rouser; from this vessel the wort either runs to the wort filter or is pumped thereto when the filter is above. This filter has a perforated wood bed, similar to that in the grain strainer, but the filtration is effected by means of an asbestos cloth, laid on the wood. From the filter the wort runs away to the wort copper, the remainder of the process of beer making being conducted in the ordinary way. This process produces wort at a much lower price than it can be produced from malt saccharine and other wort-producing materials now largely imported into this country. In Johnson's system a filter press is employed to express all the wort from the grains, and this would probably be employed in the system described above. The Johnson Saccharum Company exhibit their system as already described by us. Several other brewers' engineers are engaged in developing this system, and amongst these are Mr. A. Kinder, C.E., who has arranged his plant in such a way that the necessary high pressure may be obtained in the converter without the use of prejudicially high temperature. This he secures by the use of air which is forced into the converter by a pump, which is also otherwise alternately employed to maintain a partial vacuum for certain parts of the process. This system we may describe at another time. Amongst other drawings exhibited by Mr. Kinder is a drawing of a twelve quarter brewery which has been built for £2700. And another is of a machine for turning malt on the growing floors. A fine collection of drawings of executed breweries and maltings is exhibited by Mr. W. Bradford, C.E. Messrs. H. Stopes and Co. also show drawings of maltings constructed by them, and as proposed to be constructed with certain improvements. Messrs. Stopes are also exhibitors of brewers' machinery, including a machine of German origin for cleaning the outsides of casks. The casks are caused to revolve upon india-rubber covered wheels and between a set of hard bass brushes. These makers have also adopted the grooved roller mill with rollers having differential speeds for bruising or kibbling malt. A well-made machine of this class is exhibited, the advantage derived from the use of the grooved chilled rollers being that the malt is granulated and not powdered, only a very small percentage of flour being made. There is also on their stand a combined Simon's automatic weighing machine and a magnetic apparatus for separating nails and other pieces of iron from grain. A small bottling machine or tool is sold for 25s. It is a very simple machine, and though made at so low a price will save a great deal of time in bottling on a small scale. Some remarkable fine copper work is exhibited by Messrs. J. Shear and Sons in a new form of continuous still and condenser, and in a very large coil for evaporating sugar and concentrating glucose, &c., in a Wetzell's pan. It is about 3ft. in diameter, and contains about fifteen coils of 3½in. copper pipe bent or coiled without any irregularities or corrugations. They also show some excellent copperwork in a converter for Manbré's process for the conversion of raw grain. A well-made centrifugal yeast and sugar drying machine, with a suspended cage and arrangement of valve door in the bottom for the easy discharge of its dried contents is also shown. It is illustrated by the annexed woodcut, as driven by a



SHEAR'S CENTRIFUGAL DRYING MACHINE.

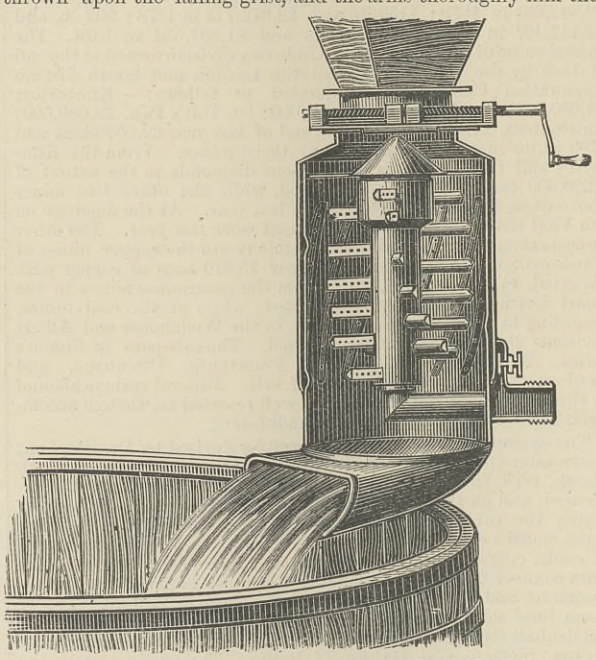
belt from shafting in the ordinary way, but one machine is shown with a combined steam engine. Some excellent copperwork is also shown by Messrs. Bindley and Briggs in a large open brewing copper, steam coils, and attemporators.

The gas engine made by Mr. F. W. Turner, to which we have referred on previous occasions, is exhibited on the stand of aërated water machinery of Messrs. Barnett and Foster, who as usual exhibit a fine collection of well-made machinery of this class. Mr. Turner's engine is of the vertical type, and possesses the advantage of being at the same time a fast running engine and giving an ignition at each revolution. The engine will, moreover, run at high or low speeds, and is very economical in price. As it will run at a high speed and receives an impulse at every revolution, this engine should be applicable for driving small dynamo-electric machines for lighting purposes.

Linford's gas engine is exhibited in motion by Mr. J. Lilley. This is, as is well known, a high-speed engine, and runs very steadily. It was the subject of an important infringement case, reported in The Engineer of April 1st, 1881, which was decided in favour of Mr. Linford. The engine exhibited is of 3-horse power.

Amongst the aërated water machinery is a large collection on the Mondollot's system, manufactured by Mr. H. Favager. One of the chief features of this system is that it dispenses with the usual gasometer or gasholder, and renders the generation of carbonic acid gas continuous and automatic and self-regulating. We shall illustrate some of these machines in another impression.

A mashing machine, with self-revolving perforated rakes, is exhibited by Messrs. Whitlock and Smale. A cylindrical chamber is attached to the lower part of the grist hopper, and within it is an upward continuation of the cold liquor pipe. This vertical part of the pipe is fitted with a number of hollow radial arms at different parts of its length, the arms being perforated on one side. The exit of the liquor or water from these holes causes the arms to revolve, and thus a spray is forcibly thrown upon the falling grist, and the arms thoroughly mix the



WHITLOCK AND SMALE'S MASHING MACHINE.

grist and liquor, and prevent the formation of lumps. The same makers show a number of attemporators made of corrugated plates, rivetted together, so that the corrugations form adjacent channels, in which the water entering at one end runs backwards and forwards until it finds its way out at the other end. These attemporators give a large surface at a low cost.

Messrs. Lawrence and Co show some of their now well-known capillary wort refrigerators for from three to sixty barrel plants.

Messrs. Hayward Tyler and Co. exhibit a fine collection of their well-known soda water and other machinery, and brewing plant and utensils. Amongst the former is an ingenious machine known as MacDonell's rotary syruping, filling, and corking machine. This machine is supplied with bottles, and then performs these functions at the rate of from 30 dozen to 160 dozen bottles per hour, according to the size of the machine.

Mr. James Galloway also exhibits soda water machinery, one machine being capable of making no less than 8000 dozen or 96,000 bottles per day.

Messrs. J. MacEwen and Co. show some well made soda water pumps, with glass cylinders. The piston and the cylinder ends are nickelled, so that these pumps are likely to remain clean, and there is the advantage that the state of the inside of the pump barrel can always be seen from outsids. Messrs. Eugene Geraut and Co. are also amongst the exhibitors of aërated water machinery and apparatus.

Several manufacturers exhibit the now well-known hydraulic filter presses. Amongst these are Messrs. S. H. Johnson and Co., A. W. Johnson and Co., Messrs. Hayward Tyler and Co., and Messrs. Musto and Co. The first named show some very large filter presses with square plates, a number of which have been made for a very large grape sugar manufactory in the United States. The most curious of the very many purposes to which these presses are now put in the arts and manufactures and industries is the filtration of sewage sludge. The sludge is dried and caked, so that it is easily removable and ready for use in whatever way it can be applied. Messrs. Johnson and Co. are now making large presses for the Coventry Sewage Works for this purpose. By brewers they are used largely now as yeast presses, and will probably be more used for expressing wort from the mash in the raw grain process of wort making.

A simple grain measure is shown by Messrs. G. Waller and Co., who also exhibit Smith's steam stoker as applied to a Cornish boiler. The fire-bars in this arrangement have a slow rocking motion given them by excentrics arranged so that the horizontal movement is much greater than the vertical movement. Steam engines are exhibited by several makers, and amongst them is a small 2-horse power vertical engine, by Mr. E. S. Hindley, fitted on a bed-plate with a hoisting drum worked by friction gear, put into or out of gear by the brake lever. The arrangement is simple and well adapted for lifting casks, sacks, &c.

It should be here remarked that credit is due to Mr. Dale for his successful organisation of this exhibition and market, and for the satisfactory catalogue of the articles exhibited and of the exhibitors' names. This is tolerably free from intrusive interleaved advertisements; they are nearly all in the proper place, at the end. The index to exhibitors is seemingly without fault, but the subject matter index could be considerably improved if Mr. Lucian Wolf, the editor, would employ a little technical assistance. Exhibitors should insist on this catalogue being as correct as possible, as careful brewers and other visitors will preserve it from year to year, so as to have means of reference to the names of the manufacturers of the articles they saw in the exhibition.

BREWING AT CAPE HILL.

On page 296 we give a perspective view of a very fine brewery erected at Cape Hill, near Birmingham, for Messrs. H. Mitchell and Co., from the designs and under the superintendence of Messrs. Scamell and Collyer, consulting engineers and architects, Westminster. Of this brewery we shall give further illustrations and description in another impression.

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

(*From our own Correspondent.*)

Business on 'Change in Birmingham to-day—Thursday—and in Wolverhampton yesterday was not conspicuous in extent, but prices were generally very strong; and the hope of which I last week wrote as distinguishing the market, that there will be no further rise this year, was ripening into conviction. Most mill and forge proprietors reported themselves well to do in all leading departments but boiler-plates; and for boiler-plates the current demand is larger than for some time past.

The chief feature of this afternoon's market was the strength of the best thin sheet makers. All these asked the full rise of £1 per ton, which a week or two ago I reported that some of them were obtaining. The new prices at works for singles, to 20 w.g., of Messrs. E. P. and W. Baldwin, of the Wilden Ironworks, near Stourport—one of the leading houses in the trade—were as follows:—"Severn" brand, £12; Baldwin-Wilden brand, B., £13; B.B., £14; B.B.B., £15; charcoal, £17 10s.; best charcoal, £20 10s.; and E.B. charcoal, £22 10s. The prices of doubles, 21 to 24 w.g., are 30s. above singles; and the prices of trebles, 25 to 27 w.g., are 60s. above singles. And one or two houses are refusing to book more orders than they already have on hand even at the £1 rise. Messrs. Crowther Bros. and Co., of Kidderminster, for instance, have issued the following circular:—"Adverting to our circular of the 28th ult., notifying an advance of 20s. per ton, orders have since come in so freely that we are obliged to withdraw all quotations and price lists, and can only enter further orders at prices to be specially agreed." This firm started a new mill ten weeks ago. Booked two months ahead, they do not care to commit themselves further. It is satisfactory that a good proportion of the orders recently booked are upon home account, London and the North of England taking a good supply of sheets for stamping and for working-up purposes.

Galvanising sheets remain in brisk request. A good quality of singles were quoted at from £8 to £8 10s.; doubles, £9 10s.; and latens, £11. Whilst the majority of the firms were content with the difference of from 20s. to 25s. between singles and doubles, there were some who to-day required the full 30s., as well between singles and doubles as between doubles and latens.

The makers of galvanised sheets sought, some of them, a further rise of from 5s. to 10s. upon the rates of a fortnight ago, but as a rule last week's declared prices ruled both yesterday and to-day. Still, makers did not hesitate to declare that if spelter continues to rise, galvanised sheets must be again advanced. The markets to which shipments are now mostly going are New South Wales, Victoria, Valparaiso and the River Plate, the Cape, India, and Canada, with Norway and Sweden.

Hoops keep in request. The prices to-day at works are £6 15s. as a minimum, but the more general quotations were £7 to £7 5s. For export to the United States, the hoops being mostly cut to lengths, the price is a further 5s. per ton; and yet another 5s. if they are of the fifteen-sixteenths width.

The tin-plate makers reported themselves busy on account of Australia, the United States, and several European markets. The leading merchant firm which ships these goods to the United States was credited yesterday with having recently bought no fewer than 4000 boxes. The demand runs mostly upon coke sorts, which were quoted to-day at 17s., up to 19s. for best. For charcoal 22s. per box was the general figure. These figures are a rise of from 1s. to 2s. per box upon three months ago.

The local demand for steel in most shapes and of most descriptions is steadily increasing, most activity being seen in mild steel billets for rolling down into sheets. There were a large number of steel sellers present last week, representing the principal centres of production, including Lancashire and South Wales and Yorkshire, but the bulk of them came from Sheffield and Rotherham and other parts of South Yorkshire. Alike crucible and Bessemer steel of all sections and qualities were on abundant offer, and the manufacturers of the crucible metal were selling Bessemer material

alongside their own. This kind of thing has become customary now in consequence of the large amount of Bessemer which, as I have reported long ago, is being used hereabouts for purposes to which two or three years ago only crucible steel was applied.

The prices asked for Bessemer were an advance of between 5s. and 7s. 6d. per ton, according to quality, upon the rates which prevailed a fortnight or so before the quarterly meetings came off, and this advance was the first which the makers of cultivating tools and other buyers in the midlands have had to pay since the revival in trade set in. Bessemer bars ranged from £7 10s. to £8 and £8 10s., according to quality, and delivered in the Midlands, or at works in Sheffield 10 per cent. less. Billets were about £6 10s. to £7 and £7 10s. per ton.

Crucible steel varied from £20 to £55 per ton delivered, according to the purposes for which it was intended to be applied. The quality mostly used for "steeling" shovels and spades was about £22 per ton; pick steel £25; and axe £35 to £40. The highest priced steels were bought chiefly for tool turning purposes. The steel made by Messrs. Osborne and Co., Sheffield, and which is known as "Mushet's Patent," was priced as usual at 1s. per lb. Merchants who buy crucible steel for export expressed themselves as insufficiently confident of the permanence of the revival to make them eager to place large orders. It often happens that at the quarterly gatherings a good quantity is bought for export to India, of a very cheap quality, and that on Australian account some fair orders are placed, and a large business is done likewise on account of the European Continent. It cannot correctly be said that on this occasion the demand on account of these markets was very active.

Pig iron was not universally to-day as strong as it was this day week; yet there were no quotable alterations. Part-mine melting iron was 47s. 6d., and forge iron of the same quality 45s.; while best, made by the same firms, was 60s. All-mine iron was strong at 65s.; hematites were 72s. 6d. to 75s., but without securing much trade.

Coal was in active demand at the recent rise

The Patent Shaft and Axletree Company, of Wednesbury, on Tuesday, adopted experimentally the Brush system of electric lighting, in lieu of gas lighting, at the section of its concern known as the Old Park Works. One of Fairley's 20in. horizontal engines supplied the motive power, and worked one of Brush's 16-light machines. Seventeen lamps were distributed through the different shops, foundries, and yards, and a steady, soft, mellow light was obtained. With one or two extra lamps, the men will be able to carry on their work with a comfort unattainable under the old system. As the men look upon the new system with favour, it will, in all probability, be eventually adopted throughout the whole establishment.

NOTES FROM LANCASHIRE.

(From our own Correspondent.

Manchester.—The iron market here so far as the demand for pig iron is concerned seems to have quieted down a little during the past week. The easier tone reported from Glasgow, and the ascertained fact that there is a good deal of iron in second hands which must sooner or later come into the market, have no doubt influenced buyers in holding back, whilst most of the large consumers are so well covered for the present that they are in a position to wait if there is a probability of the market turning in their favour. Here and there sellers have been easier to deal with, but it cannot be said that the market is really weaker, as makers have so little iron to offer for this year, and are still disinclined to sell forward, that they are not at all anxious to press sales, and where any business is done it is for the most part at about late rates. Lancashire makers of pig iron have made a few small sales during the week at their full list rates of 48s. for No. 4 forge and 49s. for No. 3 foundry, less 2½ delivered equal to Manchester. Outside brands coming into this market are still practically limited to the Lincolnshire and Derbyshire makes, but of these the quantity offering is now very limited, and for some brands buyers with orders of any considerable weight to give out find great difficulty in placing them. For delivery equal to Manchester quotations remain at 49s. to 50s. for Lincolnshire, and 50s. to 51s. less 2½ for ordinary brands of Derbyshire iron. Middlesbrough iron delivered equal to Manchester is quoted at about 51s. to 51s. 3d. per ton net cash for g.m.b., but at these figures little more than a nominal business can be done with consumers here.

Hematites are in good demand, and are firm at about 70s. per ton less 2½ for foundry qualities delivered into this district.

In the finished iron trade there are no signs of any falling off in the activity which has prevailed for the last few months. Makers all through this district continue as busy as they can possibly be, and in many cases could fill their books far into next year if they were disposed to accept forward contracts at present rates. Inquiries for export are not quite so brisk as they were, and the increase in freights which is coming into operation at Liverpool may probably tend to check further new business; but there are still large deliveries to be made on account of old orders, whilst home requirements are improving steadily, consequent upon the increasing activity in many of the leading iron consuming branches of industry. For delivery into the Manchester district bars are now quoted at £6 10s. to £7 per ton, and £6 15s. represents the actually realised price for good local brands, whilst for small parcels, or anything like deferred deliveries, some of the makers will not now take anything under £7 per ton. Other descriptions of finished iron are stiff in proportion.

Following the personal inquiries which I have made amongst the principal employers as to the condition of the engineering trades in this district, and the results of which I briefly gave last week, it will be interesting to add a summary of the last reports sent in by the men from the various branches of the Amalgamated Society of Engineers. These continue to show, if only a slow, still a steady improvement throughout the United Kingdom. There is again a decrease—this month of fifty—in the number of men out of employment, and of this decrease a considerable proportion is credited to the Manchester district, where out of about 4500 members there are now but a little over 100 on the books receiving donation as out of employment, and there is a decrease of twenty as compared with the previous month's returns. Throughout Lancashire, the reports from the various districts, although still not what may be called satisfactory, are, on the whole, more favourable. All through the Manchester district trade is returned as moderate, with in some cases improving; Liverpool, Birkenhead, Bolton, Bury, Chorley, Blackburn, Darwen, Heywood, Hollinwood, Oldham, Patricroft, Radcliffe Bridge, Staleybridge, and Widnes are also all returned as moderate, whilst Barrow-in-Furness is reported as moderate and good, Farnworth and Ramsbottom as good, St. Helens improving, and the only places returned as actually bad are Ashton, Stockport, and Wigan.

Satisfactory reports have also been received from the foreign branches. In the north of France work appears to be good, as all the members are reported in employment, whilst in the United States trade generally is returned as improving, and in connection with this I may mention that the agent of an American engineering firm has during the past week been endeavouring to hire men in Manchester to go over to the United States.

The engineers' strike in the Blackburn district, where several firms gave notice of a reduction in wages, has terminated by the men returning to work on the old terms.

By the death of Mr. E. T. Bellhouse, which took place last week at Southport, there has passed away one of the early founders of the engineering trade in Manchester. The deceased gentleman, who held a high position in his profession as an engineer, was born in 1816, and was the grandson of Mr. David Bellhouse, who established the Eagle Foundry, which, under the management of Mr. E. T. Bellhouse, who entered the establishment forty years ago, was ultimately developed into the large engineering works under the style of E. T. Bellhouse and Co., who have been long known for their hydraulic machinery and presses, and their iron houses and bridge work. Amongst the work turned out by the firm were the whole of the iron houses for the Peruvian Railway; the bridges for the South Junction and Altrincham Railway; a number of stations for the Lancashire and Yorkshire Railway; and more recently, the new bridge over the river Irwell at Throstle Nest, of which a description was given in THE ENGINEER; whilst the firm have been largely engaged in important local Corporation work.

In the coal trade of this district a steady demand is maintained for all descriptions of round coal, both for house-fire and iron-making purposes, and the pits are kept on full time. Engine classes of fuel, although going off fairly for mill purposes, hang rather in the market, owing to the increased production of slack. For round coals prices are firm with an upward tendency, but engine classes of fuel if anything are rather weak, although not actually quoted at lower rates. The average prices at the pit are about as under:—Best Wigan Arley, 9s. 6d.; seconds and Pemberton four-feet, 7s. to 8s.; common round coal, 5s. 9d. to 6s. 3d.; burgy, 4s. 3d. to 4s. 6d.; and slack, 3s. up to 3s. 9d. per ton according to quality.

Steam coal delivered at Liverpool or Preston is quoted at about 7s. 3d. to 7s. 6d. per ton, but the business doing during the week has been only moderate.

Barrow.—There is no doubt that we shall have a very good winter's trade in the hematite pig iron department, as the demand coming to hand for forward delivery is not only equal to that of the past few weeks, but shows even a better inquiry still. Prices are steady and firm, although practically unchanged from last quotations; No. 1 Bessemer, 62s. 6d. per ton; No. 2, 61s. 6d.; and No. 3, 60s.; No. 3 forge, 60s. per ton; all at makers' works. The production of pig iron at the furnaces is the same as for some time back, but this is likely to be increased in a very short time, as makers are preparing to put into blast the furnaces at those works which have been for some time undergoing a thorough repair, and they are already lighting them. The blowing-in of these furnaces will further increase the receipts on the local railways, which have during the past week or two showed a very appreciable increase in the revenue. The demand from America and the Continent is well maintained, but orders are now being booked for forward delivery. In steel, makers are well sold forward, and new orders are being booked for contracts that cannot be completed this year. The demand for steel rails shows an increase, and a heavy output of this class is being made. Steel plates and tram sections are doing a good business. Iron shipbuilders are fairly supplied with work, but are not so busy as they were a short time ago. New orders are being negotiated. Other industries doing a fair business. Iron ore in good demand. Coal in good demand. Shipping brisker.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

THE first note of dispute in the coal trade has been raised this week, and in an old region of disturbance—at Thorncliffe. A meeting of the miners employed at the Thorncliffe Collieries has decided to ask that the 5 per cent. recently conceded be returned, or, in other words, that the miners have an advance in wages to the extent of 5 per cent. One of the resolutions passed ran thus: "That a strong organisation amongst the miners of the district is necessary, in order to enable them to obtain a fair proportion of the fruits of their labour." Mr. William Chappell, secretary of the Rotherham District Miners' Association, said he had not yet lost hope that the miners of South Yorkshire would become united as one body. The lessons they had been taught during the last few years were sufficient to make men sacrifice almost anything to better their position. Men were joining their ranks in various parts of the district, and he had confidence that a better state of affairs was approaching. The miners knew perfectly well they were being subjected to all sorts of tricks, by which to reduce their wages. When miners get an advance of wages all the world knew, but the world did not know to what extent miners' wages were reduced on the most absurd grounds. The outlook of trade, he held, was exceedingly promising; more so, indeed, than it had been for several years. The best judges of trade in the kingdom were sanguine that a good run of business would be experienced during the next five or six months. The iron trade had improved, and prices had advanced considerably. The coal trade also had improved wonderfully during the last few weeks, and coal was at present selling in the London market at 26s. per ton. Coalowners and merchants had advanced their prices 1s. 6d. a ton, and a portion of these advances was due to the miners. I anticipate that the agitation at Thorncliffe will be the beginning of a general movement among the miners of South Yorkshire for an advance of wages.

Admiral Skestokoff, of the Russian Imperial Navy, who paid a one day visit to Sheffield last week, was the guest of Mr. George Wilson, chairman and managing director of the Cyclops Steel and Ironworks (Messrs. Charles Cammell and Co., Limited). The Admiral, who was attended by Captain Leontieff, Lieut. Porotchkin, and Lieut. de Ribas, is the recently appointed Chief Constructor of the Russian Navy. He witnessed the principal processes at the Cyclops Works, including the rolling and casting of armour-plates, particularly the new compound Wilson plate, with which he was much struck. The Admiral and suite afterwards lunched at the offices of the company.

I have authority for contradicting the statement which has appeared that the Dodworth Silkstone Colliery has been purchased by Messrs. B. Whitworth and Brothers, of Manchester. The property has not been offered for sale, and cannot be, except under the order of the Court, and no order of sale has yet been made, or is likely to be for some time to come.

There is no change to report in the cutlery and general steel trade this week. Trade is brisk, particularly in the higher classes of cutlery and Bessemer steel.

Messrs. W. W. Harrison and Co., Montgomery, Wales, have received the only first-class award for electro-plate at the Adelaide Exhibition.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

THE Cleveland iron market held at Middlesbrough on Tuesday last might be described as, on the whole, a steady one. The slight fall of prices at Glasgow has had the effect of putting an end to the anxiety lately evinced by buyers of all kinds to contract for future supply. Shipments continue to be very good, and this taken in conjunction with the diminished production now in full operation, will probably cause a considerable diminution in stocks at the end of this month. No. 3 g.m.b. pig iron was sold on Tuesday at 42s. 9d. per ton f.o.b., but towards the end of the market no more than 42s. 6d. could be obtained. The price of warrants still continues abnormally low, showing a continued desire on the part of the holders to realise, and indicating a fear on their part that we shall see lower prices before long.

The reduction of output of the blast furnaces has been effected in most cases by allowing the blast to enter the furnaces through small tuyeres specially constructed. Inasmuch as by this means the total quantity of air entering the furnace in a given time is curtailed, without diminishing the pressure, combustion is proportionately retarded, and consequently the amount of iron smelted is diminished. In two cases furnaces have been altogether put out, but this would have taken place in any case, as they needed re-lining. The third plan for limiting the output of Cleveland iron which has been adopted by Messrs. Bolckow, Vaughan, and Co., Witton Park, is simply to change the furnace from smelting Cleveland ironstone to smelting hematite. This method tends to increase the quantity, and, therefore, lower the price of hematite pig iron.

The strike at the Clay-lane Ironworks has come to an end. The men returned to work on the understanding that they would in future only have to charge eighteen rounds per shift instead of twenty-four, which they did previous to the restriction. This strike lasted about three days, and must have been a serious loss to the owners of the works as well as to the workmen. Manufactured iron remains in steady demand. The contracts made week by week are considerably in excess of the quantity worked off. The minimum price of ship-plates remains nominally at £6 5s., but £6 10s. has been obtained in several cases for large quantities. Angles are to be had at £5 15s., and bars about the same price.

A meeting was held at Middlesbrough on Monday to consider the advisability of erecting a monument to the memory of the late John Vaughan, partner of Mr. Bolckow. The meeting was well and influentially attended, and a great deal of enthusiasm was displayed for the object in view. A committee was formed to obtain subscriptions, and several large sums were promised then and there.

The recent gale which passed over the country has done great damage in the Cleveland district. The most serious case is that of a foundry belonging to Messrs. Smith and Stoker, of Stockton-on-Tees. A portion of the building was blown down, killing six men, including the manager, who was also son of one of the partners, a foreman pattern-maker, and the time keeper, and wounding several others. At Redcar, on the coast, roofs were completely stripped of their slates, walls were blown flat down, and chimney stacks were upset, and either lay helplessly on the roofs or fell down bodily into the streets. The loss in shipping, and especially in fishing boats, has been something fearful. Although the storm approached from the south-west, the gusts of wind which did most damage were from the north, indicating that the storm was a rotating one, or of the nature of a cyclone.

The helpers' strike at Sunderland is gradually coming to an end by the supercession of the men on strike by others from a distance. Now that they are getting beaten they are beginning as usual to give in, and to make a virtue of necessity. At a meeting held a day or two since, they passed a resolution that a section of them might be allowed to return to work. Their places are, however, filled by others, and it is doubtful whether they will be received at the yards on any condition whatever.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE tone of the Glasgow warrant market has been less firm this week, and both warrants and makers' iron have been in less demand. As the season for continental shipments is now almost at an end, the consignments in that direction are getting small. This has, of course, its influence in diminishing the general bulk of the shipments abroad; but those of the past week, which were unexpectedly small, were likewise reduced by the extremely violent weather at sea. Founders and other home manufacturers are using a large quantity of Scotch pig iron, and also increasing quantities of Cleveland iron, the imports of which are at present large. With respect to these latter, too, it is perhaps well to explain that they usually increase at this season, on account of merchants preparing for the probable interruption of the canal navigation. The putting-out of furnaces in Scotland has, as yet, had no effect upon the storing of pig iron, for in the course of the past week about 4000 tons were added to the stock in Messrs. Connal and Co.'s stores. These now contain upwards of 600,000 tons, or about 140,000 tons more than at the same date last year. This state of matters, together with the small shipments and moderate demand for makers' iron, has this week induced a number of holders to sell, with the result that prices are easier all round. There are 105 furnaces in blast, as compared with 111 at the same time last year.

Business was done in the warrant market on Friday at 52s. 1½d. per ton. On Monday, owing to the influences referred to above, there was a rapid fall from 52s. to 51s., whilst on Tuesday the market was irregular, with transactions at 51s. 3d. to 50s. 10½d., and 51s. 2d. cash, and 51s. 3d. to 51s. 2d. and 51s. 4½d. one month. The market was depressed on Wednesday, when business was done at 50s. 10d. to 50s. 3d. cash. To-day—Thursday—being a holiday, no market was held.

As indicated above, makers' quotations, or rather the prices of makers' iron in the market, are lower this week:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, is quoted at 61s.; No. 3, 52s. 6d.; Coltness, 62s. and 53s.; Langloan, 63s. and 58s. 6d.; Summerlee, 61s. and 52s.; Calder, 61s. and 53s. 6d.; Carnbroe, 54s. 6d. and 51s.; Clyde, 53s. and 50s. 6d.; Monkland, 52s. 6d. and 50s.; Quarter, ditto, ditto; Govan, at Broomielaw, 52s. 6d. and 50s.; Shotts, at Leith, 62s. 6d. and 53s. 6d.; Carron, at Grangemouth, 53s. 6d. (specially selected, 56s.) and 52s. 6d.; Kinneil, at Bo'ness, 52s. 6d. and 50s.; Glengarnock, at Ardrossan, 55s. and 51s. 6d.; Eglinton, 52s. and 49s.; Dalmellington, 52s. 6d. and 49s. 6d.

The position of the malleable iron trade continues very satisfactory, and large shipments of iron manufactures are taking place from the Clyde. The past week's shipments comprised £45,000 of machinery, of which £22,000 was sugar-making; £16,000 locomotives for Calcutta, and a mill, valued at £4800 for New Zealand; £4300 sewing machines, of which £2410 went to Gothenburg, £1380 to Rouen, and £500 to Montreal; £39,900 manufactured goods, of which £13,000 were steel rails for Galveston, £9900 for Rangoon, £8500 for Montreal, £5700 for Calcutta, £2000 for Boston, and £1000 for Spain.

The coal trade has been active during the week, there being a good demand at the slightly advanced prices. The stormy weather has to some extent impeded operations in connection with the shipping department of the trade, but there appears to have been rather more doing in household coals for home use; steam coals for home manufactures also being in good request. It has been ascertained that in the course of the past nine months 3,220,000 tons of coals have been brought into Glasgow from the various colliery districts in the West of Scotland. Of this quantity between 300,000 and 400,000 was shipped abroad.

In the West the miners are expected to keep quietly at work till the end of the present month, when they will look for the advance of wages which some of the employers are said to have promised them. The Executive Board of the Fife and Clackmannan miners met at Dunfermline on Saturday, and, after hearing reports as to the condition of trade from the various districts, passed a resolution to the effect that if an advance of 6d. per day is not conceded by the 1st November, the miners will not be held bound to work more than five days per week.

The Mining Institute of Scotland had a meeting at Hamilton—Mr. Ralph Moore, Inspector of Mines, presiding—towards the close of last week, when Mr. F. J. Rowan, of Glasgow, read a paper on the subject of firing boilers by gas. Mr. T. L. Galloway afterwards read a paper on mining surveys, and both communications were favourably criticised by those present.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

THE western part of Wales has been *en fête* this week owing to the visit of the Prince of Wales, and the opening ceremony of the new dock at Swansea. When completed I shall notice the dock at greater length. At present the date having been fixed for the opening at too early a time, and carried out so as not to

inconvenience his Royal Highness, I only notice it cursorily. It is situated on the east of the river Tawe, in Fabians Bay. It will be called the Prince of Wales Dock, will contain 23 acres of water, length 2320ft., and breadth from 500ft. to 340ft.; depth 35ft. At ordinary spring tides there will be 23ft. of water in the dock, and 33ft. on the cill. In addition there is to be a dry dock, which will shortly be commenced. Some idea of the work accomplished is given from the fact that as much as a million and a-quarter cubic yards of earth have been excavated within the old east pier, while the excavation outside of the pier amounts to 300,000 yards. Six coal tips are to be erected, five for the Great Western and one for the Midland. The whole of the bridges for this work have been supplied by Messrs. Brettell, of Shrub Hill, Worcester.

I am assured by a prominent gentleman at Swansea that every every effort will be made at the next session to carry the Swansea and Rhondda Railway Bill. Having greater accommodation, Swansea must prepare vigorously to find more exports. At present the coal total remains under 20,000 tons considerably, while Cardiff rarely falls below 100,000 tons per week.

A new line has been sketched out, which seems to me an easy one. It is from Swansea to Neath; then, utilising the Neath Canal, will get by easy gradient to Penderrin; leaving Hirwain on the right, reach the Taff Vaur Valley near Cefn, and be in direct communication with the London and North-Western; Brecon, Great Western; and with the Rhondda by way of Taff Vale. This will open out to the Great Western an alternative route for that of the Abernant Tunnel, which some day I expect to see abandoned. Still another line is to be brought forward at next session, and this by the Taff Vale Railway Company, which proposes to construct a line from Ynysowen to Castle Pit, Cyfarthfa, then by the other collieries into Cyfarthfa Works. This new line will enable the Taff Vale to work all the Cyfarthfa traffic.

The staple trades of the district are in good condition, though a little interfered with by the royal festivities.

There has been an important meeting of coal-owners at Cardiff, when amongst other questions the new regulations with regard to blasting were discussed, and it was considered that if insisted upon the supply from the important collieries of Wales must fall considerably short of the demand, especially if, as now appears probable, that demand should be sustained throughout the winter.

The Welsh iron and steel trade is good, and prices still continue to look up. Like the coal trade it wears a healthy look, and a great deal of animation exists.

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 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.

11th October, 1881.

4406 Knitted Fabrics, T. Thorpe, Nottingham.
4407. Gas Engines, J. Drake & R. Muirhead, Maidstone.
4408. Compound Materials, W. Callender, London.
4409. Telegraph Conductors, W. Callender, London.
4410. Wooden Hoops, W. Morgan-Brown.—(*H. F. Campbell, U.S.*)
4411. Mash Tuns, G. G. Cave, Castle Green, Bristol.
4412. Food for Animals, E. Wylam, Southwark.
4413. Wort Filter, G. G. Cave, Bristol.
4414. Thermometers, E. A. Brydges.—(*Dr. Kronecker, Berlin.*)
4415. Colliery Wagons, R. Hadfield, London.
4416. Furnaces, T. Hudson, Manchester.
4417. Music Stand, J. J. Gilbert, New Romney.
4418. Calcining Ores, R. Mackenzie, London.
4419. Paper Pulp, D. O. Francke, Sweden.
4420. Telephonic Apparatus, S. Pitt.—(*W. Paterson and C. R. Scribner, U.S.*)
4421. Telephone Lines, G. Pitt.—(*C. Buell, U.S.*)
4422. Spinning Threads, T. Briggs, Manchester.
4423. Slates, W. A. Barlow, London.
4424. Coverings of Vehicles, E. Gilbert and D. Sinclair, Dundee.
4425. Heating Rooms, T. Stokoe, Headingley.
4426. Knitting Maghines, H. J. Haddan.—(*R. I. Creelman, Canada.*)
4427. Pipe Joints, E. Mawbrey, Market Harborough.
4428. Telephonic Apparatus, A. Bennett, London.
4429. Preserving Hay, C. W. F. Swarbrick, London.
4430. Bicycles, T. T. Harrison, Bristol.
4431. Tables, H. Newton.—(*J. Jorgenson, U.S.*)
4432. Looms, J. Barbour.—(*A. Coulter, Kasan.*)
4433. Street Railways, A. Clark.—(*C. Rasmusen, U.S.*)
4434. Tricycles, A. M. Clark.—(*S. N. Silver, Auburn, and C. E. Page, Biddeford, U.S.*)
4435. Smelting Ores, J. W. Chenall, Morriston.
4436. Lubricating, G. Pitt.—(*D. D. Coath, Rangoon.*)
4437. Hats, &c., W. R. Lake.—(*W. A. Baglin, Brooklyn, and G. Yule, Newark, U.S.*)

12th October, 1881.

4438. Horseshoes, J. Welsby, West Derby.
4439. Electric Lamps, J. Jameson, Akenside-hill.
4440. Indicators, A. Budenberg.—(*C. F. Budenberg and B. A. Schaeffer, Buckrau Magdeburg.*)
4441. Nitric Acid, &c., J. Drucker, Manchester.
4442. Securing Handles, C. Ezard, Manchester.
4443. Wort, T. Webb, Clapton Park.
4444. Coating Surfaces, H. Lake.—(*H. Reusch, Germany.*)
4445. Screws, &c., W. R. Lake.—(*Harvey Screw Company, Incorporated, Jersey, U.S.*)
4446. Working Pumps, S. Lee & T. Allison, Huddersfield.
4447. Food, W. White, London Wall.
4448. Electro-magnets, J. Imray.—(*J. Stearns, U.S.*)
4449. Brushing, F. Stansfield, Bradford.
4450. Telephonic Communications, J. Imray.—(*J. Milton Stearns, jun., Brooklyn, U.S.*)
4451. Discharging Torpedoes, P. Brotherhood, London.
4452. Couplings, W. L. Wise.—(*L. Mégy and J. de Echeverria, Paris.*)
4453. Locks, J. M. Bibbins.—(*J. du Bois, U.S.*)
4454. Measuring, J. T. Sprague, Birmingham.

13th October, 1881.

4455. Batteries, J. W. Swan, Newcastle-on-Tyne.
4456. Furnaces, W. Black, South Shields, and T. Larkin, East Jarrow.
4457. Bleaching Jute. T. G. Young, Penicuik.
4458. Vacuum Pumps, W. H. Akester, Glasgow.
4459. Grinding Curling Stones, A. Kay, Haugh.
4460. Tentering, &c., Fabrics, J. L. Norton, London.
4461. Metal Kegs, J. Storer, Glasgow.
4462. Pumping Machinery, J. Gill, Edinburgh.
4463. Corkscrews, J. Pitt & J. Norgrove, Birmingham.
4464. Combing Wool, W. Terry and J. Scott, Bradford.
4465. Stretching Woven Fabrics, J. Lodge, Huddersfield, and M. Oldroyd, York.
4466. Knitting Machines, W. Dexter, Nottingham.
4467. Perambulators, J. H. Miles, Birmingham.
4468. Cigar-holders, H. Friedlander, London.
4469. Locking Screw Nut, C. Challis, Homerton.
4470. Furniture, J. Middleton & G. Scott, Birkenhead.
4471. Trowels, T. Tyzack, Sheffield.
4472. Electric Meter, C. V. Boys, Wing.
4473. Pneumatic Signalling, C. D. Abel.—(*P. Rimachlosky and W. Tagaitschinoff.*)
4474. Motors, W. L. Wise.—(*L. Mégy, Paris.*)
4475. Tobacco Pipes, D. T. Powell, London.
4476. Boat-detaching Gear, A. Simey, Sunderland.

14th October, 1881.

4477. Gymnastic Apparatus, A. Turner, Birmingham.
4478. Electric Lamps, R. Harrison, Newcastle-upon-Tyne.
4479. Elliptical Springs, F. Joynes, Sheffield.
4480. Umbrellas, W. Thompson.—(*J. Ganilh, Paris.*)
4481. Rotary Pump, L. Groth.—(*H. Himmelman, Sweden.*)
4482. Flyers, J. W. Naylor & T. Thompson, Keighley.
4483. Pumps, R. Hosking, jun., and W. Blackwell, Dalton-in-Furness.
4484. Sledges, W. Barnard, Springfield.
4485. Steam Boilers, G. Stevenson, Airdrie.
4486. Obtaining Oxides, J. B. Readman, Glasgow.
4487. Lamps, A. A. B. Bennett, King's Heath, J. Herd and B. P. Walker, Edgbaston.
4488. Lawn Tennis Apparatus, H. Bartlett, Exmouth.
4489. Liquors, J. Imray.—(*La Société Anonyme des Produits Chimiques du Sud-Ouest, Paris.*)
4490. Artificially Producing Snow, D. Rae, London.
4491. Soda, J. Imray.—(*La Société Anonyme des Produits Chimiques du Sud-Ouest, Paris.*)
4492. Velocipedes, W. Harrison, Manchester.
4493. Lubricating, J. J. Royle, Manchester.

15th October, 1881.

4494. Spinning Cotton, R. Scaife, Colne.
4495. Looms, W. E. Gedge.—(*J. Vacher, St. Etienne.*)
4496. Regulators for Electric Motors, J. H. Johnson.—(*La Société Anonyme La Force et la Lumière Société Generale de l'Electricité, Brussels.*)
4497. Wringing Machines, H. J. Haddan.—(*J. Kinleyside, Canada.*)
4498. Lockets, E. Richardson, Birmingham.
4499. Looms, S. O'Neill, Castleton.
4500. Soles of Boots, L. S. Cohen, Liverpool.
4501. Saccharifying Raw Grain, A. Manbré, London.
4502. Hydraulic Rams, J. Webster, Bolton.
4503. Window Fasteners, C. Gall, Halifax.
4504. Electric Arc Lamps, J. Brockie, Brixton.
4505. Pressed Glass, J. Sowerby, Gateshead-on-Tyne.
4506. Fires in Mines, J. Onions & W. Tooth, London.
4507. Insulators, A. D. Gilbert, Clapham.
4508. Production of Electricity, J. H. Johnson.—(*E. U. Parod, Paris.*)
4509. Sheaf-binding, J. Hornsby, J. Innocent, and G. T. Rutter, Grantham.
4510. Governors for Steam Engines, P. Turner, Ipswich.
4511. Air Inlets, B. R. Harrington, Beckenham.
4512. Supply of Water, W. A. McCormick, London.

17th October, 1881.

4513. Saccharine, C. Pieper.—(*P. Degener, Berlin.*)
4514. Forging Metals, E. Dearden, Darnall.
4515. Manufacture of Ice, J. Sturgeon, Liverpool, and J. W. Galwey, Warrington.
4516. Bottles, B. Azulay, Islington.
4517. Propelling Vessels, M. Hedicke.—(*H. Grauel, Germany.*)
4518. Sewing Machines, H. Lake.—(*J. Journaux, Paris.*)
4519. Axle Clips, G. Wearing, West Bromwich.
4520. Exhibiting Trade Marks, F. Mousley, Birmingham.
4521. Weighing Machine, T. Williams, London.
4522. Saddle Bars, R. Spence, Richmond.
4523. Lubricators, J. Gallie, Jersey.
4524. Collecting Dust, F. W. Borland, France.
4525. Locomotive Engines, A. W. Reddie.—(*Pneumatic Tramway Engine Company (Incorporated), U.S.*)
4526. Stoves, P. Everitt and A. Barnard, Norfolk.
4527. Soap, H. W. Blease and T. T. Wilson, Liverpool.
4528. Corking Machines, F. H. F. Engel.—(*Boldt and Vogel, Hamburg.*)
4529. Indicators, F. Engel.—(*J. Eggers, Hamburg.*)

Inventions Protected for Six Months on deposit of Complete Specifications.

4420. Telephonic Apparatus, S. Pitt, Sutton.—A communication from W. R. Patterson and C. E. Scribner, Chicago, U.S.—11*th October*, 1881.
4421. Telephone Lines, S. Pitt, Sutton.—A communication C. E. Buell, New Haven, U.S.—11*th October*, 1881.
4437. Hats, W. R. Lake, Southampton-buildings, London.—A communication from W. A. Baglin, Brooklyn, and G. Yule, Newark, U.S.—11*th October*, 1881.
4445. Manufacture of Screws, &c., W. R. Lake, Southampton-buildings, London.—A communication from Harvey Screw Company, Incorporated, Jersey, U.S.—12*th October*, 1881.

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

3996. Collecting Rain-water, W. Buck, Kilburn.—10*th October*, 1878.
3997. Gas, J. E. Dowson, London.—10*th October*, 1878.
4008. Heels for Boots, W. H. Dorman, Stafford.—10*th October*, 1878.
4012. Decanter, &c., Stands, G., G. W., and J. Betjemann, London.—10*th October*, 1878.
4014. Applying Chineeing to Slivers, W. A. Barlow.—10*th October*, 1878.
4045. Dies or Moulds, W. B. Ensor, West Bromwich.—12*th October*, 1878.
4054. Self-acting Mules, B. A. and W. Dobson, and R. C. Tonge, Bolton.—12*th October*, 1878.
4243. Winding Cops, A. Anderson and G. Browning, Glasgow.—23*rd October*, 1878.
4482. Bricks, E. Monson, Acton.—6*th November*, 1878.
4093. Brakes, G. Westinghouse, jun., London.—15*th October*, 1878.
4107. Long-range Sights, G. M. Lowe, Lincoln.—16*th October*, 1878.
4389. Railway Brakes, G. Westinghouse, jun., London.—31*st October*, 1878.
4056. Rotary Pumps, S. Pitt, Sutton.—12*th October*, 1878,
4068. Pulping Fibrous Materials, J. Cooke and G. Hibbert, Richmond, and C. E. B. Cooke, London.—14*th October*, 1878.
4075. Galvanic Batteries, J. H. Johnson, London.—14*th October*, 1878.
4112. Water-closets, G. Jennings and G. Jennings, jun., Stangate.—4*th October*, 1878.
4148. Alkali, J. C. Stevenson, South Shields.—16*th October*, 1878.
4199. Wheels of Tramcars, E. Perrett, Westminster.—22*nd October*, 1878.
4070. Filtering Air, A. R. and J. W. Harding, Leeds.—14*th October*, 1878.
4109 Endless, &c., Railways, J. A. Mays, London.—16*th October*, 1878.
4186. Transmitting Power, J. S. von Traunfels, Vienna.—19*th October*, 1874.
4251. Envelopes, C. S. Britain and H. King, Liverpool.—24*th October*, 1878.
4078. Blanks for Animal's Shoe-nails, G. C. Hopper, London.—14*th October*, 1878.
4081. Receipts of Fares, &c., J. Bailey, Wandsworth.—14*th October*, 1878.
4097. Regenerative Gas Furnaces, W. Hackney, Newport.—15*th October*, 1878.
4207. Core Bars, J. Chambers, Nottingham.—22*nd October*, 1878.
4106. Carding Wool, E. Wilkinson, Marsden.—16*th October*, 1878.
4115. Driving Belts, J. Heap, Ashton-under-Lyne.—16*th October*, 1878.
4122. Shaping Teeth of Bevel Wheels, W. W. Urquhart & J. Lindsay, Dundee.—17*th October*, 1878.
4128. Roadways, C. Bremerkamp, London.—17*th October*, 1878.
4229. Abutments for Protection of Castors, J. Reilly, Manchester.—23*rd October*, 1878.

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

3519. Looms, L. J. Knowles, Massachusetts, U.S.—13*th October*, 1874.
3562. Covering for Carding Wool, &c., R. Thorton, Clockheaton.—16*th October*, 1874.
3612. Explosive Compounds, S. Mackie, London, C. Fauré & G. French, Faversham.—20*th October*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 5th November, 1881.

2487. Mowing Machines, J. A. Carles, Toulouse.—8*th June*, 1881.
2490. Sealskins, W. R. Lake, London.—A communication from D. Mueller.—8*th June*, 1881.
2497. Provision Cases, W. Rollason, London.—8*th June*, 1881.
2507. Trusses, J. Mayer, London.—9*th June*, 1881.
2508. Sealskins, C. M. Lampson, London.—9*th June*, 1881.
2515. Taps and Valves, A. Pullan and J. R. Meihé, London.—9*th June*, 1881.
2527. Printing Surfaces, W. B. Woodbury, London.—10*th June*, 1881.
2533. Leather, J. Hall, Leeds.—10*th June*, 1881.
2534. Section Knives, T. Heiffor, Sheffield.—10*th June*, 1881.
2538. Electric Brakes, M. R. Ward, London.—10*th June*, 1881.
2542. Insulated Wires, S. J. Mackie, Peckham.—11*th June*, 1881.
2544. Zinc for Preventing Corrosion, J. B. Hannay, Glasgow.—11*th June*, 1881.
2551. Straps or Bands, H. Studdy, Waddeton Court.—11*th June*, 1881.
2553. Felt Hats, W. R. Lake, London.—A communication from C. P. Marin.—11*th June*, 1881.
2561. Bars for Holding Glass in Windows, C. H. Pennycook, Glasgow.—13*th June*, 1881.
2568. Regulating Patterns of Work, F. E. A. Büsche, Germany.—13*th June*, 1881.
2589. Desulphuration of Liquids, F. Lux, Bavaria.—14*th June*, 1881.
2619. Ball Cocks, S. Owen, London.—13*th June*, 1881.
2623. Transport of Carriages, I. Bell, F. G. Stoney, and W. E. Rich, London.—16*th June*, 1881.
2629. Materials for Blocks, G. A. Wright, Portsmouth.—16*th June*, 1881.
2639. Bessemer Converter Linings, D. Evans and A. E. Tucker, South Wales.—17*th June*, 1881.
2657. Glassholders of Gaseliers, J. Gordon, Birmingham.—17*th June*, 1881.
2669. Construction of Gas Retorts, G. Anderson, London.—18*th June*, 1881.
2674. Type Composition, I. Delcambre, Brussels.—18*th June*, 1881.
2683. Tubes, W. E. Everitt, Birmingham.—18*th June*, 1881.
2717. Feed-water Apparatus, H. H. Lake, London.—A communication from E. J. Hall.—21*st June*, 1881.
2722. Wax-thread Sewing Machines, W. R. Lake, London.—A com. from G. Copeland.—21*st June*, 1881.
2727. Healds, W. E. Gedge, London.—A communication from N. and J. Chaize.—22*nd June*, 1881.
2738. Compact Ingots, P. Jensen, London.—A communication from H. Tholander.—22*nd June*, 1881.
2760. Tool-holder, W. R. Lake, London.—A com. from E. Dervaux-Ibled & G. Schœnberg.—24*th June*, 1881.
2786. Kilns, T. Carder, Chudleigh.—25*th June*, 1881.
2792. Carriages, A. E. Dalzell, Pall Mall, London.—25*th June*, 1881.
2932. White Metal, J. C. Mewburn, London.—A communication from La Société Raynaud, Bechade Gire et Companie.—5*th July*, 1881.
2957. Caustic Holders, G. F. Redfern, London.—A communication from A. B. Clarin.—6*th July*, 1881.
3262. Mordanting Textile Fabrics, J. Knowles, Manchester.—26*th July*, 1881.
3301. Lighting Gas, E. B. Burr, Walthamstowe.—28*th July*, 1881.
3369. Electric Lighting, K. W. Hedge, Westminster.—3*rd August*, 1881.
3407. Churns, N. Stewart, Hayward's Heath.—A communication from A. Stewart.—6*th August*, 1881.
3497. Pianos, J. M. Laboissière and C. L. Daujon, Paris.—12*th August*, 1881.
3553. Dyeing Aniline Black, G. Jagenburg, Sweden.—16*th August*, 1881.
3636. Dressing Flour, &c., C. W. Maconchy, Dublin.—20*th August*, 1881.
3685. Buttons, G. Phillips, Clehonger, Hereford.—24*th August*, 1881.
3749. Barrows, B. Green, Mitcham.—24*th August*, 1881.
3839. Fire-grates, C. D. Abel, London.—A communication from A. Godillot.—3*rd September*, 1881.
3975. Carrying Electric Wires, J. W. Smith, Edinburgh.—14*th September*, 1881.
4013. Cigarettes, D. Nicoll, Strand, London.—17*th September*, 1881.
4016. Velvets, W. Mather, Manchester.—17*th September*, 1881.
4330. Knitting Machine Needles, W. R. Lake, London.—A com. from S. Peberdy.—5*th October*, 1881.

Last day for filing opposition, 8th November, 1881.

2554. Receiving, &c., Audible Signals, A. F. St. George, London.—13*th June*, 1881.
2556. Combing Machines, J. Carrol, Bradford.—13*th June*, 1881.
2563. Electric Lamps, G. G. André, Dorking.—13*th June*, 1881.
2554. Locomotive Engines, J. R. Wigham, Dublin.—13*th June*, 1881.
2571. Looms, J. Pickering, Batley.—A communication from G. Pickering.—14*th June*, 1881.
2585. Machine Hammers, H. J. Haddan, London.—A communication from A. Beaudry.—14*th June*, 1881.
2594. Burners, G. Lauckner, London.—A communication from N. S. Wax.—15*th June*, 1881.
2595. Manual Levers, J. Cuthbert, Landport, and G. H. King, Portsea.—15*th June*, 1881.
2591. Wire Gauze, R. H. Brandon, Paris.—A communication from L. Lang and Son.—15*th June*, 1881.
2601. Leggings, I. Frankenburg, Salford.—15*th June*, 1881.
2646. Vehicles, J. Wilson, London.—17*th June*, 1881.
2650. Sewing Books, G. Brown, Glasgow.—17*th June*, 1881.
2654. Book Cases, W. T. Rogers, West Dulwich.—17*th June*, 1881.
2656. Governors, J. Bourne, Bayswater.—17*th June*, 1881.
2681. Lamps, F. R. Baker, Birmingham.—18*th June*, 1881.
2693. Hackling Flax, &c., J. C. Mewburn, London.—A communication from J. Dequoy.—20*th June*, 1881.
2694. Lamps, W. H. Bulpitt, Birmingham.—20*th June*, 1881.
2689. Pressing Wads of Wax, W. Lorenz, Carlsruhe.—20*th June*, 1881.
2700. Roller Mills, M. Benson, London.—A communication from O. Oexle.—20*th June*, 1881.
2701. Canvas Stretchers, M. Lazerges, Paris.—20*th June*, 1881.
2709. Copper Caps, &c., W. Lorenz, Carlsruhe.—21*st June*, 1881.
2725. Forming Moulds, F. Ley, Derby.—21*st June*, 1881.
2729. Button, &c., Fasteners, J. Harrington, Brixton.—22*nd June*, 1881.
2773. Spinning Machinery, A. M. Clark, London.—A communication from P. Townson.—24*th June*, 1881.
2777. Railway Signalling, G. Brockelbank, Anerley.—25*th June*, 1881.
2809. Cement, W. Joy, Aylesford.—27*th June*, 1881.
2982. Binding Corn, W. Woolnough and C. Kingsford, Kingston.—7*th July*, 1881.
3123. Drilling Shells of Boilers, W. Allan, Sunderland.—18*th July*, 1881.
3250. Steam Cooking, D. Grove, Berlin.—25*th July*, 1881.
3357. Pugging Clay, C. Walton, Bournemouth.—3*rd August*, 1881.
3383. Lavatories, J. Shanks, Barrhead.—4*th August*, 1881.
3463. Protecting Cables, F. R. Lucas, London.—10*th August*, 1881.
3504. Polychromatic Printing, J. R. Meihé, London.—A com. from F. C. Hoesch.—12*th August*, 1881.
3599. Electric Lamps, C. Lever, Bowden.—18*th August*, 1881.
3649. Jigging, &c., Seeds, S. Bruce, Dublin.—22*nd August*, 1881.
3907. Rotary Motion, J. J. Read, Dublin.—9*th September*, 1881.
3965. Lamp Burners, J. S. Fairfax, London.—A communication from W. Painter.—14*th September*, 1881.
3969. Steam Steering Machine, H. Muir and J. Caldwell, Glasgow.—14*th September*, 1881.
4001. Baths, J. Shanks, Barrhead.—16*th September*, 1881.
4019. Generating Electricity, G. E. Dering, Lockleys.—17*th September*, 1880.
4041. Glass Bottles, H. Codd, London.—19*th September*, 1881.
4075. Wooden Boxes, J. Womersley, Norwich.—21*st September*, 1881.
4267. Exhibiting Words or Scores of Operas, W. Lake, London.—Com. from T. L. Jones.—21*st October*, 1881.
4357. Vacuum-pans, W. R. Lake, London.—A communication from C. Wahl.—6*th October*, 1881.
4120. Telephonic Apparatus, S. Pitt, Sutton.—A com. from W. Patterson & C. Scribner.—11*th October*, 1881.
4421. Telephone Lines, G. Pitt, Sutton.—A communication from C. E. Buell.—11*th October*, 1881.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the* 14*th October*, 1881.)

1514. Steering Ships, F. W. Wilcox, Sunderland.—6*th April*, 1881.
1560. Distributing Liquids, W. Wells, Earlswood.—9*th April*, 1881.
1671. Regulating Flow of Liquids, G. H. Flood and D. Young, London.—16*th April*, 1881.
1680. Hot Bed Frames, A. Tyson, Lancaster.—16*th April*, 1881.
1683. Signalling, A. M. Clark, Chancery-lane, London.—16*th April*, 1881.
1685. Electric Lamps, A. M. Clark, Chancery-lane, London.—18*th April*, 1881.
1688. Boot Protectors, W. Beverley, Aberdeen.—19*th April*, 1881.
1689. Spinning Frames, J. Erskine, Strabane, Ireland.—19*th April*, 1881.
1692. Registering Distance Travelled, W. Thompson and A. Morten, London.—19*th April*, 1881.
1722. Ring Frames, W. Lumb, Rochdale, and J. Smith, Bagslate.—20*th April*, 1881.
1757. Safety-valve Plugs, A. M. Taylor, Dumbarton.—23*rd April*, 1881.
1812. Concrete, E. E. Carey, Newhaven, and E. Latham, Birkenhead.—27*th April*, 1881.
1844. Filtering Chemical Solutions, H. E. Newton, London.—28*th April*, 1881.
1860. Tricycles, J. Harrington, London.—29*th April*, 1881.
1871. Velocipedes, A. G. Meeze, Redhill, and N. Salamon, London. 30*th April*, 1881.
1890. Pottery, J. H. Johnson, Lincoln's-inn-fields, London.—2*nd May*, 1881.
1910. Shaping, &c., Metals, H. E. Newton, London.—3*rd May*, 1881.
1917. Separators, B. J. B. Mills, Southampton-buildings, London.—3*rd May*, 1881.
1942. Electric Arc Lamps, J. Brockie, Brixton.—4*th May*, 1881.
1950. Electrophonic Apparatus, W. R. Lake, Southampton-buildings, London.—4*th May*, 1881.
1956. Respiratory Apparatus, W. R. Lake, London.—5*th May*, 1881.
1968. Electric Lighting, W. R. Lake, London.—5*th May*, 1881.
2161. Mechanism for Tricycles, A. Burdess, Coventry.—18*th May*, 1881.
2312. Pipe Joint for Fire Engines, E. Cooman and P. Dallard, Paris.—26*th May*, 1881.
2603. Washing Wool, J. Clough, Keighley.—15*th June*, 1881.
2931. Gas Engines, E. de Pass, London.—5*th July*, 1881.
3095. Mining Machine, W. Mather, Lancaster, and F M. Lechner, U.S.—15*th July*, 1881.
3324. Cleansing Tubes in Steam Boilers, E. Lofts and H. J. Barker, Cherry-Hinton.—30*th July*, 1881.
3346. Electrical Signalling, J. U. Mackenzie, New York.—2*nd August*, 1881.
3409. Production of Electricity, G. Westinghouse, London.—6*th August*, 1881.
3413. Lids for Oilcans, J. Nickholds, Wolverhampton.—6*th August*, 1881.
3422. Pianoforte Actions, F. L. Mitchell, Halifax.—8*th August*, 1881.
3428. Roof Principals, F. H. Beattie, Soho.—8*th August*, 1881.
3431. Mounting of Ordnance, A. Longsden, London.—8*th August*, 1881.
3434. Railway Brakes, G. Westinghouse, London.—8*th August*, 1881.
3436. Regulating Valve, G. Westinghouse, London.—8*th August*, 1881.
3441. Generating Electricity, R. R. Moffat and S. Chichester.—9*th August*, 1881.
3525. Reaping Machines, P. C. Evans and H. J. H. King.—13*th August*, 1881.
3564. Lamps for Railway Carriages, J. F. Shallis and T. C. J. Thomas, London.—16*th August*, 1881.

(*List of Letters Patent which passed the Great Seal on the* 18*th October*, 1881.)

1704. Refining Camphor, G. Atkinson, London.—19*th April*, 1881.
1720. Magnesia Products, A. M. Clark, London.—20*th April*, 1881.
1723. Exploding Gases, W. Watson, Leeds.—20*th April*, 1881.
1732. Rotary Pumps, P. Jensen, London.—21*st April*, 1881.
1736. Grinding Machines, M. Bauer, Paris.—22*nd April*, 1881.
1746. Rotary Pumps, J. Lyle, London.—22*nd April*, 1881.
1749. Boiler Tubes, W. H. Wood, Cookley.—23*rd April*, 1881.
1766. Reel Fittings for Fishing Rods, W. Hardy, Alnwick.—23*rd April*, 1881.
1767. Dyes, F. A. Zimmermann, London.—23*rd April*, 1881.
1769. Withdrawing Fire-damp, W. and J. Morgan, Pontypridd.—23*rd April*, 1881.
1786. Production of Acids, F. Wirth, Frankfort-on-the-Main.—26*th April*, 1881.
1789. Block Signalling, J. W. Fletcher, Stockport.—26*th April*, 1881.
1805. Grinding, &c., Grain, H. Seck, Frankfort-on the-Main.—25*th April*, 1881.
1815. Water-closet Cisterns, H. and W. Sutcliffe Halifax.—27*th April*, 1881.
1817. Artificial Stone, W. E. Gedge, London.—27*th April*, 1881.
1854. Lifts, J. M. Day, W. R. Green, and H. C. Walker, London.—29*th April*, 1881.
1858. Drying, &c., Grain, &c., E. Keighley, Scarborough.—29*th April*, 1881.

1873. Telegraph Cables, W. T. Henley, Plaistow.—30*th April*, 1881.
1931. Treating Textile Fabrics, H. J. Haddan, London.—4*th May*, 1881.
1953. Controlling Water Level, C. Pieper, Berlin.—5*th May*, 1881.
2080. Making Oxygen, A. M. Clark, London.—12*th May*, 1881.
2180. Distilling Apparatus, A. L. Normandy, Victoria Docks.—18*th May*, 1881.
2183. Lock-stitch Sewing Machines, C. Pieper, Berlin.—19*th May*, 1881.
2185. Chronographs, L. A. Groth, London.—19*th May*, 1881.
2279. Digging Land, W. E. Crossby, Chelmsford, and A. Carey, Rochford.—24*th May*, 1881.
2653. Stoves, W. Barton, Boston.—17*th June*, 1881.
2939. Mincing Meat, H. Dollman, Birmingham.—5*th July*, 1881.
3062. Treating Wood, C. D. Ekman, London.—13*th July*, 1881.
3099. Cutting Screw Threads, W. R. Lake, London.—15*th July*, 1881.
3208. Preparing Cotton, J. Higgins and T. S. Whitworth, Salford.—22*nd July*, 1881.
3272. Bicycles, J. H. Johnson, London.—26*th July*, 1881.
3311. Preparing Vegetable Substances, J. H. Johnson, London.—29*th July*, 1881.
3444. Detaching Horses from Carriages, W. Walker, Saltburn-by-the-Sea.—9*th August*, 1881.
3469. Railway Brakes, A. M. Clark, London.—10*th August*, 1881.
3528. Fog-signals, F. H. Holmes, London.—13*th August*, 1881.
3603. Preparing Colouring Matters, J. H. Johnson, London.—18*th August*, 1881.

List of Specifications published during the week ending October 15th, 1881.

235, 4d.; 500, 8d.; 747, 2d.; 969, 4d.; 1016, 6d.; 1036, 6d.; 1046, 6d.; 1049, 8d.; 1052, 4d.; 1057, 8d.; 1058, 1s.; 1066, 6d.; 1069, 6d.; 1071, 2d.; 1073, 2d.; 1076, 6d.; 1079, 6d.; 1080, 6d.; 1081, 6d.; 1082, 2d.; 1083, 8d.; 1084, 6d.; 1085, 6d.; 1086, 2d.; 1087, 4d.; 1088, 6d., 1089, 8d.; 1090, 2d.; 1091, 6d.; 1092, 2d.; 1094, 8d.; 1095, 4d.; 1096, 2d.; 1097, 6d.; 1098, 2d.; 1099, 6d.; 1102, 2d.; 1103, 6d.; 1104, 10d.; 1105, 2d.; 1106, 2d.; 1107, 6d.; 1108, 6d.; 1109, 2d.; 1110, 6d.; 1112, 2d.; 1113, 2d.; 1115, 2d.; 1116, 6d.; 1118, 6d.; 1119, 10d.; 1122, 2d.; 1123, 6d.; 1124, 8d.; 1125, 6d.; 1126, 6d.; 1127, 2d.; 1131, 2d.; 1132, 2d.; 1133, 2d.; 1134, 6d.; 1135, 4d.; 1137, 2d.; 1139, 6d.; 1142, 2d.; 1145, 2d.; 1146, 6d.; 1148, 4d.; 1149, 2d.; 1150, 2d.; 1152, 6d.; 1153, 6d.; 1155, 4d.; 1156, 6d.; 1157, 6d.; 1158, 2d.; 1160, 4d.; 1161, 4d.; 1162, 6d.; 1165, 2d.; 1166, 2d.; 1167, 2d.; 1170, 4d.; 1171, 2d.; 1172, 2d.; 1174, 2d.; 1177, 2d.; 1179, 4d.; 1180, 2d.; 1181, 6d.; 1182, 2d.; 1186, 8d.; 1187, 2d.; 1189, 2d.; 1191, 2d.; 1192, 2d.; 1193, 2d.; 1194, 2d.; 1195, 6d.; 1196, 4d.; 1197, 2d.; 1198, 2d.; 1199, 2d.; 1200, 2d.; 1201, 2d.; 1202, 4d.; 1203, 2d.; 1214, 4d.; 1215, 4d.; 1231, 4d.; 1241, 6d.; 1256, 4d.; 1260, 6d., 1319, 6d.; 1384, 6d.; 1397, 6d.; 1483, 6d.; 1761, 6d.; 1781, 4d.; 2179, 4d.; 2328, 6d.; 2768, 6d.; 3161, 6d.; 3182, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

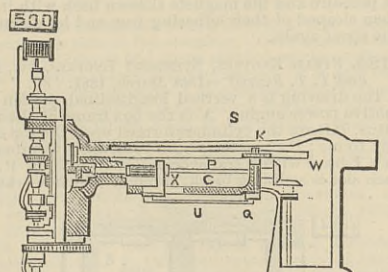
Prepared by ourselves expressly for The Engineer *at the office of Her Majesty's Commissioners of Patents.*

235. Sampling Liquids in Casks, &c., *J. O'N. Mackle.*—20*th January*, 1881. 4*d.*

A tube with open truncated conical ends contains a valve at the bottom opening upwards, so as to be raised as the tube is depressed into the liquor, and to close as the tube is withdrawn.

500. Sewing and Embroidering Machines, *W. E. Gedge.*—5*th February*, 1881.—(*A communication from E. Cornely.*) 8*d.*

The object is the production on universal feed sewing or embroidering machines of a new ornamental seam, which is obtained by the introduction of a second, which is laid like a serpentine line under the upper embroidering seam of said machine. It consists, First, in combination with a universal feed



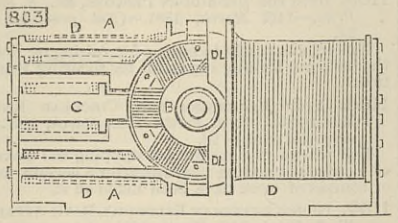
sewing or embroidering machine, of a second thread carrier oscillating above the cloth and around the needle, and following in its oscillations the direction of the feed of the needle; Secondly, in the hollow shaft or sleeve P having a longitudinal reciprocating motion on the shaft C (which directs the feed of the machine) and imparting an oscillating motion to the thread carrier above the cloth, by means of horizontal or vertical screw gears or screw shafts; Thirdly, the combination of the wheels K W, shaft S, crank Q, pitman U, and slide block X, with hollow shaft P sliding upon shaft C.

747. Stoves, *H. Defty.*—22*nd February*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to an encased furnace, and consists of a grate encased by a transparent shell or doors to protect the fire from cold air, and permit a clear view of the fire, all air entering from the back and bottom. A series of ovens or boilers for domestic purposes may be placed immediately over the flame.

803. Improvements in Dynamic Apparatus and Motors in Batteries and in Carbons, &c., *R. Walter.*—25*th February*, 1881. 10*d.*

The inventor's improvement in batteries consists in giving a rotary or other motion to plates, cylinders, or other forms, whether compositions or otherwise, of materials and metals used in the production of currents. His improvements in dynamo machines are various; we describe one of them below. The figure shows a dynamic electro machine, with one armature composed of two hollow and one solid magnet on each side of the armature. The outer magnet A is covered with wire; the coils D D nearly cover the half, and if the side in section were covered there would only be the poles D L uncovered with wire. The armature B is in six sections. Each section is a separate magnet. The core on which the wire is coiled can be hollow so as to receive pieces of turnings, cast or wrought iron, or pieces of wire. Two checks are fixed and joined to the wood which forms in smaller machines the insulator, and in which grooves are cut to receive the copper connections which unite



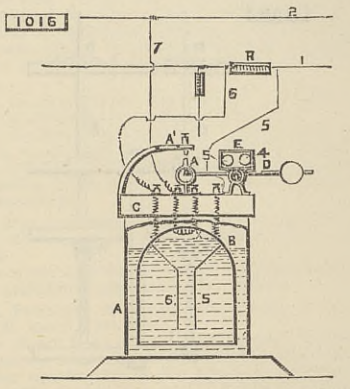
the wires of the coils of the armature and the commutator. The armature thus works nearly all covered by the outer field magnet. Various modifications of this machine are also described.

969. Grates and Stoves, *R. Crane.*—7*th March*, 1881. 4*d.*

The grate has the same appearance as an ordinary open fire register, but on each side a flue passes down under the bottom of the fire and then up the back. A well under the bottom receives the ashes. A raised hearth is formed up to the underside of grate and is made tight, sliding doors being arranged to clean out the ashes.

1016. Improvements in Weber-meters or Devices for Measuring and Registering the Current Flowing through Conductors, *E. G. Brewer.*—9*th March*, 1881.—(*A communication from T. A. Edison.*) 6*d.*

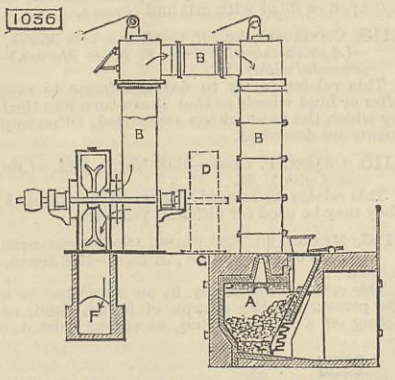
One part of this invention describes a meter, actuated by gases evolved by decomposing water with a definite part of the current. The figure shows a vessel of water, in which a second vessel floats. The current decomposing the water, the liberated gases rise into the second vessel, causing the vessel itself to



rise in the same way as a gasometer rises. At a certain point of fulness a contact is made, the gases are recombined, and the vessel returns to its original position. Another method described is by means of the electro-deposition of copper. The electrode upon which the deposition is to be made is carefully balanced, and when a certain definite quantity has been deposited the electrode sinks down deeper into the containing vessel. This action reverses the current, and the copper deposited is now taken off till the original condition is reached, when reversal again takes place, and so on.

1036. Obtaining and Supplying Gases under Pressure to Metallurgical Furnaces, &c., *J. H. Johnson.*—10*th March*, 1881.—(*A communication from C. Pernot.*) 6*d.*

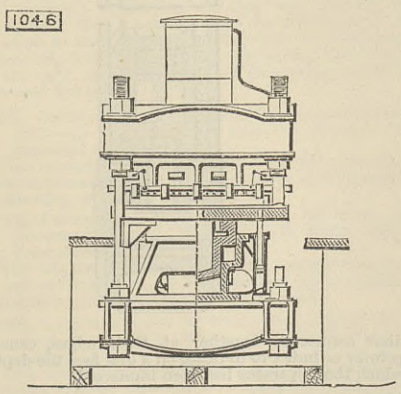
The gases generated in a gas generator A constructed for burning coal or any other suitable substance are caused to pass through a flue or chimney B provided with suitable valves or dampers. This flue communicates with a fan or other suitable blowing



apparatus C, which delivers the gas to the furnace through a channel F. Air is supplied to the furnace at the same time through a corresponding flue or passage G, similarly provided with a blowing apparatus D, which may be actuated by the same shaft as the apparatus for supplying the gas.

1046. Hydraulic Apparatus for Punching, Embossing, Pressing, Moulding, &c., *J. M. Blair.*—11*th March*, 1881. 6*d.*

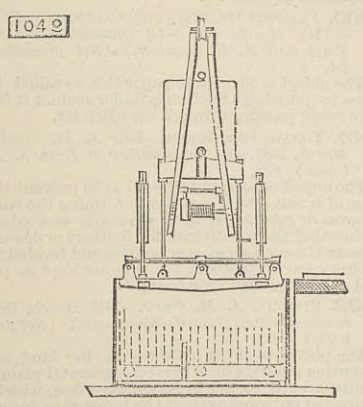
This consists of a large central cylinder and an annular space, with two or more side cylinders, all being provided or arranged with the necessary rams below or at the back of the follower. The follower is



constructed or provided with a frame or plate, so adjustable that punches or the like may be spaced as required at regular or irregular distances apart. To release plates from multiple punches used in hydraulic apparatus bars are employed, arranged longitudinally or transversely. The drawing is a view mainly in side elevation, parts being in section.

1049. Apparatus for Pickling and Swilling and Washing Metal Plates, &c., *D. P. G. Matthews.*—11*th March*, 1881. 8*d.*

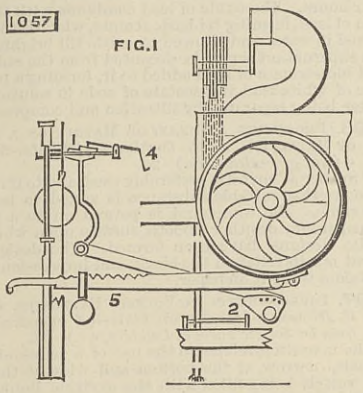
This consists, First, in constructing baths or cisterns of wood or metal, or both combined, such baths being separate or coupled together, and suspended and partially counterbalanced; Secondly, in suspending or supporting in said baths on a table or platform to



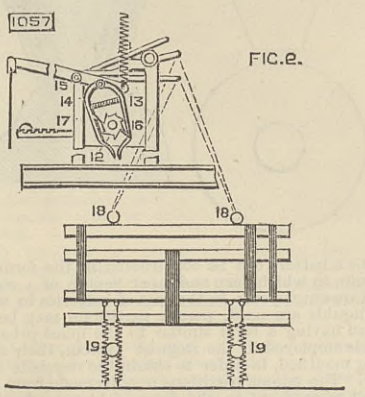
receive crates containing plates to be operated upon. The drawing shows a section of No. 2 bath.

1057. Looms, *C. Catlow.*—11*th March*, 1881. 8*d.*

This relates to means for stopping the loom on absence of weft when the shuttle is in the box nearest the weft fork; to bar temples; to the brake action; to mechanism for operating the healds in plain weaving; to letting-back appliances; and for counterbalancing the strain of the heald springs of the dobby. Also to appliances for working the peg or barrel; to guide studs and plates in connection with the heald cords



and heald staves; to appliances in pile or terry weaving apparatus, and in the use of gear wheels and tension rollers, so as to reverse the ordinary direction of rotation of taking-up and cloth rollers. Fig. 1 shows the apparatus for stopping the loom. In connection with the weft hammer 1 is a lever acted upon by a double lift tappet 2 adjustable by holes on the tappet shaft, so that when weft is absent, the fork 4 and brake lever 5 cannot act until the shuttle is in the fork-box. Fig. 2 shows the apparatus for working the pattern barrel 12, and the use of guide studs 18, on or over which the heald bands are received and worked.



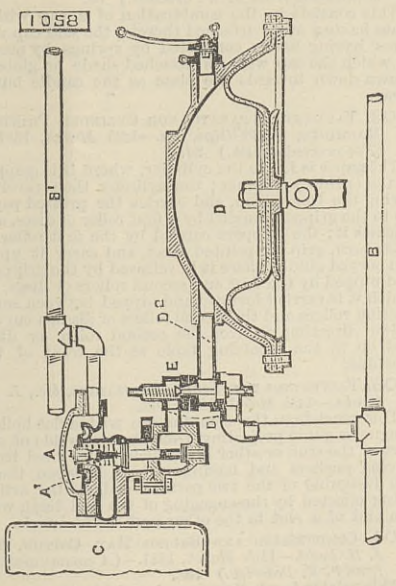
These studs ensure the heald staves being maintained at proper distances apart, and like studs 19 steady the lower heald staves. To work the barrel 12 a pair of pendant catches 13, 14 are attached to the lifting bar 15 operated from the crank shaft, so that while 13 is engaged and pulls up the notch 16, catch 14 is being raised into position to act upon, by depressing the notch 17, and so on at each motion of lever 15.

1052. Boots, Shoes, Clogs, &c., *K. Proctor.*—11*th March*, 1881. 4*d.*

The heel of the boot is shaped to receive a metal ring secured by taper-headed nails or pins, the ring being cast with pins to steady it while being driven into position. The sole is also fitted with irons similarly secured.

1058. Pneumatic Brake Apparatus for Railways, *F. W. Eames.*—11*th March*, 1881. 1*s.*

This relates to improvements on patent No. 225, dated January 20th, 1879. A is a duplex valve box shown in vertical section. A^1 is a flexible diaphragm



carrying a hollow stem, which is closed at top by a poppet valve, and carries an inverted poppet valve, which opens and cuts off communication between the vacuum reservoir and the pneumatic lever. A poppet valve is seated in the bottom of the valve box A and held down to its seat by the stem of the flexible diaphragm. B is the ordinary working train pipe connected as usual with the ejector. B^1 is the automatic train pipe, connected with the top of the duplex valve box. C is the vacuum reservoir connected with the duplex valve box below the diaphragm A^1. D is the pneumatic lever connected through the supplementary valve box E with the duplex valve box A by means of the pipes D^1 and D^2.

1066. Straining Pulp in Manufacture of Paper, *G. Tidcombe, jun.*—11*th March*, 1881. 6*d.*

The plates, instead of being formed with a groove for each slit therein, have one counter-sink or cell to a series of slits, by which means more slits can be made in a given area of plate.

1069. Date Powder, *F. Pool.*—12*th March*, 1881. 6*d.*

The dates are put whole into a vat with about one-eighth quantity of water, and left to ferment for two days, after which they are subjected to hydraulic or other pressure to remove moisture, and then through heavy rollers and a centrifugal rejector to further clear them of moisture and reject the stones. The dates are then divided into cakes and dried by air, when they are roasted and ground to powder.

1071. Elastic Webs, *H. Booth.*—12*th March*, 1881.—(*Not proceeded with.*) 2*d.*

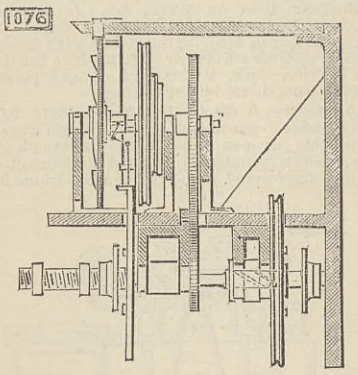
This relates to terry web, and consists in preventing the rubber from slipping in the fabric. An extra shaft is employed in the loom, and its rise and fall corresponds with that of the rubber shaft. The threads of an extra cotton warp are passed through the harness of the extra shaft in such a way that the different warp threads are arranged in the reel in the following order:—1, face; 2, back: 3, binder; 4, rubber; 5, face; 6, back; 7, extra warp.

1073. Producing Tension in Cords or Bands of Blind Rollers, &c., *G. P. Lempriere.*—12*th March*, 1881.—(*Not proceeded with.*) 2*d.*

In the axis of a coiled spring is a screw, the lower end of the spring forming a tooth to engage with such screw, while its upper end is the axis on which revolves the pulley, under which the blind cord passes. The screw and spring are contained in a case fastened to the frame, and by turning the screw the tension of the spring is regulated.

1076. Regulating the Speed of Steam Engines, &c., *H. Charlton and J. W. Wailes.*—12*th March*, 1881. 6*d.*

This relates to apparatus for regulating the speed of engines by controlling the amount of motive power admitted or by applying a brake or other device. A clock regulated by an escape motion causes a number of bolts to operate every minute on mechanism so



arranged that each bolt causes a certain slip. By this means the uniform speed due to the escapement regulator causes a certain amount of slip on the mechanism driven by the varying speed of the engine, and the difference is made to act as a means of regulating the uncertain motor.

1079. Cutting the Gimp in Shaped Articles, such as Tulles, Lace, &c., *O. L. Deschamps.*—12*th March*, 1881. 6*d.*

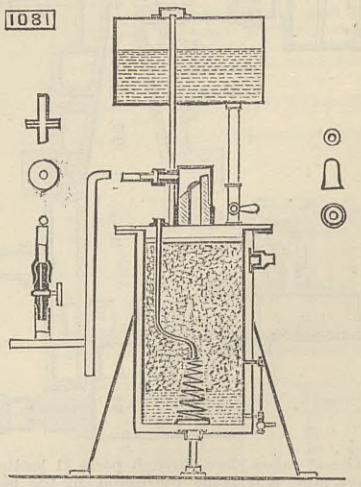
In a wooden handle a metal tube is fixed, such tube being connected with three arms uniting it to a base ring. In the tube is a cylindrical stock, with a pulley at its upper end, round the boss of which and between the pulley and the end of the tube turns a shaft carrying rollers on its opposite ends to guide the driving cord and force it to lie close to the arc of the pulley. The lower end of the stock is fitted with a lock nut, below which is a socket, from which three arms project and carry cutting rollers composed of steel discs driven by pinions gearing with a wheel in the base ring. In the latter is fixed a second ring attached to a third ring of steel, which lies in contact with the under side of the cutting rollers, which are pressed thereon by springs. Outside the base ring is a sole-piece sharpened to form a cutting blade, and on it are arranged two cutting blades which cross each other.

1080. Floating Bridges, *B. P. Stockman.*—12*th March*, 1881. 6*d.*

This relates to bridges which require to be opened for the passage of vessels, and consists in arranging the floating bridge in two halves, each made to float by pontoons and propelled from opposite sides of the river, meeting in the centre of the stream, so as to form a continuous bridge.

1081. Manufacture of Gas for Lighting, Heating, &c., *W. L. Wise.*—12*th March*, 1881.—(*A communication from N. F. Deleau and La Société Hubert Frères.*) 6*d.*

This consists, First, in causing the air or gas or gases to be carburetted to circulate through the apparatus in the opposite direction to carburetting fluid



emitted in the form of a shower from a horizontal conduit perforated with holes at its upper part; Secondly, in the use of a permeable mass consisting of horsehair and sponge; Thirdly, in forming the termination of the air or gas inlet pipe by a reservoir of iron wires wound in the form of a spiral or of wire gauze. Various other improvements are described.

1082. Stoppering Bottles, &c., *W. R. Lake.*—12*th March*, 1881.—(*A communication from F. Bohman.*) (*Not proceeded with.*) 2*d.*

A stopper is made with a flange to surround the

neck of the bottle, and is convex at its upper side, being held in contact with the bottle by a bow-piece being pushed over the stopper, such piece having in the centre a bend extending downwards and entering a depression in the top of the stopper.

1083. Perforating Paper for Mechanical Organs, &c., *H. H. Lake.*—12*th March*, 1881.—(*A communication from the Automatic Music Paper Company.*) 8*d.*

This relates to improvements on patent No. 834, A.D., 1881, and consists in obtaining a more accurate feed movement of the paper sheet and stencil by means of an extended frame supporting a belt passing over rolls, and having a detachable clamp to secure the paper and stencil together at any point on the belt, to which an intermittent movement is imparted. Mechanism is also provided to automatically cut the rack in a blank stencil sheet, the arrangement being such that the sheet is fed to the rack cutting punches by the same mechanism, which at the same time feeds the paper sheet to the perforators.

1084. Self-governing Gas Burners, *J. B. Fenby.*—14*th March*, 1881. 6*d.*

The pressure of gas is caused to act on a bell, from which a tube depends, such tube having a slit in it to admit gas, and by being caused to slide through a suitable sleeve the size of the slit left free for the passage of the gas is regulated.

1085. Fastening Folding Cards, *G. W. von Nawrocki.*—14*th March*, 1881.—(*A communication from J. L. Pechkes.*) 6*d.*

The jacquard cards are formed with notches instead of holes, and are secured together by means of cords twisted together in the notches. A machine for effecting the fastening of such cards is described.

1086. Wool Combing Machinery, *I. Bailey.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to apparatus for pressing wool into the teeth of Noble's or circular combs, and it consists of two or more plates or blades curved to the radius of the comb, and secured to a rod sliding in brackets. A cam on the driving shaft, assisted by a spring, imparts a vertical reciprocating motion to the plates.

1087. Rotary Hawse Pipe for keeping Submarine Cables Clear of the Cable Chains when the Ship is Swinging, *T. Cockshott and H. M. Goodman.*—14*th March*, 1881.—(*Not proceeded with.*) 4*d.*

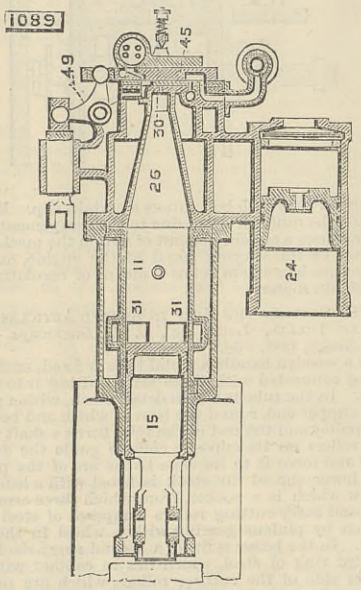
This consists of two rotating hawse pipes contained in one casting, and carried by friction rollers or other bearings in flanges or framing fixed to the ship's bow. The pipes consist of a large one concentric with the rotating casting and intended for the ship's cable, and the smaller one at one side for the passage of telegraph cables.

1088. Manufacture of Plates, Bars, &c., by Hot Rolling Iron or Steel, &c., *J. Larne.*—14*th March*, 1881.—(*Not proceeded with.*) 6*d.*

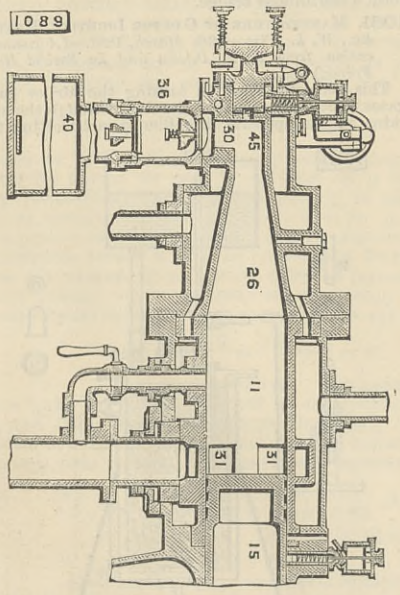
This consists in forming the rollers with grooves or channels on their surface so as to produce the desired form of truss work, lattice girders, and perforated sheets or bars, direct by hot rolling.

1089. Motors, *D. Clark.*—14*th March*, 1881. 8*d.*

This relates to gas motors or motors operating with combustible gas or vapour. In the drawing a single-acting power cylinder 11 is fixed horizontally in a jacket casing formed at one end of a bed frame having



the crank shaft bearings at the other end. The piston 15 is in the form of a hollow plunger fitted with metallic packing rings, and no stuffing-box is required at the front end of cylinder. The fly-wheel on crank shaft is connected by a rod to the piston of the displacement cylinder 24. At the inner end of cylinder 11 is a conical clearing space 26 also surrounded by a jacket water circulating round such space and cylinder 11. The air and gas enter cylinder 11 by inlet 30, and



the exhaust takes place through ports 31 leading to exhaust pipe, and being uncovered by the piston. Below the inlet is a valve box 36 having two check valves, the space between which communicates with displacement cylinder. A box 40 is placed below the lower valve, and air enters it through holes, the object being to prevent noise by drawing in air. The valve slide 45 is rectangular and works across the back end of cylinder, being kept in position by a plate acted upon by springs. It is actuated by bell crank 49, operated by a bar connected to excentric on crank shaft. In the back plate is a chamber in which a jet burns, air entering such chamber at bottom. The valve slide 45, besides effecting the ignition of the charge, also controls the admission of gas into the displacement cylinder.

1090. Friction Gearing for Calenders, *F. Wirth.*—14*th March*, 1881.—(*A communication from F. Voith and A. Niethammer.*)—(*Not proceeded with.*) 2*d.*

The object is to give to paper the so-called friction gloss by pressing a friction cylinder against it from the side when passing through the calender.

1091. Tiling for Roofs, &c., *A. M. Clark.*—14*th March*, 1881.—(*A communication from J. J. Williams.*) 6*d.*

The object is to apply tiles so as to prevent the passage of water, and it consists in forming the tiles with grooves or rebates in their side and end edges, and connecting them with metallic feathers or dowel plates inserted in such grooves or rebates and bedded in with elastic cement, whereby the tiles are kept in position and the joints made water-tight.

1092. Pistons, *A. M. Clark.*—14*th March*, 1881.—(*A communication from H. Waterman.*)—(*Not proceeded with.*) 2*d.*

The piston is of the hollow split ring kind, and the invention consists of a curved segmental plate with a hemispherical socket in its concave face, which plate is pressed outward against the inner ring by a block provided with a central stud which fits the socket, the plate and block being pressed outward by backing pieces driven between them and the piston hub. An elastic concavo-convex circular plate is laid between the follower and edge of the outer rings. The piston consists of an end plate with hub to fit the piston rod, and having on one side lateral lugs.

1095. White Lead, *H. J. B. Condy.*—14*th March*, 1881. 4*d.*

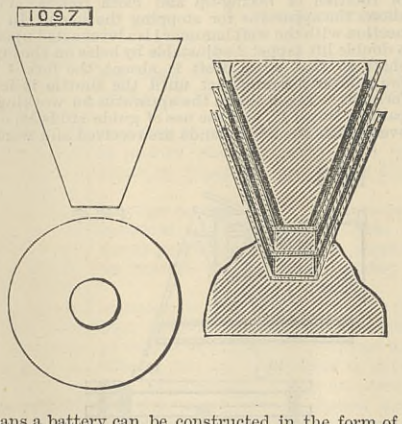
Crystallised acetate of lead is mixed with best litharge, water being added, and the whole ground together, after which it is allowed to settle for twenty-four hours. The oxide of lead combines with the acetate of lead, forming tri-basic acetate, which is then dissolved in water and allowed to settle till bright, when the supernatant liquor is decanted from the sediment and bicarbonate of soda added to it, forming a precipitate of white lead and acetate of soda in solution, the latter being separated by filtration and compression.

1096. Producing a Relief or Matrix on a Block of Metal, &c., *J. H. Coghlan.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

"Spence's" metal is preferably used, and to it marine glue or other suitable substance is added to toughen the same. The compound is poured on to a photo-transparency or other smooth surface upon which intaglio designs have been formed. The design will stand out in relief on the block, and impressions may be taken from it on paper.

1097. Improvements in Voltaic Batteries, &c., *J. H. Johnson.*—14*th March*, 1881.—(*A communication from La Société Force et Lumière, &c.*) 6*d.*

The invention relates to the use of a series of deep vessels, narrow at the bottom and wide at the top, the vessels being filled with the exciting liquid, and arranged one within another so that their sides are brought into contact with the exciting liquid of the battery, both internally and externally. By this



means a battery can be constructed in the form of a column, in which deep and taper vessels of a conical form are employed. In the case of batteries in which two liquids are used, porous partitions may be employed having a form similar to the quasi-prismatic vessels employed in the Regnier system, their shape being modified, in order to obtain the requisite taper form. The porous partitions may be made from discs of felt pressed out in the form of bags, such as are used for filtering purposes, and combined so as to form cells of the required form and capacity. Both methods of construction are shown in the figure herewith. This invention applies as well to secondary batteries as to ordinary ones.

1098. Water-closets, *J. Elms.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

An upper water-closet of the ordinary make is fitted with a second chamber underneath. The upper one will work in the ordinary way with an ordinary pull, but with the addition of a double-action crank or other contrivance, so that when the contents of the upper closet are emptied into the lower chamber, the pan of the lower one will become closed, but on the return of the pull the lower one will then open and allow the contents to fall through the pipe. By keeping the lower closet thus closed, it will prevent or check the upflow of noxious smells or gases into the upper pan.

1099. Device for Holding a Shade or Globe on a Candle, *W. R. Lake.*—14*th March*, 1881.—(*A communication from A. W. Crockett.*) 6*d.*

This consists in the combination of a cap with a plate having arms attached thereto, the said cap and arms having hooks connected by springs, by means of which the cap with its attached shade or globe is drawn down towards the plate as the candle burns away.

1102. Take-off Apparatus for Cylinder Printing Machines, *D. Phillips, jun.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The paper is fed to the cylinder, where it is gripped in the ordinary manner; the cylinder then revolves giving the impression, and carries the printed paper up to the grippers carried by a first roller or discs, and releases it; the grippers carried by the first roller in their turn, grip the printed sheet, and carry it up to the curved guide, where it is released by the grippers and nipped by the first and second rollers or discs, by which it is carried forward and nipped between small friction rollers and the second rollers or discs, a curved guide directing it over the second roller or discs and on to the receiving table at the front of the machine.

1103. Fastenings for Studs, Solitaires, &c., *J. M. Banks.*—14*th March*, 1881. 6*d.*

This consists in the combination with a flat hollow tongue or guide projecting from the underside of one part of the stud or other like article of inclined teeth having pushers and having springs between them, the fastening of the two parts or ends of the article being effected by the engaging of the said teeth with the end of a slot in the other part of the article.

1104. Compressing and Baling Hay, Cotton, &c., *J. H. Ladd.*—14*th March*, 1881.—(*A communication from P. K. Dederick.*) 10*d.*

This relates to a baling press in which the bales are made by the compression of successive quantities or sections, and which has a bale chamber formed with one or more of its sides or portions of its sides adjustable to expand or contract the said bale chamber, the side plates being constructed to form the angles or corners of the said chamber.

1105. Beds for Bedridden Persons, &c., *E. Shipton-Price.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates partly to means for raising or lowering the bed, and locking apparatus for securing it in position.

1106. Stop Mechanism for Circular Knitting Machines, *W. J. Ford.*—14*th March*, 1881.—(*Not proceeded with.*) 2*d.*

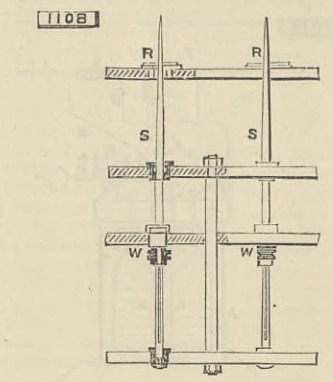
This relates to a means for stopping the movement of a circular knitting machine after a certain number of courses of work have been made on it.

1107. Improvements in Elecrical Bath Apparatus, *W. R. Lake.*—14*th March*, 1881.—(*A communication from B. Barda.*) 6*d.*

This invention relates to an improved electrical bath apparatus suitable for public establishments, or hydrotherapeutic institutions. It consists of a reservoir constructed of wood, and provided with the usual means for letting water in and out. At the front end of the reservoir are fixed seven copper terminals. The two lower are connected by wires with the electric generator. The five upper ones are connected to two terminals, which are themselves in connection with carbon poles let into the interior surface of the bath, and corresponding with the principal parts of the body which it is required to electrify. A device is also described for electrifying the whole of the body if desired. In order that the bather may turn the current on or off at will, a commutator is provided.

1108. Cop Spindles, &c., for Continuous Spinning Machines, *G. W. von Nawrocki.*—15*th March*, 1881.—(*A communication from R. Sehrke and Messrs. Büldge and Hildebrandt.*) 6*d.*

This consists in the employment of stationary rings or guides R for the yarns in combination with spindles



S, which are moved up and down through the bosses of their driving whirls W, while they revolve therewith.

1109. Cutting and Clearing Passages in Ice, &c., *J. F. Flannery.*—15*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in applying to a ship gearing for driving a sufficient number of circular or other saws, and in providing an arrangement on each side of the bows, somewhat similar to a plough or to a cow-catcher.

1110. Fastenings for Bale-ties or Binders, *R. J. Jenkins.*—15*th March*, 1881.—(*A communication from C. B. Morse.*) 6*d.*

This consists in the construction and arrangement of eyes or loops in the bale-ties or binders for the reception of the fastenings or latches.

1112. Surfacing Asphalte, &c., to Render Same Slipless, *S. C. Joyce.*—15*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in stamping a suitable shaped figure on the asphalte whilst warm. This pattern may be left open or filled with grit and cement.

1113. Omnibuses, &c., *H. Gardner.*—15*th March*, 1881.—(*A communication from F. F. de Moraes.*)—(*Not proceeded with.*) 2*d.*

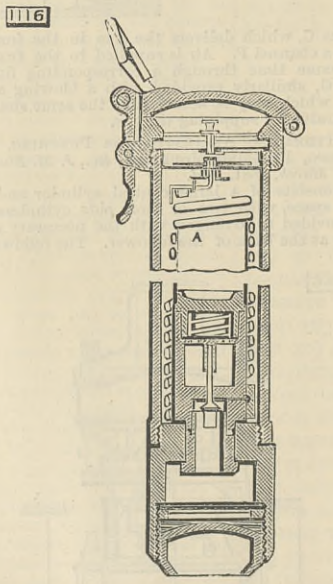
This relates partly to fixing a frame to carry the after or hind wheels so that it can turn like the frame by which the front wheels are carried. Other improvements are described.

1115. Chairs, *P. Leone.*—15*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to invalid chairs, so constructed that they may be used for different purposes.

1116. Measuring, Recording, and Registering the Depths of Liquids, &c., *A. Legé.*—15*th March*, 1881. 6*d.*

This consists essentially in an apparatus in which the pressure of the column of liquid, fluid, or gas, acting on a helical, spiral, or curved tube A, or on



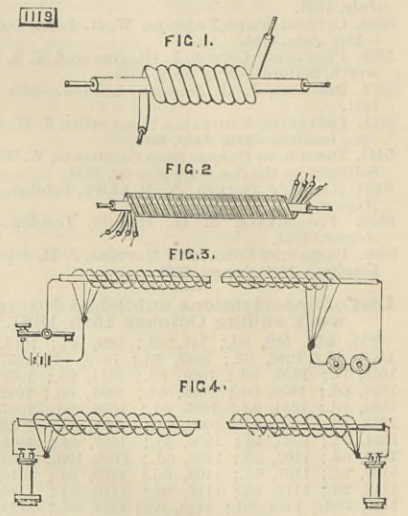
discs connected together at their edges, causes a pointer or index to indicate on a dial face the depth to which the apparatus has been immersed.

1118. Ditching, Draining, and Pipe-laying Machinery, *C. H. Binney and S. W. Blyth.*—15*th March*, 1881. 6*d.*

This consists of a plough-like machine having a beam adapted to lie upon the land; it is linked in front with a snatch block, around which the rope of a winding engine passes. This beam carries a pair of coulters and a slade so connected together that when the machine is drawn forward they cut out a ditch-like channel. The coulters are placed one in the rear of the other. Behind the mould board there is a pipe guide, by which the drain pipes are directed into the ditch immediately it is formed.

1119. Improvements in Telegraphy, *S. Pitt.*—15*th March*, 1881.—(*A communication from Dr. O. Lugo.*) 10*d.*

The First part of the invention relates to the conductors of an electric or telephonic circuit, and to a method of organising them whereby inductive action is prevented. The invention is based upon the discovery that if one portion of a circuit be surrounded by the other helically, one portion passing through the mathematical axis of the other, and being properly insulated therefrom, thus forming a solenoid, and either portion be used for the direct, and the other portion for the return conductor of a circuit, induced currents will be entirely prevented. Figs. 1 to 4 will give a better idea of the principle of this invention than we could give in words. Fig. 1 represents the two portions of a circuit organised in accordance with the principles of the invention. Fig. 2 is a modification of the same, more suitable for practical use. Fig. 3 is a theoretical diagram illustrating the



application of the invention to a telegraphic circuit. Fig. 4 the same for a telephonic circuit. It will be seen on reference to Fig. 1 that the length of the helical conductor necessarily exceeds that of the other, consequently where of equal conductivity per unit of length the total resistance of the one is greater than that of the other; although even in this case inductive effects would be prevented; still it is better to have the two conductors of equal resistance. This is done by constructing the overlapping conductor, as shown in Fig. 2, of a compound helix consisting of several parallel conductors, which are of such thickness and conductivity as to render their joint resistance approximately the same as that of the direct conductor. The conductors being insulated from one another can, by being enclosed in iron pipes, be easily adapted for subterranean uses. The Second part of the invention refers to their use for the transmission of both voltaic and magneto currents, with a portion of the apparatus at each station constituting a part of the direct conductor, and other portions constituting parts of the helical conductor.

1122. Fasteners for Scarfs, Neckties, &c., *C. Edwards.*—15*th March*, 1881.—(*Not proceeded with.*) 2*d.*

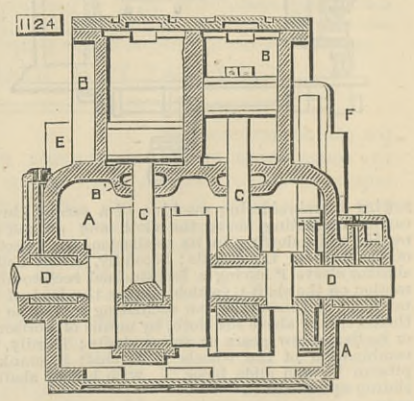
This consists chiefly in so twisting or shaping an elastic wire, or equivalent material that while it has wings that can be sewn on the scarf and remain immovable in regard to each other, the continuation of the wire at each end is looped round and forms two parts pressing or naturally standing close to each other, but which can be pushed to one side to allow the stud to pass through between them, when their resilience causes them to close and hold the stud.

1123. Driving the Rollers of Roller Mills, *P. Van Gelder.*—15*th March*, 1881. 6*d.*

This consists, First, in driving the rollers by chain gearing; Secondly, the combination with the roller mills of apparatus for separating iron particles from granulating material passing down spouts or other passages to the rolling mills formed of a series of magnets projecting from a lid, opening into such spout or passage in such manner that the lid can be opened at pleasure and the magnets thrown back with it, and then cleaned of their adhering iron and let down into the spout again.

1124. Steam Engines, Steering Engines, &c., *F. J. and T. T. Burrell.*—15*th March*, 1881. 8*d.*

The drawing is a vertical longitudinal section of a motive power engine. A is the box frame of the apparatus, B B are the cylinders formed upon the top of the box frame; C C are the piston rods, each terminating in a T-head with a transverse slot formed in it. In each slot is a sliding block, through which works the



pin of one or other of the cranks of the crank shaft D. E is a cylindrical valve rotated at the same speed as the crank shaft by toothed wheels F; the valve turns within a corresponding valve case. The rotating valve is divided longitudinally into two compartments; one compartment has steam at all times supplied to it, the other is open to the exhaust. As the valve rotates the two opposite ends of the two cylinders alternately have steam admitted to them and are open to the exhaust. Where the piston rods pass out from the cylinders B into the box frame A, a steam-tight joint is secured by packing introduced into the cavities B^1 around the piston rods through passages, the ends of which passages have screws screwing into them, by which the packing may be pressed with more or less force into the cavities B^1 as desired.

1125. Bottles for Containing Aerated Liquors, *H. Codd.*—15*th March*, 1881. 6*d.*

This relates to improvements on patent No. 2621, A.D. 1872. Inclines are provided in the neck of the bottles to receive the disc stopper as it falls.

1126. Sharpening Pencils, &c., *J. Darling.*—15*th March*, 1881. 6*d.*

This relates to a combined pencil or sharpener, consisting of a tube, or its equivalent, capable of use at one end as a protector, and having in its interior, so as to be protected by the said tube, a sharpening blade or blade and file.

1127. APPARATUS FOR PRODUCING AND INJECTING OR FORCING A MIXTURE OF AIR AND WATER SPRAY OR VAPOUR INTO FURNACES, *W. Fairweather.*—15*th March*, 1881.—(*A communication from J. Glasier.*)—(*Not proceeded with.*) 2*d.*

The ash-pit is made close so as to be practically air-tight, and a large pipe or tube is fitted through the front immediately under the fire-grate to lead in the admixture of air and water spray or vapour. This admixture of air and water spray is produced and injected or forced through this inlet tube or pipe by means of a fan or blower, into which water is admitted in the form of spray or jets through small perforated openings or gratings around the periphery of its casing. The furnace bars are made of unusual breadth and laid close together, but finely perforated for admission of the air and water spray.

1131. SKATES, *S. V. Wheatley.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to appliances adapted to grip the heel and sole of the boot.

1132. MARKING-OUT LAWN TENNIS COURTS, CREASES FOR CRICKET, &c., *E. Coote.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to means for controlling the supply of the liquid whiting or other marking liquid to the marking wheel.

1133. MILK CANS, *T. W. V. Harte.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to means for preventing the person in charge of the locked can, provided with a ventilator, from withdrawing a portion of the milk and introducing water.

1134. LAMPS FOR MINERS, *J. Fyfe.*—16*th March*, 1881. 6*d.*

This consists, First, in making the wick tube of copper or other good heat conductor, and with a part of it, or a part attached to it, projecting down into the can or holder; Secondly, in making the lamp with a jacket or screen; Thirdly, fitting the perforated casing or jacket round part of the wick tube.

1135. UMBRELLAS, SUNSHADES, AND PARASOLS, *W. E. Gedge.*—16*th March*, 1881.—(*A communication from Messieurs Revel, père et fils.*)—(*Not proceeded with.*) 4*d.*

This consists in the application of a catch or clip hook fixed to each rib, and of a runner with hollow cap intended to receive the said hooks or catches and secure the perfect closing of the ribs; this capped runner slides upon a second runner which holds the stretchers, and upon which it is actuated by a spring.

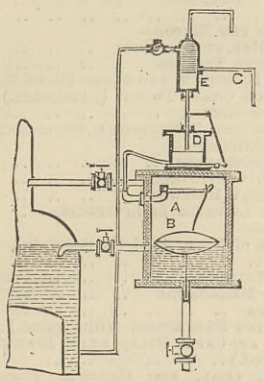
1137. MANUFACTURE OF SHEETS AND PLATES OF TIN, ZINC, AND LEAD, &c., *F. H. F. Engel.*—16*th March*, 1881.—(*A communication from the New York Hamburger Gummiwaaren Compagnie.*) 2*d.*

This consists in the production of sheet metal and metal plates with smooth or with ornamented surface out of tin, zinc, and lead, and alloys of these metals, by bringing the metal or alloy in the molten state to a pair of revolving rollers, the distance of which apart is adjustable.

1139. FEED WATER REGULATORS FOR STEAM BOILERS, *A. M. Clark.*—16*th March*, 1881.—(*A communication from H. Kuhne.*) 6*d.*

This consists of a chamber A placed level with the water space of the boiler to which a small pipe extends entering below the lowest water level, so that water is at the same level in chamber A as in the boiler. A second pipe leads from the top of chamber A to the steam space of boiler. In the chamber is a float B

1132



with a stem connected with a cock in a pipe passing through the side of the chamber. Over chamber A is a small cylinder D and above this is a smaller cylinder E, the pistons of each being connected. The pipe passing through the chamber A also enters cylinder D, and the pipe from the feed pump enters the top of cylinder E, a pipe from which leads to the boiler. When the float falls steam passes to cylinder D, and the water then passes into the boiler, the piston in cylinder E being raised over the waste pipe C.

1142. APPLIANCES FOR OPERATING VENETIAN AND OTHER BLINDS, *R. Marshall.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

To one side of the top rail is secured a bracket, which is slotted. In this slot a spindle carrying the top and with it the other laths of the Venetian blind is carried free to move. The upper part of the slot is of greater area, so as to allow, if necessary, of the blind being withdrawn. The top rail is supplied with the usual cords and wheels for raising and lowering the blind.

1145. BITS FOR HORSES, *G. W. von Nawrocki.*—16*th March*, 1881.—(*A communication from G. W. W. von Nostitz and Iaenkendorf.*—(*Not proceeded with.*) 2*d.*

This relates to bits with broken mouthpieces, and the device consists of a double hoop of steel, each forming an eyelet, through which passes the mouthpiece on which the hoops are capable of turning.

1146. WATER HEATERS, *A. Sweet.*—16*th March*, 1881. 6*d.*

This consists essentially in the combination of four or more heating chambers connected together in conjunction with a water jacket heated by burners.

1148. COAL GAS FOR ILLUMINATING, *F. J. Bolton and J. A. Wanklyn.*—16*th March*, 1881. 4*d.*

This consists in the method of abstracting ammonia from coal gas by the dry way by causing the gas to pass in intimate contact with any one or more of the following substances:—Porous commercial superphosphate of lime or porous sulphate of lime, with or without admixture of phosphate of lime and phosphate of iron, or porous chloride of calcium, the absence of free acid from the superphosphate, when such is used, having been previously ensured.

1149. WATER PIPES, *L. S. Powell and C. V. Boys.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The pipes are made of an elliptical section.

1150. NAILS, &c., *J. Noad.*—16*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to the employment of leather, guttapercha, wood, india-rubber, or their equivalents, in the manufacture and use of the heads of nails, &c.

1152. INSTRUMENTS FOR OPENING INTERNALLY STOPPERED BOTTLES, *H. Codd.*—16*th March*, 1881. 6*d.*

The opening instrument is formed of a disc or head having a short stem or shank projecting from the centre of its underside, and over the end of the shank a cap of elastic vulcanised india-rubber is placed. The cap is formed with a thick ring around its rim or edge which nips the stem near its middle; this ring stands outwards from the cap and forms a flange around it. When the end of the shank with the elastic cap upon it is passed into the mouth of a bottle, so that its end may be made to bear upon the top of the internal stopper, the thick ring which is around the edge of the cap comes down on to and rests upon the top of the bottle.

1153. APPARATUS FOR STAMPING LETTERS AND OTHER DOCUMENTS WITH STAMPS REPRESENTING DIFFERENT VALUES, *H. Codd.*—16*th March*, 1881. 6*d.*

This consists in the construction of apparatus for stamping letters and other documents with stamps representing different values in such a manner that each time any one or other of the stamps is used the money value of that stamp is recorded upon a recording apparatus common to all the stamps.

1155. MANUFACTURE OF FIREBRICKS, RETORTS, &c., *S. J. Payne.*—16*th March*, 1881. 4*d.*

The bricks are made of the following materials, thoroughly mixed together:—7 lb. sand, 1 lb. Portland cement, ½ pint silicate soda (sp. gr. about 1200).

1156. POSTAL WRAPPERS, *J. A. and C. M. Elstob.*—16*th March*, 1881. 6*d.*

This relates to the manufacture of postal wrappers to be used for advertising.

1157. COP SPINDLES, *G. W. Stafford.*—16*th March*, 1881.—(*Not proceeded with.*) 6*d.*

The spindle is made detachable from its base, and suitable means are provided for attachment, detachment, and adjustment, the spindle being tapered at each end so that it can be reversed.

1158. APPARATUS FOR MEASURING THE HEIGHTS OF OBJECTS, *F. MacDermot.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in suspending a hoop or ring of suitable material horizontally between the expanding ends of a suitable handle, which latter is held vertically in the hand of the observer, and within this hoop or ring is again suspended horizontally a disc or circular frame by pivots, the line of which is at right angles to the pivots supporting the first described and outer hoop or ring. From the centre, and also from the outer edge of the disc or circular frame, rise two vertical rods or standards, differing in height, so that a sight vane placed on their extremities will form an angle of 45 deg. at the periphery of the disc or circular frame.

1160. CALORIC MOTOR ENGINES, *H. C. F. Jenkin and A. C. Jameson.*—17*th March*, 1881. 4*d.*

This consists of an engine, the cycle of whose operations is, in the main, that of the Stirling engine, but which differs from the Stirling engine in the internal combustion under pressure of solid and gaseous fuel simultaneously.

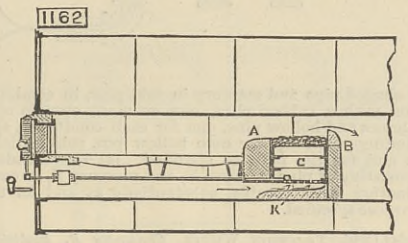
1161. PURIFICATION OF ALKALINE SOLUTIONS, *E. Carey, H. Gaskell, jun., and F. Hurter.*—17*th March*, 1881. 4*d.*

This consists, in the purification of alkaline solutions, of the addition of alumina to the solution.

1162. FURNACES OF STEAM GENERATORS, *J. Swain.*—17*th March*, 1881. 6*d.*

The object is to effect a more perfect combustion and prevent the emission of smoke, and also to obtain a better equalisation of the action of the furnaces. Behind the bridge A a wall B is placed, the space between them forming a combustion chamber. Between them several gratings C extend, the lower one being fitted with a sliding shutter also pierced

1162



with holes, and serving to open the holes in the grating to a greater or smaller extent for the admission of air, such shutter being connected to the furnace door. On the top grating a layer of clinker, fire-brick, or other heat-absorbing material is placed, and over it the products of combustion pass. Below the bottom grating is a layer of charcoal or sawdust K kept constantly burning, so as to heat the air as it enters.

1165. TREATMENT OF WHEAT, *T. A. Marshall.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to dealing with the constituents of the wheat which have been separated from the flour forming part, and more particularly with the germ or embryo, which can be separated so as to be practically free, not only from the flour, but also from the bran and other less valuable products.

1166. APPARATUS FOR STOPPING ENGINES FROM A DISTANCE, *E. F. Schonë.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The steam pipe is fitted with a stop valve, which may be shut by means of a steel band or wire passing over a pulley on the spindle of a cam, which keeps the valve open in its normal position.

1167. MARINE GOVERNORS, *J. B. Scarlett.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The steam admission to the engine is regulated in proportion to or in accordance with the resistance encountered by the upper portion of the propeller, or the portion at or near the surface of the water, or in accordance with the immersion or otherwise of the propeller, and especially the upper portion of same.

1170. LOOMS FOR WEAVING, *T. Singleton.*—17*th March*, 1881.—(*Not proceeded with.*) 4*d.*

This relates to improvements in the shuttle-box; an improved picking stud and bowl; an improved crank arm; an improved strap fork joint and an improved guide for strap fork shank; a self-acting rising and falling heald motion; regulating stay brackets and stop brackets for wing rods; regulating the reed top and bottom; regulating the stay cap; locking the reed; fork holder arrangement for sliding weft for brackets to keep the fork parallel with the weft grate; adjustable back breast beam; regulating the position of the cloth roller; knocking off the spring handle on the reed flying out.

1171. COCKS, VALVES, &c., *J. H. Johnson.*—17*th March*, 1881.—(*A communication from J. Zeleny.*)—(*Not proceeded with.*) 2*d.*

This relates to means for regulating the quantity of fluid delivered, as well as the duration of the operation of shutting or closing the valve.

1172. PRODUCING STRIPS OR PIECES OF WOOD FOR PRINTERS' USE, *J. Bryceson.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The rotating saw used is caused to act not only so as to cut out the pieces to the size and shape required, but also to give them the necessary finish.

1174. ORNAMENTATION OF MOULDINGS, &c., *F. A. C. Koenemann.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in producing an open design in plaster or other suitable material, and applying it to a plain surface or ground and attaching it thereto by glue or nails.

1177. MANUFACTURE OF HINGES, *F. E. Martineau.*—17*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to machinery used in rivetting or fixing in their places the pins or axes of hinges.

1179. HELICAL SPRINGS, *L. Sterne.*—18*th March*, 1881. 4*d.*

This relates to the construction of helical springs so as to reduce the size and weight necessary to provide a given elastic range for a given pressure. The bar, of which the spring is made, has a thin and deep middle body, with a lip or bead projecting outwards at one edge, and a lip or bead projecting inwards at the other edge. This bar is coiled in an inclined

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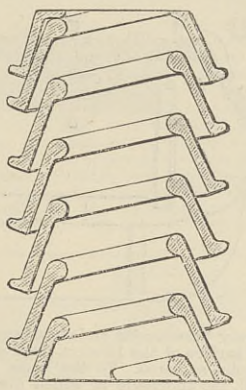

position, so that each convolution presents a conical form overlapping the next convolution in order.

1180. NEEDLES AND NEEDLE SLIDES OR BARS FOR SEWING MACHINES, *T. F. Burgess.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in arrangements by which, when the needle is pushed in to the right height, it comes against a solid abutment, and when turned round and pushed up at the same time is locked or stopped at the position where the eye is exactly true.

1181. TAPS OR COCKS, *S. Hands and W. Weaver.*—18*th March*, 1881. 6*d.*

This relates to improved means for tapping barrels, so that none of the contents is spilled.

1182. CLEANING, BLACKING, AND POLISHING BOOTS AND SHOES, *X. Courtil.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The machine consists of a frame, the upright posts of which support a crank shaft carrying a band pulley, which by means of a cord or band drives a pulley and fly-wheel fixed on another shaft which carries four revolving brushes, the three first of which are used for brushing off the dirt and polishing the blacking, the last for applying the blacking.

1186. CHAIN GEARING FOR ACTUATING OR DRIVING MACHINERY, *N. K. Husberg.*—18*th March*, 1881. 8*d.*

The chains are composed of links of a simpler form and more readily detachable than usual, and the friction when in use is less. The chain consists of double-hooked detachable links not having any open-

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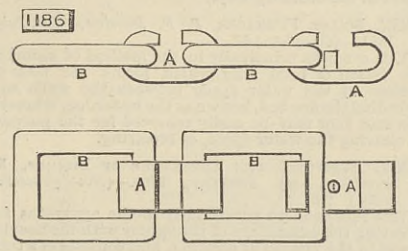

ing to engage with the toothed wheels, and links without hooks having such openings. The drawing shows one form A, being the double-hooked link, and B, the links with the openings.

1187. TRICYCLES, &c., *J. I. Warman.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

The object is to enable the propelling power to be augmented when desired, and it consists in means for driving either one or both of the large wheels of the tricycle.

1189. TRAVELLING RUGS OR WRAPPER, *I. Pick.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

A foot-warmer or muff is formed at the bottom of the rug, and a bag or pockets and a hand-muff near the top.

1191. HATS, *W. R. Seaton.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to hats with frames for supporting the outside covering, and it consists in perforating the frame so as to provide better ventilation.

1192. STOPPER FOR BOTTLES, *C. Warner.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

A metal cap is screwed into the mouth of the bottle, and fitted inside with a rubber ring and a cork ring. A glass ball exposed to the pressure inside the bottle is forced against the cork and rubber rings.

1193. LOCKS, *W. S. Smith.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to locks in which the bolt is thrown forward by a spring, and it consists in means for permitting the use of a strong spring to throw the bolt forward and yet avoid the action of the spring pressing it forward acting as an impediment to the closing of the door. For this purpose a spring catch is combined with the lock, and when the bolt is withdrawn by the turning of the handle it springs in front of the end of the bolt and prevents it from being again shot forward by its spring when the handle is released.

1194. TIME-CHECKING APPARATUS FOR WORKMEN, &c., *W. M. Llewellen.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

A box is made to move at certain times through a segment of a circle, and so direct the checks into different boxes.

1195. BALLOONS, &c., *E. G. Brewer.*—18*th March*, 1881.—(*A communication from A. Debayeux.*) 6*d.*

The objects are to propel and guide balloons, and these are accomplished by the rarefaction of air in the following manner: A fan or screw is placed at the point of the apparatus in the direction it is desired to be propelled, the propulsion being then effected by the pressure of the atmosphere on the other side or end of the balloon, that at which the rarefaction or partial vacuum of air is produced by the fan or screw.

1196. NON-CONDUCTING COMPOSITIONS OR MATERIALS FOR COVERING STEAM BOILER SURFACES, &c., *D. H. Dade.*—18*th March*, 1881. 4*d.*

This consists in the treatment of silicate cotton and other fibrous substances with a decoction of Irish moss or similar glutinous substance with or without the admixture of thin boiled starch, or of a decoction of silicate potash, or of a decoction of silicate of soda, to which glutinous decoction, especially for resisting heat, may be added a solution of trass, so as to render the silicate cotton sufficiently self-adhesive and coherent, all for the purpose of doing away with an outer casing for holding the silicate cotton in place, and to give it an exterior hard and elastic protecting skin which is not liable to crack by heat without detracting from its non-conducting properties.

1197. EMBOSSING AND PERFORATING PAPER, &c., *P. Jensen.*—18*th March*, 1881.—(*A communication from Messrs. Hohenstein and Lange.*)—(*Not proceeded with.*) 2*d.*

The embossing or perforation is accomplished by means of rollers having the required pattern engraved on their surface or on sheets fastened thereto.

1198. PRESERVING EGGS, *F. Wolff.*—18*th March*, 1881.—(*A communication from L. T. J. Boje.*)—(*Not proceeded with.*) 2*d.*

The eggs are immersed in any suitable silicate which is soluble in water, so that the shell becomes covered with a silicate of lime.

1199. WHEEL APPLICABLE TO CARRIAGES, FOR PREVENTING ACCIDENTS AND CLEARING THE TRACK, *L. Higginbottom and T. Mannock.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

In front of each wheel of the carriage another wheel is placed and runs freely on its centre, its height being such as to prevent contact with the road. This wheel rests against the carriage wheel so as to revolve in the opposite direction, and should any obstacle come in contact therewith it will be diverted from the track of the carriage.

1200. WHEELS FOR VEHICLES, *E. A. Brydges.*—18*th March*, 1881.—(*A communication from U. Goetzenbruegger.*)—(*Not proceeded with.*) 2*d.*

This relates to wheels, the hub of which consists of several parts, and it consists in forming the hub in two parts, one on the outside of the wheel, and the other on the inside next the vehicle. The outer half is recessed and provided with a female screw to receive a reduced threaded part on the inner half.

1201. EMPTYING CESSPOOLS, *E. A. Brydges.*—18*th March*, 1881.—(*A communication from U. Goetzenbruegger.*)—(*Not proceeded with.*) 2*d.*

The matter to be removed is drawn from the cesspool by forming a vacuum in the vessel to receive it by means of a double-acting air pump. The whole is mounted on a suitable frame with a motor and furnace, the foul air drawn off being burnt in the latter.

1202. CALORIC ENGINES HEATED BY INTERNAL COMBUSTION OF GAS, &c., *M. P. W. Boulton.*—18*th March*, 1881.—(*Not proceeded with.*) 4*d.*

This relates to improvements on patents No. 495, A.D. 1879, and No. 5270, A.D., 1880, in which engine successive charges of cold air or other elastic fluid received in a charging vessel were by the movements therein of a displacer passed through a separate heating vessel back to the charging vessel, whence they expanded in a cylinder performing work. This invention consists in dispensing with the separate heating vessel, by employing the internal combustion of gaseous or liquid fuel.

1203. PRINTING INK, *H. Brackebusch.*—18*th March*, 1881.—(*Not proceeded with.*) 2*d.*

25 parts paraffine oil and 45 parts colophonium are mixed by melting at about 80 deg. of heat, or by trituration at the ordinary temperature, 15 parts soot or lampblack being added. For coloured ink the soot or lampblack must be replaced by the desired colour.

1214. APPARATUS FOR HOLDING PHOTOGRAPHIC OR OTHER PICTURES, &c., *R. Sherwin and G. Evans.*—19*th March*, 1881. 4*d.*

The pictures are applied to frames or mounts, which at one edge are each connected by canvas or other guards or hinges to step-by-step rising pieces or to an inclined surface, so that at one time the frames or mounts with their pictures may be sustained upright fronting each other, and then for the examination of the picture carried by them respectively the frames may be progressively folded down, and then returned to their upright position.

1215. TREATMENT OF MARINE VEGETABLES, *J. Imray.*—19*th March*, 1881.—(*A communication from Le Marquis A. de Saint-Yves.*) 4*d.*

This relates to the treatment of marine vegetables for the separation of their saline, cellulose, and gelatinous constituents, and it consists in washing the vegetables, then drying and placing them in closed vessels on perforated or wicker screens, where they soak in three or four times their weight of water, which, when acid treatment is employed, contains about 10 per cent. of acid, preferably hydrochloric acid. The cellulose, fibres, and woody ingredients remain on the screen with the principal portion of the gelatinous matter, the salts being mostly dissolved in the liquor, which is run off and filtered. Steam under pressure is admitted to separate the cellulose from the fibre and gelatine with an equal amount of liquor containing from 15 to 30 per cent. of sour beer, vinegar, or acetates of alkaline bases.

1231. COMBINED KILN OR OVEN AND BOILER, *R. Ballard.*—21*st March*, 1881. 4*d.*

This consists in constructing lime or other kilns with a space to contain water, so that the heat of the kiln may be utilised to generate steam.

1241. SLIDING BLOCK BREECH-LOADING SMALL-ARMS, *J. Deeley, jun., and J. S. Edge, jun.*—21*st March*, 1881. 6*d.*

This consists in the construction of the cam block K on the axis of the hand lever for raising and lowering

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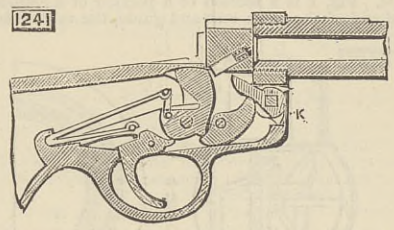

and supporting the sliding breech-block, and for extracting the empty cartridge cases, and in conjunction with the intermediate lever for cocking the hammer.

1256. COLOURING MATTERS, *G. W. von Nawrocki.*—22*nd March*, 1881.—(*A communication from J. R. Geigy.*) 4*d.*

This relates to the production of a series of colouring matters available for commercial purposes by the combination of amidoazo bodies or their substitution products with bodies of the phenole or the chinon classes or their substitution products, either alone or in the presence of a condensing medium.

1260. REVERSIBLE GARMENTS, *W. E. Gedge.*—22*nd March*, 1881.—(*A communication from S. Rosenthal.*) 6*d.*

This relates to reversible garments of cloth having a different pattern on its face, either being adapted to be worn outside, and it consists in a garment of this class arranged to be turned inside out and to fold when turned on its edges.

1397. COMPOUND FIELD ROLLERS, *R. Maynard, jun.*—30*th March*, 1881. 6*d.*

This consists of a series of alternate rings formed

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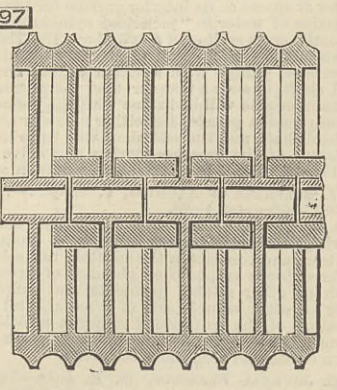


with elongated projecting bosses which carry the adjoining rings, one on each side.

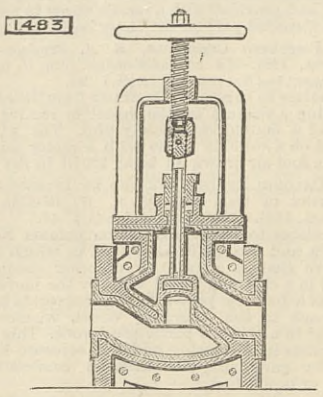
1319. SUSPENDING, FIXING, AND ADJUSTING SWING LOOKING GLASSES, &c., *G. Keey.*—24*th March*, 1881. 6*d.*

The part fixed to the frame of the glass is in two

parts, one consisting of an oblong plate screwed to the frame, and having at the middle near one edge a hollow half-cone with an internal flange at the outer narrow end, leaving a nearly semicircular hole at this end. The part of the fixing plate in front of the half cone is cut away, the side being dovetailed, and forming a seat to receive a plate carrying a half-hollow cone similar to that of the fixing plate. By sliding one half-cone the two can be approached or separated. The two half-cones are screw-threaded, and over them fits a screwed ring, by which they can be made to bind on the spindle of the pillar.

1483. Cocks, Valves, &c., for Use with Acids, *J. Ingleby.—5th April*, 1881.—(*A communication from R. Meyer.*) 6*d.*

This consists in providing cocks, valves, valve boxes, receptacles, or conduits with a lining of non-corrodible material by making the casing of two or



more parts, and of larger internal size than required, and after introducing therein a core of such a size as to leave a space at all points between it and the interior of the casing, running into such space the non-corrosible material required for forming the lining.

1761. Steam Cooking Vessels, *M. von Zyka-Radvanszky, G. Liedman, and F. W. Sharratt.—23rd April*, 1881. 6*d.*

The apparatus consists of an outer and an inner vessel, the former to be filled with water, so as to reach above a grid in the same, on which vegetables may be placed, meat being placed in the inner vessel.

1781. Castors, *A. Bell.—25th April*, 1881. 4*d.*

The part to be fixed to the leg of the piece of furniture has a central pin projecting downwards, and terminating in a conical point to fit a corresponding socket in the centre of the swivelling forked brackets or horns, the two being secured together by a pin passing through the socket, and entering a groove round the pin.

2179. Production of Meta-oxy-benzaldehyde, &c., *J. A. Dixon.—18th May*, 1881.—(*A communication from Dr. K. Koenig*) 4*d.*

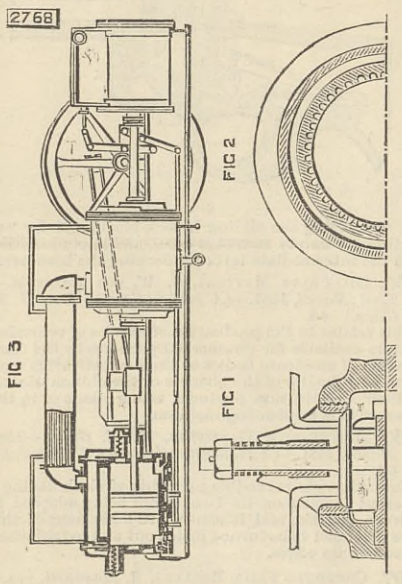
This relates partly to the production of meta-oxy-benzaldehyde from meta-nitro-benzaldehyde by reduction of the same to amido-benzaldehyde, and decomposition of the diazo compounds or derivatives of this amido-benzaldehyde with water.

2328. Moulding Human and other Figures from Paper-pulp, &c., *F. F. Bastier.—27th May*, 1881.—(*Complete.*) 6*d.*

This consists in a method of mechanically moulding paper-pulp or pasty or other matters.

2768. Engines for Compressing Air, &c., *W. R. Lake.—24th June*, 1881.—(*A communication from E. Hill.*)—(*Complete.*) 6*d.*

The First part relates to improvements in the inlet valves for air compressors, in which disc or puppet valves are used for inlet valves to the inlet cylinder, and comprises the formation of a recess in the inner face of the head of the cylinder of sufficient size and depth to receive the valve at its greatest "throw" or "lift," and the placing of a guard plate or shield over the said space, the inner face of which plate may be flush with the inner face of the head, so that the valve may not be drawn into the cylinder if its stem should be broken or it becomes detached from any other cause. Fig. 1 is a section of a portion of a cylinder head and of the valve seat and guide, the valve being



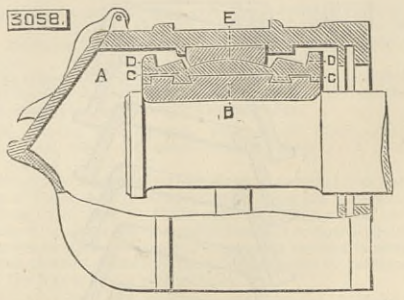
shown in elevation. The Second part comprises the formation of the cylinder proper with the required cavities or spaces on its interior surface for the desired circulation of water in "jacketted cylinders." Fig. 2 is a partial cross section of a cylinder. The Third part comprises the combination of two or more air or gas compression pumps with a steam engine and a fly-wheel shaft, in such a manner that the piston rod of the steam engine will be in line with the piston rod of the compression pumps, and either below or above the fly-wheel shaft, and the said shaft will be in line with the centre of the crosshead wrists that drive the fly-wheel shaft. Fig. 3 is an elevation partly in section.

2997. Sulphate of Alumina, *C. Semper.—7th July*, 1881.—(*Complete.*) 2*d.*

The object is to produce from ferruginous aluminous material, such as bauxite, a sulphate of alumina free from iron, and consists in the addition to a solution of the ferruginous sulphate of alumina of prussiate of potash or other soluble prussiate and sulphate of copper or other soluble salt of a metal, and in the separation of the sulphate of alumina solution from the precipitates by suitable means, and in the concentration of the said aluminous solutions.

3058. Journal Bearings, *W. R. Lake.—12th July*, 1881.—(*A communication from J. R. Baker.*)—(*Complete.*) 6*d.*

The bearing brass A is formed with a convex bearing surface B in the centre of the upper side. Surrounding it is a curb C concentric with the bearing surface, and extending from the front and rear sides of this curb are curbed and angular surfaces terminating in semicircular curbs D near the ends of brass A and concentric with curbs C. On the outer sides of the



brass midway between its ends bearings are formed. The under surface of the brass is lined with an anti-friction metal as usual. To the brass A is fitted a steel disc E, the underside of which fits the bearing surface B.

3086. Hammocks, &c., *A. M. Clark.—14th July*, 1881. —(*A communication from V. P. Travers.*)—(*Complete.*) 6*d.*

The hammock is constructed of longitudinal cords that converge at the ends, and of cross bands having tubular passages, through which the cords are drawn.

3137. Lactic Acid and Lactates, *H. J. Haddan.—19th July*, 1881.—(*A communication from C. E. Avery.*)—(*Complete.*) 2*d.*

This consists in the method of manufacturing lactic acid and lactates by the fermentation of a sugar of vegetable origin with a lactic ferment, in the presence of nitrogenous matters chiefly of vegetable origin, and of a substance suitable to gradually neutralise the acid as fast as formed.

3160. Looms, *H. J. Haddan.—20th July*, 1881.—(*A communication from L. J. Knowles.*)—(*Complete.*) 6*d.*

This consists, First, in the combination of a convertible or fast and loose driving pulley with a brake wheel and brake, the interval mechanism of the driving pulley for converting it from a fast pulley to a loose pulley being under the direct control of the brake by means of a rigid projection therefrom; Secondly, in the combination of a convertible or fast or loose driving pulley and brake wheel and brake with an ordinary loose pulley and a belt-shifting mechanism, in such manner that when the loom has been stopped by the brake and brake wheel and the conversion of the driving pulley into a loose pulley, the belt may be shifted to the pulley which is constantly loose, thereby allowing the loom to be started again in the ordinary way.

3182. Boiler Furnaces, *P. F. Dundon.—21st July*, 1881.—(*Complete.*) 6*d.*

This consists principally in the method of securing the frame or mud ring which forms the floor or bottom of the water space between the walls surrounding the fire-box, known as the water-leg, whereby the said floor may be easily removed for the purpose of clearing the water space, or repairing.

5061. Effecting the Admixture of Liquids, *W. Bradford.—4th December*, 1880.—(*Not proceeded with.*) 2*d.*

This relates more particularly to the apparatus for effecting the admixture of the lighter with the heavier worts in the process of brewing, and consists of a tube to lead the lighter portions to and distribute it through the lower portion of the heavier liquid.

5282. Preparation of Vanilline, *G. de Laire.—16th December*, 1880. 4*d.*

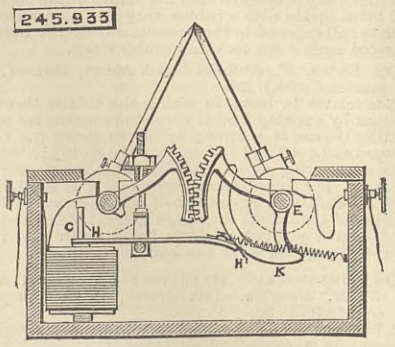
This consists in the process for producing vanilline from eugenol.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

245,933. Apparatus for Electric Lighting, *Joseph Best, Montreal, Quebec, Canada.—Filed March 9th*, 1881.

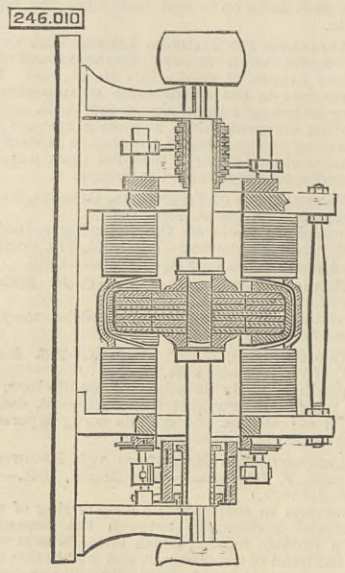
Claim.—(1) In an apparatus for electrical lighting, the carbons and horizontal rock-shafts provided with the geared sectors, in combination with a friction-sector mounted on one of said rock-shafts, and with means for actuating it, substantially as shown and described. (2) The combination of the electro-magnet,



the armature lever H, provided with flexible insulating piece H^1, the support M^1, and shaft E, provided with friction-sector K, all substantially as described and for the purpose set forth. (3) In combination, the electro-magnet C, armature lever H, provided with the insulated piece H^1, and with a retractile spring support M^1, having means for its adjustment, as described, and the shaft E, provided with a friction-sector K.

246,010. Magneto-electric Machine, *Otto Heikel, Jersey City, N.J., assignor to the National Electric Light and Power Company, New York, N.Y.—Filed November 14th*, 1878.—*Patented in France September 15th*, 1877.

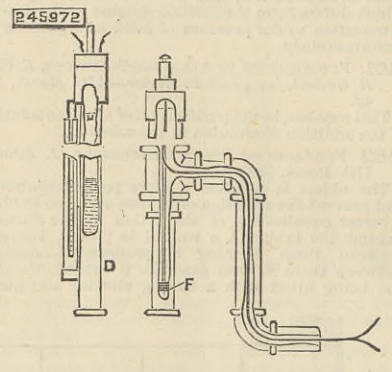
Claim.—(1) In a magneto-electric machine, one or more ranges of armature helices connected in one or more closed circuits within the machine, and circuit connections passing from the respective helices to an electric light or other device to be operated by electricity, and returning to the machine through one or more common conductors, substantially as set forth. (2) The armature or electro-magnet cores in a magneto-electric machine, projecting at each side of a disc or central support, in combination with the helix-wires wound across the central support and at the sides of the cores and around the ends, substantially as set forth. (3) The combination, in a magneto-electric machine, of a range of cores and helices connected together in a closed circuit, insulated rings upon the revolving shaft, connections from the rings to the respective helices, a circuit spring, and separate circuit connections to each ring, return circuit connections, a commutator for the return circuit connections, and a field-of-force magnet in the circuit from the commutator, substantially as set forth. (4) In an electric system adapted to numerous lights or other devices operated by electricity, a dynamo-electric generator having an armature with two or more helices or sections, collecting springs, and circuit connections, substantially as specified, whereby the current passes in both directions from the springs,



through the working devices, and then through the helices of the field-magnets, substantially as specified.

245,972. Mercury Terminal for Telegraph Cables, *William R. Patterson, Chicago, Ill., assignor to the Western Electric Manufacturing Company, same place.—Filed April 1st*, 1881.

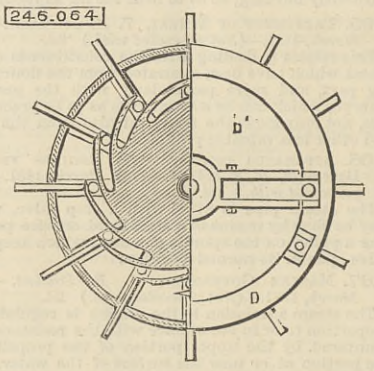
Claim.—(1) The terminal consisting of a U-shaped pipe in combination with mercury, through which one or more conductors are run, substantially as and for the purpose specified. (2) The terminal consisting of



U-shaped pipe and mercury in said pipe, in combination with a rubber plug, one or more electric conductors and hollow pins, one for each conductor, and binding-posts, one for each hollow pin, substantially as and for the purpose specified. (3) The terminal consisting of pipe D, wires E, and mercury F, in combination with a cable, substantially as and for the purpose specified.

246,064. Traction Wheel, *Chauncey B. Bostwick, Pittsburg, Pa.—Filed May 2nd*, 1881.

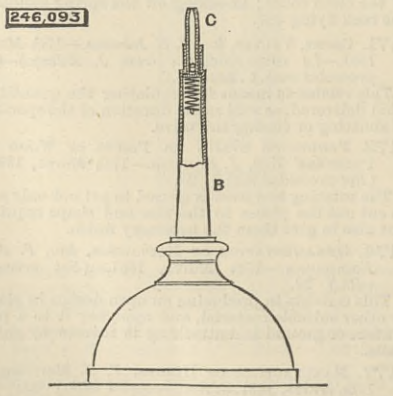
Claim.—(1) In combination with the shell D, provided with slots at its periphery, and with radial ways on its interior, the plates adapted to move in said ways, and provided with friction rollers, and the plate D^1, provided with spiral grooves on its interior, in which the friction rollers set, the whole constructed



and arranged to operate substantially as specified. (2) In combination with the shell D, plates, and friction rollers, the face-plate D, provided with spiral grooves, and the parallel ribs on the outer surface of said face-plate, the pivotted bar housed between said ribs, and the lugs on the shell, all adapted to operate substantially in the manner specified.

246,093. Oil-can Tip, *Nicholas B. Dennys, Singapore Straits Settlements, British India.—Filed July 5th*, 1881.

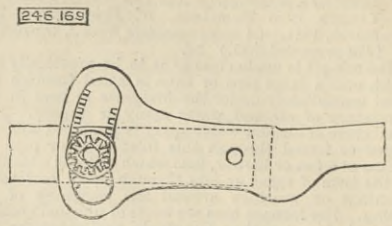
Claim.—The combination, with the tube B, provided with a shoulder at its outer end and a cross pin below



said shoulder, of the tip C, provided with a flanged cap and orifices, and the spring fitted in the tube between the lower end of the said tube and the pin, substantially as and for the purpose set forth.

246,169. Plough Standard, *Frank B. Manby, Malta, Ohio.—Filed May 14th*, 1881.

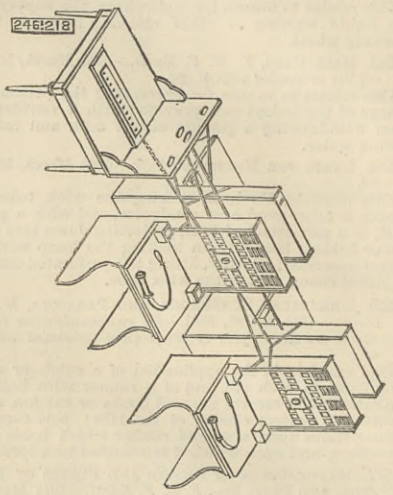
Claim.—(1) In combination with a plough beam and standard pivotted together, the rack and pinion device, for adjustment substantially as specified. (2)



The rack branch or branches of the standard, in combination with a clamp bolt and nut, and the pinions respectively connected with the head and threaded end of said clamp-bolt, substantially as described.

246,218. Telephone Central Office Apparatus, *William H. Sawyer, Providence, R.I.—Filed June 21st*, 1881.

Brief.—Communication between different switch



boards at a central office is effected by means of balls, upon which the required information is written, the balls being then conveyed to the desired table through a tube.

CONTENTS.

The Engineer, October 21st, 1881.

Coal in America.—The officials at Washington report that 5,528,970 acres of coal lands are owned by the United States in the Western Territories. About 50 per cent. is located in Utah, and 20 per cent. in Colorado. These lands can be secured under the pre-emption laws at a rate of 20 dols. per acre after complying with certain legal conditions, in tracts not exceeding 160 acres.

South Kensington Museum.—Visitors during the week ending Oct. 15th, 1881:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 12,091; mercantile marine, building materials, and other collections, 3392. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 4 p.m., Museum, 1565; mercantile marine, building materials, and other collections, 601. Total, 17,649. Average of corresponding week in former years, 16,890. Total from the opening of the Museum, 20,430,629.